14th annual Congress of the

EUROPEAN COLLEGE OF SPORT SCIENCE

Oslo/Norway, June 24-27, 2009

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Loland, S., Bø, K., Fasting, K., Hallén, J., Ommundsen, Y., Roberts, G., Tsolakidis, E.

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Welcome

On behalf of The European College of Sport Science (ECSS) and the Norwegian School of Sport Sciences (NSSS), I am delighted to welcome you to Oslo for the 14th annual ECSS Congress.

The Congress theme is 'Sport Sciences: Nature, Nurture and Culture'. Sport is a complex phenomenon that includes most dimensions of human life. The complete study of human activity in sport must build on a diversity of scientific approaches. The 14th Annual Congress programme feature theoretical, applied and cross-diosciplinary sport studies as well as research findings based on the natural, behavioural, social and human scientific disciplines.

The scientific programme is composed of more than 1.400 abstracts which were accepted after careful review by the scientific committee of the ECSS and the local scientific committee of the NSSS. The strong interest in this year's Congress underlines the growth and increasing significance of the ECSS as an interdisciplinary forum for ongoing debate. The presented abstracts comprise not only all relevant sport science subdisciplines and themes but also all continents and 79 different nations. The abstracts are distributed among four Plenary Sessions, 36 Invited Symposia, 74 Oral Sessions, and four Poster Sessions with more than 870 posters.

Oslo is the capital of Norway and is situated at the head of Oslo fjord surrounded by forested ridges. The city is unique, a city surrounding a sea inlet with mountains as a backdrop. Apart from the scientific programme features, I encourage you to enjoy Oslo and take advantage of our social programme with various sight seeing options, exercise and training possibilities and a closing banquet in the beautiful natural surroundings of the NSSS.

On behalf of the ECSS and the Oslo team I wish you all a pleasant and productive stay in Oslo!

Sigmund Loland

Congress President

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Wednesday, June 24th, 2009

13:00 - 14:00

Poster presentations

PP-PH03 Physiology 3

THE EFFECT OF EXHAUSTIVE EXERCISE ON IGA AND TNF A

NAMENI, F., GAIENII, A.A.

AZAD ISLAMIK UNIVERSITY , VARAMIN

Introduction: In vivo depletion of lymphocyte subsets allows investigation of the role of specific subsets in protective immunity. Immune cells are potent intracellular that regulate inflammation and immune response . The others have shown that exercise causes changes in specific types of immune components .The changes depend on duration and intensity of exercise . This study examined the effect of exhausting exercise on the IgA and TNFα .

Method: 20 recreational active women , volunteered for this study . Who were normal healthy , with no positive clinical finding . After having the procedures fully explained to them written information consent . Height (162.81±3.982 cm) ,weight (56.11± 5.79 kg) , BMI (21.74± 1.99 kg/h2) , and body fat (23.12±.57 %) of them measured , later subjects performed exhaustive exercise . Protocol exercise was an incremental treadmill(Bruce protocol) . Blood sampling were obtained before and after exercise and were drawn from an anticubital vein with subjects in the seated position . Paired t -test were used to determine before versus after exercise differences , α was set at 0/05. Data are presented as mean ± ME of the mean .

Results: The concentration of IgA increased and were significant , but TNFα concentration ,not changed (P ≤ 0 / 05).

Discussion: The effect of exhaustive exercise on subjects was significant that may be transient and related with intensity and duration. The results suggest that the exhaustive exercise induced changes in lymphocyte subsets but may not induced suppression immune function .

References

Gleesen , M., (2007), J. Appl. Physiol., doi: 10. 1152.

Pedersen, B.K., Toft, A.D., (2000), Br. J. Sports Med., 34:246-251.

Shaukat , A., Ullah, F., Jan, R., (2003), J. Ayub. Med. Coll Abbottabad, 15(1).

Woods, J. A., (2005), Brain, Behavior,Immunity, 19 ,369-370.

THE ALTERATION OF SOME IMMUNE SYSTEM FACTORS AFTER SIXTEEN SESSIONS OF PHYSICAL EXERCISE

POURVAGHAR, M.J., SHAHSAVAR, A.R.

1. UNIVERSITY OF KASHAN, 2. ISLAMI AZAD UNIVERSITY OF TEHRAN GHARB

The aim of this research was to examine the effects of regular running during 16 sessions on alteration in serum immunoglobulins including IgA, IgG and IgM. To this end, 12 male students participated in this semi-experimental research. The obtained average and standard deviations of factors such as age, height, weight and body mass index (BMI) are as follows: (22.1 ± 1.60), (175.2 ± 3.55), (70.51 ± 3.6) and (22.4 ± 2.1). The subjects were trained according to a running plan with a certain heart rate during 16 sessions. To determine the amount of serum immunoglobulins, the participants' blood samples were taken once before the first running session and a second time the day after the last training session. Also, a 12-minute running-walking test was performed to determine the Maximal Oxygen Consumption (VO2 Max).

In this study, the mean of the subjects' exercise time was 18.30 minutes and it seems that this time can not affect the immune system and its function. Also, the time allocated to training regarding the response from serum immunoglobulins is a determining factor in a way that the concentration alteration of serum immunoglobulins after 2 hours of pedaling was measured in an article. Another issue is the frequency of exercise sessions per week. The researches leading to a change in immunoglobulins result from more exercise sessions per week and even during one competition season.

References

1.Karacabey K, Saygin O, Ozmerdivenli R, Zorba E, Godekmerdan A, Bulut V. (2005) The effects of exercise on the immune system and stress hormones in sportswomen. Neuro Endocrinol Lett. 26(4):361-6.

2.MacKinnon LT, Jenkins DG, (1993) Decreased salivary immunoglobulins after intense interval exercise before and after training. Med Sci Sports Exerc. 25(6):678-83.

LYMPHOCYTES APOPTOSIS INDUCED BY MARATHON RACE IN ATHLETES

CURY-BOAVENTURA, M.F., ALVES, S.R., MARQUES, C.C., CONEGLIAN, V.S., LEVADA-PIRES, A.C., PITHON-CURI, T.C., CURI, R.

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Introduction: Physiological Stress induced by marathon race is able to promote transient changes on immune function. Post-exhaustive exercise of immunosuppression is characterized by a decrease in number of leukocytes, suppression of natural killer (NK) cell activity, and lymphocyte proliferation. Recent studies have been suggested that the role of leukocyte death on immunossupression is induced by exercise. Objective: Lymphocyte function and death, after a race was investigated. Methods: Nine athletes (training 170 + 15 km/wk, body fat, 6,5 + 1,7 %, race time 2h 46 + 11 min; IMC: 21,5 + 0,4) and eight non-athletes volunteers were recruited. Athletes blood samples were collected (3-7 days before, on rest) and immediately after the marathon race (42,195 km, Curitiba, Brazil). Non-athlete's blood samples were collected on rest periods. Lymphocytes were isolated by density gradient, using Histopaque-1077 and studied immediately after

isolation, or after 18h ConA stimulation. The following determinations were carried out: lymphocyte proliferation, parameters of lymphocyte death (viability, DNA fragmentation, phosphatidylserine externalization, mitochondrial depolarization) and TNF-alpha, IL-1beta and IL-10 production. Results: Marathon race had no effect on lymphocyte proliferation, viability and mitochondrial membrane polarization, but increased phosphatidylserine externalization (35 %) and reduced by 70 % TNF-alpha, IL-1 beta and IL-10 production, compared with athletes before race and non-athletes volunteers. Conclusion: Marathon race induced lymphocytes death in athletes volunteers predominantly by apoptosis, and reduced pro and anti-inflammatory cytokine production. These facts may contribute to the hypothesis that endurance exercise induce immunosuppression and raise incidence of upper tract respiratory infection in athletes.

CORRELATION BETWEEN SALIVALRY AND SERUM CORTISOL CONCENTRATION AFTER ONE SESSION SEVER ENDURANCE AND RESISTANCE ACTIVITY IN WOMEN

PARIAD, M., HASANLOUI, H., GOLI VARJOEI, M.

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Introduction: Measuring of stroeidal hormone which play an important role in metabolism regulating,specially during physical activities,has been remarkable for the researchers.a good correlation has been reported between amounts of salivarly and serum cortisol in exercise and clinical situation.but the results showed that there are some conflicts between salivarly and serum cortisol correlation.so,if we obtain a significant relation between salivarly and serum cotisol after strength and endurance training,we can obtain a better understanding of the hormone responces to physical activities.therefore,the aim of this study was to investigate the relation between salivary and serum cortisol concentration after resistance and endurance exercise protocol.

Metods: Twenty subjects (23.03±1.5yr,weight 63.88±5.88,height 168.69±6.63 kg)randomly divided into two group.endurance group participate in endurance protocol(Bruce test) and resistance group participate in resistance protocol(3 exercise,5sets×10 repetitions at 70%1RM with 3 min rest between sets).samples of salivary and serum cortisol were collected befor and immediately after both exercise protocol,and were measured using the spetial RADIM kits.data obtained from the assessing of the samples were analyzed using the statistical T-test and Pierson correlation (R). P≤0.05 was considered as the significant level.

Results: The result of this study showed that salivary and serum cortisol concentration increased in two group following both exercise protocol.and the rate of increases in salivary cortisol in both group was more than in serum cortisol concentration.and there is significant correlation between salivary and serum cortisol concentration in both group.

Discussion: We found a significant correlation between saliva and serum cortisol concentration after both exercise protocole,so this would suggest that salivary cortisol concentration might be a more suitable variable for assessing glucocorticoid activity in exercise than serum cortisol concentration,probably being less sensitive to pre-exercise emotional state.

References

Kraemer, RR., Aceredoe. O, Dze walto Wski. D, Kilgore. JL, Kraemer. GR, Gastracane. VD. (1991). Effects of Low Volume Resistive Exercise on Beta Endrophin and Cortisol Concentrations. Int. J. Sports. Med. 17(1):12

Dimitriou, L., Sharp. NCC. Doherty. M. (2002). Circadian Effect on the Acute Responses of Salivary Cortiaol and IgA in Well Trained Swimmers. Br. J. Sports Med. 36(4):260-264.

Jaffre, LG., Benhamou. L, Courteix. D. (2002). Effects of Chronic Intensive Training on Androgenic and Cortisol Profiles in Premerarchal Female Gymnasts. Eur. J. Appl. Physiol. 87(1):85-89

THE EFFECTS OF 2-DAYS REPEATED COMPETITIVE STRESS ON SALIVA IMMUNOGLOBULIN-A RESPONSES IN TRAINED MALE ATHLETES

LAING, S., JACKSON, A.R., DJEDOVIC, N., CARDINALE, M.

OLYMPIC MEDICAL INSTITUTE

A decrease in the salivary concentration of immunoglobulin A (IgA) has been implicated as a possible causal factor in the increased susceptibility of athletes to upper respiratory tract infections (URTI). The aim of this investigation was to determine the effects of two days of competitive biathlon roller-ski racing upon s-IgA concentration and secretion rate, and salivary cortisol and testosterone concentrations. Five male athletes (mean ± SEM; age 25 ± 1 years; height 177 ± 2 cm; body mass 74 ± 2 kg; body fat 10 ± 1 %; VO2max 59 ± 2 ml.kg-1.min-1) volunteered to participate in this study. All athletes were members of the British national team. None of the athletes was taking medications and/or reported symptoms of infections in the 4 weeks prior to the study . On two consecutive days separated by 20 hours, athletes completed 2 biathlon roller ski races consisting or roller skiing and rifle shooting. Race 1 was a 9.3 km SPRINT race characterised by 3 x 3.1 km roller ski loops on an undulating course with 2 x rifle shooting (one lying in a prone position and one from a standing position). Race 2 was a 13 km PURSUIT race characterised by 5 x 2.6 km roller ski loops on an undulating course with 4 x rifle shooting (two lying in a prone position and two from a standing position). During rifle shooting athletes were required to hit five targets positioned at a distance of 50 meters. For every target missed athletes were required to complete a 200 meter penalty loop. Unstimulated whole saliva samples were collected pre- and post- SPRINT and PURSUIT races. Saliva was collected for 3 ± 0.25 minutes by the athlete leaning forward and passively drooling into pre-weighed polypropylene tubes with minimal orofacial movements The s-IgA, cortisol and testosterone concentrations were determined using sandwich-type ELISAs. Saliva IgA secretion rate was determined by multiplying the s-IgA concentration by saliva flow rate. Saliva flow rate increased post-SPRINT ($P < 0.01$) and post-PURSUIT ($P < 0.05$) races. Saliva IgA concentration decreased by 53 % following the SPRINT race ($P < 0.05$) and 47 % following the PURSUIT race. Saliva IgA secretion rate showed a trend to increase following both races however was not significant. Salivary cortisol concentration increased post-SPRINT and post-PURSUIT ($P < 0.01$) races whereas, salivary testosterone decreased post-SPRINT ($P < 0.01$) and increased post-PURSUIT race ($P < 0.05$). There was a strong correlation between salivary cortisol concentration and the percentage race time spent between 90-100 % HRmax (R2 0.71, $P < 0.01$) in the SPRINT race, and there was also a strong correlation between salivary cortisol concentration and the percentage race time spent between 80-89 % HRmax (R2 0.65, $P < 0.05$) in the PURSUIT race. These findings suggest that athletes undertaking repeated intensive competitions over consecutive days do not demonstrate a reduction in saliva flow rate or s-IgA secretion rate., Sympathetic stimulation does not appear to inhibit saliva flow rate and s-IgA output (secretion rate) shortly after the race.

THE EFFECT OF AEROBIC INTERVAL AND MAXIMAL STRENGTH TRAINING ON STROKE VOLUME IN CORONARY ARTERY DISEASE PATIENTS

KARLSEN, T.
NTNU TRONDHEIM

Background: High aerobic intensity endurance training is an effective means for improving peak oxygen uptake and endurance performance in coronary artery disease patients. The purpose of the present investigation was to study the effect of high aerobic intensity interval endurance training and maximal strength training upon peak stroke volume in coronary artery disease patients. Design: Eight coronary artery disease patients (age 61.4 +- 3.7 years) trained 30 interval training sessions with 4 x 4 minutes intervals at 85-95% of peak heart rate while ten coronary artery disease patients (age 66.5 +- 5.5 years) training 24 sessions of maximal horizontal leg press. In the interval training group peak stroke volume increased significantly by 23 % from 94.1 +- 23.0 mL. beat-1 to 115.8 +- 22.4 mL. beat-1 (p less than 0.05) from before to after training. Peak oxygen uptake increased significantly by 17 % from 27.2 +- 4.5 mL. kg-1 . min-1 to 31.8 +- 5.0 mL. kg-1 . min-1 (p less than 0.05) in the same group. No change was observed in peak stroke volume or oxygen uptake from before to after training in the maximal strength training group, despite a 35% improvement in submaximal walking performance. In the endurance training group a trend towards increased resting left ventricle ejection fraction was noted with increase in left ventricle ejection fraction from 62.3  6.5 to 65.4  7.2 % (p=0.06) from before to after training. Conclusion: High aerobic intensity interval training significantly improves peak oxygen uptake and peak stroke volume in coronary artery disease patients. Improved submaximal endurance after maximal strength training does not improve peak stroke volume or peak oxygen uptake in coronary artery disease patients.

GLUCOSE CONTROL WITH MINOR STRESS DURING RESISTANCE EXERCISE IN INDIVIDUALS WITH TYPE 2 DIABETICS

MOREIRA, S.R.
CATHOLIC UNIVERSITY OF BRASILIA

Introduction: Resistance and aerobic exercises has been proposed to treatment and/or control of diabetes (Albright, 2000), but there is a necessity to other investigations among different intensities for the glycaemia of diabetics. Therefore, the aim of this study was compare the effects of resistance exercise (RE) intensity on reducing blood glucose (GLUC) on type-2 diabetes (T2D) and healthy (NT2D) individuals.

Methods: Nine T2D (47.2±12.4 years; GLUC-179.6±70.1 mg.dL-1) and 10 NT2D (50.8±12.0 years; GLUC-80.3±14.9 mg.dL-1) performed: 1) a RE circuit (3 laps of ~25min) composed by Knee Extension, Bench-Press, Leg-Press, Pull-down, Knee Flexion and Seated Row, being 30 repetitions of 23% of one maximal repetition (1RM); 2) The same circuit but 16 reps x 43%1RM; and 3) Control session. Before each session the participants ingested a standard breakfast (285 kcal). Blood lactate (LAC) and GLUC were measured during exercise and at each 15min of the 120min of post-exercise recovery. Heart rate (HR), rate-pressure product (RPP) and rating perceived exertion (RPE) were also measured.

Results: The area under the curve (AUC) evidenced a significant effect of RE on reducing GLUC (mg.dL-1x145min) for 23%1RM (T2D - 12555.8±3268.9; NT2D - 10942.7±955.8) and 43%1RM (T2D - 13432.9±3054.4; NT2D -12156.2±1062.0) vs. Control (T2D - 14576.4±3922.2; NT2D -11498.2±881.9), $p<0.05$ for the intensities and among T2D e NT2D in control. Although that, the 43%1RM was more stressful than 23%1RM session ($p<0.05$) in both groups for LAC (T2D - 542.2±143.5 vs. 432.8±126.2 and NT2D - 615.0±148.7 vs. 479.0±144.1), RPP (T2D - 1691629.7±302358.8 vs. 1582176.0±188382.5 and NT2D - 1625613.3±295464.4 vs. 1506175.6±239996.0) and RPE (T2D - 384.7±64.6 vs. 323.9±62.5 and NT2D - 419.8±56.8 vs. 338.9±23.3).

Discussion: Resistance training for T2D is important for improvement of glycemic control, insulin sensitivity and muscular strength (Gordon, 2009). And one single session can provide transient improvements in glucose capitation. Our findings suggest that resistance exercise sessions performed at light and moderate intensities were effective on reducing blood glucose for T2D, with the 23%1RM session presenting a lower metabolic, hemodynamic and perceptual stresses.

References

Albright A, Franz M, Hornsby G, et al. (2000). Med Sci Sports Exerc 32(7), 1345-1360.

Gordon BA, Benson AC, Bird SR, Fraser SF. (2209). Diabetes Res Clin Pract 83 (2), 157-175.

INTRA-ARTERIAL BLOOD PRESSURE RESPONSE DURING RESISTANCE EXERCISE OF DIFFERENT INTENSITIES IN HYPERTENSIVES TREATED WITH ATENOLOL

FORJAZ, C.L.M., GOMIDES, R.S., SOUZA, D.R., COSTA, L.A.R., ORTEGA, K.C., FERNANDES, J.R.C., TINUCCI, T., MION JR, D.
UNIVERSITY OF SÃO PAULO

Introduction: Dynamic resistance exercise is recommended in association to aerobic exercise for hypertensive patients. Blood pressure increase during this kind of exercise is mainly due to an increase in peripheral vascular resistance; however, an increase in cardiac output might also be involved. This blood pressure increase seems to be exacerbated in non-medicated hypertensives when compared with normotensives. Nevertheless, most of the hypertensives are taking medications, and some of them are receiving β-blockers, which decreases cardiac output by the inhibition of sympathetic-induced increase on heart rate and cardiac contractility. Thus, β-blockers might decrease blood pressure rise during resistance exercise which, to our knowledge, has not been studied yet. Hence, the aim of this study was to verify the effects of the selective β-blocker atenolol on blood pressure increase during dynamic resistance exercise of different intensities.

Methods: Ten essential hypertensives with systolic/diastolic blood pressures under placebo condition maintained between 140 and 160 / 90 and 105 mmHg were recruited. These volunteers were studied after 6 weeks of placebo and atenolol treatment, and they were blinded for the medication used. In each phase, the volunteers executed, in a random order, 3 protocols of knee extension exercise until fatigue: a) 1 set at 100% of 1 repetition maximum (1RM); b) 3 sets at 40% of 1RM; and c) 3 sets at 80% of 1RM. Before, during and after the exercises, intra-arterial radial blood pressure was measured. Data were compared by paired student t-test and by two-way ANOVA for repeated measures. Newman-Keuls post-hoc test was applied when necessary. P≤0.05 was considered as significant.

Results: Atenolol decreased the absolute value achieved by systolic blood pressure during the exercise performed at the 3 intensities (maximum values: 100% = 186±4 vs. 215±7, 80%= 224±7 vs. 247±9 and 40% = 223±7 vs. 252±16, mmHg, P≤0.05). Moreover, atenolol also reduced systolic blood pressure increase in the first set of exercise at the 3 intensities (100% = +38±5 vs. +54±9; 80% = +68±11 vs. +84±13 and 40% = +69±7 vs. +84±14, mmHg, P≤0.05). In regard to diastolic blood pressure, atenolol decreased its

absolute values and its increase during exercise performed at 100% of 1RM (126±6 vs. 145±6 and +41±6 vs. +52±6, mmHg, P≤0.05), but it did not change diastolic blood pressure response at the other exercise intensities.

Conclusion:

Atenolol therapy was effective in reducing both systolic blood pressure absolute values and increase during resistance exercise of different intensities in hypertensive subjects; given them some cardiovascular protection. This result supports the hypothesis that cardiac output increase is important for blood pressure enhancement during this kind of exercise.

Financial support: FAPESP

EFFECTS OF SHORT-TERM BODY-WEIGHT SUPPORTED TREADMILL TRAINING AND HEAD-UP TILT TRAINING ON HEART RATE DYNAMICS IN INDIVIDUALS WITH SPINAL CORD INJURY

MILLAR, P., RAKOBOWCHUK, M., ADAMS, M., HICKS, A., MCCARTNEY, N., MACDONALD, M.

MCMASTER UNIVERSITY

Increased risk of cardiovascular disease and autonomic disregulation are common health concerns in individuals with spinal cord injury (SCI) (Krassioukov and Claydon, 2006). Body-weight supported treadmill training (BWSTT) and head-up tilt training (HUTT) are two interventions that may help improve cardiovascular control in individuals with SCI. BWSTT has been shown to improve linear heart rate variability after 6 months of training in participants with SCI (Ditor et al., 2005), however, the effects of short-term training remain unknown. The purpose of this study was to compare the effects of short-term BWSTT and HUTT on neurocardiac regulation in SCI. Seven participants (6♂, 37.1 ± 7.7 yrs [mean ± SEM]) with SCI (lesion level: C5-T10, ASIA score: A-C; 5.0 ± 4.4 yrs post-injury) completed 4 wks of thrice-weekly BWSTT and HUTT (i.e. 12 sessions each), applied in a randomized, cross-over design, and separated by a 4 wk detraining period. Cardiac autonomic modulation was indirectly assessed at rest, before and after, each 4 wk training period using linear heart rate variability and non-linear (sample entropy and detrended fluctuation analysis (α1)) measures of heart rate dynamics. Participants completed equal amounts of BWSTT and HUTT (453.7 ± 27.3 min vs. 471.6 ± 19.7 min, p=0.24). There were no significant changes in any time or frequency indices of linear heart rate variability following either BWSTT or HUTT (p>0.05). A significant interaction effect (group x time) was detected for sample entropy as values increased following BWSTT (1.05 ± 0.14 to 1.57 ± 0.13, p<0.05) but not HUTT (1.36 ± 0.11 to 1.37 ± 0.17, p>0.05). The short-term scaling exponent (α1) exhibited a significant main effect for time (1.32 ± 0.10 to 1.17 ± 0.09, p=0.02), demonstrating an overall reduction following all training interventions. Due to the potential bidirectional responses of α1 we calculated a distance score from the value 1, which reflects healthy heart rate dynamics (Heffernan et al., 2008), defined as│1 – α1│. Following this calculation, a significant interaction effect was detected as BWSTT reduced the distance score (0.54 ± 0.06 to 0.26 ± 0.05, p=0.001), while no change was found after HUTT (0.36 ± 0.08 to 0.39 ± 0.09, p>0.05). In conclusion, 4 wks of BWSTT are sufficient to improve sample entropy and α1, but not traditional measures of linear heart rate variability. These improvements may reflect improved cardiac vagal modulation following short-term BWSTT. Further investigation is required to detail the potential effects of dynamic and passive training interventions on modulating non-linear heart rate dynamics in patients with SCI.

Ditor DS, Kamath MV, MacDonald MJ, Bugaresti J, McCartney N, Hicks AL (2005). J Appl Physiol 98, 1519-1525.

Heffernan KS, Sosnoff JJ, Fahs CA, Shinsako KK, Jae SY, Fernhall B. (2008). J Appl Physiol 105, 109-113.

Krassioukov AV, Claydon VE (2006). Prog Brain Res 152, 223–229.

13:00 - 14:00

Poster presentations

PP-PH04 Physiology 4

DECREASE IN HEART RATE AFTER LONGITUDINAL PARTICIPATION IN THE GRONINGEN ACTIVE LIVING MODEL (GALM) RECREATIONAL SPORTS PROGRAM

DE JONG, J.

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Objective: To investigate changes in heart rate during submaximal exercise as an index of cardiovascular function in older adults participating in the GALM recreational sports program who were sedentary or underactive at baseline.

Methods: A repeated measurement design was conducted; 151 participants were included, providing 398 heart rate files over a period of 18 months of GALM. Multilevel analyses were conducted; growth and final models containing a time variable and the covariates of sex, BMI, energy expenditure for recreational sports activities (EErecsport) and leisure-time physical activities (EEltpa) were developed.

Results: Significant decreases in mean heart rate over time appeared for all walking speeds. The covariates of sex and BMI were significantly related to mean heart rate at each walking speed, except for BMI at 7 km/h. No significant relations between EErecsport, EEltpa and mean heart rate occurred, except for EEltpa at 7 km/h. From baseline to T4, decreases in predicted mean heart rate were 5.5, 6.0, 10.0 and

9.0 beats/min at 4-, 5-, 6- and 7 km/h walking speeds; relative decreases ranged from 5.1 to 7.4%.

Conclusions: Significant decreases found in heart rate during submaximal exercise reflected a potential increase in cardiovascular function after 18 months of participation in GALM.

EFFECT OF VIGOROUS PHYSICAL ACTIVITY ON ARTERIAL STIFFNESS IN HIGH SCHOOL BOYS

MIURA, H.

LABORATORY FOR APPLIED PHYSIOLOGY

Introduction: Recently, the occurrence of life style-related such as hypertension, atherosclerosis, obesity, and hyperlipemia is increasing in young and old men. One of the reasons for this is lack of physical activity. Physical activity may play a pathophysiological role in the

development of atherosclerosis. Previous research reported that habitual exercise reduced arterial function in middle- to older aged men (Tanaka et al. 2000). However, few attempts have so far been made to identify the role of physical activity in arterial function on younger populations. Therefore, we tried to evaluate the influence of physical activity on arterial stiffness estimated by pulse wave velocity in high school students.

Methods: We studied 183 healthy high school boys aged 15 to 18 years (Height: 169.9±6.3cm; Weight: 63.1±10.2kg; %body fat: 14.6±5.8%). Subjects were divided into two groups: 83 were in the active group who participated in sports or athletic clubs in addition to physical education class and 100 were in the control group who were sedentary. The brachial systolic and diastolic blood pressure (SBP, DBP), and brachial to ankle pulse wave velocity (baPWV) were measured using a volume-plethymographic apparatus while in the supine position. In order to estimate the energy expenditure (EEA) during walking, moderate, and vigorous activities, the International Physical Activity Questionnaire with short format was adopted.

Results: In the active group, EEA during moderate and vigorous activities as well as the baPWV significantly differed from those in the control group (moderate-EEA: 87.3±94.1 vs. 37.5±38.2kcal/day; vigorous-EEA; 753.9±725.4 vs. 33.4±113.7kcal/day; baPWV: 1072.7±133.5 vs. 1150.6±162.7cm/sec, respectively). However, no significant differences of walking-EEA, of SBP, or of DBP were found between the active and control groups (walking-EEA: 5.4±9.5 vs. 8.9±13.9kcal/day; SBP: 124.7±10.2 vs. 124.7±10.1mmHg; DBP: 66.8±7.5 vs. 67.9±7.7mmHg, respectively). No significant correlation was found between all EEA and blood pressures. baPWV was significantly correlated to EEA during vigorous activity ($r=-0.27$, $p<0.05$).

Discussion: Compared with non-active boys, active high school boys have slower baPWV without any changes in blood pressure. Regular exercise increases the production of nitric oxide more and decreases endotheline-1 less (Maeda et al. 2001). The present results imply that these suggested effects are produced by greater physical activity. The level of physical activity influenced on arterial function in teenagers, which is agreement with previous results in middle- to older aged men (Seals 2003). From these results, spending more time performing vigorous physical activity has a favorable effect on arterial stiffness in teenagers as well as the elderly.

References

Maeda S et al. (2001), Life Sci, 69, 1005-1016.

Seals DR. (2003), Exerc Sport Sci Rev, 31, 68-72.

Tanaka H et al. (2000), Circulation, 102, 1270-1275.

VALIDITY OF A WRIST-WORN ACCELEROMETER IN CHILDREN

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Introduction: Regular physical activity is a behaviour related to several positive health outcomes in children (Steele, RM, et al). However, the detailed relationships between activity and health outcomes have been hampered due to imprecise methodology, where intensity, type, frequency and duration of physical activity have been difficult to quantify. Furthermore, methodological shortcomings may have contributed to reduced contrast between physically "active" and "inactive" individuals and consequently an underestimation of the risks of physical inactivity. The aim of the present study was to assess the validity of a wrist worn accelerometer (Actiwatch) for estimating energy expenditure during various free-living activities and to determine cut-off values for light, moderate and vigorous intensity.

Methods: Twenty-two normal weight children (mean age [SD] 8.8 [0.9] years) performed eight different activities of different intensities. Energy expenditure was assessed using indirect caloriometry (Douglas bag technique) during these activities. Additionally, resting metabolic rate was measured at a separate occasion. Actiwatch motion sensors (Cambridge Neurotechnology Ltd Papworth, UK) were worn on the wrist of the non-dominant arm. Epoch length was set to 15 s.

Results: The equation for total energy expenditure (cal x min-1 x kg-1) was found to be 34. 44 + 0.22 x counts x 15s-1 and for activity energy expenditure 5,35 + 0,22 x counts x 15s-1. Accelerometer output explained 83% (95% CI; 0.77 to 0.89) and 86% (95% CI: 0,81 to 0,91), of the variance in total energy expenditure and activity energy expenditure, respectively. The explained variances were generally higher for prediction of activity intensity (METs) than energy expenditure (EE or AEE). Cut-off limits (95% CI) for inactivity (1.5 METs) , moderate intensity (3 METs) and vigorous intensity (6 METs) respectively was found to be 83 counts x 15s-1 (75 to 91), 251 counts x 15s-1 (226 to 274) and 584 counts x 15s-1 (531 to 637), respectively. Gender, age, resting energy expenditure and anthropometric variables increased precision only marginally.

Discussion: The present study indicates that a motion sensor, worn on the wrist of the non-dominant arm, appears to be valid for estimating energy expenditure and physical activity intensity in children aged 8 to 10 yrs. The proposed cut-off limits may be used to record time spent in physical activity of different intensities. Other measures of physical activity, such as self-reported data or direct observation, are generally less valid in children (Welk GJ et al), possibly due to the intermittent nature of their movement. Additionally, the placement on the wrist is comfortable and makes it possible to wear the monitor continuously for several days, without taking it off.

References

Steele RM, Brage S, Corder K, Wareham NJ, Ekelund U (2008) J Appl Physiol. 105(1):342-51.

Welk GJ, Corbin CB, Dale D. (2000) Res Q Exerc Sport. 71(2 Suppl):S59-73.

HABITUAL RESISTANCE TRAINING IN MEN ASSOCIATES WITH GREATER FOREARM VENOUS COMPLIANCE

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BACKGROUND and PURPOSE: Venous compliance of the extremities is a major determinant of the amount of blood that may be translocated to the central region, because small changes in peripheral blood volume can greatly impact cardiac filling pressure and subsequently cardiac output. It is reported that the venous compliance is reduced with age in sedentary and endurance-trained men, but compliance is greater preserved in endurance trained-men. Aerobic exercise as well as resistance exercise has become a popular modality of exercise performed by most populations, and has become an integral component of exercise recommendations endorsed by a number of national health organizations. It remains unclear, however, whether habitual resistance training affects venous compliance. The purpose of the present study was to compare the venous compliance in daily resistance-trained men with age-matched control men.

METHODS: Eleven resistance-trained middle-aged men (age, 37.7±1.5 yrs; height, 171.3±1.9 cm; body weight, 75.6±2.2 kg) and thirteen age-matched controls (age, 36.7 ± 1.6 yrs; height, 171.6±1.6 cm; body weight, 73.4±1.9 kg) were studied. Resistance-trained men had

been performing resistance training for over10 years. Changes in forearm volume were measured noninvasively using strain-gauge plethysmography at the maximal forearm circumference. Forearm venous compliance was measured in supine subjects by inflating a venous collecting cuff, placed around the upper arm, to 60 mmHg for 8 min and the decreasing cuff pressure at 1 mmHg/s to 0 mmHg. Forearm venous compliance was determined using the first derivative of the pressure-volume relation during cuff pressure reduction (compliance = β1 + 2•β2•cuff pressure).
RESULTS: The leg extension power and the handgrip strength in resistance-trained men were significantly higher than those in control men (2293±155 vs 1693±99 watts, 52.6±1.3 vs 44.3±1.9 kg, respectively; both p<0.05). Systolic blood pressure and mean arterial pressure were significantly higher in resistance-trained men as compared with control peers (132±4 vs 116±3 mmHg, 95±3 vs 85±2 mmHg, respectively; both p<0.05). There were no group differences in maximal oxygen consumption, resting or maximal heart rate, blood glucose, HDL-cholesterol and triglyceride. Forearm venous compliance at 20 mmHg cuff pressure was 16% greater in resistance-trained men as compared with age-matched sedentary controls (0.097±0.005 ml/dl/mmHg vs 0.083±0.004ml/dl/mmHg, p<0.05).
CONCLUSIONS: These results of the present study indicate that performing chronic resistance training may increase venous compliance in middle-aged men, suggesting that greater venous compliance with habitual resistance exercise may have important implications regarding arterial blood pressure regulation during orthostatic stress or during exercise in healthy adult men.

BONE MINERAL DENSITY AND IGF-1 IN 13-15 YEAR OLD FEMALE ATHLETES

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Introduction: It is well known that insulin-like growth factor-1 (IGF-1) is an effective osteoporotic growth factor, which increase dramatically during puberty, augmented by the increasing levels of sex steroids, and positively affects bone turnover by stimulating osteoblasts proliferation and differentiation (Davies et al., 2005). Bone mineralization increases with age, height, and body mass increase throughout childhood, with a significant gain during pubertal development, resulting in an increase of BMD of about 40% during this period (Gordon, 1991). The aim of this cross-sectional study was to evaluate the relationships between BMD and IGF-1 in adolescent female athletes.
Methods
The participants were eighty 13-15 year-old girls comprising three groups: gymnasts (n=23), sprinters (n=24) and controls (n=33). Body height and body mass were measured, and body mass index (BMI) was calculated (kg/m2). BMD at lumbar spine (L2-L4) and femoral neck (FN) were measured by DXA. Morning fasting blood samples were collected for analysis of IGF-1 and IGFBP-3, and IGF-1/IGFBP-3 molar ratio was calculated. For those girls who had menarche, the fasting blood samples were drawn on early follicular phase of the menstrual cycle.
Results: Gymnasts BMD FN was significantly higher than sprinters and controls (1.13 ± 0.15 vs. 1.05 ± 0.09 and 1.01 ± 0.11 g/cm2, respectively). The levels of IGFBP-3 were significantly greater in gymnasts than in sprinters (6.0 ± 0.7 vs. 5.5 ± 0.7 mg/L, respectively). There were significant correlations of IGF-1 and IGF-1/IGFBP-3 molar ratio with BMD FN and L2-L4 (r = 0.39-0.59) in gymnast and control groups, but not in sprinters. After adjusting for age, body height and body mass, the significant correlations between IGF-1 and BMD variables (r = 0.49-0.52) were revealed in gymnast group only. Stepwise multiple regression analysis indicated that BMD FN and L2-L4 were influenced by IGF-1 up to 31.0-34.6 % (R2x100) in gymnasts, and by IGF-1/IGFBP-3 – up to 19-32 % (R2x100) in controls.
Discussion: In our study, no significant differences between the groups were found in respect to IGF-1 levels and IGF-1/IGFBP-3 ratio, but BMD FN was significantly greater in gymnasts. Previously, IGF-1/IGFBP-3 was indicated as the most robust predictor of femoral neck BMD in young adult women with different physical activity patterns (Snow et al., 2000). This corresponds well with our research findings, although the significant relationships of BMD FN and L2-L4 with IGF-1 levels and IGF-1/IGFBP-3 ratio were found in pubertal gymnast and controls, but not in sprinters. We conclude that IGF-1 is strongly correlated with BMD FN and L2-L4 in adolescent gymnasts, but not sprinters.
References
Gordon CL, Halton JM, Atkinson SA (1991) Growth Dev. Aging, 55: 257-262.
Davies JH, Evans BAJ, Gregory JW (2005) Arch Dis Child, 90:373-8.
Snow CM, Rosen CJ, Robinson TL (2000) Med Sci Sports Exerc, 32(11):1902-7.

THE CELLULARITY OF ADIPOCYTE AND SECRETION OF ADIPOCYTOKINES DURING AND AFTER VOLUNTARY WHEEL RUNNING EXERCISE IN HYPERPHAGIC AND OBESE OLETF RATS

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The purpose of this study was to investigate the optimal weight reduction program for the exercise therapy. We tested about the relationships between cellularity of adipocytes and secretion of adipocytokines at the end and 2-day after of voluntary wheel running exercise.
Otsuka Long-Evans Tokushima Fatty (OLETF) rats, an animal model of hyperphagia and obesity, were used in this study (19-week-old at the end of experiment). The rats were randomly assigned to either the 4-week voluntary wheel running exercise (15 to 19-week-old) or control group (Cont). The half numbers of exercising rats were killed at the end of exercise period (Ex-end), and the others were assigned to the 2-day recovery period at which these rats were prohibited from accessing to running wheel (Ex-recov). Throughout the experimental period, all rats were provided with water and standard chow food ad libitum. For the quantification of number and size of adipocyte, adipose tissue were fixed with 10% formalin phosphate buffer, and the sectional cell diameter of adipocyte were analyzed in the hematoxylin and eosin stained preparations. Adipocytokine levels in blood were measured using ELISA kit.
Compared to Cont group, Ex-end group exhibited the remarkable reduction in body weight, abdominal fat pad weight, blood leptin concentration, and size of adipocyte in abdominal fat pads. Compared to Ex-end group, Ex-recov group provided a marked increase in body weight, although there were no changes in weight and size of adipocyte in abdominal fat pads. Unexpectedly, blood leptin concentrations in Ex-recov group were higher than in Ex-end group.
These results suggested that the regulatory mechanism in expression and/or secretion of leptin from adipocyte is different between during and after exercise therapy.

IS SKELETAL MUSCLE LEPTIN SENSITIVITY REDUCED BY BED REST?

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Human obesity is mainly caused by a sedentary life style and is characterised by a high concentration of leptin in plasma associated with leptin and insulin resistance in peripheral tissues, such as skeletal muscle. Skeletal muscle expresses long and short protein isoforms of the leptin receptor. A mechanism that could explain skeletal muscle leptin resistance in obesity is a down-regulation of leptin receptors (OB-Rs) and/or up-regulation of suppressor of cytokine signaling 3 (SOCS3) and protein-tyrosine phosphatase 1B (PTP1B) which are negative regulators of insulin and leptin signaling. Both obesity and bed rest may induce inflammation and according to rodent experiments PTP1B protein expression may be increased by inflammation in skeletal muscle. Therefore, the aim of this study was to test the hypothesis that bed rest causes down- and upregulation of OB-R and SOCS3/PTP1B protein expression, respectively, in human skeletal muscle.

Methods. Deltoid and Vastus Lateralis muscle biopsies were obtained from 12 healthy men before and after one week bed rest performed in eucaloric conditions (mean ± SD, age: 26.2 ± 5.3 years; height: 181.7 ± 6.1 cm; body mass: 75.5 ± 11.2 kg; BMI: 22.8 ± 2.7 kg/m2 and VO2max: 3.9 ± 0.8 L/min). Total protein extracts were prepared from muscle biopsies and OB-R, SOCS3 and PTP1B protein expression was analyzed by Western blot. Serum leptin and soluble isoform of the leptin receptor (sOB-R) concentrations were determined by ELISA before and after bed rest.

Results. Serum leptin concentration was increased by 26% after bed rest compared with before bed rest ($P<0.05$). However, serum s-OBR concentration was unaffected by bed rest ($P=0.6$). Alpha tubulin protein expression, used as a loading control in our immunoblotting assays, was not affected by bed rest in either the deltoid or Vastus Lateralis muscle biopsies (both $P>0.05$ compared with before bed rest). OB-R (short and long isoforms) and SOCS3 protein expression normalized to alpha-tubulin was unchanged after bed rest compared with before bed rest in deltoid and Vastus Lateralis muscles (all $P>0.05$). PTP1B protein expression normalized by alpha-tubulin was unaffected by bed rest in deltoid muscle biopsies ($P>0.05$). However, PTP1B protein content in Vastus Lateralis muscle was 90% higher after bed rest than before bed rest ($P<0.01$).

Conclusions. PTP1B protein expression is markedly increased in human Vastus Lateralis but not in the deltoid muscles after one week of bed rest. Since PTP1B is able to dephosphorylate the insulin receptor and also the Janus Kinase 2 (JAK2) (first step in leptin signalling), it may induce both insulin and leptin resistance. Moreover, our results indicate that one-week bed rest elicits leptin resistance as reflected by the increased basal leptin serum concentration and its free fraction, despite no significant changes in body fat mass.

References. Guerra et al. PLoS ONE 3, e3466 (2008). Guerra et al. J Appl Physiol 102, 1786 (2007).

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IS EXERCISE A LEPTIN SIGNALLING MIMETIC IN HUMAN SKELETAL MUSCLE?

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Leptin plays a crucial role in the regulation of appetite, body fat mass and basal metabolic rate. Upon binding to the long form of its receptor (OB-Rb), leptin stimulates janus kinase 2 (JAK2) and signal transducer and activator of transcription 3 (STAT3) phosphorylation. OB-Rb mediated phosphorylation of STAT3 is required for leptin regulation of energy balance and body weight. In lean, but not in obese human skeletal muscle, leptin is able to stimulate fatty acid oxidation, suggesting triglyceride accumulation and lipotoxicity in obesity could be caused by changes in the leptin signaling cascade. Leptin may down-regulate leptin signaling in the target tissues by inducing the protein suppressor of cytokine signaling 3 (SOCS3), which blunts JAK2/STAT3-dependent leptin signaling and causes leptin resistance in the skeletal muscle. Protein-tyrosine phosphatase 1B (PTP1B) is a negative modulator of leptin and insulin signaling because is able to dephosphorylate JAK2 and the insulin receptor and may explain leptin and insulin resistance in peripheral tissues. Exercise partially prevents muscle leptin resistance in rodents. Therefore, the aim of this study was to study if sprint exercise could be a leptin signalling mimetic in human skeletal muscle.

Methods. Tyr1007/1008-JAK2 and Tyr705-STAT3 phosphorylation level and SOCS3/PTP1B protein expression were determined by western blot in fifteen young healthy men in response to a 30 s sprint exercise (Wingate test). Subjects were randomly distributed into two groups. One group exercised under fasting conditions (n=7, C), and the other ingested 75g of glucose (G) one hour before exercising (n=8).

Results. Tyr1007/1008-JAK2 phosphorylation was unaffected in the control Wingate test (all $P>0.05$ versus rest). In contrast, compared to pre-exercise levels, Tyr1007/1008-JAK2 phosphorylation was increased 120 min after the Wingate test performed following glucose ingestion ($P<0.05$). Compared to pre-exercise conditions, Tyr705-STAT3 phosphorylation was increased 30 min after the sprint exercise ($P<0.05$). Glucose ingestion blunted the increase in Tyr705-STAT3 phosphorylation detected 30 min after the Wingate test. In the glucose group, 2 hours ($P<0.05$) and 4h ($P<0.05$) after the Wingate test Tyr705-STAT3 phosphorylation was increased compared to pre-exercise levels. Compared to pre-exercise conditions, SOCS3 protein expression was increased 120 min after the sprint exercise ($P<0.05$ versus resting). Glucose ingestion blunted SOCS3 protein expression increase 120 min after the Wingate test. The level of PTP1B protein expression was not affected by either glucose ingestion or exercise (all $P>0.05$).

Conclusions. STAT3 phosphorylation level and SOCS3 protein expression is markedly increased 30 and 120 min respectively, after sprint exercise. These responses were blunted by oral glucose ingestion. Our results suggest that sprint exercise performed in fasting conditions is a leptin signalling mimetic in human skeletal muscle.

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13:00 - 14:00

Poster presentations

PP-PH05 Physiology 5

IS AEROBIC ENDURANCE A DETERMINANT OF THE AMPLITUDE OF THE SLOW COMPONENT OF THE V ̇O_2 KINETICS DURING AN EXERCISE OF SEVERE INTENSITY?

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Introduction: It is generally considered that performance in long duration events is mainly determined by maximal oxygen consumption (VO2 max), the energy cost of locomotion and the fractional utilization of VO2 max (also called aerobic endurance). It has been proposed that the amplitude of the slow component of the VO2 kinetics during severe intensity exercise should be added to this model. Since this variable shares many underlying mechanisms with aerobic endurance, we wanted to determine whether these two physiological parameters were independent one to each other.

Methods: Thirty moderately-trained male endurance athletes gave their written informed consent to participate in this study. They completed a maximal continuous graded exercise test (session 1), followed by two randomly ordered constant power tests (sessions 2 and 3), and a constant duration test (session 4). All tests were performed on a bicycle ergometer, Constant power tests were performed at an intensity corresponding to 90 and 100% of peak power output (PPO) measured during session 1. The slope of the relationship between intensity of exercise and the natural logarithm of time to exhaustion was considered as the index of aerobic endurance (IE, unitless), and used afterwards as the criterion measure for aerobic endurance. The slope of the relationship between work and time was considered as the critical power (CP, in W), and used afterwards for intensity determination during session 4. Constant duration test consisted in two bouts of 6 minutes of exercise at an intensity corresponding to 30% of the difference between CP and PPO. Sixty minutes of passive recovery were given between the two bouts of exercise. Oxygen uptake was determined continuously on a breath-by-breath basis during session 4. The signals from both tests were resampled to second by second and ensemble-averaged to produce an average response. A classical bi-exponential model was used to fit this new signal and estimate the amplitude of the slow component.

Results: Once the study completed, participants were ranked according to their IE. The median-third was excluded. The higher third formed the high aerobic endurance group (HEG) and the lower third formed the low aerobic endurance group (LEG). There was no overlap in IE between groups. Mean VO2 peak and IE for HEG and LEG were 4122 ± 511 vs 3911 ± 825 ml.min-1 (NS) and -21.7 ± 3.4 vs -13.9 ± 0.7 ($p < 0.001$), respectively. The amplitude of the VO2 slow component was not different between groups (626 ± 96 vs 536 ± 168 ml, corresponding to 26 ± 3 vs 24 ± 7 % of end exercise VO2, respectively; NS) and was not associated with IE ($r = 0.14$, NS).

Conclusion: Contrarily to our hypothesis, the amplitude of the VO2 slow component was not associated with aerobic endurance. It can therefore be considered as a possible independent predictor of performance in long duration events. Future studies should assess its relative weight when compared with the classical determinants.

A NEW MODEL AND MEANS OF ANALYSIS FOR THE HEART RATE KINETICS IN RESPONSE TO EXERICSE

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Introduction: Mathematical models in the form of a nonlinear dynamical system have recently been developed both for heart rate (Stirling et al, 2008a) and oxygen uptake kinetics (Stirling et al, 2008b, 2005). The point of maximum curvature has been proposed by Stirling and Zakynthinaki, (2008) as a marker for physiological time series. This marker defines the point after which the heart rate no longer continues to rapidly rise and instead follows either a steady state or slow rise (i.e. the slow component). The aim of this study is to apply these methods of analysis and models to examine the way the point of maximum curvature changes with improved fitness resulting from training.

Methods: Beat to beat heart rate data were obtained from an athlete who performed a series of bouts of exercise at different constant intensities. The optimal fit of the heart rate model to the basic response pattern (Zakynthinaki et al, 2007) of the raw un averaged data was obtained used a stochastic optimization algorithm (Zakynthinaki and Stirling, 2007; 2008). The point of maximum curvature was then calculated using the method described in Stirling and Zakynthinaki (2008). The same point is calculated for the same exercise intensity following a period of training which has resulted in speeded kinetics.

Results: It was observed that by calculating the point of maximum curvature, the time and the value of the heart rate at which the heart rate time series changes from a rapidly rising function to either a steady state or slow component was easily detected. The point of maximum curvature was also found to change with speeded kinetics following a period of training.

Discussion: A method based on obtaining the point of maximum curvature was used for determining the time and heart rate (or oxygen uptake) after which a plateau or a slow component in the heart rate (or oxygen uptake) kinetics is achieved. This method was shown to be of much use for understanding the heart rate kinetics in response to constant intensity short duration exercise. We concluded that the point of maximum curvature is a useful tool for understanding speeded heart rate kinetics following training. This method also has many applications in similar problems in oxygen uptake kinetics.

References

Stirling JR and Zakynthinaki MS, (2008) J Nonlin Math Phys 15(sup3), 396-403..

Stirling JR, Zakynthinaki MS, Sampedro J and Refoyo I (2008a) J Nonlin Math Phys. 15(sup3), 426-436.

Stirling JR, Zakynthinaki MS and Billat VL, (2008b) Bul. Math. Biol, 70(5):1348-1370.

Stirling JR, Zakynthinaki MS, Saltin B, (2005) Bul. Math. Biol. 67(5), 989-1015.

Zakynthinaki MS, Stirling JR, (2008). Comp Phys Comm, 179(12), 888-894.

Zakynthinaki MS, Stirling JR, Sillero M, Sampedro J, Refoyo I, Materials Matematics, UAB (2007).

Zakynthinaki MS, Stirling JR, (2007) Comp. Phys. Commun. 176(2), 98-108.

TECHNICAL MODIFICATION OF THE METAMAX II METABOLIC ANALYZER FOR MEASUREMENTS ON FIREFIGHTERS IN THE HEAT

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Background

Fire-fighting is physically very demanding. Testing of firefighters' physical ability is needed, but there is no close agreement between performance on standard laboratory tests and results of simulated rescue operations [1]. This suggests that tests should be carried out on fire-fighting-related activities, which may include tasks in the heat. The Metamax II (Mmx) is a portable metabolic analyzer that allows field testing [2]. This instrument like all electronic instruments does not tolerate heat. Moreover, the Mmx' software requires that both inspired and expired air is passed thru its triple V flow transducer to work properly. When firefighters work at the scene of fire, they are dressed up for smoke diving, inspiring from bottles with pressurised air led to the face mask thru a solid tube. Expired air is released to the surroundings. Consequently, during smoke diving only expired air is available for analysis by the Mmx. Therefore, to measure the oxygen uptake of firefighters during smoke diving by the Mmx, we had to modify the instrument. We here describe our approach.

Principle of operation

The Triple V flow transducer is a turbine-type flow-meter a light-weight fan rotates in proportion to the flow. Two sets of diodes and photocells (flow 1 and flow 2) record each rotation, and the sequence 1–2 or 2–1 distinguishes between inspiration and expiration. Only data for expirations are used for further calculations, but the software requires an inspiration signal between two expirations to work properly.

Methods: An extension to the cable connecting the Triple V to the main unit was cut. The individual wires of the cut ends were mounted on a small circuit board with a Pic 16F 628/20 microprocessor, programmed to pass all signals thru during expiration. After a complete expiration the microprocessor produced an artificial inspiration signal. Noise was removed. The signal in each wire during use was read on an oscilloscope.

Connections to fit the Triple V to the outlet of the Interspiro face mask were made, thus allowing expired air to pass from the mask thru the Triple V. The Mmx II was placed in a dedicated heat-protected box mounted out the subject's back, and tubes as well as the Triple V were heat protected by isolating materials.

Results: With no inspiration signal the software did not work properly, reporting a lung ventilation at least 30% too low. The microprocessor reproduced the square-wave signals even during maximal expirations. During exercise lasting up to 8 min in a heat chamber (t > 120 °C) the temperature in the heat protecting box stayed below 30 °C.

Conclusions

By proper modifications the Mmx II may be used to measure the oxygen uptake of firefighters dressed up for smoke diving even in hot and polluted environments.

References

1. Heimburg, Rasmussen, Medbo. Ergonomics, 2006; 49: 111–126.

2. Medbø, Mamen, Welde, Heimburg, Stokke. Scand J Clin Lab Invest. 2002; 62: 585–598.

EFFECTS OF LOAD CARRIAGE AND POLES USE ON WALKING VELOCITY AT FIELD TRACKS

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INTRODUCTION: The use of the walking poles has increased, however de literature still does not a consensus about their benefits. It as also been reported that the load carriage with poles use, spite of reducing the mechanical load of the lower limb may cause higher fatigue. The purpose of this study was to determine the effects of poles and load carriage on the walking velocity and on rate of perceived exertion (RPE). The velocity was examined for four walking condition: non-poles and non-load (W), with poles and non-load (WP), non-poles and with load (WL), with poles and with load (WLP).

METHODS

Twenty six healthy masculine volunteers walked at a self-selected pace during a pedestrian field track with 821 m long on level terrain (mean±SD, age 23,30 ± 2,69 years; body weight 76,96 ± 12,19 Kg; height 176,25 ± 5,70 cm; body fat percentage 14,69 ± 5,89%). The subjects completed each trail in a randomized order after return to the metabolic rest values between trails. The rest heart rate (HR) and oxygen consumption (VO2) were recorded by a portable telemetric system. Rating of perceived exertion (RPE) was measured at the end of each trial by the modified Borg scale (1-10)[1]. The weight carriage was 25% of the subject's body mass, in a backpack with internal frame, sternum strap, hip belt and load lifters adjusted for each subject as well the telemetric poles.

RESULTS: Significantly differences were not found in RPE for comparisons M vs MP and ML vs MLP. Walking speed shows a significantly decrease (= 0,05, IC 95% 0,01 to 0,1, P 0,05) between M vs MP.

CONCLUSIONS

The results indicate that the use of poles doesn't increase the perceptive demands (RPE). The use of poles at load carriage didn't alter RPE and the walking speed. These results indicate that the use of poles may point as a strategy to reduce perceptions of physical exertion associated to the load carriage.

References

ACSM (2006). Guidelines for Exercise Testing and Prescription. Baltimore: Williams & Wilkins; p.368 - 6th.ed.

Deaton, M., Kolvalcik, P., Saunders, M. (2004). Metabolic responses during Appalachian Trail backpacking with and without trekking poles. American College of Sports Medicine, Indianapolis.

Jacobson, B. H., Wright, T., Dugan, B. (2000). Load carriage energy expenditure with and without hiking poles during inclined walking. International Journal of Sports Medicine, 21(5), 356-359.

Knight, C., Caldwell, G. (2000). Muscular and metabolic cost of uphill backpacking: are hiking poles beneficial? Medicine e Science in Sports e Exercise, 32(12), 2093-2101.

Sklar, J., DeVoe, D., Gotshall, R. (2003). Metabolic effects of using bilateral trekking poles whilst hiking. Journal of Human Movement Studies, 44, 73-185.

HEART RATE, VO2, BLOOD LACTATE, RECTAL TEMPERATURE AND VERTICAL JUMP MEASURED DURING CONTINUOUS AND INTERMITTENT <110% IAT> PROTOCOLS

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INTRODUCTION: Objectives of the study were to analyze the response on VO2 (Vacumed mini-cpx), heart rate, blood lactate concentration, rectal temperature and maximal vertical jump during two intensities of treadmill protocol.

METHODS: Subject

Eleven male were recruited to take part in the study. Selection criteria included male; age 25-44 yr; high aerobic fitness, defined 62.6 (4.2) mL•Kg-1•min.

Protocol

Treadmill speeds were set at 100% (CON) of the individual velocity of the anaerobic, and of the same velocity (INT110), always preceded by 2.69 m•s-1 for 10 min of warm-up at level grade. Speed was kept constant for all remaining stages. During intermittent trials, every 3 min thereafter treadmill was stopped during 2 minutes, while in continuous trial this resting period was every 13 minutes. In both protocols this sequence was until the subject signalled that he had reached exhaustion.

Measures

Anaerobic threshold was determined during a maximal incremental test independently by two experienced individuals who compared their results and reached a consensus. Graphs of VE over time, Ve over •VO2, and/or Ve/•VO2 over •VO2 were used for this determination. This method of determining VT has been shown to be accurate and reliable (3)

The tests were performed at least 2 day apart but no more than 7 days apart

Statistical Analysis

Mean values and standard of deviation (SD) were calculated for all parameters. Comparisons during the protocols were done using analysis of variance (ANOVA)

Statistical significance was accepted at P < 0•05.

RESULTS: At the end of exercise trial (3, 13, 28, 43 minutes, and exhaustion time) VO2 were not different in INT110 (50.0±4.4; 52.1±5.1; 51.4±4.9; 52.2±5.4; 53.2±5.4 mL•kg-1) and CON (46.5±5.8; 51.5±5.1; 51.3±5.1; 53.0±4.4; 55.2±4.6 mL•kg-1). Blood lactate was not different in INT110 (1.0±0.3; 4.1±1; 4.3±1.2; 4.7±1.5; 6.0±1.8 mM) and CON (1.1±0.4; 4.0±0.9; 4.3±0.9; 4.7±1.1; 6.2±1.5 mM). Heart rate was not different in INT110 (164±11; 173±10; 178±7; 181±9; 186±5 bpm) and CON (158±9; 171±9; 177±8; 182±6; 188±6 bpm). Rectal temperature increased at a greater rate during the exercise in CON than in INT110, getting values of 39.8±0.1 vs. 39.3±0.1 (P<0.05) Basal stage was not different between both protocols. Time flight measured in the CMJ was no different in CON than in INT110, finding that before exhaustion, subjects had greater time flight in compare to basal values, only in INT110 (550.9±43vs 537.4±39ms p<0.05).

DISCUSSION/CONCLUSION

Continuous exercise at anaerobic threshold intensity, produce similar effects that intermittent exercise 110% of anaerobic threshold intensity, in VO2, heart rate, and lactate accumulation, but the core temperature is lower in intermittent exercise what allows to get fatigue later than in continuous exercise. These results obtained in intermittent exercise are showed in the maintenance of the legs power capacity during the vertical jump.

PHYSIOLOGICAL COMPARISON OF TWO TREADMILL EXERCISE PROTOCOLS FOR THE DETERMINATION OF LACTATE THRESHOLD AND VO2MAX

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Introduction: Laboratory treadmill running tests are commonly used to assess the effects of training programmes and to prescribe training intensities for athletes. It is well established that some variability in the results exists as a consequence of varying the testing protocols (Froelicher et al. 1974; Pollock et al. 1976).

Aim: The purpose of this study was to determine the differences in two commonly used treadmill protocols for the determination of lactate threshold (LT) and VO2max.

Method: Eight healthy, recreationally active volunteers (mean +/- SD: age; 24 +/- 5 years, height; 177.8 +/- 4.8cm, mass; 73.9 +/- 10.8kg) participated in the study. All subjects completed two maximal graded treadmill (MGT) tests to volitional exhaustion in a randomised order. Expired air samples and heart rate were measured continuously throughout and earlobe blood samples were taken for the determination of blood lactate. On completion of each trial VO2max was determined by averaging the highest observed consecutive values over one minute. LT was identified as described by Weltman et al. (1990). Protocol # 1 comprised a 5 minute warm up at 10km.h-1 after which, the gradient was fixed at 1% and starting speed was 11km.h-1. Stages were 4 minutes in duration, at the end of which speed was increased by 0.6 km.h-1. Once blood lactate reached 4mmol.L-1, speed remained fixed and the gradient was increased by 1% every minute until volitional exhaustion was reached. Protocol # 2 comprised a 5 minute warm up at 10km.h-1. Gradient was fixed at 7.5%. The starting speed was 8km.h-1 and increased by 1km.h-1 every 3 minutes until volitional exhaustion was reached.

Results: All statistical analysis was conducted using SPSS version 12.0 for windows. Paired samples t-tests were used to determine any differences between the two protocols. Alpha was set at P <0.05. No significant differences were found between any of the variables.

Conclusion: Both tests are equally valid in a group of trained individuals.

References:

Froelicher, V.F., Brammell, H., Davis, G., Noguera, I., Stewart, A. and Lancaster, M.C. (1974). A comparison of three maximal treadmill exercise protocols. Journal of Applied Physiology, 36, 720-25.

Pollock, M.L., Bohannon, R.L., Cooper, K.H., Ayres, J.J., Ward, A., White, S.R. and Linnerud, A.C. (1976). A comparative analysis of four protocols for maximal stress testing. American Heart Journal, 92, 39-46.

Weltman, A., Snead, D., Stein, P., Seip, R., Schurrer, R., Rutt, R. and Weltman, J. (1990). Reliability and validity of a continuous incremental treadmill protocol for the determination of lactate threshold, fixed blood lactate concentration and VO2max. International Journal of Sports Medicine, 11(1), 26-32.

EFFECTS OF PHARMACOLOGICAL BLOCKADE ON HEART RATE DYNAMICS IN PARTICIPANTS WITH SPINAL CORD INJURY

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Cardiovascular and autonomic dysfunction are common impairments in patients with spinal cord injury (SCI) (Krassioukov and Claydon, 2006). Non-linear heart rate (HR) variability techniques may help to detect subtle changes in HR behaviour (Mäkikallio et al., 2002), though the physiological basis of these measures in patients with SCI remains unknown. The present study examined the effects of pharmacological blockade on non-linear measures of HR dynamics in participants with incomplete tetraplegia. Measurements were taken during rest, sympathetic blockade with intravenous metoprolol (3 x 5 mg, each separated by 5 min), and vagal blockade with intravenous atropine (0.02 mg/kg), in the supine and cardiovascular stress positions. The cardiovascular stress position included simultaneous 40° tilt plus cold pressor (10°C) and isometric jaw contraction. Under these conditions, HR dynamics were assessed using sample entropy, detrended fluctuation analysis ($\alpha 1$ and $\alpha 2$), and correlation dimension techniques. Five male participants (41.7 ± 6.0 yrs; lesion level: C4-C7; ASIA scale: B-D, 13.4 ± 3.0 yrs post injury [mean ± SEM]) completed the study protocol. HR exhibited a significant effect for condition ($p<0.001$) and position ($p<0.05$). Non-linear measures were unchanged with metoprolol in both positions, compared to baseline. Atropine reduced sample entropy (1.48 ± 0.07 to 0.44 ± 0.09, $p<0.01$) and correlation dimension (2.90 ± 0.70 to 0.05 ± 0.02, $p<0.05$) while increasing $\alpha 2$ (0.77 ± 0.11 to 1.34 ± 0.12, $p<0.05$) in the supine position. Atropine also reduced $\alpha 1$ (1.29 ± 0.09 to 0.96 ± 0.11, $p<0.01$) and correlation dimension (1.13 ± 0.30 to 0.11 ± 0.11, $p<0.05$) during the cardiovascular stress position. A significant interaction effect was detected for sample entropy as values during baseline (1.48 ± 0.07 vs. 1.00 ± 0.07, $p<0.001$) and following atropine (0.44 ± 0.09 vs. 0.85 ± 0.07, $p<0.05$) differed between the supine and cardiovascular stress positions. Correlation analysis revealed significant associations between HR and non-linear measures ($p<0.01$). Thus, in comparison to blockade of the β1-adrenoreceptor system, vagal modulation is the main determinant of non-linear HR measures in male participants with incomplete tetraplegia. These measures may be useful in assessing neurocardiac function in clinical populations and requires further exploration.

Krassioukov AV, Claydon VE (2006). Prog Brain Res 152, 223–229.
Mäkikallio TH, Tapanainen JM, Tulppo MP, Huikuri HV (2002). Card Electrophysiol Rev 6: 250-255.

ARTERIAL STIFFNESS OF JAPANESE JUNIOR HIGH SCHOOL STUDENTS IN 12-15YEARS OLD

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Purpose;
The arterial stiffness is an independent risk factor of cardiovascular diseases. The arterial stiffness was measured by the pulse wave velocity between brachial and ankle arteries (baPWV). In adults, it is known that the arterial stiffness increases with age. However, there are few reports to show relationship of the secondary sexual characteristic period and the arterial stiffness. It is considered that the secondary sex characteristic begins around 11years old in men, 9years old in women as for Japanese. Therefore, we estimated that junior high school students(age of 12-15) were in the secondary sex characteristic period. We examined the relationship of the arterial stiffness and the secondary sex characteristic.
Methods;
Sixty-eight Japanese junior high school students participated in this study (1st grade: men;n=12, women;n=11. 2nd grade: men;n=11, women;n=12. 3rd grade: men;n=15, women;n=7). All subjects were engaged in some kind of sport activities. We compared their arterial stiffness with their grade in school advanced. In addition, we examined the relationships between the degree of obesity and the arterial stiffness. We used Hibi-type (overweight child determination method in Japan) for a determination of the degree of obesity. We divided subjects into three groups depending upon the degree of obesity; overweight-group of over 20%, normal-group of 19~-19%, underweight-group of under –20%. We excluded underweight-group of women, because it was alone.
Results;
The baPWV of men increased with their grade in school advanced (1st graders 804±73, 2nd graders 871±144, 3rd graders 942±183cm/s). The 3rd graders were significantly higher than the 1st graders. On the other hand, the baPWV of women significantly decreased with their grade in school advanced (1st graders 973±102, 2nd graders 830±87, 3rd graders 763±104cm/s). The 1st graders were significantly higher than the other grades. When we divided men into overweight-group(n=11, 1011±241cm/s), normal-group(n=16, 843±125cm/s), underweight-group(n=15, 854±94cm/s), the baPWV of overweight-group was significantly higher than the other groups. However, no significant difference was seen in the baPWV in women between overweight-group(n=9, 891±121cm/s) and normal-group(n=20 863±130cm/s).
Discussion;
In the present data, junior high school students who predicted in the middle of the secondary sex character period, the arterial stiffness of men increased with age. However, women decreased. It is evident that the arterial compliance increases by the estrogen secretion in adult women. We are considered that a low arterial stiffness of women is related to the increase in the production of estrogen. Meanwhile, the arterial stiffness in overweight-men was increased even though they engaged in sports activities. However, there was no significant difference in the overweight-women. These results suggest that it is a different blood vessel dynamics in men and women of the secondary sex character period.

13:00 - 14:00

Poster presentations

PP-PH06 Physiology 6

THE IMPACT OF A FEMALE INTERNATIONAL FIELD HOCKEY TOURNAMENT ON PERFORMANCE AND MARKERS OF IMMUNE STATUS AND MUSCLE DAMAGE.

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Background: International field hockey tournaments requires teams to play a series of matches on consecutive days with no more than 1-2 days recovery before the next match. Little is known about the performance and physiological impact of such a schedule on elite female players. In male international field hockey players alterations in motion characteristics and the intermittent nature of the activity are altered with repeated match exposure (Sunderland et al., 2008). The aim of the present study was to assess the impact of a tournament schedule on performance, markers of immune status and muscle damage of elite female hockey players.

Method: Ten female international field hockey players gave informed consent to participate in the study. The mean (SD) age and mass of the players were 25.2 (4.0) years and 64.4 (6.4) kg respectively. Data were collected during a 5 day tournament (non ranking) period comprising: day 1-2, and 4-5 match days and day 3 recovery day. Fasted capillary blood samples were taken on all days. Plasma samples were analysed for immunoglobulin A (IgA), Creatine Kinase (CK), C-reactive protein (CRP) and Urea. Unstimulated saliva samples were taken for all days and analysed for testosterone, cortisol and testosterone/cortisol ratio (T/C ratio). A global positioning system was used to assess distance covered at particular speeds ('standing' 0-0.7; 'walking' 0.7-6.1; 'jogging' 6.1-11.2; 'running' 11.2-15.1; 'fast running' 15.1-19.1; 'sprinting' >19.1 km/h), intensities ('low' 0-6.1; 'moderate' 6.1-15.1; 'high' >15.1 km/h) and heart rate. Data was analysed using 1- and 2-way ANOVA with repeated measures. Statistical Significance was set at $P<0.05$.

Results: No differences were observed in the mean distance covered between games 1-4. As the tournament progressed no significant differences were observed in the distances covered in motion type or intensity. IgA was significantly lower on day 3 (1.46 (0.6) g/l, $P=0.018$) when compared to day 4, which corresponded to two consecutive matches (Day 1 and2) and a recovery day on day 3. CK increased from 116.0 (28.8) U/l at rest to 165.9 (42.8) U/l ($P=0.026$) after the second game, reduced below initial baseline following a recovery day and subsequently increased after the following game (181.7 (77.1) U/l; $P<0.001$).

Conclusions: The repeated match play experienced in the present tournament did not result in any residual or accumulated fatigue. It is possible that a more demanding competitive schedule such as that experienced during the Olympic Games will have an effect of the activity patterns of players during later matches.

Sunderland, C., Stokes, K. & Morris, J. (2008) Performance, immune status and muscle damage during an international field hockey tournament. 13th Annual Congress of the European College of Sports Science. Estoril, Portugal.

THE EFFECT OF DELAYED ONSET OF MUSCLE SORENESS ON HABITUAL TRAPEZIUS ACTIVITY

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Introduction: The frequently cited pain adaption model (Lund et al 1991) predicts that muscle pain, acute or chronic, will cause inhibition of muscle activity to protect the muscle from further damage. The model is supported by laboratory studies but there is a lack of studies investigating the effect of muscle pain on habitual muscle activity during daily activities. The aim of the study was to investigate whether acute upper trapezius pain, caused by delayed onset of muscle soreness (DOMS), influences habitual trapezius activity.

Methods: Eleven right-handed female subjects (mean age 22 yrs, range 20-24 yrs) were recruited from a convenience sample of university students. Long-term (5 hrs) surface electromyographic (sEMG) activity was recorded (Myomonitor III, Delsys, US) bilaterally from the clavicular, descending, transverse, and ascending parts of trapezius on two consecutive weekdays. Inclinometers were used to record body posture (sitting, standing, walking) and bilateral upper arm movement synchronously with sEMG. Subject where instructed to maintain normal daily activities during recordings but to avoid vigorous physical activity. Immediately after the first field recording, muscle pain was induced to the left upper trapezius by eccentric shoulder depression exercise. Assessment of pressure pain threshold (PPT) at the start of the field recordings and hourly pain scores on visual analogue scale (VAS) during the field recordings was used to quantify trapezius pain.

Results: PPT decreased for the left medial, center, and lateral part of the upper trapezius ($P<0.004$ for all comparisons) from day 1 to day 2. PPT remained unchanged in the lower left and right trapezius. VAS scores increased from day 1 to day 2 for the left upper trapezius ($P<0.004$). The root-mean-square median sEMG level increased during seated posture for the left descending trapezius ($P<0.05$). Trapezius activity remained unchanged in all other parts of the left trapezius and all parts of the right trapezius. Arm elevation, arm movement, and time with different body postures remained unchanged from first to second field recording.

Discussion: Trapezius pain (i.e., DOMS) was demonstrated by the reduced PPT at the three sites associated to the exercised upper part of the left trapezius and by the raised hourly VAS scores during the second long-term recording. An increased level of sEMG activity in the pain-afflicted descending part of the left trapezius was observed in periods with seated posture, i.e., situations with very low muscle activity or nominal muscle rest. These findings indicate that nociceptive input induces increased trapezius muscle tonus during periods with low biomechanical loading. Thus, the present study opposes the prediction of the pain adaption model.

References

Lund JP, Donga R, Widmer CG, Stohler CS (1991). Can J Physiol Pharmacol, 69, 683-694.

THE EFFECTS OF EXERCISE-INDUCED MUSCLE DAMAGE ON CYCLING ENDURANCE PERFORMANCE

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The effects of exercise-induced muscle damage on cycling endurance performance

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University of Chester

Introduction: The benefits of including resistance-based training for optimising endurance performance (Paavolainen et al., 1999) would suggest that endurance athletes engage more frequently in training that might cause symptoms of exercise-induced muscle damage (EIMD). Whilst, EIMD has been reported to impair muscle strength and power (Twist & Eston, 2007), the effects on endurance performance during ecologically valid settings have yet to be elucidated.

Method

Following ethical approval, 17 participants were randomly assigned to either a treatment (n = 8) or control group (n = 9). Participants initially performed an incremental ramp protocol on a cycle ergometer to establish the workload corresponding to ventilatory threshold (VT). After a minimum of 24 h, participants performed a 5-minute fixed-intensity cycling at VT, followed by a 15-minute cycling time-trial. Physiological, metabolic, and perceptual responses were measured during both fixed workload and time-trials. Perceived levels of muscle soreness and peak isokinetic knee extensor torque at 60 deg.s-1 were also recorded. Following 30 minutes rest from baseline measures, participants in the treatment group performed 10 x 10 plyometric jumps to induce symptoms of EIMD. After a further 48 h, measurements of perceived muscle soreness, peak isokinetic strength, and endurance performance during fixed-intensity and time-trial cycling were repeated.

Results: Significant interactions of time and group indicated increased muscle soreness and reduced knee extensor strength ($P < 0.05$) for the treatment group following EIMD. No significant interactions of time and group on heart rate, RER, or blood lactate response were evident during the fixed-intensity exercise ($P > 0.05$). However, VO2, VE, and RPE values were all significantly increased at VT in the treatment group at 48 h following EIMD ($P < 0.05$). During the 15-minute time-trial, mean power output, distance covered, and VO2 during the time-trial were significantly lower in the treatment group at 48 h following EIMD ($P < 0.05$). Moreover, there was no significant interaction of time and group for RPE ($P>0.05$), suggesting that effort perception was unchanged during the time-trial in both groups following EIMD.

Discussion: We propose that the increased VE response was a sensory cue for the increased RPE during fixed-load exercise following EIMD. Furthermore, the increased VO2 following EIMD might have been evident to facilitate the rise in VE during fixed-intensity cycling. EIMD also impairs time-trial cycling through altering the sense of effort. Athletes should be aware of performing muscle-damaging exercise in the days preceding competition.

References

Paavolainen et al. (1999). J Appl Phsiol. 86: 1527-1533.

Twist, C. & Eston, R. (2007). J Exerc Sci Fit. 5: 1-9.

CHANGES IN THE RATE OF FORCE DEVELOPMENT MEASURED AT DIFFERENT MUSCLE LENGTHS FOLLOWING ECCENTRIC AND ISOMETRIC EXERCISE

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Introduction: The maximum rate of force development (RFD) has been shown to decrease after eccentric exercise (Crameri et al., 2007). However, there is little information regarding the changes in RFD when it is assessed at different lengths of the exercised muscle (RFD-length relationship). Besides, although muscle damage can also occur after isometric contractions at a long muscle length (Philippou et al., 2003), it is not known whether RFD is similarly affected after this form of exercise. The aim of this study was to examine the effects of isometric exercise at long muscle length on RFD-length relationship and to compare them with those presented after eccentric exercise.

Methods

Fourteen male volunteers, randomly divided into the eccentric (ECC, n=7) or the isometric (ISO, n=7) exercise group, performed 50 maximal voluntary eccentric, or isometric contractions at a long length of the elbow flexors of the non-dominant arm, on an isokinetic dynamometer. Peak isometric force (PIF) and time to peak force (TPIF) were measured at five different elbow angles, i.e., 50o, 70o, 90o, 140o, 160o, before and for 4 consecutive days post-exercise, and maximum RFD was determined as the PIF/TPIF ratio. Flexed (FANG) and relaxed (RANG) elbow angles and muscle soreness (DOMS) were also assessed at the same time points. Two-way ANOVA with repeated measures on one factor (day) was used for statistics.

Results: Both exercise protocols induced significant changes in the indirect markers of muscle damage post-exercise, i.e., DOMS, FANG and RANG, compared with baseline ($P<0.01$). Maximum RFD before exercise was higher at the elbow angle of 140o compared with 50o and 70o ($P<0.001$), while a similar RFD-length relationship was found in both groups. Maximum RFD was significantly decreased in both groups at all the angles tested in the days after the exercise regimens ($P<0.05$-0.001). The percent changes in RFD (i.e., normalized to pre-exercise values) were also significant in each group over time ($P<0.05$-0.001), but not between angles in any group or between groups.

Discussion: RFD-angle relationship was found to be similarly affected after both eccentric and isometric exercise at a long muscle length. The decreased RFD following muscle damaging exercise has been attributed to changes in cytoskeletal integrity and to an increase in the compliance of some muscle fibers (McCully and Faulkner, 1985; Crameri et al., 2007). However, the similar decreases in RFD at various muscle lengths found in the present study imply that other factors such as neuromuscular disturbances following muscle damage (Sayers et al., 2000) may also play an important role.

References

McCully KK, Faulkner JA. (1985). J Appl Physiol, 159, 119-126.

Philippou A, Maridaki M, Bogdanis GC. (2003). J Sports Sci, 21(10), 859-865.

Crameri RM, Aagaard P, Qvortrup K, Langberg H, Olesen J, Kjaer M. (2007). J Physiol, 583, 365-80.

Sayers SP, Clarkson PM, Lee J. (2000). Med Sci Sports Exerc, 32(9), 1587-1592.

MRF RESPONSES IN THE ARM FLEXOR MUSCLES TO HIGH-FORCE ECCENTRIC EXERCISE

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NORWEGIAN SCHOOL OF SCIENCES

Introduction: High-force eccentric exercise may result in muscle damage involving myofibrillar disruptions and in some cases segmental fibre necrosis. The repair processes may involve activation of satellite cells leading to satellite cell proliferation and later differentiation and fusion with other satellite cells or damaged myofibers. After activation, the proliferation and later differentiation of satellite cells are driven by the myogenic regulatory factors (MRFs). Consequently, the expression of MRFs can be used as markers of myogenic events during the course of activation of satellite cells (1). The purpose of this study was to investigate the MRF responses in the arm flexors after unaccustomed eccentric exercise and to a repeated bout three weeks later. We hypothesized that in the exercised arm the MRF levels would increase after bout 1, but after bout 2 the increase would be attenuated do to less damage in the repeated bout.

Methods: Thirty-three young males and females (23-28 years) participated. Seventy unilateral voluntary maximal eccentric actions with the arm flexors were performed twice (bout 1 and 2) with the same arm, separated by three weeks. The participants were randomized into a test and a control group. The exercise was performed with the same arm, randomly chosen, on bout 1 and 2. The other arm served as a non-exercised control. Nine days after the exercise bouts, tests of the force-generation capacity were performed. Biopsies from m. biceps brachii were collected from both exercised and control muscle 1, 48, 96, 168 hours after bout 1 and 1, 48 hours after bout 2. In order to visualize satellite cells cross sections were analyzed for immunoreactivity against CD56/NCAM (immunohistochemistry- IHC), and MRF protein content was determined using Western blotting.

Results:

The force-generating capacity measured as isometric torque was markedly reduced (-40-50%) after both exercise bouts. Long lasting recovery indicates muscle damage confirmed by other histological methods. So far only three subjects have been analyzed for MRFs and the preliminary results indicate that the MRF responses are according to our hypothesis. The rest of the samples will be analyzed the next months and the complete results on MRFs and satellite cells will be presented at the congress.

Discussion: In this study, the combination of IHC and Western blotting will give new information about the MRF response after a single bout of muscle damaging eccentric exercise and following a less damaging repeated bout of exercise.

References:

THE EFFECT ON NEUROMUSCULAR JUNCTION FORM AND CONTRACTILE PROPERTIES IN THE RAT SKELETAL MUSCLE FOLLOWING THE ECCENTRIC CONTRACTION EXERCISE.

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CHUKYO WOMEN'S UNIVERCITY JUNIOR NATIONAL INSTITUTE OF FITNESS AND SPORTS, KANOYA, AICHI UNIVERSITY OF EDUCATION

Introduction: The purpose of this study was to investigate the effect of the muscle damage by the exercise on neuromuscular junctions (NMJs) form and function in the rat skeletal muscle. In skeletal muscle after eccentric contractions, exercise induced muscle injury has been studied. Our studies so far have reported that significant changes in ultrastructural features of architecture of NMJs occurred in skeletal muscle fibers damaged by BPVC during the degeneration processes. And degradation of the ultrastructural features in NMJs occurred due to temporary denervation during muscle fiber degeneration processes. On the other hand, it is not clear the muscle damage by exercise causes the abnormality of the neuromuscular junction. In this study, we observed the degeneration processes of NMJs form following muscle fibers damages by eccentric contraction exercise. Additionally, the muscular contraction immediately after eccentric contraction exercise was measured.

Materials and methods

Female Fischer 344/Jcl rats (10 weeks old, body weight, 150–170 g) were used. All procedures in the animal experiments were performed in accordance with the guidelines presented in the Guiding Principles for the Care and Use of Animals in the Field of Physiological Sciences, published by the Physiological Society of Japan.

Training protocol: Downhill training ran on the treadmill continuously for 5min running with 2min rest interval, 18bouts at 40m/min and 16 degree decline. Downhill training it carried out once.

Contraction characteristic: Single muscle fibers were dissected from the extensor digitorum longus (EDL) muscles. Muscle contraction characteristic was measured after eccentric contraction exercise: 1,2,4,8,16,24,60 hours after exercise. The contraction characteristic developed by the nerve stimulation and by the muscle stimulation.

Morphological observation: We observed the degeneration of neuromuscular junctions on the muscle after eccentric-exercise: 1,2,4,8,16,24,60 hours after exercise. Three Types of fibers were classified based on differences ATPase activity. The muscle fiber composition is shown at muscle fiber for different types the number ratio. The morphological observation of neuromuscular junction by optical microscope used cholinesterase and silver staining.

Results: Significant changes in NMJs form occurred in skeletal muscle fibers damaged by eccentric contraction exercise. There was a difference in comparing indirect stimulation tension for the direct stimulation tension after exercise 4 hours. Significant changes was recognized after 16 hours. Significant changes Significant changes of both characteristics appeared after 16 hours. The muscle contraction characteristic was decreased, when the NMJs form is abnormal. It was indicated that the abnormal NMJs form was a factor of the decrease of the muscle contraction force.

EFFECTS OF TENDON VIBRATION ON DISCHARGE BEHAVIOR OF HUMAN MOTOR UNIT DURING SUBMAXIMAL ISOMETRIC CONTRACTION

KAMO, M.

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Introduction

Discharges of motor units (MU) are well known to show elongating trends in the spike interval during voluntary constant-force isometric contraction (e.g. Kamo, 2002), but neural mechanisms underlying those trends remain unclear. A reduction in Ia afferent activity have been advanced as a possible cause the spike interval elongation (Macefield et al., 1991; Griffin et al., 2001). This study examined effects of manipulation of peripheral afferent by tendon vibration on elongating trends in spike interval of MU during the constant-force contraction.

Methods: Subjects voluntarily performed isometric knee extension with a knee angle of 90 deg at slightly above the recruitment threshold force of the single MU for 60 s (control experiment). Two other situations were used to manipulate (reduce and gain) afferent input by tendon vibration: (1) during the contraction after prolonged vibration (10min), and (2) during the contraction with vibration. The single MU activities in the control experiment, in which there was no intervention, were compared under two experimental situations. Action potentials of single MU were recorded in the vastus medialis muscle using non-invasive surface-array electrodes. Vibratory stimulation was applied perpendicularly to the patella tendon with 75 and 100 Hz frequency and 0.5-0.8 mm displacement.
Results: In the first situation, the spike interval of MUs elongated gradually during contraction, but the amount of the elongation was less than that in control experiment. In the second situation, the spike interval of MUs at the onset of constant-force contraction was significantly longer than that in the control experiment and subsequently shortened to the same interval as that in the control experiment at 30 s, but it began to elongate thereafter.
Discussion: Irrespective of peripheral afferent manipulation, the elongating trend in the spike interval did not disappear during the constant-force contraction. Results suggest that changes in neural input information to single MUs with peripheral afferent stimulation do not eliminate the spike interval's trend of elongation in the presence of voluntary drive.
References
Griffin et al. (2001) J.Physiol., 535, 929-936.
Kamo (2002) Eur. J. Appl. Physiol., 86,375-381.
Macefield et al., (1991) J.Physiol., 440, 497-512.

CHANGES OF REST METABOLIC RATE AND BODY FAT RELATED TO 8 WEEKS WHOLE BODY VIBRATION TRAINING OF YOUNG FEMALE

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Recent study showed that intensity and duration of aerobic training should be gradually increased so that to maintain the effect of fat oxidation activation in long term health-related physical training. There is a reason to consider strength and whole body vibration training as one of the most perspective types of such training. However, its influence upon energy expenditures and activation of fat losses at rest needs further investigations. The aim was to determine the effects of 8-weeks of mainly strength physical exercises in combination with vibration impacts of inclined type upon rest metabolic rate and fatless body mass, girth of hips as well as cellulite manifestation in young females.

Thirty seven young females aged 20-25 years (students) without any contra-indications took part in the studies. Subjects of experimental group were used vibration platform (VP) LADIES-№1, whereas those of control group performed the same exercises using non-working VP. One medial-distal complete inclined vibration constituted 0..10 mm at frequency of up to 14 Hz. 24 training sessions (45-55 min) were performed in 8 weeks. Total duration of vibration load at one session constituted 8-12 min. The program of physical exercises designated as 'vibrobic' was performed. The exercises preferentially stimulated leg and trunk muscles as well as those of back. After 4 and 8 weeks were measured: rest metabolic rate (VO2), RQ, BMI, fatless body mass (FBM), and girth of two hips.

The results showed that resting oxygen uptake in group of vibration training increased for 8 weeks - from 2,85 (0,15) up to 3,14 (0,13) ml.kg-1.min-1 ($p<0.05$);. resting RQ in 24 hours after last exercises session decreased in the first 4 weeks vibration training only – from 0,841 (0,004) up to 0,819 (0,003) ($p<0.05$). FBM at the end of 8 week trainings was the greater in group of vibration training – 47.30 (2.27) vs 46.73 (2.72) ($p<0.05$), whereas initial values did not differ from control group. In overweight young women only (BMI 25 kg/m2 and higher, n=9) at vibration training took place decrease of BMI (from 26.07 (1.57) up to 24.89 (1.52) kg/m2) and % body fat (from 31.4 (1.4) to 29.0 (1.5) %.

The girth of two hips decreased for 8 weeks in group of vibration training (from 97.8 (3.2) to 96.4 (3.6) sm whereas in control group it did not differ from initial values. Visibility of cellulite of a back surface of two hips in 4 weeks in group of vibration training decreased from 470.4 (35.5) up to 413.4 (29.7) sm2 ($p<0.05$). In control group significant changes were for 8 weeks only.

We concluded that young female special physical training with whole body vibration stimulation induced increasing of rest metabolic rate. The main effects of decreasing in body fat have occurred faster and have been more expressed by the end of training program. It is determined by high potential of vibration stimulation associated with impacts of physical exercises for health-related female training.

INFLUENCE OF THE WHOLE BODY VIBRATION STIMULATION IN THE PROCESS OF HEALTH- RELATED PHYSICAL EXERCISE UPON STRENGTH CAPACITIES OF YOUNG FEMALES

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Introduction. Vibration physical exercises represent a new type of physical exercises the influence of which has been related to the idea of muscle additional stimulation according to mechanism of spinal reflexes (2). Vibration impacts create additional load on neuromuscular apparatus without significant influence upon subjective perception of tension. Meanwhile, application of vibration impacts for the whole body in the course of health-related training of females is somewhat restricted due to insufficient elaboration of the technology of vibration load application in combination with strength exercises. The aim of the study consisted in revealing the effects of 8-weeks mainly strength physical exercises in combination with vibration inclined type for the whole body upon strength capacities and fatless body mass of young females.

Methods. Thirty seven young females aged 20-25 years (students) without any contra-indications took part in the studies. Subjects of experimental group were used vibration platform (VP) LADIES-№1, whereas those of control group performed the same exercises using non-working VP. One medial-distal complete inclined vibration constituted 0..10 mm at frequency of up to 14 Hz. 24 training sessions were performed in 8 weeks. The program of physical exercises designated as VIBROBICA® was performed. .Strength type exercises preferentially stimulated leg and trunk muscles as well as those of back. Total duration of vibration load at one session constituted

8-12 min. After 4 and 8 weeks were measured: isometric strength (knee extensors); isokinetic strength and strength endurance (feet and arms); explosive strength (in jumps) and jumps endurance (1).
Results. The results showed the special effects of concomitant whole body vibration and physical exercises upon isometric, isokinetic, jumping strength and strength endurance. Augmentation of strength has been observed both in experimental and control group. However, in the group of vibration stimulation these effects have occurred faster and have been more expressed by the end of training program. Mean increasing of feet and arms extensors isokinetic strength for 4 weeks were 9.82 (1.9)% in experimental group meanwhile in control group 5.92 (1.8) for 8 weeks ($p<0.05$). There were no differences of increasing of jump endurance (4.10 vs 3.81%). In group of vibration stimulation strength capacities were increased especially during the first 4 weeks of training and has occurred without any expressed augmentation of active body mass.
Conclusion. We concluded that young female subjected to physical training with whole body vibration stimulation main effects have occurred faster and have been more expressed by the end of training program. The more essential effects were related to maximal and time development of strength and height of jump but not to endurance values.
1.Bosko C. Strength assessment, ISSS, Rome, 1999,165.
2.Torvinen S. et al Clin Physiol Func Im, 2002, 22,p.145-152.

13:00 - 14:00

Poster presentations

PP-BM03 Biomechanics 3

MECHANICAL EFFICIENCY AND RUNNING ECONOMY IN OCCASIONAL AND SKILLED RUNNERS AND THEIR RELATIONSHIP WITH THE KINEMATIC VARIABILITY OF THE BODY CENTRE OF MASS

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Aim. The aim of this study was to investigate whether a significant relationship does exist between metabolic cost (C), "apparent" mechanical efficiency (η) and temporal (step duration) and/or spatial (three-dimensional displacement) variability of the body centre of mass (BCOM) in running. Our hypothesis is that skilled runners (SR) have a lower C, a higher η and a lower BCOM variability in respect to less experienced ones (OR). Material and methods. Fourteen healthy males were studied: 7 OR (33±13 yrs of age, 71±3 kg of body mass, 1.76±0.05 m of stature) training up to 2 hours per week and 7 SR (32±12 yrs, 67±6 kg, 1.77±0.04 m) training from 2 to 6 hours per week. A motion capture system (Vicon®, USA) was employed to record kinematic data at 100Hz. The 3D displacement of the BCOM was obtained [1] and the difference between the maximal and minimal value in a step was calculated in the x, y and z direction; the duration of each step was calculated as well. The variability of these parameters was assessed by calculating the coefficient of variation (CV) of over 10 consecutive running steps. Finally, mechanical work (W, J/(kg m)) was also computed [1]. Experimental protocol. Each subject was requested to run, on the level, at 5 incremental speeds (v, from 8 to 16 km/h) on a treadmill (h/p/Cosmos, G). During the experiments, oxygen uptake (V'O2) was measured by means of a portable metabograph (K4b2, Cosmed, I). C was calculated as net V'O2/v and expressed in J/(kg m). The "apparent" mechanical efficiency was calculated as the ratio W/C. Results. C was found to be lower (albeit not significantly) in SR (4.39±0.36 J/(kg m)) than in OR (4.51±0.39 J/(kg m)) and W was found to be larger ($p<0.01$) in SR (1.94±0.23 J/(kg m)) than in OR (1.77±0.22 J/(kg m)). The larger W in SR is associated with a significantly larger ($p<0.05$) vertical BCOM displacement (0.09±0.01 m) in comparison with OR (0.08±0.01 m); indeed: $W=1.38+5.52 \times BCOMv$, $n=70$, $r=0.52$, $p<0.001$. Finally η was found to be larger ($p<0.001$) in SR (0.44±0.03) than in OR (0.39±0.02). Significant relationships were found between C and/or η and the temporal and spatial (vertical and forward direction) variability of the BCOM: the higher the variability, the larger C and the lower η. Discussion. The "apparent" efficiency of running (η) is larger in SR than in OR and this has to be attributed to differences in W rather than in C. In turn, the observed differences in W can be attributed to differences in the "active stiffness" of the lower leg: the higher the stiffness, the larger the BCOM vertical displacement and hence the larger W (and η). Larger η values are also associated with a lower intra step variability (both spatial and temporal) of the BCOM. These findings could tentatively be explained by a more symmetrical gait pattern in skilled runners in comparison with occasional ones.
References
[1] Minetti et al. (1993) Mechanicals determinants of gradient walking energetics in man. J. Physiol. 471: 725-735.

CHARACTERISTICS OF THE SUPPORT LEG MOVEMENT IN THE START AND TOP SPEED PHASES OF ELITE SPRINTERS

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Purpose:
The purpose of the present study was to examine the characteristic of the sprint start movement of elite sprinters.
Methods:
The measurement was performed at the 100-m event of the 11th IAAF World Championships in Athletics, Osaka, Japan. The movements of four male and three female elite sprinters, whose results were 9.85-10.20 sec in male and 10.99-11.98 sec in female, recorded by four high-speed cameras (200 fps) and analyzed with direct linear transformation method. The analysis phases were during start phase (6 steps from start) and middle phase (around the 60m from start). Their running velocity, step length, and step frequency as well as the angles of joints, segments and leg during the supporting phase. The peak angular, segment and leg swing velocities were calculated. The leg swing angle of the supporting leg was defined as the angle between a line from the trochanter major to the lateral malleolus and a perpendicular line from the trochanter major to the ground.
Results and Discussion:
The leg swing velocity and forward rotation velocities of the thigh and shank segments were higher with increasing steps. During the start phase, the forward rotation velocity of the thigh segment was already reached those during the middle phase. However, the forward

rotation velocity of the shank segment was significantly lower during the start phase than during the middle phase. Therefore, the leg swing velocity during the start phase can be obtained mainly due to the increment of the forward rotation velocity of the thigh segment. The previous study had reported that the knee joint during the foot contact phase should not be extended to transfer the hip extension velocity effectively to the leg swing velocity during the middle phase (Ito et al., 1998). During the start phase, however, the extension velocity of the knee joint and the amplitudes of the knee joint changes were greater in the start phase than in the middle phase. In addition, the angle of the shank segment was smaller as compared to that during the middle phase. It is likely that the elite sprinters could obtain the leg swing velocity by the knee extension due to the forward rotation of the thigh segment during the start phase.

References:

ITO.A et al (1998) Relationship between sprint running movement and velocity at full speed phase during a 100 m race. Japan Journal of Physical Education 43, 260-273 (in Japanese).

THE RELATION ANALYSIS ON THROWING ANGLE AND MOTION IN JAVELIN THROW

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Introduction: Throwing angle is important for better performance in track & field javelin throw. Javelin throwers tend to throw higher than optimal angle. Coach instructs athlete to throw lower, and thrower tries to throw the javelin lower. However, it is difficult for throwers to throw the javelin in lower angle. In this study the factors of the throwing angle in javelin throw were examined from the viewpoint of the throwing motions.

Methods: Subjects were 9 javelin throwers (aged 19.33 years+-1.414, best performance 55.75m+-8.047, career of javelin throw 48.22month+-1.563, body height 171.04cm+-8.042, body weight 68.39kg+-10.925), 2 female and 7 male throwers. The experiment was carried out from the throwing gate, which enables measuring the throwing angle, initial velocity and attack angle immediately, right after throwing. Subjects got their throwing angle after throwing from this gate. For the first throw, they threw the javelin normally. From the second to sixth throw, they were to declare their target throwing-angle beforehand, e.g. "higher" or "lower", those were recorded. Every throwing motion was filmed with two high-speed video cameras, film rate 250 / sec. by NAC. 21 out of 54 feasible throwing motions were analyzed by the three-dimensional analysis with motion analysis software, Dynas-3D by Shin-Osaka Shokai Co., Ltd. The correlation of the analyzed data, initial velocity of javelin (IVJ), velocity of body gravity (VBG), throwing angle (THA), attack angle (ATA), trunk angle (TRA), arm angle (ARA), arm-trunk angle (A-TA) and elbow angle (EA) etc. at release (R); last (LFC), second (SFC) and third foot contact (TFC) before releasing; third foot takeoff (TFT) before releasing were analyzed with the statistic software, SPSS.

Results and Discussion: A clear interactive relation was observed throwing angle and IVJ (r=-0.787, p=.01), VBG at R (r=-0.666, p=.01), THA on the XZ plane at TFT (r=-0.711, p=.01) and at TFC (r=-0.882, p=.01), TRA on the XY plane at TFC (r=0.642, p=.05), TRA on the XZ plane at R (r=0.593, p=.05) and SFC (r=0.700, p=.01), ARA on the XY plane at R (r=0.585, p=.05), and ARA on the XZ plane at SFC (r=0.552, p=.05), at TFT (r=0.803, p=.01) and at TFC (r=0.724, p=.01), and left ARA on the XY plane at R (-0.597, p=.05), at LFC (r=-0.787, p=.01) and at SFC (r=0.795, p=.01), left ARA on the XZ plane at RFC (r=0.550, p=.05) and at TFT (r=0.623, p=.05), A-TA at LFC (r=0.754, p=.01), TRA on the ZY plane at R (r=0.700, p=.01) and at TFT (r=0.561, p=.05).

3 followings were mainly suggested from the experiment. 1) When the direction of javelin leans toward X axis at TFC, the throwing angle is lower. 2) When the trunk leans toward horizontal line at TFC, the throwing angle is higher. 3) When the throwing arm leans toward horizontal line at R, the throwing angle is higher.

Reference

1) Paavo V. Komi et al., Biomechanical Analysis of Olympic Javelin Throwers, INTERNATIONAL JOURNAL OF SPORT BIOMECHANICS, Vol.1, Nr. 2, pp 139-150, 1985

BIOMECHANICAL ANALYSIS OF SPRINT RUNNING MOVEMENT OF ELITE SPRINTERS: THE THIGH AND SHANK SEGMENT'S MOVEMENT DURING THE CONTACT PHASE

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Purpose:

The purpose of the present study was to examine the characteristics of lower limb's movements around the top sprint speed phase of elite sprinters. Especially, it focused on the movements of the thigh and shank segments during the contact phase.

Methods:

The subjects were 6 male (9.85-11.24 sec) and 6 female (10.99-13.10 sec) sprinters, who participated in a 100-m races in 11th IAAF World Championships in Athletics, Osaka, Japan. Their running movements of one stride at approximately 60-m point were recorded by two high-speed video cameras (200fps) and calculated the following parameters with three-dimensional direct linear transformation method: average running velocity during the one stride, step length and step frequency as well as the average segment and joint angles of legs during the contact phase. The contact phase was divided into the ratio of 43% and 57% as the deceleration and acceleration phases, respectively. These phases were defined by the previous study (Fukuda et al., 2004) which calculated from the horizontal components of the ground reaction forces.

Results and Discussion:

The average angular velocity of the shank segment during the deceleration and acceleration phases were positively related to their running velocity. In these subjects, the average angular velocity of the shank during the deceleration phase was slightly higher than that of the thigh. It is likely that the greater forward rotation velocity of the shank segment could be occurred by the deceleration force of the initial impact. Consequently, the angular velocity of the knee joint showed a flexor direction during the deceleration phase. During the acceleration phase, on the other hand, the average angular velocity of the thigh segment increased, especially for the lower sprint velocity group, and did not showed any significant difference with that of shank segment. However, the average angular velocity of shank segment decreased similarly to all of them from the deceleration to acceleration phase. Consequently, the knee joint extended during the acceleration phase in the lower sprint velocity group. These results suggest that the elite sprinters can be hardly extended of the knee during the acceleration phase due to the greater angular velocity of shank segment. This is likely that elite sprinters could be transferred angular velocity of thigh segment effectively to the leg swing velocity.

References:

Fukuda, K., Ito, A. (2004) Relationship between sprint running velocity and changes in the horizontal velocity of the body's center of gravity during the foot contact phase. Japan J. Phys. Educ. Hlth. Sport Sci. 49: 29-39 (in Japanese).

INITIAL ROTATIONAL VELOCITY OF HIPS IS A KEY FACTOR IN DISCUS THROW

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The purpose of this study was to investigate relationships between the official discus throwing distance and the movements of discus throw or the release conditions of discus. The throwing movements of 18 male discus throwers were recorded by two digital video cameras (60 Hz) in the 11th World Championships in Athletics in Osaka and the Japan Track and Field National Championships, and also in experimental trials. From the video data of trials when each athlete had thrown the longest distance, real-life three-dimensional coordinates of their body landmarks and the center of the discus were calculated with the direct linear transformation method. The throwing movements were divided into six instants and analyzed.

The initial velocity and the height of discus at the moment of release showed a positive correlation with the throwing distance. The throwing distance had no relation with the release height normalized by the body height and the release angle. These results suggested that the initial velocity and the release height of discus must be important to take longer throws, however the release height was dependent on the body height. At the right-foot takeoff (R-off) and the left-foot touchdown (L-on), both discus velocity and rotational velocity of hips indicated positive correlations with the throwing distance. Positive relations were shown between the discus velocity at R-off and rotational velocity of shoulders and hips at the same instants. The discus velocity at L-on had a positive relationship with the rotational velocity of shoulders at that time. The higher discus velocity at R-off of longer-distance throwers suggested that increase of rotational velocity of the whole body at the beginning of throwing movements is important. The translational velocity of the center of mass including thrower and discus (CM) at left-foot takeoff (L-off), right-foot touchdown (R-on) and L-on were recognized as a negative correlation with the official distance. The translational velocity of CM showed a negative relation with the rotational velocity of hips at L-off, and also velocity of CM indicated a negative correlation with torsion angle of trunk at R-on. These results suggested that longer-distance throwers might keep lower translational velocity of CM to obtain lager torsion angle of trunk during the flight phase.

These findings were concluded as follows. Differences in movements which determine throwing distance appeared from the beginning of throwing movements. That is, it is necessary for throwers to increase discus velocity with rotational velocities of shoulders and hips from the initial phase of throwing. At the middle phase, to maintain a lower translational velocity of CM must obtain higher rotational velocity of hips, and thus a larger torsion angle of trunk is produced by the higher rotational velocity of hips. The increase of rotational velocity of hips, shoulders and arm swing occurred in order during the final phase before discus release.

FOOT STRIKE PATTERNS OF HIGH LEVEL MALE 800M RUNNERS

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Recently Hasegawa et al (2007) investigated the foot strike patterns and ground contact times during a half marathon. They found that foot strike patterns were related to running speed with forefoot and midfoot strikers exhibiting shorter ground contact times and faster running speeds. The purpose of this study was to conduct a similar analysis in male 800m runners. Ten seeded sub-elite races were filmed on one evening at a British Milers Club meeting. Seventy one runners were filmed by a 100-Hz video camera at a height of 15 cm placed 15 m from the start / finish line. All runners completed their race and were captured on both laps of the race. Average race time showed a range of 14.46 s from 107.53 to 121.99 s with a mean 115.21 +/- 3.41s and coefficient of variation of 3.0%. The mean contact time for lap 1 was 156 +/- 12 ms and for lap 2 it was 168 +/- 16 ms. On lap 1 35%, 48% and 17% of runners made initial ground contact with the forefoot, midfoot and heel respectively. For lap 2 these values were 34%, 51% and 15%. Two way ANOVA s comparing ground contact time across the different races for lap 1 and lap 2 revealed significant main effects for both lap ($F_{1,61} = 46.315$; $P < 0.000$) and race ($F_{9,61} = 2.766$; $P = 0.009$). Those runners who displayed the same foot strike pattern on both laps ($N = 48$) were entered in to a 2x3 ANOVA comparing ground contact times by lap and foot strike position. This showed significant main effects for both lap ($F_{1,45} = 32.600$; $P < 0.000$) and foot strike position ($F_{2,45} = 12.779$; $P < 0.000$). Post-hoc analysis revealed significant differences between the heel and both other contact points. The shortest ground contact times were for the forefoot (156 ms) followed by midfoot (161 ms) and heel (177 ms). For each contact point there was a significant increase (forefoot – $t_{15} = 2.782$, $P = 0.014$; midfoot – $t_{24} = 3.501$, $P = 0.002$; heel – $t_{8} = 5.292$, $P = 0.001$) in ground contact time between lap 1 and lap 2. Linear regression revealed a significant relationship between average running speed and ground contact time for both lap 1 and lap 2, however only a small portion of average running speed was accounted for (10.3% lap 1 and 11.9% lap 2). This study found that foot strike patterns were related to running speed. The relationship between ground contact time and running speed supports the notion of a spring-mass model of locomotion. Over the course of an 800m race ground contact time increased irrespective of foot strike position. This implies an element of fatigue, with runners presumably requiring longer to generate the same impulse. Alternatively, this may have been a reflection of the pacing strategy during the races, with all races adopting a first lap that was quicker than average race speed.

References

Hasegawa, H., Yamauchi, T., and Kraemer, W.J. (2007) Foot strike patterns of runners at the 15-km point during an elite level half marathon. Journal of Strength and Conditioning Research 21(3): 888-893.

FOOT STRIKE PATTERNS OF HIGH LEVEL FEMALE 800M RUNNERS

HAYES, P.R., CAPLAN, N.

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Recently Hasegawa et al (2007) investigated foot strike patterns and ground contact times during a half marathon. They found foot strike patterns were related to running speed with forefoot and midfoot strikers exhibiting shorter ground contact times and faster running speeds. The purpose of this study was to conduct a similar analysis in female 800m runners. Five seeded sub-elite races were filmed on one evening at a British Milers Club meeting. The runners ($N = 34$) were filmed by a 100-Hz video camera at a height of 15 cm placed 15 m from the start / finish line. All runners completed their race and were captured on both laps of the race. Average race time showed a range of 15.85 s with a mean 132.84 +/- 4.43 and CV of 3.3%. Mean contact time for lap 1 and lap 2 were 163 +/- 14 ms and 179 +/- 16 ms. On lap 1 27%, 44% and 29% of runners made initial ground contact with the forefoot, midfoot and heel respectively. These values

were essentially unchanged at 27%, 41% and 32 % on lap 2. An ANOVA comparing ground contact time across the different races for both laps revealed significant main effects for lap ($F_{1,29} = 35.445$; $P < 0.000$) and race ($F_{4,29} = 6.112$; $P = 0.001$). Runners displaying the same foot strike pattern on both laps (N = 27) were entered in to a 2x3 ANOVA comparing ground contact time by lap and foot strike position. This showed significant main effects for lap ($F_{1,24} = 28.707$; $P < 0.000$) and foot strike position ($F_{2,24} = 4.299$; $P < 0.025$). Post-hoc analysis revealed significant differences between heel and forefoot strikers. The shortest ground contact times were for the forefoot (167 ms) followed by midfoot (172 ms) and heel (181 ms). Both forefoot and midfoot strikers exhibited a significant increase (forefoot – $t6 = 5.435$, $P = 0.002$; midfoot – $t10 = 4.038$, $P = 0.002$) in ground contact time between laps. Heel strikers showed no significant increase in ground contact times across the two laps (heel – $t8 = 1.692$, $P = 0.129$). Linear regression revealed a significant relationship between average running speed and ground contact time for lap 1, lap 2 and average contact time. Only a moderate portion of variation in average running speed was explained (29.9 %, 25.6 % and 36.9% for lap 1, lap 2 and average contact time respectively). This study found that foot strike patterns were related to running speed. The relationship between ground contact time and running speed supports the notion of a spring-mass model of locomotion. Over the course of an 800m race ground contact time increased. This implies an element of fatigue, with runners presumably requiring longer to generate the same impulse. Alternatively, this may be a reflection of the pacing strategy during the races, with all races adopting a first lap that was quicker than average race speed.

References

Hasegawa, H., Yamauchi, T., and Kraemer, W.J. (2007) Foot strike patterns of runners at the 15-km point during an elite level half marathon. J. Strength Cond. Res 21(3): 888-893.

FOOT STRIKE PATTERNS OF HIGH LEVEL FEMALE 1500M RUNNERS

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Recently Hasegawa et al (2007) investigated the foot strike patterns and ground contact times during a half marathon. They found that foot strike patterns were related to running speed with forefoot and midfoot strikers exhibiting shorter ground contact times and faster running speeds. The purpose of this study was to conduct a similar analysis in male 800m runners. Two seeded sub-elite female 1500 m races were filmed on one evening at a British Milers Club meeting. Twenty four runners were filmed by a 100-Hz video camera at a height of 15 cm placed 15 m from the start / finish line. All runners completed their race and were captured on all four laps of the race. Average race time showed a range of 46.21 s from 254.66 to 300.87 s with a mean 272.04 +/- 10.63 s and coefficient of variation of 3.9%. The mean contact time for laps 1 – 4 was 172 +/- 12 ms, 178 +/- 16 ms, 186 +/- 16 ms and 185 +/- 20 ms. On lap 1 20.8, 50.0 and 29.2% of runners made initial ground contact with the forefoot, midfoot and heel respectively. For lap 4 these values were 25.0, 41.7 and 33.3%. A two way ANOVA comparing ground contact time across the different races for each lap revealed significant main effects for lap ($F_{3,66} = 12.367$; $P < 0.000$) but not race ($F_{1,22} = 2.151$; $P = 0.151$). Those runners who displayed the same foot strike pattern on both laps (N = 18) were entered in to a 4x2 ANOVA comparing ground contact times by lap and foot strike position. This showed significant main effects for each lap ($F_{3,45} = 7.014$; $P < 0.001$) and foot strike position ($F_{2,15} = 4.372$; $P < 0.032$). Post-hoc analysis revealed significant differences between the heel and midfoot contact points. The shortest ground contact times were for the midfoot (174 ms) followed by forefoot (179 ms) and heel (196 ms). Lap 1 had shorter ground contact times than any of the other three laps. Linear regression revealed a significant relationship between average running speed and average ground contact time however only a moderate portion of average running speed was accounted for (23.8%). This study found that foot strike patterns were related to average running speed. The relationship between ground contact time and running speed supports the notion of a spring-mass model of locomotion. Over the course of a 1500m race ground contact time increased irrespective of foot strike position. This implies an element of fatigue, with runners presumably requiring longer to generate the same impulse. Alternatively, this may have been a reflection of the pacing strategy during the races, with all races adopting a first lap that was quicker than average race velocity.

References

Hasegawa, H., Yamauchi, T., and Kraemer, W.J. (2007) Foot strike patterns of runners at the 15-km point during an elite level half marathon. Journal of Strength and Conditioning Research 21(3): 888-893.

FOOT STRIKE PATTERNS OF HIGH LEVEL MALE 1500M RUNNERS

CAPLAN, N., HAYES, P.

NORTHUMBRIA UNIVERSITY

Recently Hasegawa et al (2007) investigated the foot strike patterns and ground contact times during a half marathon. They found that foot strike patterns were related to running speed with forefoot and midfoot strikers exhibiting shorter ground contact times and faster running speeds. The purpose of this study was to conduct a similar analysis in male 1500m runners. Five seeded sub-elite races were filmed on one evening at a British Milers Club meeting. Fifty two runners were filmed by a 100-Hz video camera at a height of 15 cm placed15 m from the start / finish line. All runners completed their race and were captured on all four laps of the race. Average race time showed a range of 37.65 s from 225.34 to 262.99 s with a mean 236.91 +/- 8.83 s and coefficient of variation of 3.7%. The mean contact time for laps 1 – 4 was 167 +/- 16 ms, 172 +/- 17 ms, 175 +/- 17 ms and 176 +/- 19 ms. On lap 1 34.6, 46.2 and 19.2% of runners made initial ground contact with the forefoot, midfoot and heel respectively. For lap 4 these values were 36.5, 36.5 and 27.0%. Two way ANOVA s comparing ground contact time across the different races for each lap revealed significant main effects for both lap ($F_{3,141} = 12.109$; $P < 0.000$) and race ($F_{4,47} = 3.863$; $P = 0.009$). Those runners who displayed the same foot strike pattern on both laps (N = 44) were entered in to a 4x3 ANOVA comparing ground contact times by lap and foot strike position. This showed significant main effects for each lap ($F_{3,123} = 6.694$; $P < 0.000$) and foot strike position ($F_{2,41} = 23.132$; $P < 0.000$). Post-hoc analysis revealed significant differences between the heel and both other contact points. The shortest ground contact times were for the forefoot (161 ms) followed by midfoot (169 ms) and heel (192 ms). Lap 1 had shorter ground contact times than any of the other three laps. Linear regression revealed a significant relationship between average running speed and ground contact time for all four laps and average contact time, however only a moderate portion of average running speed was accounted for (24.8 – 34.9%). This study found that foot strike patterns were related to average running speed. The relationship between ground contact time and running speed supports the notion of a spring-mass model of locomotion. Over the course of a 1500m race ground contact time increased irrespective of foot strike position. This implies an element of fatigue, with runners presumably requiring longer to generate the same impulse. Alternatively, this may have been a reflection of the pacing strategy during the races, with all races adopting a first lap that was quicker than average race velocity.

References

Hasegawa, H., Yamauchi, T., and Kraemer, W.J. (2007) Foot strike patterns of runners at the 15-km point during an elite level half marathon. Journal of Strength and Conditioning Research 21(3): 888-893.

13:00 - 14:00

Poster presentations

PP-CO02 Coaching 2

THE MEETING IN A SUCCESSFULLY COACH-ATHLETE RELATIONSHIP

JOHANSEN, B.T., SVELA, A.E.

UNIVERSITY OF AGDER

Introduction: The purpose of this study was to investigate the meeting that take place in professional coaching in a coach-athlete relationship, all facets related to the process leading up to a successfully coach-athlete relationship (Jowett, 2008), communication in the relationship, type of leadership, and factors related to their satisfaction with performance and instruction of their coach-athlete relationship.

Method

Due to the two different types of sports that exist, individual and team sports, two different coach-athlete relationships were included in this study, but only results from the team dyad will be presented in this paper. The team sport coach and athlete are performing at top national level in football, and the dyad is respectively the head coach and the captain of the team. They share a history of three years together. The coach is 42 years of age, coaching experience from top national level for eight years with national cup trophy in 2000. The athlete is 35 years of age and has been playing at top national and international level for more than fifteen years.

In-depth interviews were conducted and arranged to take place individually. An interview guide was used for gathering data and an Ipod recorder was used during the interview. Both interviews lasted for approximately 1 hours and 10 minutes.

The analyses of the data obtained followed a phenomenological procedure (Aanstoos, 1983) trying to grasp and identifying meaning units, specifying central themes, and then articulating their psychological sense or meaning in order to examine the nature of the meeting in a successfully coach-athlete relationship.

Results: Results from interviews with both the coach and the athlete in the team sport coach-athlete relationship indicated that factors such as social support, commitment, humor, use of time, attention, and carefulness are all important facets for the dimension building a successfully relationship. In the dimension communication vital facets appear to be thoroughly, the frequency, the consistency between verbal and non verbal communication, and the art of the informal communication during everyday practice. For the dimensions leadership and performance and instruction it seems to be respectively consistency for the coaching process, and focus on the impact of intrinsic motivation (Jowett, 2008) and evaluation of own development as most important.

Discussion: In general both the coach and the athlete underlined the significance of consistency and commitment for a successfully relationship in order to perform in sport. The study also revealed that communication and democratic leadership is vital factors for the meeting in the relationship for both the coach and athlete to grow and develop which is in line with former research.

References

Aanstoos CM (1983). J Pheno Psych, 14, 243-266.

Jowett S (2008). Scand J Med Sci, 18, 664-673.

LEADERSHIP BEHAVIORS AND COACH-ATHLETE RELATIONSHIPS IN SCANDINAVIAN COACHES

JOHANSEN, B.T., CHRISTENSEN, J.B., ENOKSEN, E., FAHLSTRÖM, P.G., HAGESKOG, C.A., HØIGAARD, R.

UNIVERSITY OF AGDER

Introduction: The purpose of the study was to investigate in a sample of Scandinavian elite coaches, the relationship between perceptions of their own leadership behavior and their perception of the coach-athlete relationship.

Method

149 elite coaches (e.g. national top and/or international level) from Denmark (n=50), Norway (n=50) and Sweden (n=49) participated (134 male, mean age 38.3±9.8yrs; 15 female, mean age 39.1±8.4). 58 percent of the coaches were coaches of individual sports and 42 percent were coaches of team sports. 59 percent of the participants had at some point, undertaken academic study related to sport at university level. A paper-copy questionnaires were distributed by post to all coaches listed in each country's athletic federation index.

Leadership behaviour: Coaches self reported their perceptions of their own leadership behaviors using the Leadership Scale for Sport (Chelladurai & Saleh, 1980). The Cronbach's alpha for self reported leadership behavior was: .79 training and instruction, .59 positive feedback, .66 social support, .78 democratic behavior, and .46 autocratic.

Coach-athlete relationship: The nature of the coach-athlete relationship was evaluated using the 13-item Nordic Coach–Athlete Relationship Questionnaire (NOR-CART-Q; Jowett & Ntoumanis, 2003). The Cronbach's alpha for closeness, commitment, and complementarity was .83, .72 and .67 respectively.

Results: Positive feedback, training and instruction, and democratic behavior were the most frequent self-reported behavior subscales amongst the coaches. Moreover, it is a positive relationship between commitment and training and instruction ($r=.25$, $p < 0.01$) positive feedback ($r= 22$, $p < 0.01$) and social support behavior($r=.22$ $p < 0.01$). Complementarity was positively related to training and instruction behavior ($r=.17$, $p < 0.01$). Multilevel logistic regression analyses indicated a significant difference between coaches in Denmark and Sweden on commitment (5.39 vs. 5.95) and complementarity (5.82 vs. 6.26) and coaches who are educated in sport use more positive feedback (4.25 vs. 4.41). Moreover, coaches with more than 10 years experiences in coaching us significantly more training and instruction (3.65 vs. 3.82) and social support (3.02 vs. 3.23) than coaches with less experiences. Furthermore, coaches in individual sport reported more democratic behavior (3.80 vs. 3.23) and less autocratic behavior (2.56 vs. 2.78) then coaches in team sport.

Discussion: In general coaches with more experience and more sport education used more positive feedback and social support. The study also revealed differences in leadership behavior between individual and team sport which is in line with former research.

References

Chelladurai P , Saleh SD (1980). Int J Sport Psych, 2, 34-45.

Jowett S , Ntoumanis (2003). Scand J Med Sci, 14, 245-257.

THE PENALTY IN FOOTBALL

VICENTE, A., FERNANDO, C., LOPES, H., ALMADA, F.

UNIVERSITY OF BEIRA INTERIOR, UNIVERSITY OF MADEIRA, VML LTD.

INTRODUCTION: The penalty is important in a football game, because of the percentage of achieved goals, and since through them the tie situations can be resolved. It is known by "the lottery'.

We reject, however, these statements, because in previous studies we've found that, considering 8 possible directions (1 - initial position, 2 - up, 3 other – right: high, medium low and, 3 more identical to the left) for the goalkeeper to displace in order to defend the ball, in more than 40% of the situations, they've chosen the correct direction (even arriving late), which would not have been possible if the decision was purely random.

The question we ask, to diagnose and prescribe training situations with greater intentionality, is: which variables settle the success in a penalty?

METHODS: We've analyzed 250 penalties, through image digitization of video, football games of the FIFA and UEFA top competitions over the last 10 years.

Knowing the space (e) that the ball should travel to the goal (11m), the goal dimensions (2.44mx7,32m), that one second of film contains 25 frames (0,04 seconds), we measured the time the goalkeepers took to move up to intercept the ball, the time that the ball took to reach the goal or be intercepted, the moment when the goalkeeper started his displacement in relation with the kick, and the ball average speed

We've also defined, in the situations that haven't ended in goal, what corrections should be made into the striker to be successful.

We've made the same analysis for the goalkeepers in situations where they could not avoid the goal.

In this sense, we've defined what corrections should be made and when these could result in success for both the striker and the goalkeeper.

After making the sequence we've functionally defined what was happening in each penalty.

RESULTS: From the 250 penalties analyzed, we've seen that:

- 157 (62,8%) were scored;
- The other 93 (37,2%) weren't scored. From theses, 44 were intercepted by the goalkeeper (47,3%) and in the other 49 the ball was not kicked in the goal direction (52,7%).
- We've also get that:

• the goalkeepers reaction time was at least 0,7 seconds (complex reaction time)

• the ball time to reach the goal even varied between 0,4 and 1,2 seconds was only higher that 0,6 seconds when the goalkeeper was already out of balance when the ball was kicked.

• the goalkeepers started their displacement, in average, 0,4 seconds before the ball was kicked.

• in 47% of the situations the goalkeepers moved in the ball direction.

DISCUSSION: Although the penalty is not a purely random situation, despite the great variability of situations and values for the different variables involved, we've set a time where key decisions are taken either to the goalkeeper and the striker.

This is the time for the kinetic energy accumulation of the movement of different segments used in the kick. At this stage there is an inverse relationship between the acceleration time and the speed that the ball can reach.

DO ELITE COACHES UNDERSTAND SPORT SCIENTISTS? – A STUDY ABOUT THE USEFULNESS OF RESEARCH DATA

ESTEVES, D., PINHEIRO, P., BRÁS, R., O'HARA, K.

UNIVERSIDADE DA BEIRA INTERIOR

Despite the abundance of scientific literature, databases and electronic papers concerning sport sciences (Lippi et al., 2008), there is a general perception that coaches lack operative data to the decision making process (Midgley et al., 2007), that is the major task of the sport training process (Abraham et al. 2006). In this sense, we came to a paradox: the amount of available data may not correspond to the enhancement of sport performance during training process. This paradox may be related to a data overflow problem (Liautaud & Hammond, 2000).

Under the scope of contributing to minimise that "gap" between research and coaching practice, this work aims (1) to evaluate the usefulness of research data, concerning the needs of the coaches and (2) to propose some major solutions to minimise this problem.

This study used a survey to evaluate the perceptions of 47elite coaches in Portugal regarding both the usefulness of data in scientific literature and data overflow problem. Results show that elite coaches lack operative data, or because they perceived is not available for ecologic training process, or it is available but not in an "adequate", understandable language.

Among this investigation, we reach several major conclusions: (1) data overflow may be a problem in sport sciences; (2) to do a proper use of available data, it is necessary the implementation of mechanisms in data's search, selection and treatment, according to Information Management Theory (Eppler & Mengis, 2004; Savolainen, 2007) and (3) research results in sport sciences must be oriented to the training process, and transmitted more efficiently to the coaches (similar results were pointed out by Williams & Kendall, 2007).

ABRAHAM, A., Collins, D., Martindale, R. (2006). The coaching schematic: validation through expert coach consensus. J Sports Sci., 24(6), 549-564.

EPPLER, M. Mengis J. (2004). The Concept of Information Overload: A Review of Literature from Organization Science, Accounting, Marketing, MIS, and Related Disciplines. The Information Society, 20(5), 325-344.

LIAUTAUD, B., Hammond, M. (2000) e-Business Intelligence: Turning Information into Knowledge into Profit. Ed. McGraw-Hill Professional.

LIPPI, G., Guidi, G. C., Nevill, A., Boreham C. (2008). The growing trend of scientific interest in sports science research. J. Sports Sci. 26(1), 1-2.

MIDGLEY, A. W., McNaughton, L. R., Jones, A. M. (2007). Training to Enhance the Physiological Determinants of Long-Distance Running Performance: Can Valid Recommendations be Given to Runners and Coaches Based on Current Scientific Knowledge? Sports Med. 37(10), 857-880.

SAVOLAINEN R. (2007). Filtering and withdrawing: strategies for coping with information overload in everyday contexts. Journal of Information Science, 33(5), 611.

WILLIAMS, S. J., Kendall, L. (2007). Perceptions of elite coaches and sports scientists of the research needs for elite coaching practice. J. Sports Sci., 25(14), 1577 – 1586.

THE FEINT IN FOOTBALL

VICENTE, A., LOPES, H., FERNANDO, C., ALMADA, F.

UNIVERSITY OF BEIRA INTERIOR, UNIVERSITY OF MADEIRA, VML LTD.

INTRODUCTION: In football training to be able to identify the variables involved in a feint makes it possible to do specific corrections in the action of a player, even if it is a higher level one (but not only), because it allows diagnosing the cause of the error and what can be most useful to train, prescribing exercises that require more emphasis on the improvement of relevant aspects and not the generality of the situation, and even to control the progress that is being achieved through the measurement of the evolution that is happening in the factors trained.

So, it's increased the profits yield because the training is directed to the important aspects in that situation for that player.

METHODS: We've analyzed 276 feint situations through image digitization of videos from high competitive level football matches of clubs and national teams.

In the analysis were considered the time of each frame (0.04 seconds) and the relationship established between the stimuli that were provided by the player who made the feint and the response of the opponent.

We've considered also as a point of reference of minimum reaction time 0.4 seconds.

We've found in 134 of analyzed situations, those that were not successful, what corrections should be made to avoid the error.

In all feints we've analyzed the relation between the two players and the corrections that each could make to improve his performance.

We've also analyzed a number as high as possible of the same situations from the same players, and also in these sets of situations obtain successful as well as missed feints.

RESULTS: From the 276 analyzed situations we've obtained the following distribution:

- Total of players analysed 35
- From this 35 players, 26 of them have a sample of 10 feints with an average of 6 succeeded and 4 missed.
- From the other 9 players we have a percentage of 12,8 feints from each one being 30 of them missed.

We've seen that the successful feints were not the ones with shorter execution time, on the contrary, in 76% of them, they were significantly slower that the identical feints from the same player than the feints that were missed.

When considering what corrections should be made, was considered that the action of the opponent who made the cut would be the same and found that in 91% of cases if the player action had been slower (taking into account that the opponent's position would be the same) that he would had naturally succeeded.

DISCUSSION: The success of a feint is not dependent of the speed with which it is made but in the effect it is possible to obtain in the opponent and the ability of the player who will perform the feint has to wait for the signal that sends to the opponent will make effect before changing his action to what he must to do.

The feint, as we set, 'is played' in times of decision making and reaction times of both players.

13:00 - 14:00

Poster presentations

PP-HF04 Health and Fitness 4

EFFECTS OF A CORPORATE FITNESS PROGRAM UPON EMPLOYEES OF DIFFERENT AGE RANGES

MELLO, A.

FEDERAL UNIVERSITY OF RIO DE JANEIRO

Introduction: Competitiveness of globalized markets demands, besides quality products, the attention of business companies to the environment, safety and health, differentials of great relevance. Among many initiatives, companies have implemented corporate fitness programs aiming the health and the fight against their employees' chronic degenerative diseases (OPS/OMS, 2005), promoting decrease in absenteeism and in early retirement. In Brazil, Petrobras – Petróleo Brasileiro S/A, in its CENPES unity located in Rio de Janeiro, offers a physical conditioning program (bodybuilding, gymnastics and stretching) to its employees at the Espaço Bem-Estar wellness center.

Methods: The aim of the present study was to investigate possible impacts on the employees' health who participated in the program, according to four different age ranges. The sample consisted of 107 users of both genders and the following variables were investigated: Weight, Body Mass Index (BMI), Fat Percentage (%Fat), Lean Body Mass (LBM), Flexibility and Maximum Volume of Oxygen (VO2maximum). Individuals were assessed in two moments: 1- Before the beginning of the activities in the program and 2- After six months of enrollment. The Exploratory Data Analysis technique was applied to the treatment of rough data and verification of the adherence variables to the normal curve (NIST/SEMATECH, 2006). The parametric t-test, two paired samples for the means, was applied for comparison of the means and identification of the differences. Statistical analysis was conducted using the Statistica 6.0, R 2.4.1 and Microsoft Excel 2003 softwares.

Results: Frequency distribution demonstrated the following behavior: between 20<x≤30 years of age were 22.43% of the participants, between 30<x≤40, 29.91%, between 40<x≤50, 38.32% and over 51, 9.35%. Results indicated that at the age range of 20<x≤30 there was an increase in LBM and in Flexibility in the comparative analyses conducted before and after six months in

the program at a 5% significance level. In 30<x≤40 there was a reduction in %Fat and increase in Flexibility. The 40<x≤50 age range was the most significant in the study because all variables underwent positive changes, except for Flexibility. Over 51 years of age it was observed an increase in VO2maximum.

Discussion: The results of the study showed that the fitness program resulted in benefits to the employees' health, be it in the LBM increase, %Fat decrease, Flexibility increase or VO2maximum, but benefits may vary according to age ranges. Youths tend to improve Flexibility more, whereas the employees over 40 improve VO2maximum more.

REFERENCES

NIST/SEMATECH e-Handbook of statistical methods. Engineering statistics handbook. In: <http://www.itl.nist.gov/div898/handbook/index.htm>, December/2006.

OPS/OMS. Doenças crônico-degenerativas e obesidade: estratégia mundial sobre alimentação saudável, atividade física e saúde. Brasília, 2003. In: <http://www.opas.org.br>, August/2005.

CORPORATE FITNESS AND NUTRITION AS AGENTS IN THE REDUCTION OF RISK FACTORS FOR NON-TRANSMISSIBLE CHRONIC-DEGENERATIVE DISEASES

MELLO, A.

FEDERAL UNIVERSITY OF RIO DE JANEIRO

Introduction: Public institutions and business companies are concerned about non-transmissible chronic degenerative diseases (NTCDD) as arterial hypertension, cardiovascular diseases and diabetes mellitus. Petrobras, a Brazilian company of oil and gas, has created policies of prevention and control of its employees' health and founded the Center for Health Promotion/ CHP [Centro de Promoção de Saúde] in its main building in Rio de Janeiro, integrating fitness performed every week and regular food guidelines. The aim of this study was to verify possible alterations in the risk factors for NTCDD in groups of participants in the program at the CHP after the period of a year of activities, according to the week frequency to the program.

Methods: The functional and biochemical profiles of a sample composed of 357 employees were assessed, selected according to the presence of risk factors for NTCDD through an annual medical exam. The sample was divided into three groups: employees with frequency (F) to the program of physical exercise ≥ twice a week (G1, n=59); F = once a week (G2; n=115); and assessed employees who did not join the program (G3; n=215). All were submitted to the initial anthropometric and nutritional assessment but only G1 and G2 had all the variables re-assessed. Total body mass, relative body fat (%F), waist perimeter (WP) were assessed. We considered hypertensive individuals those who presented systolic blood pressure (SBP) ≥ at 140mmHg, and/or diastolic blood pressure (DBP) ≥ at 90mmHg. The biochemical variables were composed by the assessment of fast glycemia and determination of the lipid profile (triglycerides, total cholesterol, LDL and HDL). We determined the prevalence of the Metabolic Syndrome (SM) according to criteria established by the American Heart Association (2005). For the statistical analysis we used the two way-ANOVA in the SPSS 13.0 program, with 0.05 significance level.

Results and Discussion: As regards the lipid profile, we observed a reduction in all the assessed fractions where were highlighted the decrease in LDL (G1 males: 139.4 vs. 112.9 mg/dl and G1 females: 130.6 vs. 117.7 mg/dl); (G2 males: 133.5 vs. 117.8 mg/dl and G2 females: 134.9 vs. 103.7 mg/dl) ($p < 0.05$); G3: (G3 males: 134.5 vs. 122.3 mg/dl and G3 females: 123.1 vs. 117.3 mg/dl ($p > 0.05$). We observed the maintenance of the MS percentage among the females in G2, and a statistical significant increase in the female participants in G3 (50% vs. 100%). Among males, there was a decrease in MS in G1 (50% vs. 39%) and an increase with statistical significance in G3 (50% vs. 100%). As regards the glycemic profile, there was a good control of the levels of serum glucose, as in G1 as in G2, and a tendency of increase in G3. There were statistically significant reductions in SBP, DBP, %F and WP in physically active individuals. Even with low weekly frequency to the fitness and nutrition program participants obtained benefits in the reduction of risk factors for NTCDD.

REFERENCES

AHA. Statement and guideline development. Dallas, 2005.

ELDERLY WORKERS IN PHYSICALLY DEMANDING JOBS: HOW DO THEY MANAGE?

JEBENS, E., MEDBØ, J.I., MAMEN, A., KNUTSEN, O.

NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH

Introduction: Work in the construction industry is physically demanding and influence the workers' physical and psychological resources. Musculo-skeletal disorders constitute the most common diagnose for disability pensions in the trade. The construction industry is the second largest branch for disability retire¬ment for the age group 60–64 yr. This supports the concept that may be called the "strenuous work hypothesis". Senior construc¬tion workers that report lasting health problems or feel they are so worn out that their work ability is considerably reduced, have the largest tendency to retire early.

Physical ability is reduced by age. A common and important misunderstanding is that workers with physically demanding tasks assume that they maintain their physical work ability through their work. This may not be correct. Therefore, elderly workers may be at disadvantage in physically demanding job.

The purpose of this study was to examine conditions that may retain the seniors (50+ yr) in working life until they reach the age of normal retirement of 67 year (national insurance).

Methods: First a survey (questionnaires) was carried out among all employees in a medium-sized construction company (n = 100). Thereafter 40 construction workers (20 above 45 yr, 20 below 30 yr) were tested for muscular strength, cardio-respiratory fitness, and body fatness. Moreover, 18 of the older and 12 of the younger workers were followed for 1 h each during their normal work while oxygen uptake and heart rate were measured continuously by automatic analysers.

Results

Having good health / not being worn out was reported as the most important requirement for staying in work to normal age of retirement. Moreover, most of the workers stated that the work was medium to very strenuous, that they had demanding working positions and that they had daily handling of tools and equipment weighing from 1 to 45 kg. They reported varying degrees of pain and duration of pain in neck, upper and lower back, shoulders, arms, hands, hips and knees.

The group of young workers had a higher VO2-max than the older group: 53±8 vs. 41±6 ml kg-1 min-1. For both groups the work taxed on average 31% of VO2-max and 53% of HR-max. Peak load for a few minutes duration was 54±12% of VO2max and 71±9% of HR-max.

Discussion: For both age groups VO2-max was typical for relatively untrained persons of their age, suggesting that their work did not improve their fitness. During work both groups taxed their aerobic power similarly and equal to the internationally accepted level of a mean of 30 % of max aerobic power during an 8 h working day. These data suggest that elderly workers, when given the possibility, may adjust the physical demands to a level they can sustain. However, individual values suggest that for some unfit senior workers the aerobic demand may exceed the proposed upper limit.

DO PEOPLE ON LONG TERM SICK LEAVE EXPERIENCE AN INCLUDING WORKING LIFE?

BARSNES, B., MAGNUSSEN, L.H., RÅHEIM, M.

SOGN OG FJORDANE UNIVERSITY COLLEGE AND UNIVERSITY OF BERGEN

Introduction: During the last decades, many countries have experienced increasing numbers of people on disability pension and long-term sick leave, despite economic growth and expanding health care systems (Ahlgren and Hammerstrøm, 1999.) In Norway, official reports have investigated the subject to search for explanations and solutions (NOU, 2000). An agreement towards a common responsibility for an including working life has been signed by the Norwegian government and the employee and employers organizations (Arbeids- og velferdsetaten, 2008). The aim of our study is to provide an insight into how people on sick leave experience the cooperation with their employer, their doctor and the governing authorities.

Methods: Focus groups were used for the interviews (Kvale, 1996). The interviews were a part of a larger intervention study at a workplace including 60 employees on long-term (> 6 weeks) sick leave. Twenty-five of the employees were asked to participate in the focus groups. Seventeen responded positively, and were divided into three groups.

Preliminary Results: Most of the participants were satisfied with the way their employer supported them during their period of sick leave, but participants with non-specific disorders (no diagnosis) and participants with a psychiatric diagnosis expressed problems in communicating with their employer.

The views of the doctors' involvement were divided. Some participants expressed very high regards for their doctors, while others complained about them being hard to reach and difficult to communicate with.

The Norwegian Labour and Welfare Services (NAV) mainly received negative reviews, with the participants expressing that they were offered little help. For instance they had to figure out their own rights and remember to fill out the correct forms at the appropriate times on their own.

Discussion: More knowledge is required at the workplaces for employers to better handle employees with non-specific disorders or a psychiatric diagnosis. Social support at the workplace has been shown to be an important factor for job satisfaction, and the opposite might discourage motivation staying in or returning to work (Drabløs, 1993).

For both doctors and officers at NAV a focus on individual communication skills and attitudes should be emphasized (Magnussen et al, 2007). The focus group participants in the present study also suggested that there should be advisers at NAV designated to helping people on sick leave, and that those advisers should be separate from the caseworkers.

References

Ahlgren C, Hammerstrøm A (1999).Scand J Public Health, 27, 220-227.

Arbeids- og velferdsetaten (2008).<http://www.nav.no/page?id=307> [16.06.08]

Drabløs PA (1993).Norsk tidsskr.arb.med, 14, 197-210

Kvale S (1996). Interviews:an introduction to qualitative research interviewing. SAGE publications, California.

Magnussen L, Nilsen S, Råheim M (2007).<http://www.ncbi.nlm.nih.gov/sites/entrez>

NOU 2000:27 (2000).< www.dep.no/sos/norsk/publ/utredninger/NOU>

RELATION TO CORPORATE HEALTH PROMOTION WHICH AIMS TO PREVENT METABOLIC SYNDROME USING E-WELLNESS SYSTEM

YOSHIZAWA, Y., YOKOYAMA, N., SAKATO, Y., KUNO, S.

UNIVERSITY OF TSUKUBA

[Introduction]This study implemented a health promotion project with a central focus on lifestyle-type exercise programs conducted at convenient times and places to suit the individual lifestyles of the metabolic syndrome research subjects, as well as people at risk, by taking company A, which is expanding nation-wide, as a model. These results will be studied concerning how changes to attitudes in relation to physical activity, as well as the type of effects brought about by work environment thought to affect the volume of physical activity would influence increases in the quantity of physical exercise program activity.

[Method]Six month interventions were carried out on 351 consenting males taken from 4,233 persons that undertook a physical examination, that were aged above 40 years (48.8±8.9 years), and had the company in-house reference value of more than two items as being a metabolic syndrome risk group/applicable group. Intervention results were split into two groups; a group where the average increase per day was less than 3,000 steps (N=170) and a group where the average increase per day was greater than 3,000 steps (N=89).

[Results]With regards to changes in body composition and the number of steps pre and post-intervention, comparing post intervention to pre-intervention, a decrease was seen in body weight, BMI, body fat ratio and physical strength age and an increase was seen in muscle ratio and number of steps. In relation to work environments, including increased number of steps and commuting environment, there was no significant difference in job types and commuting time, but significant differences were seen in whether or not commuting was done by car and whether or not overtime was performed. Further, significant differences were seen in the items where commuting was done by walking, walks were taken, and where exercise was taken during breaks from work. In the greater than 3,000 steps group, commuting was by means of public transport such as buses and trains implied that life was also lived with a high awareness of physical activity. In contrast to this, in the less than 3,000 steps group, the result was that more than 40% commuted by car and a large ratio of respondents stated that overtime was performed.

[Discussion and Conclusions]In the event the standard is taken as an increase of greater than 3000 steps per day, it was evidenced that for the work environments studied, the causal factors of commuting method (non-car usage group) and whether or not overtime was performed were significantly high for the number people who managed to achieve the standard. Further, from the fact that whether commuting is by walking or not has an effect, even on awareness of physical activity, potential was evidenced to deliver certain effects on metabolic syndrome outbreak and its prevention through implementation of exercise programs for the mode of commuting amidst working environments.

BODY COMPOSITION, HANDGRIP STRENGTH AND AEROBIC FITNESS IN 6000 FINNISH MEN

HEISKANEN, J., LÄHDESMÄKI, A., HAKONEN, H., KANKAANPÄÄ, A., KOMULAINEN, J., HAVAS, E.

LIKES FOUNDATION

INTRODUCTION: Obesity is a health threat in Finnish population and there is no wide measured data of Finnish working aged male. Jack the Finn truck tour was executed in September 2007 and May 2008 to increase working aged men's awareness of their health and physical fitness and at the tour was measured over 6000 Finnish men.

METHODS: Body composition (n=6082) was measured by bio electric impedance device InBody 720, which were 3-4 in a truck according to city.

Aerobic fitness (n=3161) was assessed by Polar OwnIndex (VO2max, ml-1*kg-1*min).

Handgrip strength (n=3241) was measured by Saehan hand dynamometer.

Socioeconomic status was researched in three different inquiries (n=1038).

RESULTS: Of all tested men (n=6187) were 55–64 years 27 %, 45–54 yrs 24 %, >64 17 %, 35–44 15 %, <25 6 % and 25–34 11 %. 51 % of the men consisted of workers.

According to BMI slightly or significantly overweight (BMI>25) were <25 years 43% (n=349), 25-34 62% (n=667), 35-44 76 % (n=900), 45-54 79 % (n=1452), 55-64 80 % (n=1686) and >64 79 % (n=1028). Estimated by fat percent (F%) slightly or significantly overweight (F%>20) were <25 years 24%, 25-34 40 %, 35-44 55 %, 45-54 62 %, 55-64 69 % and >64 76 %. The averages of visceral fat area (VFA=cm2) were: <25 years 60, 25-34 86, 35-44 107, 45-54 120, 55-64 133 and >64 143. According to the device manufacturer for individual's health the recommendable value should be under 100 m2 regardless the age.

Skeletal muscle mass (kg) averages were: <25 years 36,7, 25-34 37,6, 35-44 38,3, 45-54 37,3, 55-64 36,0 and >64 33,7. Handgrip strength (kg) had a significant correlation to skeletal muscle mass (kg): 0,60. The correlation of fat mass (kg) was -0,52, F% -0,46, BMI -0,45 and VFA -0,48 to VO2max.

CONCLUSIONS: Obesity is quite common in this kind of population judged by fat percent. Visceral fat tends to increase and skeletal muscle mass decrease according to ageing. Skeletal muscle mass is highly in connection with handgrip strength. Excessive body fat mass reduces aerobic fitness. An average Jack Finn according to this data is approximately 50 years, slightly overweight and abdominal obese, is in fair aerobic shape and has good muscle strength.

This study gives fresh reference value data of working aged male population's physical fitness and health.

AEROBIC FITNESS OF PHYSICAL THERAPY STUDENTS

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IntroductionIt is reported that aerobic fitness of Norwegian military recruits from 1985 to 2002 decreased by 8%, while body mass and body mass index increased by 7 and 6% (Dyrstad 2005). It is also reported that the number of military recruits that are dismissed from duty because of poor fitness has increased over the years (Kurtze 2003). Consequently, it is interesting to investigate the aerobic fitness of young male and female students that perform some physical activity as part of their curriculum and examine whether their fitness level have changed in the last decade. MethodsEach year from 2000 to 2009, ~10 % of the physical therapy students enrolled at the Oslo University College were randomly selected to participate in an exercise test. The test was performed on a Monark E834 ergometer. Following warm-up, the work load was increased by 25 W every 60 second until exhaustion. Gas exchange was measured by a SensorMedics 229 metabolic cart. Work rate was recorded in Watts (W). All tests were performed by the same investigator. Results were analysed by ANOVA and independent samples t-test. Statistical significance was set at $p < 0.05$. ResultsMean (SD) age, height, bodyweight and BMI of the 137 persons (67 females and 70 males) in the present study was 23 ±3.9 yrs, 175±9.3 cm, 72 ±12 kg and 23.2 ±2.2. Body weight and BMI did not change during the analysis period.Average (SD) VO2max values over 10 years show significantly higher values for men than for women, i.e. 3.83 ±0.6 vs. 2.67 ± 0.3 L min-1, $p<0.001$.There were no changes in aerobic capacity of neither women nor men during the period from 2000 – 2009. For women and men the average VO2max (SD) values from 2000-2009 were as follows: 2.76±0.2 vs. 3.99±0.5, 2.51±0.29 vs. 4.23±0.29, 2.73±0.49 vs. 4.10±0.36, 2.46±0.27 vs. 3.75±0.41, 2.69±0.36 vs. 3.96±0.66, 2.78±0.27 vs. 3.94±0.56, 2.71±0.28 vs. 3.93±0.43, 2.77±0.15 vs. 3.86±0.63, 2.69±0.43 vs. 3.61±0.68, 2.67±0.43 vs. 3.53±0.75 L min-1. DiscussionThe present findings suggest that the VO2max of young students is unchanged during the last decade. This is in contrast to the findings of Dyrstad (2005). Our population is, however, small (n=137) compared to the study of Dyrstad (loc.cit.), thus our data may not reflect the true aerobic capacity of the general population of young men. In contrast to Dyrstad (2005), body weight and BMI of the men (and women) in the present study was unchanged during the last decade. Hermansen (1965) examined the aerobic capacity of male and female students and observed values of 3.2 and 2.3 L min-1, respectively, which seem comparable to the present findings. This suggests that the aerobic capacity of young male and female students have remained unchanged for the last decades, and that the aerobic capacity of young male physical therapy students is somewhat higher than VO2max of young Norwegian recruits.ReferencesDyrstad SM, Aandstad A, Hallen J (2005). Scand J Med Sci Sport 15: 298–303Hermansen L, Andersen KL (1965). J Appl Physiol 20: 425-431Kurtze N, Gundersen KT, Holmen J (2003). Norsk Epidemiologi 13: 171-176

EFFECTS OF THE SLOW SPEED RESISTANCE TRAINING ON ARTERIAL STIFFNESS BY ONE'S OWN WEIGHT.

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Properly done resistance training increased strength, muscle mass, bone mineral density, glucose tolerance, functional abilities, and hence potentially reduces morbidity and premature mortality. However, high strength resistance training increased arterial stiffness of a major contributor to cardiovascular disease (1). Okamoto et al. (2006) reported that arterial stiffness was decreased by low-intensity resistance training with slow lifting and lowering for eight weeks (2). However, it did not clarify the effect of slow speed resistance training on arterial stiffness by one's own weight. We hypothesized that slow speed resistance training by one's own weight for eight weeks decreased arterial stiffness.

Subjects were six healthy men (21.2±0.75years old, 169.7±3.93cm, 63.3±5.78kg). Subjects were voluntary participated in this study. Experiments were carried out under the approval of the Ethical Committee of the Kawasaki University of Medical Welfare and all subjects provided written informed consent. Subjects performed slow speed resistance training three times a week for eight weeks. Training was

conducted by two sets of 10 repetitions (3s for eccentric and concentric actions, 1-s pause) of push up, reverse push up, sit up, side arm back extension, half squat, hip lift. Each training items of interval was one minute. It was measured height, weight, body mass index, body fat, brachial blood pressure, ankle blood pressure, brachial-ankle pulse wave velocity (baPWV), pulse pressure, heart rate by four times (before training, four weeks, eight weeks, twelve weeks) for twelve weeks. Subjects rested in the supine position for 10 min before measurements. baPWV was measured using formPWV/ABI (Colin Co., Ltd, Komaki, Japan) and by the oscillometric method. This device recorded the PWV, blood pressure, an electrocardiogram.

There were no significant differences in the before training baPWV among the four groups. Blood pressure, pulse pressure and heart rate were unchanged by slow speed resistance training for eight weeks. %HRmax was 47±4.04 during the slow training.

Consequently, it was clarified that arterial stiffness was not changed by slow speed resistance training of one's own weight for eight weeks.

(1) Westcott, W. L. et al. (2001). Effects of regular and slow speed resistance training on muscle strength. Journal of Sports Medicine and Physical Fitness 41:154-8

(2) Okamoto, T. et al. (2006). Effects of eccentric and concentric resistance training on arterial stiffness. Journal of Human Hypertention 20 : 348-354

13:00 - 14:00

Poster presentations

PP-HF05 Health and Fitness 5

MEASURING PHYSICAL ACTIVITY IN ACTIVE COMMUTING

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Purpose

From a public health point of view it is of interest to position different forms of existing physically active behaviours in relation to potential health outcomes. In order to do so, there is a need to establish the energy turnover per week related to a certain form of physical activity. With a research focus on active commuting, it is possible to combine data on route distance, frequency of trips per week and energy demands per kg body weight and km of commuting. For this purpose is has proven to be necessary to develop different methods, and recently we have established a criterion method for route distance measurements (Schantz & Stigell 2009). For reasons of simplicity and large scale studies, the aim of this study is to investigate whether other often used methods for estimating route distances are valid and reproducible.

Methods: A total of 133 individuals participated in the study after having been recruited while walking or cycling to work in the inner urban area of Stockholm, Sweden. They drew their commuting routes on maps and answered different questions in a questionnaire twice, with slightly more than two weeks in between. Route distances were determined with the criterion method (Schantz & Stigell 2009) and compared with distance values obtained by four other methods: self-reported data, straight-line distance, geographic information system (GIS) modelled shortest routes and global positioning system (GPS).

Results: No order effects were noted for any of the methods. All of them, with self-reported data being the sole exception, displayed a very high reproducibility. However, to varying degrees, the methods either under- or overestimated the route distances (range: -21 to +27%).

Conclusion: The study reveals that a number of methods commonly used within the transport sector for determining route distances are not successful in accurately describing route distance when walking or bicycling for commuting purposes. By using correction factors, the deviations in mean values from the corresponding values obtained by the criterion method, can be neutralized. However, on the individual level, deviances from the correct value will still exist. This problem exists for all methods, but it is particularly evident for the self-reported data. Therefore, when there is need for distance values for analytical purposes, for example in a scientific context, the criterion method (Schantz & Stigell 2009) is recommended.

References

Schantz, P. & Stigell E. 2009. A criterion method for measuring route distance in physically active commuting. Med Sci Sports Exerc 4 (2): 472-478

INCREASING PHYSICAL ACTIVITY AND IDENTIFYING REASONS FOR INCATIVITY - A REVIEW

ROVIO, E., LINTUNEN, T., HAVAS, E.

LIKES RESEARCH CENTER, JYVÄSKYLÄ, FINLAND

Introduction: The aim of this poster is to (1) evaluate intervention studies aiming at increasing physical activity and (2) suggest new approaches to the study of physical inactivity and behavioral change from the sociological and social psychological points of view. Most of the people in the developed countries are not sufficiently physically active for physical activity to have a beneficial effects on their health. In addition, physical inactivity decreases productivity in the work place, causes workplace absenteeism and has significant effect on social and health care costs.

Methods: A review of the current literature and earlier physical activity intervention studies.

Results: Researchers have used a wide variety of interventions to stimulate increased physical activity (Biddle & Mutrie, 2008). Informational approaches aim at increasing knowledge and changing attitudes, while behavioral and social approaches aim at teaching behavioral management skills and at creating facilitative social environments. Environmental and policy approaches in turn aim at building a safe and attractive structure for physical activity (e.g., on the institutional/legislative level through changing organizational regulations, policies, and laws). Targets of interventions have been individuals, groups and communities (e.g., school, workplace). In general, it is relatively easy to increase physical activity in the short term, but not permanently (Biddle & Mutrie, 2008). Strategies that would be successful in enhancing physical activity have been hard to determine.

A less studied approach to the investigation of physical activity is to apply tools used in the sciences of sociology and social psychology. Researchers would then be able to focus "hard to reach" segments of the population and identify their complex social and environmental determinants. There is a need to understand the interaction between these inactive individuals and their everyday environment, such as combining work/school and leisure time, shared family time, especially around the (hidden) norms of eating, or evaluating the effect of the information society on physical activity. Inactive individuals in different groups should be identified and the effect of these groups on their physical activity studied. It would be valuable to understand how the role of an inactive person develops.

Conclusions : The challenge of getting people to be physically active is a global one. There is a need for a greater understanding of the determinants of inactivity in people's everyday lives. Long-term studies focusing on inducing change in exercise behavior, explaining what works, how and for whom are missing. Identifying such factors could provide essential guidance for behavioral change.

References

Biddle, S. J. H., & Mutrie, N. (2008). Psychology of physical activity. Determinants, well-being and interventions (2nd ed.). London: Routledge.

PERCEPTION OF FATIGUE DURING WATER FITNESS EXERCISE

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FACULTY OF ECERCISE SCIENCES - UNIVERSITY OF MILAN

INTRODUCTION: During exercise, subjects can perceive fatigue at different workout intensities. Gender seems to be scarcely related to the perception of fatigue, as well as the age between young and middle-aged people. Borg's RPE (Ratings of Perceived Exertion) and CR10 (Category Ratio anchored at the nr 10) surveys have been designed in order to measure the perception of fatigue [1, 2].

The aim of this study was to analyze the perception of fatigue in middle-aged women during a mid, high and very high intensity water exercise, both in lower (L) and upper (U) body.

METHODS: 11 middle-aged women (44.4±2.9 years, 55.8±4.5 kg, 165±3 cm, BMI 20.5±1.7) participated in the study. Through the Borg's CR10 scale questionnaire, the perception of the fatigue in L and U exercises has been evaluated. During 5 successive training sets, for each body part, CR10 was collected twice (after warm up and after the first block of workout) in order to evaluate two 6-minutes exercises randomly performed, based on standard external charge of workout carried out at three levels: mid (MI), high (HI) and very high (VHI) intensities.

Intensity settings for L exercise (running) were: L-MI = 24 beats at 135 bpm + 8 beats at speed max; L-HI = 16 beats at 135 bpm + 8 beats at speed max; L-VHI = 8 beats at 135 bpm + 8 beats at speed max.

Intensity settings for U exercise (arm ad/abductions) were: U-MI = 6 arm ad/abs at 135 bpm (24 beats) + 8 beats at speed max; U-HI = 4 arm ad/abs at 135 bpm (16 beats) + 8 beats at speed max; U-VHI = 2 arm ad/abs at 135 bpm (8 beats) + 8 beats at speed max.

The effective perception of different intensities during water exercise and the differences between lower and upper body perception have been analyzed.

RESULTS: Subjects were able to properly differentiate exercise intensities, both in lower body and in upper body. Significant differences ($p<.001$) were found.

Comparing L and U, the perception of fatigue differed at MI and VHI (4.95±0.96 vs. 3.85±1.02, $p<.05$ and 7.88±0.60 vs. 6.63±1.28, $p<.05$, respectively) whereas did not differ at HI (6.15±.62 vs. 5.27±1.28, $p>.05$).

CONCLUSION: Middle-aged women are able to differentiate the efforts in water exercise among Mid, High or Very High intensities. However, the intensities proposed were not exactly perceived from our subjects and the efforts were differently perceived in the lower and the upper body exercises. Hence, exercise intensities have to be modified in order to proper manage the efforts and to perform at adequate intensities corresponding to the expected CR10 scores.

REFERENCES

[1] Borg G (1998). Borg's Perceived Exertion and Pain Scales. Human Kinetics, Champaign, IL.

[2] Borg G (2004). The Borg CR10 Scale® Folder. A method for measuring intensity of experience. Hasselby, Sweden. Borg Perception.

METABOLIC RESPONSE DURING AN AQUATREADMILL CLASS IN YOUNG AND MIDDLE AGED ADULTS

PIACENTINI, M.F., CARMINUCCI, R., QUINCI, M.L., GIANFELICI, A., CAPRANICA, L.

UNIVERSITY OF ROME-FORO ITALICO

Introduction: The acute and chronic effects of aquatic exercise for health and fitness has received more and more attention, especially as a mode of exercise for special populations. Aquatreadmill classes are performed in group and conducted by an instructor who with the aid of music regulates exercise intensity on land by showing the velocity per minute (vpm) to reach during each phase of the lesson. Hydrobike has already been shown to be extremely intensive for young participants (Piacentini et al 2007 and 2008, Giacomini et al 2007). Therefore, the purpose of the present study was to evaluate energy cost, heart rate (HR) response and rate of perceived exertion (RPE) during an aquatreadmill lesson in young and older individuals.

Methods: Six young (age: 26.8±4.8 yrs) and 12 middle aged participants (age: 53 + 3.5 yrs) were recruited for the present study. All participants performed the same lesson on an aquatreadmill (HYDRORIDER), that was structured in 9 different phases characterized by different vpms each five minutes long. Ventilatory gases were collected (FITMATE, COSMED, Italy) and HR monitored (Polar, Finland) during exercise and RPE was measured at the end of each phase. A non parametric Friedman test was performed for significance ($p<0.05$).

Results: As expected, there was a difference in VO2, RPE and HR between the different phases of the lesson. Exercise intensity was significantly ($p<0.05$) different between young and older adults. The average intensity measured as %HRmax was 61+5% for the young and 70+5% for the middle aged while %VO2max did not differ between groups (56+14% and 57+13% for young and middle aged respectively). The average RPE measured during the classes was 10.6+0.8 and 10+2.5 for young and middle aged respectively.

Discussion/Conclusions

For the young group, this activity does not represent an intensive training. According to ACSM guidelines, they reach an intensity classified as moderate, both for HR and RPE. Therefore, to increase cardiovascular fitness other types of activities are suggested for young individuals (ACSM 1998). Instead, the group of middle aged participants, showed higher HR but moderate perception of effort. These results are in contrast with previous work (Raffaelli et al 2007), that found that at the same relative intensity, the perception of effort is lower in land based compared to water based activities. According to our results, the RPE alone could be misleading in programming exercise for

individuals above 50 years of age, in an aquatic environment, because despite low RPE values, the HR increased throughout the whole lesson.

The authors acknowledge Cosmed for financial support

References

ACSM position stand (1998) Med Sci Sports Exerc

Piacentini MF et al. (2008) Proceedings of the 13th ECSS congress

Piacentini MF et al. (2007) Proceedings of the 12th ECSS congress

Giacomini et al. (2007) Proceedings of the 12th ECSS congress

Raffaelli etl al. (2007) Proceedings of the 12th ECSS congress

EFFECTS OF WATER EXERCISE DVD MEDIA AIMNG EXERCISE ADHERENCE FOR ELDERLY FROM COLD SNOWY REGION

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HOKUSHO UNIVERSITY

Introduction: We have long been studying about the benefits of water exercise for elderly in cold snowy region (CSR). It is important to keep physical fitness to prevent slips and falls in these people (Hanai et al, 2006), especially during winter season when their physical activity fall due to snowy climate. In the present study, to facilitate the beneficial effects and their adherence of water exercise program, we developed a self-training protocol of water exercise that could be performed in swimming pool and also at Japanese bathtub. This protocol was recorded visually in DVD media, and distributed to participants who continued, or discontinued the water exercise class during winter season (Oct to Feb 2008). The purpose of the present study was to investigate the effects of self-training protocol prescription for elderly in CSR on physical fitness levels and exercise adherence.

Methods: Twelve subjects were participated water exercise class from May to November 2008. Prior to winter season, (September) we distributed a water exercise protocol by DVD media to facilitate exercise adherence during winter season. From December 2008 to March 2009, half of the subjects continued WE class (CWE group), and the other half discontinued (DWE group). The state of exercise adherence was asked by the questionnaire. Also, Life-related fitness assessment(LRFA) for the people in Northern regions included side jump, sit ups and step over and duck under the rope (Watanabe et al. 2008) were tested in the periods at May, October 2008 and March 2009. Analyzed data were compared between the groups.

Results: Life-related fitness tended to improve or maintain at most of the subjects during the periods from May to November 2008. However, the data of LRFA showed significant decline at DWE group in the periods from November 2008 to March 2009. Also, the state of exercise adherence was low at DWE group.

Discussion: The contents of water exercise DVD media was developed including lower limbs strengthening, balance and stretching training at swimming pool, also exercise at Japanese bathtub as home-based exercise. Both groups applied self-training prescription by DVD media, however, high percentage of exercise adherence and improvement of LRFA were found only at CWE group. DVD media was useful tool to raise exercise adherence with participation of group-based exercise class.

References

Hanai A et al. (2006). Rev Port Cien Desp 6(Supl.2) 361-365.

Watanabe M et al. (2008). Bulletin of Hokusho College, 46:83-96.

THE IMPACT OF A 6 MONTH JEET KUNE DO TRAINING PROGRAMME ON PHYSICAL FITNESS IN UNTRAINED MALES

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INTRODUCTION: Recently the relationship between martial arts and physical fitness (1) has been pointed out, specially in the elderly (2). Along with other martial arts Jeet Kune Do is a complete activity in terms of physical demand, such as strength and flexibility. The aim of this study was to evaluate the physical fitness impact due to a 6 months training programme based on Jeet Kune Do martial art in untrained people.

METHODS: Ten untrained males (M, mean±SD, age 26.3±5.6 years, height 174±0.1 cm, body mass 71.1±8.4 kg) volunteered for this study. None of them had previous experiences in martial arts. After familiarisation with all the tests, each participant underwent a series of physical fitness evaluations: upper limbs rapidity (UR) measured by the time (s) of 20 consecutively arm extensions, back and hamstrings flexibility (BF) measured by the distance of the reached point (cm) after a trunk flexion, hip flexibility (HF) measured by the degree (deg) of maximum legs width on the transverse plane in the sitting position, reaction time (RT) measured by the seconds (s) employed to punch an aim after a sound signal, lower limbs power (LP) measured by the distance (m) reached after a long jump, punch attack endurance (PE) measured by heart rate (HR, bpm) after two series of punch combinations. These tests were repeated after six months of a specific Jeet Kune Do training programme. The programme was divided as follows: endurance (months 1-2: 400 min, months 3-4: 320 min, months 5-6: 240 min), submaximal strength (months 1-2: 240 min, months 3-4: 320 min, months 5-6: 320 min), maximal strength (months 1-2: 320 min, months 3-4: 240 min, months 5-6: 240 min), rapidity (months 1-2: 240 min, months 3-4: 320 min, months 5-6: 480 min) and relaxation and flexibility (months 1-2: 240 min, months 3-4: 240 min, months 5-6: 160 min).

RESULTS: Between pre and post training, improvements expressed as absolute percentage were statistically significant ($p<0.05$) in UR (13%), BF (90%), HF (1%), RT (23%), LP (2%) and PE (9%).

CONCLUSIONS: Observing the pre- and post- percentage improvements in all the tests, Jeet Kune Do appeared to be effective in enhancing physical fitness level of untrained males, specially regarding UR, BF and RT. A lack of a control group makes arguable whether small increases (i.e. HF, LP and PE) would be detectable after this kind of training programme. Nevertheless the relationship between martial arts and physical fitness seems to be strong concerning trunk flexibility, reaction time and upper limbs rapidity, therefore we suggest that further studies should better elucidate the impact of Jeet Kune Do on physical fitness.

REFERENCES

1) Takeshima N, Rogers NL, Rogers ME, Islam MM, Koizumi D, Lee S. Functional fitness gain varies in older adults depending on exercise mode. Med Sci Sports Exerc. 2007 Nov;39(11):2036-43

2) Hackney ME, Earhart GM. Tai Chi improves balance and mobility in people with Parkinson disease. Gait Posture. 2008 Oct;28(3):456-60

STUDY CONCERNING THE TRACK AND FIELD ROLE IN EDUCATION FOR HEALTH

MIHAILESCU, L., MIHAILESCU, N.

UNIVERSITY OF PITESTI

Introduction. Recent researches are emphasizing that in the European Union, until 27% of men and 38 % of the women are obsesses. The same information sources are underlining that the number of the overweight children is growing every year with approximately 400 000 and they estimate that, 10 to 30% of the children between 7–11 years and 8 to 25 % of the teenagers, 14–17 years are overweight.

Hypothesis. We consider that, by the multiple effects of the running, in association with a proper food diet, it can be reestablished the morpho-functional and psycho-affective balance of the people, and implicit regaining the ponderal homeostasis. The effects of the walking and running therapy and the combinations between them are obvious in time at the circulator, respirator, digestive and locomotory apparatus level as well as the neuron-endocrine-metabolic level.

Content.Subjects and research methods. The research was focused on an experiment realized from 2006 to 2008, on a sample of 200 pupils between 16–18 years, pupils that were practicing athletics during extracurricular lessons, in urban environment.

During the experiment, by determination of the basic metabolism(%), we discovered that: running in 200m/minute rhythm, in the summer, on flat, plain ground – 445%; running in 200m/minute rhythm, in the winter, on to the mountain - 1.300%; running in 400m/minute rhythm, in the summer, on flat, plain ground - 8.000%; running in 400m/minute rhythm, in the winter, on to the mountain - 10.000%.

Conclusions. The track and field skills have many trumps that recommend it's in order to be used in prophylactic and therapeutic purpose: The track and field skills have in their structure basic motive skills, they have a natural prevalent character, they are easy to practice: march, running, jump, throw; The track and field skills can be practiced in natural or improvised conditions, without being necessary a sophisticated and expensive material base; The specific effort of the middle-distance, long-distance and very long-distance, determines a big energetic consumption, the specific effort of this kind of running being an anaerobic one that encourages the acceleration of the "burns", the metabolic catabolism, until the decomposition of the lipids;

Selective bibliography

1.Contributions of the European Commission Green paper Consultation, 2006, (http://ec.europa.eu/health/ph_determinants/life_style/nutrition/green_paper/nutritiongp_contributions_en.htm; 2.Dumitru,G., 2003, The physical activity – indispensable factor of the health promotion neglect almost ignored in Romania. The National meeting "Sport for all, from theory to practice – S.O.S. nation state", Constanta, p.10 – 20; 3.Dumitru,G. Romascu, D.1998, Fitness assessment in primary and secondary school teachers from Romania. The 3-rd Annual Congress of The International Institute For Health Promotio, Washington, DC; 4.European Heart Network, 2006, Statistical data about cardiovascular disease in Europe (http://www.ehnheart.org/content/sectionintro.asp?level0=1457);

BODY FAT DISTRIBUTION AND HEALTH-RELATED QUALITY OF LIFE

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UNIVERSITY OF ATHENS

Background: Obesity is a risk factor for diseases and adversely affects Health-Related Quality of Life (HRQoL), which has been defined as an individual's perceived physical and mental health over time (1). However, the effects of obesity in HRQoL in the Greek population have not been previously examined. The aim of the present study was to investigate the impact of obesity on HRQoL in a Greek adult population.

Methods: Participants were 327 men and women between the ages of 30 and 50 years. The waist to hip ratio (WHR) was calculated from measures of waist and hip circumferences, whereas the body fat (BF) was estimated from biceps, triceps, suprailiac and abdominal skinfolds. Participants were categorized to four WHR groups and to three BF groups. The Greek version of SF-36 (3) was used for the evaluation of the HRQoL and the Baecke physical activity (PA) questionnaire (4) for the assessment of two PA indices (leisure time and sport). A series of MANCOVAs were conducted to examine the differences in HRQoL between the WHR groups and the BF groups.

Results: Significant differences were found between the WHR groups with the sex (Wilks' lambda=0,870, p=0.049) and the sport index (Wilks' lambda=0,725, p=0.000) as covariates. Participants with low WHR have higher values in physical functioning subscale (F(3, 323)= 37.784, p=0.000) and in physical health factor (F(3, 323)= 9.590, p=0.000) than participants with high and very high WHR. As far as the results of BF groups were concerned, significant differences were found with the sex (Wilks' lambda=0,868, p=0.001) and the sport index (Wilks' lambda=0,650, p=0.000) as covariates. Participants with normal BF had higher values in physical functioning subscale (F(2, 324)= 77.870, p=0.000) and in physical health factor (F(2, 324)= 26.846, p=0.000) than overweight and obese, whereas overweight had higher values in the same subscales than obese. However, participants with normal BF and overweight had lower values in psychological health factor (F(2, 324)= 10.135, p=0.000) than obese. Also, overweight had lower values in social functioning (F(2, 324)= 3.295, p=0.038) and mental health (F(2, 324)= 3.625, p=0.028) subscales than obese.

Conclusions: The results confirm the negative impact of total and central adiposity on the physical functioning and health in the Greek adult population.

References

1. Jia H, & Lubetkin EI. The impact of obesity on health-related quality of life in the general adult US population. J Public Health, 2005; 27: 156-164.

2. Keller, S.D., Ware, J.E., Bentler, P.M., Aaronson, N.K., Alonso, J., Apolone, G., et al. Use of structural equation modeling to test the construct validity of the SF-36 Health Survey in ten countries: Results from the IQOLA Project. J Clin Epidemiol 1998; 51:1179-1188.

3. Baecke JAH, Burema J, & Frijters, JR. A short questionnaire for the measurement of habitual physical activity in epidemiological studies. Am J Clin Nutr 1982; 36:936-42.

BODY MASS INDEX AND HEALTH-RELATED QUALITY OF LIFE AMONG GREEK ADULTS

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Background: The prevalence of obesity is increasing and contributes to the burden of diseases. A few studies in various countries have indicated that obesity adversely affects Health-Related Quality of Life (HRQoL) and mainly physical health (1-2). HRQoL has been defined as

an individual's perceived physical and mental health over time. However, the effects of obesity in HRQoL in the Greek population have not been previously examined. The aim of the present study was to investigate the impact of obesity on HRQoL in a Greek adult population.

Methods: Participants were 327 healthy men and women between the ages of 30 and 50 years. Body weight was measured to the nearest 100 gr with calibrated scales, height in bare feet to the nearest cm. Body Mass Index (BMI) was calculated as weight (kg) divided by height (m) squared. Participants were categorized to three BMI groups (normal weight, overweight, obese). The Greek version of SF-36 was used for the evaluation of the HRQoL, which includes 8 subscales each measuring a separate health factor (3). Two indices of physical activity (PA) were assessed (leisure time and sport) using the Baecke PA questionnaire (4). A series of MANCOVAs were conducted to examine the differences in HRQoL between the three BMI groups, whereas age, sex and the two PA indices were the covariates.

Results: Significant differences were found with the sex (Wilks' lambda=0.814, F(2, 324)= 3.378, p=0.000), the sport index (Wilks' lambda=0.551, F(2, 324)= 10.817, p=0.000) and the leisure time index (Wilks' lambda=0.839, F(2, 324)= 2.857, p=0.000) as covariates. Participants with normal weight had higher values in physical functioning subscale (F(2, 324)= 115.986, p=0.000) and in physical health factor (F(2, 324)= 25.342, p=0.000) than overweight and obese, whereas overweight had higher values in the same subscales than obese. However, participants with normal weight had lower values in psychological health factor (F(2, 324)= 6.552, p=0.002) than obese.

Conclusions: The results confirm the negative impact of obesity on the physical functioning and health in the Greek adult population.

References

1. Jia H, & Lubetkin EI. The impact of obesity on health-related quality of life in the general adult US population. J Publ Health, 2005; 27: 156-164.

2. Surtees PG, Wainwright NWJ, & Khaw K.T. Obesity, confidant support and functional health: Cross-sectional evidence from the EPIC-Norfolk cohort. Intern J Obes, 2004; 28: 748-758.

3. Keller, S.D., Ware, J.E., Bentler, P.M., Aaronson, N.K., Alonso, J., Apolone, G., et al. Use of structural equation modeling to test the construct validity of the SF-36 Health Survey in ten countries: Results from the IQOLA Project. J Clin Epidemiol 1998; 51:1179-1188.

4. Baecke JAH, Burema J, & Frijters, JR. A short questionnaire for the
measurement of habitual physical activity in epidemiological studies. Am J Clin Nutr 1982; 36:936-42.

13:00 - 14:00

Poster presentations

PP-HF06 Health and Fitness 6

PHYSICAL ACTIVITY LEVELS OF TOTAL JOINT ARTHROPLASTY PATIENTS: A DESCRIPTIVE META-ANALYSIS

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SCHULTHESS KLINIK

INTRODUCTION. Physical inactivity is a modifiable lifestyle-related risk factor considered one of the leading causes for the major non-communicable chronic diseases. The proportion of individuals meeting the health-enhancing physical activity (PA) recommended levels decreases with increasing age. This appears even more evident in patients with osteoarthritis of the hip or knee. Total joint arthroplasty (TJA) is a well established successful surgical procedure for patients suffering from severe osteoarthritis and joint degeneration. Therefore, a successful treatment such as TJA should not only improve pain and function, but also allow patients to be physically active. The determination of the current state of PA research in TJA patients regarding quality and quantity represents the cornerstone for future investigations. The aim of this study was to systematically review the literature on PA levels in TJA patients.

METHODS. Relevant publications were identified using computer-aided search (MEDLINE, Cochrane Library, and EMBASE). Of 1688 identified citations, 1631 articles were excluded after screening titles and abstracts. The fulltexts of the remaining 57 articles were retrieved and analyzed. Twenty-seven articles met the inclusion criteria. Where possible, data were summarized using meta-analytic methods (random-effect models for taking into account any heterogeneity).

RESULTS. PA has been quantified using self-reported questionnaires, pedometers and accelerometers. Meta-analysis was only possible for the studies were PA was measured using pedometers (n=15) and accelerometers (n=6). The wMean measured using accelerometers was 11250 (95%CI: 10290 to 12210) steps/day, and was higher than steps measured using pedometers [5022 (4305 to 5740) steps/day]. Subgroup analysis on pedometer data only showed higher PA in patients assessed <5 yrs from the surgery [4251 (3427 to 5074) steps/day] than >5 yrs [6032 (5369 to 6695) steps/day]. Meta-regression (steps vs age) showed that 1 year of aging would correspond to a PA decrease of 90 steps/day (-156 to -22; P=0.008).

DISCUSSION. The results of this study showed that PA levels in TJA patients as assessed by pedometers are well below the currently recommended level of 10000 steps/day. Furthermore, PA levels decreased with increasing age. Patients >65 years old performed less steps than similar aged healthy people [4613 (3457-5770) vs 6565 (4897-8233) steps/day, respectively] as reported in a recent meta-analysis (Bohannon, 2007). Similar findings were found examining qualitatively PA obtained from self reports. A difference superior to that reported in the literature was found between PA assessed using accelerometers vs pedometers. In conclusion, this study showed that PA levels of TJA patients are lower than those of healthy people and below recommended levels. These observations highlight the urgent need for strategies to increase PA levels in this population.

Bohannon RW. Phys Ther. 87:1642-50, 2007

MOTIVATION FOR LIFE STYLE CHANGES TO IMPROVE HEALTH IN PEOPLE WITH IMPAIRED GLUCOSE TOLERANCE

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NORD-TRØNDELAG UNIVERSITY COLLEGE

Introduction: The association of an inactive lifestyle with obesity and Type 2 diabetes is well known (Ackermann et al., 2008; Schneider & Elouzi, 2000). Correspondingly, research over the last decades has provided strong support for the positive effect of physical activity in the treatment and obviation of Type 2 diabetes (Califf et al., 2008; Krook et al., 2003). The aim of the study was to elucidate attitudes and

concerns about motivation to adopt a new lifestyle with physical activity and other health promoting elements to reduce impaired glucose tolerance (IGT) and, consequently, the risk of having Type 2 diabetes.

Methods: Eighteen subjects in central Norway participated in a semi structured interview study, defined as participants with IGT according to guidelines by WHO (1999). The sample consisted of 4 men and 14 women divided into two groups with 9 individuals in each. Both Group 1 and Group 2 included two men and seven women. Group 1 was enrolled in a physical exercise program from start of the project, whereas Group 2 was put on hold until Group 1 had completed their instructed training program. The participants were between 33 and 69 years old. This interview study is part of a larger research project.

Results: The participants attributed great significance to their physical health and were strongly motivated to prevent disease development. This focus changed their priorities regarding daily living in certain ways, and related issues were frequently addressed in the semi-structured interviews. Manifest analysis of the content across all interviews justified the identification of four important categories of content: Structure and rhythm, Sickness, Activity and Social relations.

Discussion: The participants in the project increased their awareness of the importance of structure in everyday life, including rhythm of meals and regular exercise to avoid developing Type 2 diabetes. These findings are in line with those of a review study by Yates et al., (2007), which indicates the contribution of physical activity may be of importance, but independent of dietary changes and weight loss, in the prevention of Type 2 diabetes in people with symptoms of pre-diabetes is equivocal.

References

Ackermann, R. T., Finch, E. A., Brizendine, E., Zhou, H., & Marrero, D. G. (2008). Am J.
of Preventive Medicine, 35(4):357-63.
Califf, R. M., Boolell, M.,Haffner, S. M., Bethel, M. A., McMurray, J., Duggal, A., Holman,
R. R.; NAVIGATOR Study Group. (2008). Am Heart J. 156(4):623-32.
Krook, A., Holm, I., Petterson, S., Wallberg- Henriksson, H. (2003). Clinical Physiology &
Functional Impairment, 23, 21 – 30.
Schneider, S. H., & Elouzi, E. B. (2000). New Brunswick: UMDNJ- Robert Wood Johnson Medical School.
WHO; Consultation Group. (1999). Definition Part 1: Diagnosis and Classification of Diabetes
mellitus. Geneva: World Health organization; WHO/NCD/NCS/99.2
Yates, T., Khunti, K., Bull, F., Gorely, T., & Davies, M.J. (2007). Diabetologia, 50,
1116-112.

UNSTABLE VS. CONVENTIONAL JOGGING SHOE CONSTRUCTION: DIFFERENCES IN PHYSIOLOGICAL DEMAND AT LOW-INTENSE RUNNING?

RING-DIMITRIOU, S., STÖGGL, T., HEHENBERGER, E., MÜLLER, E.

UNIVERSITY OF SALZBURG

Introduction: It has been demonstrated that the construction of footwear mimicking a barefoot condition can affect knee pain and joint loading (Nigg et al., 2006; Shakoor et al., 2008). Furthermore differences in energy requirement depending on the type of soles were reported in intensive running (Nigg et al., 2003) and prolonged walking (Saito et al., 2007). However, the impact of an unstable shoe construction on the physiological demand was not measured yet and was the subject of that investigation.

Methods: Twenty eight adults aged 24.1±2.8 yrs (67±8.1 kg, 22±1.7 kg/m) participated in 3 tests. An incremental step-test until exhaustion was conducted on a motorized treadmill (1% inclination, 5 min steps, 30 s rest, 0.5 m/s increment, Saturn 4.0, hp/cosmos, GE) to determine running velocity at 2 mmol/l blood lactate concentration (v-2LA; arterialized earlobe blood; lactate analyzer Biosen 5040, EKF Diagnostics, GE). After 2 wks four 30 min lasting sub-maximal tests at v-2LA with the conventional jogging shoe of the individual (CS) or the unstable Masai Boot Technology® shoe (US) were completed in the sequence CS-US on first day and US-CS on second day separated by 48 hrs from each other (1h rest in between daily bouts). Each 30min-test was split in 10min bouts with a 30s rest period in between to sample arterialized blood for determination of LA. During the whole test oxygen uptake (VO2) and energy expenditure (kcal) were measured with a respiratory gas exchange analyzer (K4b², Cosmed, IT). Heart rate (HR) was monitored via beat-to-beat transmitter (Polar, FI). Before completing the submaximal tests subjects got a standardized instruction into running with the US over 2 wks. The mean values of the two measures in each situation were used as criterion variables. The hypothesis was tested with a paired sample t-test at p-level of <0.05. Cohens' d was determined for effect size.

Results: The physiological response while running with US at v-2LA increased significantly by 23% in LA ($t(27)=-5.6$, $p=.0001$, $d=1.1$), 7% in kcal ($t(27)=-4.3$, $p=.0001$, $d=0.7$), 4% in VO2 ($t(27)=-2.4$, $p=.02$, $d=0.4$) and 2% in HR ($t(27)=-3.2$, $p=.003$, $d=0.6$) compared to CS.

Conclusion

As indicated by the medium to large effect size (d) low-intensive running over 30 min with the unstable shoes enhanced the physiological load compared to the CS significantly. We assume that the larger involvement of lower-extremity small muscle groups was responsible for the response as demonstrated by studies on instable shoe construction (Nigg et al., 2006).

References

Nigg BM, Emery C, Hiemstra LA (2006). Med Sci Sports Exerc 38(10), 1701-1708.
Nigg BM, Stefanyshyn D, Cole G, Stergiou P, Miller J (2003). J Biomech 36, 569-575.
Saito S, Muraki S, Tochihara Y (2007). J Phyisol Anthropol 26(5), 521-526.
Shakoor N, Lidtke RH, Sengupta LFF, Block JA (2008). Arthritis & Rheumatism 59(9), 1214-1220.

PHYSICAL EFFICIENCY AND TRAINING SUITABILITY OF HEALTH RESTRICTED CONSCRIPTS ON EXAMPLE OF UNIT IN ESTONIAN ARMY

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Introduction: Estonian draftees are divided into 4 category based on their health condition – healthy, healthy with restrictions, unfit temporary and unfit steadily. Only draftees from first and second category are allowed for entering into service . All soldiers in Estonian Defence Forces must take the Army Physical Fitness Test (APFT) in four stages (first in the beginning, second at the end of the basic training

course,third in the middle and fourth at the end of the service) during the service. Current follow-up study continues recent investigations among conscripts having revealed relations between their physical performance and health problems.

Methods: 1312 male conscripts, aged 18-22 participated in the survey in years 2007-2008. The individual medical records of freshmen as well as their APFT results were collected, stored in a data base and analysed.

Results: The division of received conscripts in years 2007-2008 is following: 76% healthy and 24 % healthy with restrictions . In spite of that, 9-15 % from conscripts were excluded from service before the end of conscript time (in years 2006-2008). When exploring the dynamics of physical progress on conscripts serving in Estonian Military, most recent studies have been indicated, that the soldiers within category healthy did not deviate significantly from normal average physical test development dynamics of the last five years (r=0,87, p<0,05). Simultaneously the physical test development dynamics of the soldiers˙group healthy with restrictions has weakly correlated with the average physical test development dynamics of the latest five years (r=0,18, p< 0,005).

Discussion: M-type (musculosceletal) diseases (49 % from all within category healthy with restrictions) expressed less decreasing effects to the soldiers´fitness dynamics than any type of diseases. Most of soldiers, who did not pass any stages of APFT belonged to the F- (16 %), I- (5 %), Q- (5%) and H-type (5%) group of diseases (F-mental disorders, I- diseases of circulatory system, Q- congenital malformations, H-diseases of the eye). The soldiers from latter groups didn´t acquire necessary fitness rate by the end of service time and a lot of them didn´t hold out (they were excluded to reserve before the end). Consequently , physical efficiency and training suitability of the health restricted conscripts is quite low (excluding M-type diseases).Thereby, there is an indirect evidence that economical cost for livelihood of conscripts within the category healthy with restrictions for groups of F-, I-, Q- and H-type diseases can be considerable.

References:

Antson, Henn, Märks, Heino. The diseases of the musculoskeletal system and conscripts' physical readiness related to this in the unit of the Estonian Army. ECSS Estoril, 09-12. July 2008.

EFFECTS OF EXERCISE ON PHYSICAL FITNESS FACTORS, BODY COMPOSITION AND BLOOD LIPIDS OF ADDICTED PERSONS AFTER ONE YEAR QUITTING DRUGS

BANITALEBI, E., FARAMARZI, M., MARANDI, M., AZAMIAN-JAZI, A.

ISLAMIC AZAD UNIVERSITY, SHAHREKORD BRANCH

Effects of exercise on physical fitness factors, body composition and blood lipids of addicted persons after one year quitting drugs

1-Ebrahim Banitalebi (M.Sc) Islamic Azad University of Shahrekord Branch. 2-Mohammad Faramarzi (Ph.d) Shahrekord University. 3-Mohammad Marandi (Ph.d) Isfahan University. 4-Akbar Azamian-Jazi (Ph.d) Shahrekord University .

Introduction: There is some concern that drugs abuse treatment may actually pose a risk toward unhealthy eating and weight gain. Dysfunctional eating patterns and excessive weight gains have been observed during recovery from drug and alcohol addictions (Cowan and Devine 2008). The purpose of this study was to determine amount of weight gain, Lipids, WHR, BMI, fat percentage some physical fitness factors after quitting drugs. In addition, the study of the efficacy of a selected physical activity on some anthropometric variables (weight, BMI, and WHR), blood lipids, and physical fitness factors such (Vo2max, flexibility, and fat percentage) on subjects who have quitted abusing drugs between 30-60 days.

Method: 37 subjects who were 23-49 years old, and had one-year quitting history. Participants were randomized at approximately 1:1 ratio under the supervision of a project investigator (exercise group 18 persons and control group 19 persons), and 38 individuals completed the entire study; 16 persons were in exercise group and 15 persons were in control group. Exercise consisted primarily of some plays such as badminton playing, walking and so on. Exercise duration progressed from 20 minutes at the baseline to 45 minutes at the end of 12 weeks, and Intensity of exercise progressed from 50% of heart rate reserve of baseline to 70 % at 12 weeks. Body composition was assessed using the sum of three skin-fold measurement specific for males (chest, abdomen, and tight) (ACSM 2000). Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and triglyceride (TG) were measured enzymatically using Diagnostic kits.

Results: There were significant decrease in weight(p=0.002), BMI(P=0.001), WHR(P=0.004), Ch(P=0.009), HDL(0.045) and LDL(0.002), Vo2max(p=0.000), flexibility(P=0.000) and Pull-up(P=0.001), but There were not in VLDL(P=0.9) and TG(P=0.544).

Conclusion: One of the reasons for weight gain is because nicotine and drugs speed up body metabolism (Cowan and Devine 2008). It postulates that for these measurements, increasing is inevitable (Abrantes 2006). Exercise without changes in diet produced significant reduction in weight gain, and increasing BMI (p<0.01). It appears that, physical activity and exercise can prevent or manage overweight after quitting drugs, substances and smoking.

References

Abrantes., A (2006). Butler Hospital / Brown Medical School.

ACSM (2000). Lippincott, Williams & Wilkins, Baltimore 24: pp 63-66.

Cowan., J and Devine., C (2008). Appetite Journal; 50 (1): pp 33- 42.

HYDRODENSITOMETRY

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Problem

The actual problem of body composition (BC) evoked the formulation of five models of BC and development of evaluating methods. Currently used methods are principally based on measured values of indicators (body density, total body water), which are later on converted into parameters identifying BC. The results of methods correlate together, but the methods do not show identical results. Coming out from multi-componential methods of assessment of BC, hydrodensitometry is one of reference methods (Kennon T. Francis, 1990).

Methods: In hydrodensitometry we use a water tank (90x110x145 cm) above which there is a weighing chair assembly and mobile scales with an accuracy of 0.001kg. The measured person is weighed on land at first, than under water after maximal expiration. Before the measurement the weight of device calibrated so that recording of net weight is enabled. The scales communicate with a PC which records the weight during a constant time period. By means of specific prediction formulas coming out from the assumption of constant density and hydration of fat and fat free mass it deduces amount of fat mass and lean body mass in an organism. A residual volume is regarded by a constant.

Results: The result of underwater weighing is 10 values of weights under water, of body densities and of fat percentage according to various prediction formulas in every tested person (Brozek et al., 1963; Siri, 1961). On one expiration we record one to two values of the weight under water; the resultant value is, concerning scales oscillation, an average value within 2 s. Applied measurements show that after examinee's experience it is possible to record even 7 almost equal measurements (in various examinees: 4.89±0.05 kg, 4.40±0.10 kg, 3.81±0.01 kg, 3.95±0.02 kg). For a definitive evaluation it is possible to take the average of three records or the higher weight with the lowest part of fat tissue.

Limitations

Limitations of hydrodensitometry consist of an individual fluctuation of hydration of fat free mass and of density of particular components related to age, sex and amount of fat mass. The maximal expiration of the examine and the chosen method of residual volume estimation are also one of the limitations. Assuming minimisation of possible errors sources we may find hydrodensitometry as one of the most suitable laboratory methods for BC assessment.

References

Brozek JF, Grande F, Anderson, JT, Keys A. (1963). Ann NY Acad Sci, 110, 113–140.

Kennon T.Francis (1990). Physical Therapy Volume, 70(10), 70–76.

Siri, SE. (1961). Body composition from fluid spaces and density: analysis of methods. In:

Brozek, J, Henschel, A. Techniques for measuring body composition. National Academy of Sciences - National Research Council, Washington, 223–234.

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VALIDITY AND RELIABILITY OF SHORT-FORM INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE IN SEDENTARY COLLAGE STUDENTS: PHYSIOLOGICAL AND CLINICAL RELEVANT.

ALOMARI, M., QHATAN, R., KEEWAN, E., ABUWARDEH, A., AMER, A., KHABOUR, O.

JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

INTRODUCTION: The international physical activity questionnaire (IPAQ) is a simple widespread tool to assess physical activity (PA) pattern in a variety of populations and societies. However, the validity against fitness and circulatory measures and the reliability of the short-form version in Middle Eastern sedentary collage students has not been examined.

METHODOLOGY: Therefore, the IPAQ was administered 3 times in 127 sedentary collage students with age range 18-23 years. Subsequently, percent body fat (%BF), body mass index (BMI), waist/hip (W/H) ratio, maximum walking distance achieved in 6 minutes (6MWD), and maximum handgrip strength (MHG) were examined. Blood pressure (BP) was measured using standard auscultatory method. The questionnaire reliability and validity were performed using intraclass (ICC) and Pearson correlations, respectively, whereas the Student t-tests was used to compare the IAPQ items between males and females.

RESULTS: The ICC coefficients for walking, moderate, vigorous and total PA/week were, 0.97, 0.96, 0.97 and 0.97, respectively. Additionally, males as compared with females scored greater in walking (549.3±684.5 vs. 163.5±340.6; p=0.001) and less in moderate (540.0±711.5 vs. 1426.1±2005.1; p=0.006) PAs, while vigorous (4757.3±4583.5 vs. 3565.5±2391.2; p=0.11) and total (5950.7±5028.8 vs. 5132.9±3762.8; p=0.35) PAs were the same. Additionally walking PA correlated with muscle mass (r=0.5; p=0.0001), BMI (r=0.2; p=0.01), W/H ratio (r=0.3; p=0.002), MHG (r=0.3; p=0.004), and 6MWD (r=0.2; p=0.03) as well as with diastolic (r=-0.6; p=0.004), mean (r=-0.5; p=0.05) and pulse pressure (r=0.5; p=0.01). Moderate PA correlated with body mass index (r=-0.2; p=0.04) and W/H ratio (r=-0.3; p=0.007). Finally vigorous PA correlated with 6MWD (r=0.2; p=0.04) and total PA correlated with %BF (r=-0.3; p=0.008) and BMI (r=-0.2; p=0.05).

CONCLUSION:

The results indicate that IPAQ items are reliable with the walking and moderate PA items can discriminate between males and females. Additionally, validity of the questionnaire items against health-related fitness and BP measures is acceptable, with the walking appears to be most representative when assessing PA pattern in sedentary collage students. Finally, the association of walking PA with blood pressure measures is particularly important because of its physiological and clinical relevant.

EFFECTS OF A CUSTOM-MADE MOUTH GUARD ON THE MUSCLE STRENGTH AND POWER

SUGAWARA, M.

NAGASAKI UNIVERSITY, FACULTY OF EDUCATION

The use of the mouth guard is essential in contact sports for mitigating the impact on the head and protecting the mouth, its surrounding tissues, and head and neck from injuries. Recently, mouth guards have come to be used not only to prevent injuries and protect the teeth, but also to improve athletic performance. In this study, effects of custom-made mouth guards prepared by a dentist on dentition models that closely fit the wearers, and are comfortable to wear on the muscle strength and power of athletes were evaluated in 11 college American football players. The leg-flexion strength, leg-stretch strength, arm-flexion strength, grip strength, back strength, vertical jump, standing trunk flexion, jumping reaction time, anaerobic power, and blood lactate level were measured with and without using the mouth guard. The leg-flexion strength and leg-stretch strength were increased significantly by the use of the mouth guard. The arm-flexion strength, grip strength, back strength, vertical jump, and standing trunk flexion were improved, though not significantly, by the use of the mouth guard. No significant difference was observed in the jumping reaction time between with and without the mouth guard. The anaerobic power was significantly greater ($p<0.05$) with the mouth guard (992.64±81.95 Watt) than without the mouth guard (912.45±84.59 Watt). No significant difference was observed in the increase in the blood lactate level after the measurement of the anaerobic power between with and without the mouth guard, probably because the subjects could exert muscle strength more efficiently by the use of the mouth guard. The results of this study suggest that the use of a custom-made mouth guard is advantageous for exertion of muscle strength and power. Whether the mouth guard is effective for the prevention of dental injuries in actual sports activities is another important question to be addressed in future studies.

13:00 - 14:00

Poster presentations

PP-HF07 Health and Fitness 7

STUDY OF THE CARDIOVASCULAR RESPONSE TO HARVARD STEP TEST IN DRUG ADDICTS IN REHABILITATION PHASE

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UNIVERSITY OF TRÁS-OS-MONTES

This case-control study intended to evaluate the physiological response to effort (cardiovascular component) on a group of drug abusers in therapy, and elucidate eventual insufficiencies in cardiovascular performance as compared to a control group.

Our sample was constituted by twelve adult men drug consumers (28 +4.59 years of age; 75.38 +6.57 Kg weight and 179 +0.08 cm height) included in a rehabilitation program (mean of 6.04 +5.79 months of participation in the program), and 14 controls (25.07 +5.30 years of age; 75.25 +10.76 Kg weight and 175.5 +0.07 cm height) took part on this investigation. All the subjects were healthy and had no participation on any organized physical activity. We used the Harvard Step Test to evaluate the recovery index, recording the heart rate every 5 seconds with a polar monitor.

Results show no significant differences ($p>0.05$) in recovery indexes between both groups (69.34 +14.28 experimental group and 67.40 +5.58 the control group), as well as no differences was observed in beats per minute at every minutes of the test and in the percent of variation of heart rate in all 60 seconds. When we excluded from the statistical analysis, the drug abusers that consumed cocaine (n=3), no changes in the relations were noted. The means comparison (T-student) between cocaine consumers and control group didn't result on differences in any dependent variable. After mean adjustment with ANOVA, the results suggest some effect of weight and age in test performance, or else, this variables account for the variations in results between subjects.

We conclude that cardiovascular capacity, measured has the response to a sub-maximal test is not impaired in drug abusers. Conversely, individuals in therapy for drug abuse should be encouraged to participate in sports activities, representing sub-maximal efforts. We need more evidence to support our results, namely other tests and functional evaluations, and knowing the cardiovascular response to maximal effort.

Lange, R.A., Hillis, L.D. (2001). Cardiovascular complications of cocaine use. N. Engl. J. Med. 345 (5): 351-8.

Neiman, J., Haapaniem, H.M., Hillbom, M. (2000). Neurological complications of drug abuse: pathophysiological mechanisms. Eur. J. Neurol. 7(6) : 595-606.

Pu, L., Bao, G.-B., Xu, N.-J., Ma, L., Pei, G. (2002). Hippocampal long-term potentiation is reduced by chronic opiate treatment and can be restored by re-exposure to opiates. J. Neurosci. 22 (5): 1914-21.

Raine, N. M., Cable, N. T., George, K. P., Campbell, I. G. (2001). The influence of recovery posture or post-exercise by potension in normontensive men. Med. Sci. Sports Exerc. 33(3) :404-12.

Van Bockstaele, E.J., Peoples, J., Menko, A.S., McHugh, K., Drolet, G. (2000). Decreases in endogenous opioid peptides in the rat medullocoerular pathway after chronic morfine treatment. J. Neurosci. 20 (23): 8659-66.

EFFECTIVENESS OF A PHYSICAL ACTIVITY PROGRAM TAILORED TO PATIENTS' HEALTH STATUS AND ACTIVITY LEVELS: A PILOT RANDOMIZED CONTROLLED TRIAL

MARTIN-BORRÀS, C., PUIG-RIBERA, A., GINÉ-GARRIGA, M., MARTIN, C., DORDAL, S., CASANOVAS, E., RIERA, M., GUERRA-BALIC, M.

PRIMARY HEALTH CARE OF BARCELONA, INSTITUT CATALÀ DE LA SALUT

Carme Martin-Borràs1,2,3; Anna Puig-Ribera1,4; Maria Giné-Garriga1,2,3; Carlos Martin1,5; Susagna Dordal6; Elena Casanovas6; Montse Riera6; Mîriam Guerra-Balic3

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There is scarce evidence in Spain about effective ways of producing sustained increases in patients' physical activity (PA) that can be easily integrated into the primary care work routine.

PURPOSE. To evaluate the short and mid-term impact of a PA program over a patients' total PA and their attitude towards practicing PA, using a pilot randomized control trial (RCT).

METHODS. Following ethical approval, thirty primary care patients with a low level of PA, an associated chronic disease and non medical contraindication to practice PA (5 male, 25 female; 69±10 years; 31.3±2.9 kg/m2) were randomly allocated to a control group (CG)(n=12) (usual care) or intervention group (IG) (n=18) (3-month PA program; two sessions/week; 60 minutes/session). Previously validated questionnaires to measure total PA (IPAQ short version) and Stages of Change (SOC) for PA were administered 4 times: pre, post intervention, 3 and 6-month follow-up. Effects over the intervention were evaluated by calculating the magnitude of change between pre and 3 and 6-month follow-up scores for total METS minutes/week and maintaining/changing patient's SOC for PA. Independent t-test (METS minutes/week) and Chi-square test (SOC for PA) were used to identify significant differences and associations between groups.

RESULTS. Patients' adherence to the program was high (78% assistance). The average METS minutes/week at baseline were 1662 (±1362) for the CG and 1659 (±1235) for IG. The IG showed higher MET minutes/week in the 3-month follow-up (2823±1813) and 6-month follow-up (1992±1201) than the CG (1731±1281 in the 3-month follow up and 1707±1249 in the 6-month follow up). The difference between groups was significant ($t(18)=-3.12$, $p=0.006$). At baseline, 66% of the IG (8 subjects) and 80% of the CG (8 subjects) were at the precontemplation/contemplation stage for PA. In the follow-up, 95%

of the IG (14 subjects) had moved towards the action/maintenance stages while 100% of the CG (12 subjects) remained in the initial SOC. There was a significant association between participating in the PA program and patients' changing their SOC for PA (Χ2(3)=24.7, $p<0.001$).

CONCLUSION. This preliminary data indicated the effectiveness of a low-cost PA promotion program on patients' short and mid term adherence to PA. Further research will evaluate the long-term adherence (12-month) of the program on a RCT with more than 400 patients.

PREDICTING MAXIMAL OXYGEN UPTAKE FROM A PERCEPTUALLY REGULATED EXERCISE TEST <PRET>.

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Introduction: Recent investigations (Eston et al, 2005; 2008; Morris et al, 2009, in press) have provided encouraging evidence to support the prediction of maximal oxygen uptake (Vo2max) from a perceptually regulated exercise test (PRET). The PRET has typically required participants to exert themselves over a range of intensities up to a rating of perceived exertion (RPE) of 17 (Very hard) on Borg's 6-20 scale. This intensity is, however, considered to be too strenuous and possibly unsafe for non-athletic populations. The purpose of the present study is therefore to examine the validity and reliability of predicting Vo2max from a PRET incorporating a ceiling intensity of RPE 15.

Methods: Fifteen volunteers (24.7 ± 3.1 years) completed three PRETs (T1, T2 and T3) each separated by 48 hours, and one maximal graded exercise test on a magnetically braked cycle ergometer. Participants self-regulated their exercise during 3-min bouts at RPE levels 9, 11, 13 and 15, administered in a randomised order. Oxygen uptake (Vo2) was recorded continuously during each bout. Vo2 values for the RPE range 9–15 were extrapolated to RPE 20 using regression analysis to predict individual Vo2max scores. The levels of agreement between predicted and actual Vo2max scores, and the trial-to-trial predicted scores were quantified via the 95% limits of agreement (LoA) technique and an intraclass correlation coefficient (ICC).

Results: The mean values for actual Vo2max (39.8 ± 5.4 ml/kg/min) and those predicted from the three PRETs (T1, 38.9 ± 5.5; T2, 37.2 ± 6.3; T3, 38.0 ± 6.8 ml/kg/min) were not significantly different (p = .326). The LoA between actual and predicted Vo2max were -0.9 ± 12.3, -2.5 ± 11.2, and -1.8 ± 9.5 ml/kg/min, for T1, T2 and T3, respectively. Importantly, 60% (T1) 67% (T2) and 80% (T3) of participants had predicted values that were within ± 5 ml/kg/min of their actual Vo2max. The consistency of the predicted Vo2max values was reflected by LoA of 1.6 ± 9.7 ml/kg/min (T1 – T2) and -0.8 ± 8.2 ml/kg/min (T2 – T3) and corresponding ICCs of 0.66 and 0.80.

Conclusion: Our findings have demonstrated that following practice trials, predictions of Vo2max from a 9-15 PRET were, for most participants, in close agreement with actual values. Given that this modified PRET is shorter and safer than those used previously, its potential as an assessment and monitoring tool for various non-athletic populations has been established. Further research along these lines is on-going.

References

Eston R et al (2005). Eur J App Physiol 93: 221-7

Eston R et al (2008). J Sports Sci 26:131-9

Morris M et al (2009). J Exerc Sci Fitness 7: in press

BENEFITS FROM A PREVENTIVE HEALTH TRAINING <COMBINED> WITH ELEMENTS FROM GOLF SPORT

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Purpose: Based on the demand for building up health resources and according to the guidelines of German health insurances, a preventive health program with elements of golf was developed in order to reduce lack of physical activity by health-oriented exercises as well as to promote physical, mental and psychosocial health resources and strengthening and mobilization of the trunk. In order to accomplish the goals of preventive health training, the health- promoting aspects of golf haven't been considered yet. A preventive health training combined with elements from the golf sport was developed. The purpose of this study was to evaluate the benefits of a preventive health training intervention which included golf elements due to motor function and perception.

Methods: The benefits were analyzed in a controlled study (n=22). The intervention period took eleven weeks, in which participants performed a weekly training session and an controlled additional voluntary training program at home. The control group did not participate in the training program. Strength, flexibility, coordinative and relaxing exercises with elements from the golf sport were practiced according to preventive guidelines. Test and retest followed via questionnaire in order to record the physical condition, perception and muscle function.

Results: The subjective health perception increased in the physical dimension by 7,5 % and the mental did not change considerably. The strength ability of the trunk flexor advanced by 23,3% (p≤ 0.001). Flexibility did not change considerably. Increase of physical activity (6,3 ± 4,7 to 10,2 ± 9,2 hours per week) and reduction of reasons for physical inactivity (e.g. motivation, p=0.0039, uncertainty reduce, p=0.022) improved the movement status.

Conclusion:

The training group was able to build up health- promoting resources by participation in the preventive health training with elements from golf sport compared to the control group. The comprehensive guidelines of health insurances regarding preventive measures have been largely fulfilled.

This pilot study encourages new developments of health- promoting programs in prevention and rehabilitation focussing on reduction of weight, stress management, or children's health training.

ON TRANSIENT KINETICS OF PULMONARY OXYGEN UPTAKE AS AN ESTIMATOR FOR HEALTH-RELATED FITNESS

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Introduction: The time constant of phase II in pulmonary oxygen uptake on-kinetics (phase II VO2tau) during cycling is known to be approximately 30 s in healthy young subjects. The level of phase II VO2tau is likely to reflect a balance between oxygen supply and utilization in exercising muscle. In patients with peripheral arterial disease (PAD; Bauer et al., 1999) and insulin-dependent diabetes mellitus (IDDM; Regensteiner et al., 1998), a longer phase II VO2tau has been reported. This may be attributed to limited peripheral blood flow (PAD) and metabolic abnormality (IDDM), respectively. Therefore, we attempted to examine the association between change in phase II

VO2tau and changes in anthropometric and physiological variables in order to determine whether phase II VO2tau might be a good estimator for evaluating health-related fitness.

Methods: Fifteen male subjects (aged 26 to 50 yrs) doing no regular physical training participated in this study. They were asked to perform low-intensity long-duration (>60 min) training in the form of walking exercise 3-4 times a week for 12 weeks. We prospectively collected data on aerobic fitness (VO2max), phase II VO2tau and variables related to glucose and lipid metabolism at pre-, mid- and post-training periods every six weeks from the beginning of the training. Anthropometric variables were also measured at the same interval periods.

Results: There were significant decreases ($P<0.05$) in anthropometric variables (abdominal circumference; thickness of visceral fat; waist to hip ratio) in the pre- to mid-training periods, thereafter, no significant changes were noticed. Similarly, VO2max increased significantly during the pre- to mid-training period ($P<0.01$), but not during the mid- to post-training portion. In contrast, phase II VO2tau remained unchanged from pre- to mid-training, but a significant reduction ($P<0.05$) was measured at the post-training point. In addition, the same pattern of change, as a function of training, was observed for HOMA-IR, triglycerides (TG) and high-density lipoprotein (HDL).

Discussion: Changes in phase II VO2tau resulting from low-intensity training were found to be independent of changes in VO2max (Fukuoka et al., 2002) and anthropometric variables; however, the changes corresponded to changes in glucose and lipid metabolism. The improvement of phase II VO2tau is inferred to be the result of regular physical activity even in the absence of increased VO2max and reduced body fat. From these findings, we conclude that phase II VO2tau may serve as a reliable estimator for evaluating health-related fitness, as viewed from an aspect different from the commonly used parameter of VO2max.

References

Bauer TA, Regensteiner JG, Brass EP, Hiatt WR (1999). J Appl Physiol, 87(2), 809-816.

Fukuoka Y, Grassi B, Conti M, Guiducci D, Sutti M, Marconi C, Cerretelli P (2002). Pflugers Arch, 443(5-6), 690-697.

Regensteiner JG, Bauer TA, Reusch JEB et al (1998). J Appl Physiol, 85(1), 310-317.

COLD WATER DOES NOT INFLUENCE PERFORMANCE OF SELF RESCUE IN SEA KAYAK

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Introduction: Sea kayaking has become a popular sport and recreation activity in all seasons. However, accidents in sea kayak often occur when kayaking alone and capsizing in cold water. In these situations ability to carry out a self rescue may be essential for surviving. As cold water has detrimental effect on muscular strength, manual dexterity, mental functioning (Giesbrecht & Bristow, 1992; Baker & Atha, 1981) and may lead to severe hypothermia, it is one of the main treats for capsized sea kayakers. Hence, wet suit or dry suit is recommended clothing. However, in some situations these suits are less practical and comfortable than lighter clothing. Hence, the objective of this study was to examine how cold water influenced the performance of self rescue in sea kayak wearing light clothes.

Methods: A total of 14 subjects ((mean ± SD) 21,9 ± 3,1 years, 7 women) completed the study. The self rescue procedure used was the standard paddle float self rescue. The study had a crossover design. All subjects practised the rescue in a swimming pool. After that they completed one test in the swimming pool (water temperature of 30,5 ± 2,0 C°) and one test in the sea (water temperature of 10,2 ± 0,4 C°) wearing the same light clothes. Time to complete the rescue, error in the procedure, heart rate and the subject's expectations and experiences of the rescue (one to five scale) was assessed.

Results: No differences were found in time to complete the rescue (169,9 ± 32,9 vs 168,6 ± 34,0 seconds; NS), error in the procedure ((N)1,6 ± 1,2 vs 2,1 ± 1,5; NS) or heart rate (141,6 ± 18,3 vs 140,2 ± 17,0 beats/min; NS) between the procedure carried out in the swimming pool and sea, respectively. Subjects judged the rescue carried out in the swimming pool to be easier to execute than the rescue carried out in the sea ($p = 0,014$), but the latter was judged to be easier to perform than expected ($p = 0.003$).

Discussion: Young, healthy women and men performed the standard paddle float self rescue just as good in cold water as in warm water wearing light clothes. Subjects had sound expectations to the level of challenge of executing the procedure in cold sea water. Even though sea kayaking in cold water wearing light clothes may compromise safety, the study shows that sea kayaking wearing light clothes in relatively cold water may be reasonable. However, every single kayaker must do sound judgment in different situations, based on the individual's accepted risk level, weather conditions, water temperature, equipment, kind of trip and competence.

References

Baker S & Atha J (1981). Brit J Sports Med, 15, 111-5

Giesbrecht GG & Bristow GK (1992). Aviat Space Environ, 63, 1077-81

COMPARISON OF PHYSIOLOGICAL AND METABOLIC RESPONSES TO PLAYING NINTENDO WII SPORTS AND BRISK TREADMILL WALKING

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Introduction: Health problems (e.g. type 2 diabetes) have been clearly linked with a lack of physical activity (Booth et al., 2000). Interactive game play may provide an opportunity for increasing physical activity in social-recreational and home environments. Therefore, the aim of the study is to analyse physiological and metabolic responses whilst playing games on the Nintendo Wii Sports (i.e. tennis, baseball and boxing) and compare those responses with brisk treadmill walking.

Methods

Ten participants (3 females, 7 males, 21±1 years; 73.9±12.0 kg; 1.76±0.06 m) walked briskly at a self-selected pace (6.1±0.6 km•h-1, 3x10 min, 5 min rest periods) or played tennis, baseball and boxing in similar time sequence. Exercise time was chosen to match recommendations for 30 min as a minimum requirement for physical activity in one session (Haskell et al., 2007). Physiological and metabolic responses were measured with a portable metabolic system (Cosmed K4b2) and averaged for each 10 min of activity. These responses were similar for each 10 min bout of walking and averaged to provide an overall walking response. One-way ANOVA with post-hoc paired samples t-tests were used for data analysis with significance level set at $P < 0.05$.

Results: There was a trend for the heart rate in tennis to be lower than boxing ($P=0.068$) and walking ($P=0.058$). Heart rate for baseball was 24 beats and 25 beats lower than boxing ($P=0.013$) and walking ($P=0.011$). Heart rate for boxing and walking was similar. Minute ventilation was lower for tennis and baseball ($P<0.05$) compared to boxing and walking. Boxing had a larger oxygen uptake than tennis ($P=0.026$) and baseball ($P=0.004$) but was similar as walking ($P=0.318$). Brisk walking had higher oxygen uptake than tennis ($P<0.001$)

and baseball (P<0.001). Boxing had higher energy expenditure than baseball (P=0.019) but was not different than tennis (P=0.085) and walking (P=0.503). Fat oxidation was only higher in walking compared to tennis (P=0.004) and baseball (P=0.003) with no differences between sports. Carbohydrate oxidation was not different between brisk treadmill walking and Nintendo Wii Sports boxing (P=0.085) or between sports. RER values were not different between brisk treadmill walking and Nintendo Wii Sports (P=0.714) or between sports.

Discussion: Game play in young-adults with Nintendo Wii Sports boxing resulted in similar physiological and metabolic responses than brisk treadmill walking. Assuming that brisk walking is of sufficient intensity to provide health benefits, game play of tennis and baseball with Nintendo Wii may not necessarily meet requirements for physical activity to provide health benefits.

References

Booth FW, Gordon SE, Carlson CJ, Hamilton MT. (2000). J Appl Physiol, 88, 774-787.

Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, Macera CA, Heath GW, Thompson PD, Bauman A. (2007). Circulation, 116, 1081-1093.

EFFECTS OF MUSCLE CONTRACTION TIMING DURING RESISTANCE TRAINING ON VASCULAR FUNCTION

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HEALTH SCIENCE AND APPLIED PHYSIOLOGY

Introduction: Muscle contractions in normal resistance training are performed by eccentric (lowering phase) and concentric (lifting phase) muscle contractions. However, the difference in effects of timing of muscle contraction during resistance training on arterial stiffness is unknown. The present study investigated the effect of muscle contraction timing during resistance training on vascular function in healthy young adults.

Methods: Thirty healthy men were randomly assigned to group of resistance training with quick lifting and slow lowering (ERT, n=10), group of resistance training with slow lifting and quick lowering (CRT, n=10) and sedentary groups (SED, n=10). The ERT and CRT groups underwent 2 supervised resistance training sessions per week for 10 weeks. The ERT group performed the on set of 8 to 10 repetitions with 3 sec eccentric and 1 sec concentric muscle contractions. In contrast, the CRT group performed the on set of 8 to 10 repetitions with 1 sec eccentric and 3 sec concentric muscle contractions.

Results: Brachial-ankle pulse wave velocity (baPWV) after ERT did not change from baseline. In contrast, baPWV after CRT increased from baseline (from 1049 +/- 37 to 1153 +/- 30 cm/s, $P < 0.05$). No significant changes in flow-mediated dilation were observed in the ERT and CRT groups. These values did not change in the SED group.

Conclusion: These findings suggest that although both training does not deteriorate a vascular endothelial function, resistance training with quick lifting and slow lowering (i. e. ERT) prevent the stiffening of arterial stiffness.

13:00 - 14:00

Poster presentations

PP-AP02 Adapted Physical Activity 2

BASKIN: A SPORT FOR EVERYBODY

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Introduction: Baskin is a new sport activity, projected and realized in Cremona, Italy. It was created to allow differently and normally skilled people to play together in the same pitch. The word Baskin is the combination of the words basket and integration, not only meant for disabled and normally skilled people, but also for different sexes.

Innovations and analogies compared to ordinary basketball

The idea and principles of ordinary basket are maintained the same. Anyway there are some differences, which I point out in the part below:

- the number of baskets changes to 4; 2 on the short side and 2 on the borders of the centre line. They have different heights so everybody has the actual opportunity to score: the ones on the short side measure 3.05 m, the other measure 2-2.20 m. Under the ones on the centre line even lower baskets (1-1,20 m) can be placed.
- the conventional size of the court is 28 x 15 m, but it's not mandatory, it can be varied according to needs, contexts and situations.
- there are 2 semicircle shaped areas with a radius of 3 m and they are divided in 3 sectors. These divisions are marked with adhesive tape.
- the match is divided in 4 games, with stops in the same cases as real basket, and also in a player with role number 1.
- to play a Minibasket ball is used; it can be changed in case a role 1 player throws.
- there are 12 players, 6 inside a 6 outside the court. All players must play, and the total add of the shirt numbers must never be more than 23. The number on the shirt is composed by 2 digits: the first one is there to indicate the role, the second one is to distinguish players.

Players are divided, according to their physical characteristics, in classes 1 to 5:

1: a disabled player that can't move at all. He or she is always in the area of the lower basket, and when gets the ball, he or she has 10" and 2 shots to score;

2: a disabled player with all or some use of the hands but no leg use. He or she stays under the lower basket, and when he/she gets the ball then he or she can have 10" to score;

3: a disabled player with all or some use of the hands and partial leg use, which doesn't comprehend running or walking fluently. He or she can't run and has 10" to score after he or she receives the ball;

4: a partially disabled player with all or some use of the hands, and full leg capabilities (walking, running, dribbling);

5: a fully skilled basket player.

In conclusion

This new sport allows disable people to feel really integrated and socially accepted. It also has good benefits for what concerns self esteem and confidence, but also psychomotor abilities. It is an awesome weapons to fight insecurity, paranoia due to different physical condition, and other disturbing psychological statuses.

References

A. Bodini, F. Capellini, Baskin: fondamenti sportivi e sociali, Cremona,2007

THE SIGNIFICANCE OF 'NATURE EXPERIENCES' AMONG PEOPLE WITH PSYCHIATRIC DISORDERS

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Introduction: The aim of this study was to reveal how patients with psychiatric disorders experience participating in different outdoor activities and, moreover, to understand whether activities in 'nature' can enhance their quality of life.

Method

The study had a qualitative design. Participant observation and in-depth interviews were used. Six patients from a district psychiatric centre took part in a minimum of three days to maximum six days of outdoor hikes during a period of three weeks. The participants suffered from complex psychiatric conditions (e.g. depression, psychoses, personality disorders, and addictions). Their age varied between 18-71 years. The trips were organized in early autumn with a focus on good outdoor locations in the landscape of Sogndal, a small town in the western part of Norway. The trips consisted of short hikes, including a rest by a campfire with good food and a selection of outdoor activities.

Analysis/Discussion: In order to explain outdoor experiences, several theories can be applied. The environmental-psychological perspective, which attempts to explain the connections and experiences between humans and the physical environment, is a natural choice. Central to environmental-psychological research is the evolutionary perspective. It assumes that humans are adapted through evolution to be living in a natural environment. This perspective looks at which types of environment possess recreational qualities with regards to human health. Several studies have found evidence indicating that humans adopt a more positive emotional condition after having experienced natural surroundings when compared to urban surroundings (Ulrich et al. 1991). One of the participants, 'Hanne', seems to support this research. When asked about how she experienced being in the outdoors, she answered: 'Feel calm, is not restless. It gives me peace in a strange way. Calm and at peace with nature and myself. I don't quite know how to explain it. Feel completely calm.' This calm was also accentuated by other participants in the group. The evolutionary perspective of environmental-psychology provides an answer to why nature has a beneficial and calming effect on humans. However, this approach has problems to articulate how this is experienced by the individual. To better understand the experiential aspects of the participants, a phenomenological perspective is established. The phenomenological perspective, with its focus on the body and its close relation to the environment, can provide us with an understanding of the ways in which a person experiences the surroundings. The study reveals that psychiatric patients with serious disorders, experience participation in outdoor activities in a positive way. Hence, nature and outdoor activities can be integrated into everyday life in treatment of psychiatric patients.

References

Ulrich R S, Simons R F, Losito B D, Fiorito E, Miles M A, Zelson M (1991). J of Environmental Psychology, 11, 201-230.

EUROPEAN BEST PRACTICES AND POLICIES FOR PROMOTION AND IMPLEMENTATION OF ADAPTED PHYSICAL PHYSICAL ACTIVITY FOR ELDERLY PERSONS RESULTING FROM THE THENAPA II NETWORK

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Introduction: The populations of Europe is ageing. Data shows that total population of people over 65 increased 12,86% between 2002 and 2025. Nearly 37% of the European population will be aged 60 years or more in 2050 [EC, 2006]. Although there is some awareness about the benefits of physical activity and many of the issues regarding elderly persons are being discussed nowadays, there is still a long way to go to achieve full awareness and inclusion of older adults and especially older disabled people. The challenge is to expand the concept of an active lifestyle for all elderly persons.

Methods: During three years experts in the domain of ageing and disability from 27 European countries worked together to face this challenge. The project has reviewed the information and statistics, gathered by all the partners on good practices and policies extending throughout Europe. As a network THENAPA II developed many products that facilitate the process of awareness rising in the domain of APA for the Elderly.

Results: This research made the identification and the fulfilment of relevant educational programmes in the students' curricula. In turn these programmes have to motivate students from different academic domains to work with and for the elderly population and at the same time – to help expand the concept of active lifestyle for the elderly [THENAPA II, 2008].

Our data showed that although many good practicises were presented, not many programmes were exclusive for elderly people with a disability. To better serve the ultimate goal which is to motivate all older adults, regardless their abilities, to participate in different physical activities, the following products were developed [THENAPA II, 2008]:

-the DVD "Never too old to be active. The joy of movement" contains three motivational movies that are meant to convince elderly themselves to participate in Adapted Physical Activities.

-"Active Ageing Activity Cards" are an excellent tool for everyone who wants to organize an exercise session for older adults with or without disabilities.

Those products complement each other; their specification gives a possibility to reach not only one type of end-user, but a whole spectrum of other potential users.

Another product is the Curriculum of The European Master Programme in Adapted Physical Activity for the Eldery. The Curriculum includes 11 modules that aim in developing competencies for a variety of specialists.

Recommendations have been developed by as part of the THENAPA II project. The Network recommends the European Commission that all EU member states should implement its findings under 3 different headings: (1) the policy, (2) research and/or education programmes and (3) the elderly persons with/without a disability.

References

EC [2006] Population statistics. Office for Official Publications of the European Communities, Luxemburg

THENAPA II [2008]: www.thenapa2.org/publications/products/

Acknowelegment

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EXPERIENCE OF USE OF PHYSICAL CULTURE DEVICES DURING REABILITATION OF 4-7 YEAR-OLD CHILDREN WITH INFANTILE CEREBRAL PARALYSIS

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Present research actual continuity. Infantile cerebral paralysis has many clinical presentations. To overcome clinical appearances of this disease many scientific research of different effectiveness were carried out. Infantile cerebral paralysis severity depends on disordered motor function evidence which is mainly caused by abnormal distribution of muscular tonus and dystaxia.

Study methods and management. The research was carried out in the biomedical department of the Slavenskiy-on-Kuban Pedagogical State Institute and in the physical education and sanative technologies of the Volgograd State University. The research presents methodology of use of physical culture devices during rehabilitation of infantile cerebral paralysis taking into consideration their physiological characteristics and capacities. The results of five-year exercise according to individual rehabilitation program for 4-7 year old children (18 people) with spastic cerebral paralysis of minor and moderate severity were generalized.

Research results and their discussion. The offered program including therapeutic exercises, mechanotherapy and massage contributed to the desorded motor function decrease, motor activity increase, improvement of daily living activities of children with cerebral paralysis of minor and moderate severity.

Physical exercises with the use of applied, breathing, overall developing, muscle-strengthening and speed exercises correcting faulty positions and deformations are aimed at antagonists` reciprocal interrelation restoration, rise in inferior and superior extremities mobility, movement coordination, equilibrium, locomotor and cardio-respiratory apparatuses fitness improvement. A specific importance was brought to mechanotherapy as one form of remedial gymnastics having an overall and local influence upon infantile body suffering from cerebral paralysis. Mechanotherapy was practiced on different training stimulators such as trampoline, balancing platform, cinder track, fitness cycle, etc.

Conclusions:

1. The offered rahabilitation program for children of preschool age with spastic forms of cerebral paralysis of minor and moderate severity with the use of remedial gymnastics, massage and mechanotherapy proved its high effectiveness.

2. Five-year practice of physical rehabilitation exercises has significant influence on locomotor and cardio-respiratory apparatuses fitness improvement for children of preschool age with spastic forms of cerebral paralysis of minor and moderate severity. These results are based on improvement of power endurance rate of abdominal muscles and support ability of inferior extremity.

3. Positive changes in operant behaviour and manipulative capability factor structure of children with spastic forms of cerebral paralysis of minor and moderate severity were diagnosed; this modification shows differentiation processes in central nervous system.

QUALITY OF LIFE IN ELDERLY MEN WITH CHRONIC CORONARY ARTERY DISEASE: EFFECT OF COMBINED EXERCISE TRAINING

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Introduction: In recent years, health-related quality of life (HRQoL) has been increasingly used as an indicator of health outcome.The aim of this study was to evaluate the effect of three months lasting combined endurance/resistance training on the HRQoL in elderly men with chronic coronary artery disease (CAD).

Methods: 26 men older than 65 years with stable chronic CAD (mean age 70 ± 5 years, mean body weight 86,5 ± 11 kg, mean height 173 ± 5 cm, EF 48,5 ± 9%, were examined before and after three months lasting aerobic training combined (from 3rd week in the course) with resistance training.

Symptom-limited spiroergometry was provided before and after the training period. The first spiroergometry was applied for the evaluation of anaerobic threshold to decide on the aerobic training intensity. Load intensity for the resistance training phase was determined by the method of 1-RM (30-60%). The training (exercise unit) was performed three times a week. The impact on quality of life was measured using the Seattle Angina Questionnaire (SAQ).

Results: It is concluded that the all 5 SAQ dimensions were significantly better after the training. Physical limitations (67 ± 25 vs. 76 ± 26**), stability of symptoms (67±26 vs. 82 ±18*), frequency of symptoms (73± 20 vs. 82 ± 18**), treatment satisfaction (84 ± 17 vs. 92 ± 21**) and disease perception (62 ± 20 vs. 73 ± 20**). Peak exercise oxygen uptake (VO2peak) increased from 18,6 ± 3,1 to 19,8 ± 4,0** ml. kg-1.min-1 (*P < 0.05, ** P < 0.01, Wilcoxon).

Discussion: The Seattle Angina Questionnaire is a valid and reliable instrument that measures five clinically important dimensions of health in patients with CAD. (Spertus, 1995). CAD negatively affects HRQoL. In patients with CAD, age and sex independently affected the HRQoL. Older patients had worse HRQoL. (Unsar et al., 2007) In recent years was shown, that one-sided preference of endurance training in older age was not able to satisfy all requirements for maintainence of the strength necessary for satisfactory quality of life. (Macek et al., 2006). In our study three months lasting combined endurance/resistance training significantly improves quality of life and aerobic capacity in elderly men with chronic coronary artery disease. There were no exercise-related adverse events during exercise training. Combination of strength and endurance training seems to be the most effective training schema in older persons.

References

Macek M, Mackova J, Radvansky J. (2006). Med Sport Boh Slov, 15 (1) 33-41.

Spertus JA, Winder JA, Dewhurst TA et al. (1995) J Am Coll Cardiol, 25 (2)
333 - 341.
Unsar S, Sut N, Durna Z. (2007). J Cardiovasc Nurs, 22 (6) 501-507.

LOWER LIMBS COMPOSITION AND JUMPING PERFORMANCE IN CHILDREN AND ADOLESCENTS WITH DOWN SYNDROME

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Introduction: Jump power is associated to the composition (lean, fat masses and bone masses) of lower limbs in healthy population(1). Lower levels of strength in quadriceps and hamstring have been observed in children and adolescents with Down syndrome(2). We aimed to elucidate whether children and adolescents with DS have impairments in jumping performance and to find the possible relationships with lower limbs composition.

Material and methods: 30 children (17 male) with DS, mean age 14.7±3 yr. were compared with 30 healthy and without mental retardation (MR) children, matched in age and sex. The total body lean mass and lower limbs bone mineral content (BMC), fat and lean masses of the subjects was measured using dual energy X-ray absorptiometry (DXA). The jump performance was assessed throw the height jumped in counter movement jumps (CMJ) and Abalakov (ABA) jumps. Differences in the jumped height between groups (male and female separately, and as a whole) were established using Student's unpaired t test, analysis of covariance was performed to test the differences in the upper and lower limbs lean mass using height and Tanner maturational status as covariates. Pearson's correlations were applied to identify the relationships between lower limbs BMC, fat and lean masses and both jumps.

Results: Significant higher CMJ and ABA jumped height was found in children without DS ($p<0.01$). Children without DS had higher lean mass and BMC in the lower limbs when both sexes were compared as a whole group and also separately ($p<0.05$); there were no differences in the fat mass. Lean mass and BMC in the lower limbs were correlated in both groups (SD $r=0.93$; control $r=0.92$, both $p<0.01$); also fat mass and BMC had a relationship in the group with DS ($r=0.39$, $p<0.05$). CMJ and ABA jumped height was highly correlated with BMC (CMJ $r=0.47$, $p<0.01$; ABA $r=0.55$, $p<0.01$), lean (CMJ $r=0.46$, $p<0.01$; ABA $r=0.56$, $p<0.01$) and fat masses (CMJ $r=-0.68$, $p<0.01$; ABA $r=-0.71$, $p<0.01$) in the control group. In the group with DS, height jumped in the CMJ was correlated with BMC and lean mass ($r=0.45$; $r=0.39$, $p<0.05$), and in the ABA with BMC ($r=0.45$, $p<0.05$).

Discussion: Children with DS showed less lean mass and BMC in the lower limbs than their peers without MR; the jumped height of this population is also lower. CMJ was similarly related with lower limbs composition in both groups; however, the lack of relationship between ABA jump and lean mass could be explained by the technical factor associated to this kind of jump.

References:

1. Vicente-Rodriguez G et al. Bone 2003;33(5):853-9.
2. Angelopoulou N et al. Calcif Tissue Int 2000;66(3):176-80.

13:00 - 14:00

Poster presentations

PP-SA01 Sport Statistics and Analyses 1

STATISTICS BETWEEN WINNING AND LOSING TEAMS BY COMPETITION LEVELS IN VOLLEYBALL - WORLD CUP AND CHAMPIONSHIP 2007

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Introduction: Game analysis (GA) allows for the interpretation of the organization of teams and the identification of game statistics so as to improve competitive performance. Volleyball game-related statistics are used to identify and control team and individual performances, aiming to find a way to score two more points than the opposing team. The characteristics identified in the diverse competition levels might present specificities for each game level. Therefore, the purpose of the present study has been to identify the game-related statistics that allow for the discrimination between winning and losing teams in competition levels in volleyball.

Methods: The statistics of all the games (n=344) of the diverse World championships 2007 (including all levels of competition and both genders) were analyzed using the Software VIS of the 'score box' of the International Volleyball Federation (FIVB) by undertaking the analysis of the discriminating function (DF) so as to identify the indicators that contributed more to establish the maximum difference between victories and defeats. Through the structural coefficients (SC), we have identified the game-related statistics that best discriminate the levels.

Results: Our results showed that the obtained functions in this discriminating analysis were all statistically significant ($p<0.05$) and classified correctly in 82.3% of the cases. As there are high values of quality reception and excellent sets in the senior teams, they obtained lower values in the continuity reception and faults sets. At the same time, the junior teams presented higher values of continuity reception. Thus presenting a possible explanation for the occurrence of faults sets, seeing as they are two actions preceded by the opponent's service. The structure coefficients identified team continuity reception (SC=-0.35) and faults sets (SC=-0.30) for function 1. For function 2, only the excellent digs (SC=0.32) contributed to discriminate the groups.

Discussion: The results are going to suggest that the greater the experience with reference to age and competition level of the players, the better the levels of reception. Contrarily, the lower the age of the players and the competition level is, the lower the number of continuity receptions.

A possible explanation for these divergences in the values found in the present study may result from the differences in the tactical-technical capacity between competition levels, resulting from the differentiated qualities in the reception between extreme levels.

The ensuing results of the seniors present higher values in excellent distribution, slightly lesser in relation to the following variables; the same takes place for the continuity sets and the faults sets.
These profiles may better help coaches in their preparation according to this specificity, allowing teams to be ready to control these variables in competitions.

STATISTICS BETWEEN WINNING AND LOSING TEAMS BY COMPETITION LEVELS AND GENDER IN VOLLEYBALL

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Introduction: The identification of sports skills underlying high-level performances can be information of great value to volleyball coaches, thereby allowing them to establish and monitor playing patterns. The aim of this study has been to identify the volleyball game-related statistics that allow for discriminating performances by gender and level of competition.
Methods: The statistics of all the games (n=344) of the diverse World championships 2007 (including all levels of competition and both gender) were analysed using the Software VIS of the 'score box' of the International Volleyball Federation (FIVB), and involved the analysis of the discriminating function (DF) so as to identify the indicators that contribute more to establishing the maximum difference between victories and defeats. Through structural coefficients (SC), we have identified the game-related statistics that better discriminate the levels and genders.
Results: The results showed that for gender x level of competition the obtained functions in selective analysis were all statistically significant ($p<0.05$) and classified correctly in 85.6% of the cases.
The structure coefficients from Function 1 reflected team faults percentages (SC=0.39), shots spikes percentages (SC=-0.38) and continuity digs percentages (SC=0.31). Function 2 reflected excellent Digs (SC=0.31) and continuity digs (SC=0.31). Function 4 showed team faults percentages (SC=0.35) contribution for discriminating the groups. Function 5 showed the excellent digs (SC=-0.39), the faults receptions (SC=0.35) the faults digs (SC=-0.34) and Serve aces (SC=0.30) contribution for discriminating the groups.
For the team faults percentages, it may be observed that there are differences between men and women at different levels of competition. The majority of the teams lose many points through the faults made. It is possible to observe that, in men's Volleyball, the juniors present elevated team faults percentages, following the same pattern as the seniors and, finally, the youth. In the female Volleyball, the seniors present elevated team faults percentages, the juniors an intermediate figure and the youth present a limited number.
Discussion: The results show that the use of this study can help coaches to understand better the differences between players – the different genders of players and level of competition – and better regulate training sessions and competition.
As the game level increased, so did the risk, because not taking a risk can mean losing a point. In the game of senior Volleyball there is a greater error because continuity may provide an opening for the adversary to score. Men versus women: men fail more probably because they also risk more and in so doing end up by increasing the possibility of losing.
It is worthwhile pointing out that the success rate in the attack is almost always higher for seniors, regardless of gender, and decrease gradually until the younger players.

THE EFFECTIVENESS OF BASKETBALL PLAYERS IN OFFENSE, FOLLOWING AN OUTSIDE GAME, THROUGH VIDEO ANALYSIS

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Introduction: An offensive strategy can include movements like shots with screen, without screen or shots near of far from the basket (Wissel, 2006). The outside game is part of the control offense and is based on shots performed from medium or far distances. The effectiveness -or not- of a shot depends on the amount of pressing applied on the defense, as well as on the personal characteristics of the player shooting (Smith & Spear, 1981). Many coaches prefer developing strategies far from the basket, so that all players can shoot (Gillen, 1993). The aim of this study was to analyze the outside game in European Championships.
Methods: The sample consisted of 80-videotaped Basketball games from the 2003, 2005 and 2007 Mail European Championships. The phases recorded were the outside game and the offenses with and without screen, as well as the effectiveness of the above offenses. To define effectiveness, the authors considered the successful or missed two-point and three-point shots, the won offenses and the turnovers. The following equipment was used: A video set to record the games shown on various channels; a video card for the digitalisation of the games; A computer (P/C); the "Sportscout" programme for the analysis of the digital video. For the statistical analysis of the data, the method used was the analysis of frequencies and the non-parametric test x2. The $p< .05$ was defined as level of significance.
Results: The outside game took up 65% of the executed offenses. 4 out of 10 of the offenses far from the basket were realized after a screen, while 6 out of 10 without a screen. The teams performed a higher score of two-point and three-point shots, after a screen. The dominant offense with screen was the pick and roll, while the most frequent offense without screen was the 1 on 1.
Discussion: The dominant offensive tactic without screen was the offense 1 on 1, which is in accordance with Tavares et al., 2003. As for the offenses without screen, the dominant element of control offense was the pick and roll (Ociepka, 2004; Filipovski, 2005). Both the distribution of the offensive strategy and the effectiveness of the players are similar to those of previous researches (Tavares et al., 2003). The development of an offensive strategy must satisfy players, coaches and fans, but it must also be successful (Wissel, 2006).
References

Filipovski, S. (2005). The pick-and-roll offense. FIBA Assist Magazine, 12, 29-31.

Gillen, P. (1993). Pete Gillen. IN: Masters Press, Indianapolis.

Ociepka, B., (2004). Defending the Pick n' Roll. FIBA Assist magazine, 11,30-34.

Smith, D. & Spear, B. (1981). Basketball Multiple Offence and Defense. Prentice Hall Inc. Englewood Cliffs N. J.

Tavares, F. & Gomes, N. (2003). The offensive process in basketball – a study in high performance junior teams. International Journal of Performance Analysis in Sport, 3 (1), 34-39.

Wissel, H. (2006). Man-to-man offense: passing game. FIBA Assist Magazine, 18, 6-10.

SPACE-TIME COORDINATION DYNAMICS IN BASKETBALL: INVESTIGATING THE INTERACTION BETWEEN THE TWO TEAMS

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Introduction: Bourbousson, Seve and McGarry (submitted) reported an investigation of space-time patterns of basketball players in terms of the couplings among player dyads. The present study examined basketball game behaviour from analysis of the interaction between the two teams, addressing whether basketball subscribes to dynamical system descriptions at different levels of analysis.

Methods: Six game sequences were selected for analysis from which the x-y coordinate data of each player was obtained. From these data the longitudinal and lateral movements of the teams were then analyzed using two metrics, the centre of gravity and the stretch index. The former assesses the central position of a team and the latter the dispersion of a team about its central position. The relative phase between the centres of gravity, as well as the stretch indexes, and a new measure termed the differential stretch index (i.e., the difference between the stretch indexes of the two teams) were then used as collective variables to assess the interaction between the teams. Investigation of correspondences between game events (i.e. shot attempts and ball possession) and the collective variables used was realized.

Results: In regard to the phase analyses, an in-phase relation between the teams was evidenced with more stability reported for the longitudinal direction than for the lateral one. The differential stretch index in contrast demonstrated two separate and stable properties for both the longitudinal (-0.6 m and 0.8 m) and lateral directions (-0.4 m and 0.6 m). In the investigation of correspondence between game events and collective variables, qualitative analyses identified two classifications of shot attempts: individual shots and team shots, with the second shot type being produced seemingly just after a large perturbation in relative phase between centres of gravity when measured in the lateral direction. Major variations in the differential stretch index were related with changes in ball possession.

Discussion: The different results obtained by using different metrics and collective variables demonstrate that the information obtained from the analysis is much informed by the particular indicator used. The relative phase perturbations of the centres of gravity were forecasting shot attempts when produced by team work. This indicator might well contain useful information for sports practitioners. Otherwise, the supposition that in general the attacking team tends to expand and the defending team contracts was supported by the differential stretch index, with the teams switching between expansion and contraction in alternating fashion with changes in ball possession . In sum, the space-time patterns of basketball teams, while different with regard to the particular indicators used, were nonetheless consistent with a unified description of self-organizing behaviours in sports competition.

References

Bourbousson J, Seve C, McGarry, T. (submitted). J Sports Sci.

COMPARISON BETWEEN WOMEN'S AND MEN'S GAME AT RUGBY WORLD CUP LEVEL

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No study has accounted for the comparison between women´s and men´s game at rugby world cup level. The rugby men's game has developed since 1995, so has the women's game, but while the women's game is structurally similar to that played by men in RWC 99. The aim of this study is to determine if any relationship exists between women´s and men´s game at rugby world cup level. Archival data report to game-related statistics from thirty matches played in Women´s RWC 2006 and forty-eight matches played in Men´s RWC 2007. We analyzed and compare matches during the different stages (pool, knockout and final stages) of RWC finalist countries. The statistical review and match analysis are analysed to help identify the most powerful game-related statistics to discriminate the game. In women´s RWC 2006 the average number of points per match was 39. 179 tries were scored in the 30 matches and there were six times more tries than penalty goals. The activity cycles: ball in play time averaged 41%, rucks/mauls averaged 131 per game, passes averaged 220 per game and almost 80% of all passing movements contained 2 passes or less. Open play kicks averaged 43 per game. Women set pieces: average 31 lineouts per game, 68% were contested and possession was retained on 73% of occasions. There were an average of 28 scrums per game and the possession retained was 89%. In men´s RWC 2007, the average number of points scored per match was 52. In RWC 296 tries were scored in the 48 matches, average 6.2 tries per game. 32% of tries came from lineout possession, 18% from scrum, 17% came from turnover or handling error and 15% came from opponents kick. The men´s activity cycles: ball in play time averaged was 44%, the men's game produces 40% more rucks and mauls and around 35% more passes, average 144 per game. The men´s set pieces were lineout also average 31 per game just over 60% were contested and possession was retained on 80% of occasions. There were only 19 scrums per game/RWC 2007 some 9 more than in the Women's RWC 2006. Apart from scrums - which were 33% more frequent in the men's game, all core elements were recognizably the same, but with one significant exception - kicking. While the average number of tries were similar, when it came to kicks there were huge differences between the men's game and the women's game. Kicking therefore was a far less noticeable part of the women's game with fewer kicks at goal, a lesser success rate and fewer kicks from hand during open play. What is clear therefore is that kicks at goal are less frequent and less successful than in the men's game. This also illustrates the fact that kicks over a certain distance cause considerable difficulty to many women's teams. There are some common tendencies in men´s and women´s game at rugby world cup level. The various teams may find the data of benefit in establishing benchmarks and performance indicators for future tournaments. REFERENCES I.R.B. (2006/2007) Statistical review and match analysis of Game. Dublin

RUGBY UNION GAME-RELATED STATISTICS AS A PREDICTOR OF WINNING OR LOSING TEAMS IN CLOSE GAMES

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Studies rarely differentiate the characteristics of winners or losers in rugby union games. Rugby game-related statistics are a powerful tool to analyze teams` and players performance in different skills (Vaz, 2008). Unlike other team sports, available research is still unclear about the game-related statistics that discriminate between winning and losing teams. Only Jones et al. (2004) have identified lineout's won on oppositions throw and tries scored as statistically different between rugby union game winners and losers. The aim of this study was to identify the rugby union game-related statistics as a predictor of winning or losing teams in close games. Archival data report to game-related statistics from 135 IRB games and 207 Super twelve games played between (2003-2006). Afterwards, a cluster analysis

was conducted to establish, according to game final score differences, three different groups for the subsequent analysis. Only the close games group was selected for analysis (IRB n=64 until 15 points difference and Super twelve n=95 until 11 points difference). Finally, an analysis to the structure coefficients (SC) obtained through a discriminant analysis allowed to identify the most powerful game-related statistics in discriminating between winning and losing teams. The discriminant functions were statistically significant for Super twelve games (Xi-square = 33.8, P<0.01), but not for IRB games (Xi-square = 9.4, P=n.s.).In the first case, winners and losers were discriminated by possessions kicked, (SC=0,48) tackles made (SC=0,45), rucks and pass (SC=0,40), passes (SC=-0,39), mauls won (SC=-0,36), turnovers (SC=-0,33), kicks to touch (SC=0,32) and errors made (SC=-0,32).The minus sign denotes higher values in losing teams. Rugby union game-related statistics were able to discriminate between winners and losers in close games. The need for objective, accurate and relevant feedback about player's performance from both training and competition has led to the development of match analysis systems based on computer and video technology. Coaches can use these results for players' recruitment, team preparation and for directing the competition.

REFERENCES

Jones N M, Mellalieu S and James N (2004) Team performance indicators as a function of winning and losing in rugby union. International Journal of Performance Analysis in Sport, 4 (1), pp. 61-71.

Vaz; L. (2008). Identifying the rugby game-related statistics that discriminate between IRB and Super twelve winning and losing teams in close games. World Congress of Performance Analysis of Sports VIII (WCPAS) -Magdeburg-Germany

MATCH DEMANDS OF BEACH SOCCER: A CASE STUDY

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Introduction: Despite the increasing worldwide popularity of Beach Soccer, played either at amateur and professional level, few scientific studies focused on this sport, leaving open several questions about its performance profile. Thus, the aim of this study was to examine the responses to a Beach Soccer friendly match in varsity players.

Methods: Ten male players (age 23.6±4.4 yrs; body mass 71.8±3.8 kg; height 1.77±0.05m) of the Magna Græcia University beach soccer team provided their written consent to participate in the study. The subjects were divided in two teams (1 goalkeeper, 2 defenders, 1 pivot, and 1 attacker). The beach soccer match consisted of three 12-min periods with 3-min breaks in between. During the match heart rate was continuously recorded every 5 s (Polar Team System, Polar Electro, Finland). Before the match and at the end of each period blood lactate concentrations (La; Accusport, Roche, Switzerland) and power performances (countermovement jump, CMJ; Optojump, Microgate, Italy) were measured. To estimate the intensity of efforts during the match, HR was expressed as a percentage of HRmax using 5 categories: >95%, 86–95%, 76–85%, 65–75%, <65%. ANOVA for repeated measures was used to test differences (p<0.05) between periods.

Results: Match intensity showed differences for HR categories (p=0.001) and their interaction with match periods (F(8, 64)= 4.18; p=0.0005), and La values (p=0.03). A progressive decrease of occurrence toward the end of the match emerged for HR>85% (periods: first=75%, second=61%, third=31%). A similar trend emerged for La values (periods: first=8.7±4.0mmol.L-1; second=6.7±3.8mmol.L-1; third=5.3±2.7mmol.L-1). With respect to pre-match condition (36.6±5.3cm), higher (p<0.004) CMJ performances were found at the end of the match periods (first=39.5±6.5cm; second=40.9±6.4cm; third=39.2±6.0cm).

Discussion: The present findings indicate that Beach Soccer is an intermittent sport activity that places a high load on players, with the anaerobic metabolism providing an important energy source during games. Although the marked decrease in intensity of playing might indicate that players undergo fatigue (Mohr et al., 2003), this speculation is in contrast to the increased CMJ performances of players, which might be attributed to an enhanced neuromuscular activation (Vetter, 2007). Thus, it might be hypothesized that players tend to adopt tactical strategies to spare their energies throughout the match and further studies are necessary to clarify these aspects.

References

Mohr, M., et al. (2003). J. Sports Sci., 26: 141-148

Vetter, R.E. (2007). J. Strength Cond. Res., 21: 923-929

CORRELATIONS BETWEEN TEAMS' HEIGHT AND GAME-RELATED STATISTICS IN YOUNG FEMALE INTERNATIONAL LEVEL BASKETBALL GAMES.

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Introduction: Body size and height are important anthropometric factors to competitive advantage and field playing position in basketball (Carter et al., 2005; Drinkwater et al., 2008). Increasing importance is given to some game-related statistic parameters, such as 2 and 3 point field goals percentage, opponent 2 and 3 field goals percentage, number of rebounds, assist, fouls, steals, turnovers and blocks per game (Trninic et al., 1999; Gómez et al., 2008). No studies before have searched for relationships between teams' height and game parameters. Therefore, the aim of this study was to look for correlations between teams' height and game-related statistics in young elite female basketball games.

Methods

The game-related statistics from 496 matches of the Under 20 female European Championship (2005 to 2008) were examined. Teams had an average height of 181 (SD 2.00) cm and an average age of 19.34 (SD 1.34) years. Correlations between height and game parameters were assessed by Pearson correlation coefficient. The significant level was set at p = 0.05

Results: In parallel with a positive significant correlation between the percentage of the games won and defensive rebounds (r = 0.43) and total rebounds (r = 0.35), the data analysis showed positive significant correlations between the teams average height and: percentage of the games won (r = 0.34), defensive rebounds (r = 0.32), offensive rebounds (r = 0.26), total rebounds (r = 0.35), blocks (r = 0.46). Negative significant correlations was found between the teams average height and: points allowed per game (r = -0.37), opponent field goals percentage (r = -0.45), opponent 2 points field goals percentage (r = -0.40), opponent 3 points field goals percentage (r = -0.41), fouls (r = -0.32).

Discussion: In U20 female European Basketball Championship height appears to be significantly correlated with several "performance indicators" (Hughes et al., 2002) such as: assist, defensive rebounds, 2 and 3 point field goals percentage (Trninic et al., 1999; Gómez et al., 2008). The significant correlation found between average team's height and percentage of the games won emphasizes the impor-

tance of height in basketball as a performance indicator. It is therefore necessary to study other age/sex categories to have a full knowledge of all significant parameters.

References

Drinkwater EJ, Pyne DB, McKenna MJ. (2008). Sports Med, 38(7), 565-578.

Carter JEL, Ackland TR, Kerr DA, Stapff AB. (2005). J Sports Sci, 23(10), 1057-1063

Gómez MA, Lorenzo A, Barakat R, Ortega E, Palao JM. (2008). Percept Mot Skills, 106(1), 43-50

Hughes MD, Bartlett RM. (2002). J Sports Sci, 20, 739-754

Trninic S, Dizdar D, Fressl ZJ. (1999). Kinesiology, 31(1),29-36

13:00 - 14:00

Poster presentations

PP-SM03 Sports Medicine 3

HAEMATOLOGICAL CHANGES, CELL DAMAGE AND OXIDATIVE STRESS DURING A SKI-MOUNTANEERING COMPETITION

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INTRODUCTION: Blood changes and muscle cell damage have been described in many sports (Nikolaidis, 2008). Also, high intensity exercise produces oxidative stress which has been related to fatigue, damage and overtraining (Fisher-Wellman & Bloomer, 2009). Information about ski-mountaineering is scarce. Therefore, the aim of this study was to analyse the effect of a ski-mountaineering competition on blood measurements.

METHODS: 21 male skiers participated in this study. Blood samples were taken before and immediately after an official two-day ski-mountaineering competition to measure in serum: red cell count, white cell count, biochemistry, C-reactive protein, cortisol, creatine kinase (CK), aspartate aminotransferase (AST), alanine aminotransferase (ALT), γ-glutamyl transpeptidase (GGT), lactate dehydrogenase (LDH), alkaline phosphatase (AP), total antioxidant status (TAS), superoxide dismutase (SOD), glutathione reductase (GR) and glutathione peroxidase (GPx).

RESULTS: After the competition there was a decrease in the red cells (4.78 x 106/µl ± 0.0 vs 4.56 ± 0.1**), haemoglobin (15.0 g/dl ± 0.1 vs 14.2 ± 0.3**), mean corpuscular haemoglobin concentration (35.7 pg ± 0.2 vs 34.3 ± 0.3**, whereas bilirrubin (0.60 mg/dl ± 0.1 vs 1.10 ± 0.1**) increased (all maintained within normal parameters).

We also found an increase in the leucocytes (7.4 x 103/µl ± 0.3 vs 11.2 ± 0.6**), neutrophils (3.60 103/µl ± 0.23 vs 8.68 ± 0.60**) and monocytes 103/µl (0.50 ± 0.04 vs 0.90 ± 0.06**); but, lymphocytes 103/µl (2.80 ± 0.13 vs 1.50 ± 0.10**), basophyls 103/µl (0.10 ± 0.01 vs 0.04 ± 0.01*) and eosinophils 103/µl (0.40 ± 0.05 vs 0.07 ± 0.02**) decreased.

Muscle enzymes' levels were higher after the competition (CK: 173 U/L ± 20 vs 664 ± 74**, AST: 25.7 U/L ± 1.4 vs 43.0 ± 3.2** and LDH: 305 U/L ± 12 vs 402 ± 14**), together with the cortisol (6.6 µg/dl ± 0.8 vs 16.8 ± 1.0**) and C-reactive protein (0.10 mg/d ± 0.02 vs 0.65 ± 0.04**).

On the other hand the capacity of the glutation peroxidase also increased (68.13 U/l ± 26.23 vs 117.70 ± 29.58**).

*p<0.05, **p<0.05

DISCUSSION: A two-day ski-mountaineering competition produced marked haematological changes: haemolysis, leucocytosis and lymphopenia. There was also muscle cell damage and oxidative stress. It would be interesting to know if these changes may affect performance; and if so, it could be important to design interventions to lower them.

REFERENCES:

Nikolaidis MG, Jamurtas AZ, Paschalis V, Fatouros IG, Koutedakis Y, Kouretas D. The effect of muscle-damaging exercise on blood and skeletal muscle oxidative stress: magnitude and time-course considerations. Sports Med. 2008;38(7):579-606

Fisher-Wellman K, Bloomer RJ. Acute exercise and oxidative stress: a 30 year history. Dyn Med. 2009 Jan 13;8(1):1.

THE COL5A1 GENE AND MUSCULOSKELETAL SOFT TISSUE INJURIES

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Purpose: Genetic elements have been shown to predispose individuals to chronic Achilles tendinopathy (TEN) and anterior cruciate ligament (ACL) ruptures. The CC genotype of the BstUI RFLP within the COL5A1 gene was significantly over-represented in the age-matched (±38 years) asymptomatic controls, when compared to TEN subjects in South African and Australian populations [1;2]. Similarly, within females but not males, this genotype was also significantly over-represented in age-matched (±27 years) asymptomatic controls when compared to ACL subjects [3]. The frequency of the CC genotype of the age-matched (±27 years) asymptomatic male controls (16%) where distinctly different to the frequency of the combined male and female asymptomatic controls in the TEN studies, as well as the female controls in the ACL study (24-27%).

Aims and Methods: Considered together, these results highlight two important aspects which need further investigation. Firstly, is there a gender-specific COL5A1 BstUI RFLP genotype effect on TEN. Secondly, since the younger male controls within the ACL study had a lower CC genotype frequency is the distribution of this COL5A1 polymorphism within the controls age-dependent, particularly among males.

Results: There was no evidence that the association of the COL5A1 BstUI RFLP with TEN in the two previously published studies were gender-specific. However, when the 299 male asymptomatic controls from all studies were pooled and dived into age-group tertiles, there was a significant linear trend (P=0.047) for the CC genotype frequency amongst the male age groups, with the youngest group having the lowest (17%) and the oldest group the highest (29%). There was however a similar CC genotype content in all three female (n=251) age groups (23 to 26%).

Conclusion: Although the COL5A1 BstUI RFLP CC genotype was under-represented in females, but not males with ACL ruptures there appears to be no gender-specific under-representation of this genotype within TEN. Consequently, there is an age-dependant increase in the CC genotype of this sequence variant within a pooled group of asymptomatic male controls. The practical implication is that the selection of control groups is of critical importance when future studies of this nature are designed. Future research investigating this genetic variant as a risk factor for soft tissue injuries should consider these findings when selecting a control group.

References

1. Mokone GG et al. (2006) The COL5A1 gene and Achilles tendon pathology. Scand J Med Sci Sports 16:19-26.

2. September AV et al. Variants within the COL5A1 gene are associated with Achilles tendinopathy in two populations. Br J Sports Med; In Press.

3. Posthumus M et al. (2008) The type V collagen (COL5A1) gene is associated with anterior cruciate ligament injuries. Archivos de Medicina del Deporte 25:461.

RISK FOR "TIME LOSS INJURY" AND SKILL LEVEL AMONG 11-TO 12- YEAR-OLD MALE SOCCER PLAYERS

SEVERINO, V., GONÇALVES, R., SIMÕES, F., REGO, I., MAZZUCO, M., FIGUEIREDO, A., PÁSCOA PINHEIRO, J., COELHO E SILVA, M.

UNIVERSITY OF COIMBRA

An injury consensus definition was established under the auspices of FIFA Medical Assessment and Research Centre (Fuller et al., 2006). Risk for injury was already investigated in elite soccer (Ekstrand et al., 2004; Hagglund et al., 2003). Research in youth athletes is less abundant and still lacking in Portugal. The current study adopts the mentioned operational definition of "Time Loss Injury" [TLI] to estimate the incidence and prevalence of injuries among 11 to 12 years old Portuguese soccer players.

Based on soccer players from five clubs, the sample was composed by 62 subjects (11.0-12.9 years). At the starting month of the season players were measured in height, weight, fitness defined as lower limb muscle power (vertical jumps with and without counter movement using an ergo-jump, Bosco, 1994), 10x5-m agility test (Philippaerts et al., 2006), 20-m endurance test (Yoyo, Bangsbo, 1994) and 7-sprint test (Reilly & Poran, 2003) and four soccer-specific skills (shooting, dribbling, passing and juggling; see Figueiredo et al., 2009). The authors individually registered the number of sessions, games and respective minutes over two seasons and monitored the episodes of TLI on a weekly basis.

After baseline measurements, 58% of the sample did not registered any TLI, 24% registered two episodes and 18% three or more over two consecutive seasons. The occurrence of injuries resulted in a loss of 490 days of practices and competitions. The total amount of exposures was 13,488 sessions and 1,046,346 minutes. The incidence was 5.19 injuries per 10,000 sessions of exposure and 0.67 injuries per 10,000 minutes. Injured athletes were significantly more talented in skills (juggling; dribbling) and attained better performances in the agility test as well as in best sprint of the anaerobic protocol.

In summary, four out of every ten initiates are victims of sport injuries. The current study also suggests that being skilled is a risk factor for sport injuries. It is of interest to confirm this trend and to consider policies for developing biological readiness among talented young soccer players.

Partially supported by FCT [contact: mjcesilva@fcdef.uc.pt]

Bangsbo J (1994). Fitness Training in Football. Bagsvaerd: HO & Storm.

Bosco C (1994). La valoration de la fuerza com el test de Bosco. Barcelona: Editorial Paidotribo

Ekstrand et al. (2004). Scand J Med Sci Sports. 14: 34-38

Hagglund et al. (2003). Scand J Med Sci Sports. 13: 364-370

Fuller CW et al. (2006). Scand J Med Sci Sports. 16: 83-92

Reilly T, Doran D (2003). Fitness assessment. Science and soccer,. London: Routledge, 21-46

PHYSICAL ACTIVITY IN PRIMARY DYSMENORRHOEA

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FACULDADE DE DESPORTO - UNIVERSIDADE DO PORTO

Purpose – The aim of this study is to determine the influence of physical exercise in primary dysmenorrhoea and associated symptoms.

Methodology - This analytical cross sectional study comprised 72 volunteers women, aged between 17 and 25 years, of which 37 were physically active (non-competitive) and 35 were sedentary. In order to determine the existence of dysmenorrhoea the Moos Menstrual Distress Questionnaire was applied as well as the Visual Analogue Scale Survey to measure the severity of pain. For statistical analysis chi-square test and Mann-Whitney were used.

Results – Physical Active girls had less menstrual pain compared to sedentary ones (56.8% vs 97.1% ;p <0001). Regular physical activity showed significantly, less duration (p = 0014) and intensity of menstrual pain (p = 0001). In addition, the physical active women felt less disturbs caused by menstrual pain (p = 0,018). Furthermore they felt less incapacity to accomplish to daily activities (p = 0.09) and absenteeism at work or school was lower (p = 0 , 02).

In the analysis of the symptoms associated with dysmenorrhoea, the sedentary group showed greater severity of symptoms in the categories: 'bad pain and being' (p <0001), 'fluid retention' (p = 0002), 'feelings negative (p <0001) and 'concentration' (p = 0017).

Conclusion – Our results suggest that regular practice of physical activity contributed in a positive way to improve the disorders caused by primary dysmenorrhoea.

INFLUENCE OF ORAL CONTRACEPTIVES ADMINISTRATION IN THE CAPACITY OF MUSCLE STRENGTH

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FACULDADE DE DESPORTO - UNIVERSIDADE DO PORTO

Introduction / Objectives: This study aims are twofold: (1) to determine whether the administration of oral contraceptives (OC) influences the capacity of muscle strength, and (2) to analyse if there is variation in strength levels between the initial follicular and mean luteal phases of the menstrual cycle (MC) in women who take and don't take OC.

Relevance: The knowledge of the possible influence of CO in the capacity of muscle function will enhance the sports performance and clinical practice.

Methodology: A total of 40 University students participated in this study. Two groups were assigned (young women who take CO n = 20; young women not taking regular NCO n= 20). An electronic isometric dynamometer was used to measure the maximum voluntary isometric contraction of quadricípite during follicular and mean luteal MC in both groups. T test was used for independent samples to compare the mean muscle strength and t test for paired samples, to compare the intra-group force mean differences in two phases of MC assessed.

Results: No statistical significant differecnes were found between the groups in initial follicular phase (37,86 ± 9,92 vs 34,90 ± 7,32 Kg/N; p = 0.29); and in mean luteal phase (41,43 ± 7,71 vs 40,00 ± 8,26 Kg/N ;p = 0.58). In women taking OC, there is no statistical evidence (37,86 ± 9,92 vs 41,43 ± 7,71 Kg/N ;p = 0.06) to say that there are differences in the production of strength between the two phases of MC. In women who weren't taking OC, there were found statistical significant differences in the production of strength between the two phases (34,90 ± 7,32 vs 40,00 ± 8,26 Kg/N; p = 0.01).

Discussion / Conclusion: Our results suggest that the administration of CO does not influence the capacity of muscle strength but eliminates the fluctuations in strength during the different phases of MC.

INFLUENCE OF COMPRESSION STRESS TO THE ARTICULAR CARTILAGE - AN EXTRA-VIVO STUDY USING MAGNETIZATION TRANSFER CONTRAST IMAGING -

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NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY

Introduction: Magnetization transfer contrast (MTC) is an imaging method, which creates tissue contrast in a different manner as T1 and T2 relaxation time by the exchange of magnetization between macromolecular protons and bulk water, via cross relaxation or chemical exchange. Therefore, it may be beneficial to evaluate articular cartilage using MTC because it has abundant macromolecules and its function should be specified by macromolecular protons. We had reported the change of MTC effect in human cartilage with exercise (ECSS 2004-2008). In this study, we observed the MTC effect in bovine cartilage during mechanical compression to verify the change of MTC effect reflected behavior of articular cartilage to compression stress.

Methods: Ten 8-mm-diameter cylindrical cartilage plugs were harvested from bovine tibia for the specimens. MTC images were obtained before, during, and after application of mechanical compression using Fast Low Angle Shot (FLASH) (TR(ms)/TE(ms)/FA(deg)=11.9/3..5/30) and FLASH-MTC sequence on a 2T superconducting magnet and a 72-mm birdcage coil. The off-resonance sinc pulse was set at a frequency offset of 1.5KHz from the free proton resonance with a duration of 3msec and an amplitude of 20x10-6T as preparation for MTC images. The mechanical compression (97.6kPa) was applied with a custom-built MR-compatible pressure device. The quantitative analysis of bovine cartilage was performed with Ms/Mo. Ms/Mo was calculated as follows: Ms/Mo = SNR with MTC / SNR without MTC, where SNR is signal-to-noise ratio.

Results: The specimens had mean Ms/Mo of 0.71 before compression. The Ms/Mo of specimens with mechanical compression decreased to 0.53 ($p<0.05$) and recovered to similar level to the pre-compression after compression had been removed.

Discussion/Conclusion

We investigated the MTC effect of the bovine cartilage during mechanical compression stress. The Ms/Mo decreased under compression and recovered by removal of compression. These results suggest that water content within the cartilage changed with mechanical compression. Furthermore, this extra vivo study also provides ample experimental support for our recent in vivo study.

13:00 - 14:00

Poster presentations

PP-SM04 Sports Medicine 4

INVESTIGATION ON THE RISK FACTOR OF SOCCER-RELATED INJURY FROM PHYSICAL MATURATION ASPECTS

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Introduction: The increasing of mechanical stress which forced during the training and the match is thought to be the risk factor of the soccer-related injury during puberty. It has been reported that the increase of mechanical stress depends on the physical maturation and large individual difference in physical and biological maturation exists during puberty. These findings led us to propose two hypothesizes. First, early-matured adolescents, who may be stronger and bigger, are more likely to suffer from acute traumatic injury. Secondly, it is thought that intensive training may be overly stressful for late matured players as compared to early and average matured players because of their physical weakness. Therefore, in this study we examined the relationship between injury rates and biological maturation in adolescent soccer players. In addition we investigated the other risk factor of the over-use injury during puberty.

Mothod: One hundred and twenty five well-trained adolescent soccer players aged 12.2±1.5 years old (9.5~14.8 years old) were participated in this study. Participants were divided into three age categories (U11, U13 and U15), four maturational difference (MD: skeletal age-chronological age) groups: Early (MD>1.0), Average (MD= ±1.0), Late (MD>1.0), and four height increment phase (HIP; Phase1 to Phase4) according to their annual height increment. Then relation between injury rate and these maturational statuses were examined.

Result: The rate of injury increases with age ($p<0.01$). In U15, late maturity players had the highest occurrence of overuse injury, while early-matured players tended to be vulnerable to acute traumatic injury. Moreover, players whose HIP was determined as phase2 (growth spurt) during the pre-season period had significantly higher rates of overuse injury than any other HIP group ($p<0.001$). In terms of acute injuries, players in Phase3 (after growth spurt) had the highest injury rate of all the HIP groups ($p<0.01$). During Phase2, players showed a rapid gain in height. Moreover, in Phase2, 56.9% to 91.7% of proximal tibial apophyses were determined as being in the apophyseal or epiphyseal stage of growth.

Discussion: These result may imply that relative stress forced by training becomes stronger for late matured players in older age group. Moreover, physical growth and apophyseal fragility are thought to be risk factors for soccer-related injuries. A player who's pre-season HIP is determined as Phase2 might be more vulnerable to overuse injury. Hence, we believe that evaluating individual pre-season HIP and biological maturity would help coaches and athletic trainers to predict and prevent certain kinds of soccer-related injuries.

CHANGES IN HCT AND HB IN RESPONSE TO HIT AND HVT

ZINNER, C., WAHL, P., HAEGELE, M., ACHTZEHN, S., DE MARÉES, M., MESTER, J.

GERMAN SPORT UNIVERSITY COLOGNE

Introduction: Although there is a lively discussion about different physiological effects of high intensity training (HIT) vs. high volume training (HVT), the effects of these two types of training on blood profiles have been payed less attention. Numerous studies examined the response of blood profiles after short term maximal exercise or long-duration exercise, but to the best of our knowledge no study investigated the different response of blood profiles between these two interventions. Therefore the aim of the study was to compare the changes of hematocrit (Hct), haemoglobin (Hb) and plasma volume (PV) after a HIT session and a HVT session.

Methods: 8 male athletes (27.4 ± 6 years, 182.3 ± 8 cm, 75.6 ± 9 kg, 67.9 ± 4 ml/kg/min) performed two training sessions on a cycle ergometer. The HIT-session consisted of four 30 sec lasting maximal sprints with five minutes rest in between. During the recovery intervals, subjects remained in a sedentary position on the cycle ergometer. The HVT-session consisted of a 60 minute continuous trial at an intensity 41–45% of VO2max.

Both sessions started with a warming up of 10 minutes at an intensity of 1.5 Watt/kg bodyweight. Venous blood samples were taken before the warming up and ten minutes after the last sprint and after the 60th minute respectively.

Results: Hct values showed no significant differences before both sessions (43.0 ± 1.7 % vs. 42.7 ± 1.3 %). After the training Hct values were significantly increased after HIT (46.3 ± 1.7 %), but no significant changes were found after HVT (43.6 ± 1.7 %).

Significant changes in the Hb values were also found only after HIT (pre training 14.7 ± 0.6 g/dl vs. post training 15.5 ± 0.6 g/dl) (HVT: pre 14.7 ± 0.5 d/dl, post 15.0 ± 0.7 g/dl).

The percentage changes in PV were calculated from hematocrit and haemoglobin values (Dill, 1974). The increments of PV after the two interventions were significantly different (5.9 ± 1.9 % HIT and 1.8 ± 3.6 % HVT).

Discussion: The small shift of Hct, Hb and PV after HVT could be explained by the water loss during long duration exercise (sweat), but during the HIT session water loss due to sweat can be ruled out. The shift of PV, Hct and Hb after HIT was likely a result of an increased plasma osmotic pressure and local capillary hydrostatic pressure. During HVT sessions, hemodynamic forces are considerably lower than during the HIT sessions. For endurance athletes the WADA defined upper limits for Hct and Hb concentrations to reduce risk of blood manipulations. In this context focus lies on individual blood profiles to get individual Hct and Hb characteristics. Further studies should examine the effects of on PV, Hct and Hb during an interval of HIT and the shift over the time.

References

Dill D.B., Costill D.L.: Calculation of percentage changes in volume of blood, plasma, and red cells in dehydration. J Appl Physiol 37: 247–248, 1974.

THE PREVALENCE OF METABOLIC SYNDROME IN JAPANESE STUDENT SUMO WRESTLERS

SAKAMOTO, S., MIDORIKAWA, T., OHTA, M., TORII, S., KONISHI, M., TAKAGI, S., BEMBEN, M.G., KONDOH, M.

1. WASEDA UNIVERSITY, 2. KANAZAWA SEIRYO UNIVERSITY, 3. UNIVERSITY OF OKLAHOMA, 4. NIHON UNIVERSITY

Purpose: The purpose of the present study was to investigate whether obese athletes, i.e., Sumo wrestlers, who are severely obese but have high physical activity levels suffer to metabolic syndrome.

Subjects: Subjects were 19 young Japanese student Sumo wrestlers. Their age was 19.5±0.8 years, body height 178.0±6.8cm, body weight 126.6±14.3kg, BMI 40.0±4.9kg/m2.

Methods: Sumo wrestlers underwent the following measurement (body composition including waist circumference, dual energy x-ray absorptiometry (DEX), MR imaging at abdomen, blood sampling at the fasting state in the early morning and blood pressure (BP)).These bloods were used for measurements of HDL-Cholesterol (HDL-C), triglyceride (TG), glucose and insulin level (IRI). Thereafter, the diagnosis of metabolic syndrome was made by the criteria proposed by the Japanese Society of Internal Medicine.

Results: Abnormally large waist circumferences (119.5±9.1cm) were present in all Sumo wrestlers. Eleven Sumo wrestlers (57.9%) had high blood pressure (systolic BP 125±23mmHg, 9 wrestlers≧130mmHg; diastolic BP 70±17mmHg, 4 wrestlers≧85 mmHg) and 6 wrestlers (31.6%) were categorized as dyslipidemia (HDL-C 44.4±8.7mg/dl, 5 wrestlers <40 mg/dl: TG 98.3±33.0mg/dl 1 wrestler≧150 mg/dl) as determined by the criteria. None of the Sumo wrestlers had fasting hyperglycemia (glucose 84.8±5.8mg/dl) for the criteria. The prevalence of metabolic syndrome in these Sumo wrestlers using the criteria was 4 wrestlers (21.1%), although about a half of the wrestlers (47.4%)had abnormal values for insulin resistance (IRI 13.6±6.5microIU/ml, 5 wrestlers≧15.0microIU/ml; HOMA-R 2.83±1.32 9 wrestlers≧2.5).

Discussion and Conclusion: The present study is the report that the prevalence of metabolic syndrome in young Japanese obese athletes (Sumo wrestlers) was 21.1% following the criteria determined by the Japanese Society of Internal Medicine. The Ministry of Health, Labour and Welfare in Japan reported that the prevalence of metabolic syndrome was 2.6% in Japanese males in their 20's, but there was no information how many obese men was included in the report. These results indicated that daily high intensity physical activity as demonstrated by Sumo wrestlers, does not reduce all risk factors for obesity, but the risk factors were somewhat attenuated as evidenced by the unexpectedly low incidence of metabolic syndrome. We think that it is necessary for us to continue further more investigation in this point of view.

DECREASED PERFORMANCE IN ATHLETES WITH PERIMESNTRUAL SYNDROMES

VAISBERG, M., BERENSTEIN, E., DI BELLA, Z.J., SCATENA, D.A., LOPES, A.C.

FEDERAL UNIVERSITY OF SÃO PAULO

Despite the great number of women performing sports there are only few studies about anatomical, psychological hormonal aspects that affect performance. A great part of these studies mention the relation between menstrual cycle and performance, but they don't

consider perimenstrual alterations. The prevalence of perimenstrual syndromes (PMS) in Brazil varies between 8 to 86%. These percentages enhance the importance of perimenstrual syndromes in the performance for competitive and non-competitive athletes. We studied thirty-one handball athletes, with normal menstrual cycles and non users of hormones. A questionnaire of pre-menstrual symptoms has been applied for three consecutive months and the diagnosis was made based upon the total score of six days preceeding menstruation, compared to the score of 5 to 10 days after menstruation. The diagnosis of perimenstrual syndrome was established when the athlete presented four or more symptoms, including one having to do with an altered mood. For the evaluation of resistance we compared the capacity to perform resistance exercises of the abdominal wall muscles and leg muscles. The prevalence of perimenstrual syndromes in our study was 71%. We analyzed our data in a cross-sectional and longitudinal study, finding that athletes with PMS were less capable to do resistance exercises during the pre-menstrual period compared to the post menstrual period, suggesting a decrease in performance. We were able to demonstrate that athletes evaluated in two different times showed a decrease in resistance of abdominal muscles (p< 0,01 and p< 0,01), leg muscles (p <0,01 e and p< 0,07) and arm muscles (p< 0,01 and p< 0,01), differences statistically significant. Asides the high prevalence of perimenstrual syndrome in the group of athletes we studied, we were able to demonstrate in this group a decrease performance in athletes performing resistance exercises during pre-menstrual period.

CAROTID FLOW VOLUME IN EVALUATING EXERCISE CAPACITY

TANAKA, S., YAMADA, A., YOTSUMOTO, M., YAMAMOTO, S., NAKAMURA, T., YASUI, T., NAKANISHI, T., MITSUI, M., KITAJIMA, M., KASHIZUKA, S.

MUKOGAWA WOMEN'S UNIVERSITY

Carotid flow volume in evaluating exercise capacity

TANAKA, S,. YAMADA, A,. YOTSUMOTO, M,. YAMAMOTO, S,. NAKAMURA, T,. YASUI, T,. NAKANISHI, T,. MITSUI, M, M,. KITAJIMA, M,. KASHIZUKA, S.

Mukogawa women's university Japan

Introductions

Echocardiography is the basic and non-invasive method in assessment of heart's structure and function in elite athletes, so it is sometimes used for medical check and studying in some special sports. In men, it has been studied that prediction of the peak oxygen consumption with evaluation of the cardiac output at rest or diameter of the left ventricular at the end diastolic phase by echocardiography. In this study, we examined carotid blood flow and cardiac output, and we also studied peak oxygen consumption (VO2), then we evaluate the relationship between carotid blood flow or cardiac output and peak oxygen consumption.

Methods: For 23 well general female college students, we examined wall- thickness (LVPWd: left ventricular posterior wall diameter), IVSd (Inter-ventricular septal end diameter) at the end of diastolic phase, a cardiac output (CO) and carotid flow volume (FV) by ultrasonography. We also examined peak VO2 using breath by breath analyzer by gradual increasing work load with treadmill running.

Results: Peak VO2 was 47.07 (SD: 0.67) ml/kg/min, and was significantｌｙ correlated with IVSd, LVPWd and CO. In addition, cervical artery flow volume was also significantly correlated with peak VO2.

Discussion: In the previous study of men, athletes compared to normal controls, LVPWd and IVSd were significantly larger and LVPWd or IVSd could be used for evaluating training effects. In this female study, we suggests that FV can be used for evaluating training status or level besides IVSd, LVPWd and CO.

References

Macchi C, Catini C, Catini CR, Contini M, Zito A, Urbano F, Miniati B, Molino Lova R, Gulisano M, Brizzi E. (2001). Ital J Anat Embryol, 106(3). 221-31.

Basavarajaiah S, Wilson M, Naghavi R, Whyte G, Turner M, Sharma S. (2007).

Br J Sports Med, 41(11), 784-8.

Braksator W, Król W, Mamcarz A, Krysztofiak H, Wrzosek K, Dłuzniewski M. (2006). Przegl Lek. 63(2), 53-7.

Bassett DR Jr, Howley ET. (2000). Med Sci Sports Exerc, 32(1), 70-84.

EFFECTS OF AEROBIC EXERCISE INTENSITY ON CARDIOVASCULAR RISK FACTORS IN PATIENTS WITH METABOLIC SYNDROME

KANG, S.J., KIM, B.R., KIM, J.H., LEE, D.K., OAK, J.S.

1. CHANGWON UNIV., 2. INJE UNIV., 3. SEOUL NATIONAL UNIV. OF EDUCATION, 4. DANKOOK UNIV.

The purpose of this study was to investigate the effects of aerobic exercise intensity on cardiovascular risk factors in patients with metabolic syndrome. The subjects were middle-aged women. Promotion Center of the C city. The subjects were randomly divided into the following three groups: moderate-intensity group(n=9, 40-60% of the heart-rate-reserve(HRR) method), high-intensity group(n=9, 60-80% of the HRR), and control group (n=8). The exercise groups were invited to participate in an exercise program consisting of a motor-driven treadmill walking and/or running for 12 weeks with frequency of 5 times per week, while the control group remained in normal lifestyles but refraining from any type of regular exercise.

The Fasting glucose were significantly decreased than those after treatment in both moderate and high-intensity exercise groups before treatment whereas the control group showed no difference. However, no significantly difference between moderate and high intensity exercise groups.

The Total cholesterol and LDL-C levels were significantly decreased than those after treatment in both moderate and high-intensity exercise groups before treatment. The HDL-C levels were increased in both moderate and high-intensity exercise groups after the treatment. The triglyceride levels were no difference among the group, but the triglyceride was decrease after treatment then before treatment. However, no significantly difference between moderate and high intensity exercise groups.

The Insulin and Insulin resistance were significantly decreased than those after treatment in both moderate and high-intensity exercise groups after treatment.

The Renin-angiotensin Ⅱ levels were significantly decreased than those after treatment in both moderate and high-intensity exercise groups before treatment.

The C-reactive protein were significantly decreased than those after treatment in both moderate and high-intensity exercise groups before the treatment.

Consequently, the moderate and high-intensity aerobic exercise during 12 weeks effect positively on cardiovascular risk factors such as obesity, hypertension, diabetes, hyperlipidemia, insulin resistance, inhibition of renin-angiotensin Ⅱ activation and decrease of C-reactive protein of patients with metabolic syndrome.

13:00 - 14:00

Poster presentations

PP-TT06 Training and Testing 6

DEVELOPMENT OF A TEST BATTERY FOR THE SOCCER GOALKEEPER

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RUHR UNIVERSITÄT BOCHUM

Up to now regular performance diagnostics in professional and upper-league amateur soccer have only dealt with the requirement profiles of outfield players. The goalkeeper´s special workload demands in competition and training have not been given enough attention. In order to close this gap we began to develop a specific test battery focused on the offensive and defensive requirements of the goalkeeper in the modern game. Therefore, in accordance to a systematic analysis of all goalkeeper activities during the European Championships 2008, we designed the following tests:

- Elementary ability tests: Squat Jump (SJ), Counter-Movement-Jump (CMJ), Foot Tapping (FT)
- Complex offensive ability tests: precision and speed of passes, throws and kicks
- Complex defensive ability tests: 5 and 10 m sprint, sidestep sprint (SS), reaction and action velocity (RAV) and safe hands (SH).

RAV is measured by a self developed measurement system, the "Keepers Time Detector" (KTD 4pro), consisting of a fourfold selected optical signal and four respective defense actions to a fixed and contact sensitive ball (top right, top left, bottom right, bottom left of the goal). We analyze time and split time for singular or multiple defense actions. SH was measured using a ball cannon and a protocol with a stepwise increasing ball velocity.

The test battery was applied with seven 1st division teams ("Junioren Bundesliga"). Sixteen junior goal keepers (18.0±0.9 yrs; 187±5 cm; 80.4±7.7 kg) participated in the study. Selected results (mean values, standard deviation) are presented: SJ height (39.4±4.4 cm); CMJ height (47.5±5.8 cm); FT (11.4±1.1 Hz); throwing distance (39.2±3.3 m); speed of kicks (109.9±5.0 km/h); 5 m sprint (1.11±0.05 s) and 10 m sprint (1.87s±0.05 s). Singular RAV in different directions did not correlate very closely, neither to the top left and right angles of the goal (left 1.41±0.07 s vs. right 1.39±0.06 s; r=0.5), nor to the bottom left and right angles (left 1.30±0.05 s vs. right 1.23±0.07 s).

The individual results are compared to the collected mean values and specific training recommendations are given to the coaches. Specific differences in the reaction and action velocity (RAV) to the left vs. right or to the top vs. bottom angles, respectively, are analyzed individually. Further detailed analysis of movement processes (footwork, step-sequences, upper body work) are planned focusing on an increasing efficiency of motor solution.

PHYSICAL AND PHYSİOLOGICAL PROFİLE OF ELİTE SOCCER REFREES IN PRE PREPERATİON AT HIGH ALTITUDE

KIZILET, A., KIZILET, T., TOPSAKAL, N., ORTA, L.

MARMARA UNIVERSITY

BACKGROUND: The purpose of this study was to examine the relationship between maximal aerobic power and fatique index in elitee soccer referees and assistant referees. The second purpose of this study was to examine the relationship between after multistage Shuttle run test's actıve recovery heart rate, blood lactate level with maximal aerobic power and fatique index in elitee soccer referees and assistant referees.

METHOD: 5 top class and 25 elitee soccer male referees mean age 33,47 ±4,76, height 178,83 ±3,80 cm, weight 79,25.±5,60 kg., body mass index 23,46 ±1,99, % body fat 14.8 ± 2,35; and 7 top class and 44 elitee male assistant referees mean age 29,76 ±3,64, height 178,13 ±4,78 cm, weight 74,82 ±6,11 kg., body mass 21,03 ± 1,48, body fat 15,02 ±2,47 gr. took part in the study. Maximal oxygen uptake (maxVo2) during Multistage Shuttle run test and fatique index during 6x40 metre repeated-sprint performance test were measured in the soccer field. All tests were performed higher than 1500 metres altitude before preperatıon term. Blood lactate were measured by Roche, Micro Volume Lactate Analyser. Significant correlations were examined via Pearson product correlation coefficients.

RESULTS: Elite referees demonstrated a mean aerobic power of 46,23 ±3,03 ml.kg-1/ min-1. Mean final heart rate, after 1 min, 2 min and 3 min resting heart rate were 179±9, 141±12, 118±9, 108±8 b.min¬¹, respectively. After multistage shuttle run testing blood lactate level were 7,84±1,97 mmol l (-1), mean fatique index were 0,25 ± 0,13 s. and mean sprint time were 5,96 ± 0.21 s. Assistant referees demonstrated a mean aerobic power of 46,83 ±2,93 ml.kg-1/ min-1. Mean final heart rate, after 1 min, 2 min and 3 min resting heart rate were 180±10, 139±13, 119±10, 110±9 b.min¬¹, respectively. After multistage shuttle run testing blood lactate level were 7,64 ±1,95 mmol l(-1), mean fatique index were 0,62 ±0,43 s. and mean sprint time were 6,19 ±0.24 s. No significant correlations were established between maximal oxygen uptake and the fatique index (r= -125 and -042, p>0.05) in referees and assistant referees. There was no significant correlation between active recovery heart rate, blood lactate level with maxVo2 and fatique index in referees and assistant referees. There were just significant negative correlation between maxVo2 and blood lactate concentration in elite assistant referees (r= -,424 p<0.05).

CONCLUSIONS: Tests were performed before pre-sessıon and hıgh altitude, because of thıs will be expected to affect negative on maxımal aerobic power and fatıque index variables. İmproved of maximal aerobic power might reduce the negative effect on blood lactate accumulatıon.

References

Carlo Castagna , Grant Abt ve Stefano D'ottavıo, 'The relationship Between Selected Blood Lactate Thresholds and Mactch Performance in Elite Soccer Referees', Journal of Strenght and Conditioning Research, 16(4), 623-627, 2002

COMPARATION BETWEEN SOCCER PLAYERS IN FUNDAMENTAL SKILL FROM DIFFERENT POSITION.

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Introduction: The athletes' performance and accuracy from the basics movements it may interfere on the match results, using the premises that the team with the best average in the fundamentals has the best probability of a positive result. The purpose of this study was to evaluate and compare four basics soccer fundamentals in a group of soccer players who plays in a different position.

Methodology: The experimental group of 20 Brazilian male soccer player (mean age 16,3) were tested throughout a 4 basic soccer fundamental in a field test. The fundamentals tested were accuracy shooting, accuracy pass, conducting the ball and penetration throughout obstacles without the ball and with the ball. Group 1 consisted of four fullbacks, group 2 four halfbacks, group 3 four wings, group 4 four midfield and group 5 four forward. Accuracy shooting: consisted of an unobstructed divided goal in 6 quadrants target with different punctuation. The participants were asked to take four shots from a set distance away in 15 seconds. Accuracy pass over a short distance: This test is handicapped by the amount of time a subject has to complete the course. The test was designed so that each pass should be done with alternative feet, left right, left right or visa versa. A participant must score maximum accuracy points before time. Penetration throughout obstacles without the ball and with the ball: this test was designed to improve close control while at pace without and with the ball. Eight cones are set out in a slalom effect and a single cone is placed a set distance. The idea was for the subject to run the slalom course up and down, with(out) the ball at his feet to the other designated cone.

Results: Observed differences occurred during the Penetration throughout obstacles without the ball were: the wings (mean 7,4 ±0,7 m/s); the fullbacks (7,2 ± 0,2 m/s); the halfbacks (7,5 ± 0,9 m/s); midfielders (7,4 ± 0,6 m/s); and (7,1 ± 0,7 m/s) for the forwards. No significant difference were found between the groups $p<0,05$. Penetration throughout obstacles with the ball the mean were for: the wings (11,4 ± 1,9 m/s) ; fullbacks (10,9 ± 1,4 m/s); halfbacks (10,9 ± 1,3 m/s); midfield (9,9 ± 1,6 m/s) and (9,3 ± 2,3 m/s) for the forwards. A significant difference were found t student $p<0,05$ between the wings players and forwards.

Conclusion: the forwards players appear to posses a better speed in the penetration run throughout obstacles with the ball among the others groups. This could be especially important because the speed and the fundamentals skills based on the level of the game and the player can make the difference during the match.

Reference

Baumgartner,T;Jackson,A.(1995). Measurement for Evaluation: in physical Education and Exercise Science. Wm.C. Brown Communications,Inc.

National Coaching Commission (1993). AYSO Advance Coach Manual. American Young Soccer Organization.

THE ROLE OF FATIGUE DURING THE PHASES OF THE VERTICAL JUMP IN YOUNG FOOTBALL PLAYERS

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Introduction: The analysis of the vertical jump phases becomes relevant in consideration of the epidemiological data of non-contact muscular and joint traumas. Such data have shown that non-contact traumas in team sports constitute 39% of injuries in female basketball and 14% of injuries in men's football (Junge et al., 2006) Thus, the assessment of the vertical jump is not only a control indicator of performance and efficiency of the neuromuscular system of athletes, but it can also be analysed from the qualitative point of view.

The aim of the study was to investigate the influence of fatigue upon various phases of the vertical jump after a maximal aerobic power test.

Methods: The sample was formed of n=15 young professional football players (mean±SD age, height and weight: 13.7±0.4 years, 166.1±6.1 cm, 58.7±4.7 Kg respectively).

The Counter Movement Jump (CMJ) was used to evaluate vertical jump phases by means of two different dynamometric platforms, one for each limb (Twin Plates and Globus Italia), equipped with specific software for the analysis of the movement. The evaluation of the jump was carried out before and immediately after the execution of an incremental shuttle run test (Léger & Cazorla, 1993). Statistical analysis was carried out using the non-parametric Wilcoxon signed-rank test with $p<0.05$ considered as significant.

Results: The mean values showed a significant decrease in the height of the vertical jump (-12,1%, $p<0.001$), an significant increase in the overstretching time phase, that is, the eccentric loading phase ($p<0.001$) following the performance of an incremental shuttle run; a temporal increase was observed in the isometric stabilization phase when the subject terminates the jump after landing, but statistics did not find the change to be significant.

The mean value of maximal aerobic velocity reached by the sample in the Léger test was 13.0±0.5 km/h; equal to a VO2 max of 57,0 ml/kg/min.

Discussion: During the vertical jump, the athlete reproduces all the patterns of neuromuscular activation that can be found during characteristic sports movements, like breaking, cutting, acceleration and landing after the execution of a jump (Sannicandro, 2008).

The analysis of some phases of the jump demonstrate the considerable influence that fatigue has upon the ability of the athlete to elevate the body and, above all, upon the duration of the extremely important phase of pushing.

Alterations to the usual execution pattern of the jumping movement and, in particular, to the eccentric phase of the jump, could be put compared to slight decreases in postural control and consequently represent a potential risk of joint injury in the lower limbs.

References

Junge et al., Am J Sports Med, 34 (4):565-577. 2006

Léger L., Cazorla G., A.R.E.A.P.S..1993

Sannicandro I., Br J Sports Med, 42 (6): 541. 2008

RELATIVE CHANGES IN BODY COMPOSITION AND FUNCTIONAL CAPACITIES IN REGIONAL YOUTH SOCCER PLAYERS 10 - 16 YEARS

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Introduction. In general, the changes in body composition and functional capacities that occur with chronological age during puberty in males is well documented (Malina 2004). In addition, Philippaerts & al. (2006) have shown that the peak development in functional

capacities occurs around at time of peak height velocity among youth soccer players. Even though the peak height velocity is obviously independent from exact chronological age, the Finnish junior soccer teams are organized based on chronological age. Therefore, the aim of this study was to examine in which chronological age group the peak development of different body composition variables and functional capacities occurs.

Methods. Three age groups (10y, 12y and 14y) of the regional club team (n = 12-14 players/team) representing area of around 160 000 habitants were followed two years in terms of body composition (height, weight; standard techniques, muscle mass; bioimpedance Inbody 720), hormonal status (testosterone; basal venous sample after 12 h fasting), speed (30 m; light cells), agility (8-track; light cells), explosive strength (CMJ; contact mat, 5-step; standard technique), isometric strength (legs 107°, abdominals, back; dynamometer) and soccer skills (passing and dribbling; skill tracks). Thus, in the present set-up age groups from 10y to 16y were covered so that the same players were followed from 10y to 12y, from 12y to 14y and from 14y to 16y.

Results. The relative peak development in measured variable occurred between 10y to 11y in soccer skills (8.4 ± 2.6 %); between 12y to 13y in length (5.0 ± 1.7 %), weight (14.1 ± 4.6 %), muscle mass (15.2 ± 7.9 %), speed (5.2 ± 3.8 %) and agility (3.8 ± 2.6 %); between 13y to 14y in hormonal status (5.8 ± 5.5 nmol/l), CMJ (13.5 ± 10.4 %) and leg strength (24.1 ± 28.4 %); between 14y to 15y in 5-step (8.1 ± 4.2 %), abdominal strength (26 ± 16.5 %) and back strength (17.7 ± 12.7 %). No peak development was found between 11y to 12y or between 15y to 16y in any measured variables.

Conclusions. The results of the present study suggested that the peak development during puberty in Finnish regional soccer players occurred first in the basic soccer skills followed by the changes in body composition and speed related tasks and finally in the explosive and maximal strength. From the results of the present study it can be recommended that the soccer training should focus on exercises which develop speed and basic soccer skills in early puberty. At the age of 14 years the players are ready to begin strength training and are hormonally more ready for "adult-like soccer training".

References

[1] Malina & al. (2004) Growth, Maturation and Physical Activity. Human Kinetics: Champaign.

[2] Phillippaerts & al. (2006) J Sports Sci, 24(3): 221-230.

OBSERVATIONAL METHODOLOGY IN FOOTBALL: DEVELOPMENT OF AN INSTRUMENT TO STUDY GOALKEEPER BEHAVIOR IN THE DEFENSIVE PROCESS – SOFGR1.

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Traditional methods for quantifying sport performances (e.g., frequency of actions) are limited in their ability to describe the interaction of events that occur over time (Borrie et al., 2002). The aim of our study was to develop an innovative instrument for observation that can strengthen the existing schemes of game analysis in football in order to provide specific additional information on the behavior of Goalkeepers (GK) during the Defensive Process (DP).

The observational design of this study is located in quadrant IV, i.e. it has got a Follow-up design/Nomothetic/multidimensional (Anguera et al., 2000). The observational instrument is formed by a combination of field format and systems of categories. Our research focused on binomial Finalization/GK or attempted Finalization/GK, and investigated what precedes the finalization and what happens to the completion of the GK intervention.

The games were recorded on VHS video and then converted to MPEG-1. Our decision in relation to the observational sample took into account the establishment of 2 sampling levels (intersessional and intrasessional), from which a series of measures were taken. After a series of experimental observational sessions to test the observational instrument and to train the observers, we analyzed the quality of data through the intra-observer agreement (verified by the Kappa index of reliability of Cohen). The comparison of data recorded during the observational period was done using the SDIS-GSEQ program and its function for "calculating the Kappa coefficient".

The resultant observational instrument 'ad hoc' was created according to four criteria: i) guiding the offensive process; ii) offensive end of the process; iii) GK in the defensive process; and iv) effectiveness of the GK in the defensive process. The instrument of codification was sufficiently discriminatory; therefore fulfilling the requirements for the purpose it was created. It also demonstrated to be highly reliable, seen by the high correlation values (over 97,5 % for all criteria), and therefore opening the possibility for more objectives studies.

This instrument may be improved in the future by adapting it to the specific aims of the investigation and knowing that one can add or delete criteria, or simply focus on specific aspects of interest in studying certain football match periods.

Anguera, M. T.; Blanco, Á.; Losada, J. & Mendo, A. (2000). La MetodologíaObservacional en el Deporte: conceptos básicos. Lecturas Educación Física y Deportes. Revista Digital. Ano 5 - N.º 24. Buenos Aires. Argentina.

Borrie, A.; Jonsson, G. K. & Magnusson, M. S. (2002) 'Temporal pattern analysis and its applicability in sport: an explanation and exemplar data', Journal of Sports Sciences, 20:10, 845 – 852.

A COMPARISON OF PHYSIOLOGICAL PARAMETERS BETWEEN FOOTBALL PLAYERS AND RUNNERS COMPETING IN VARIOUS RUNNING EVENTS

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Introduction: Which type of endurance is crucial in modern football - aerobic or anaerobic? Over the last 20 years football has evolved, especially in terms of athletic preparation of the players, to answer demands of higher intensity of the game and longer field distances covered by players. All those changes require specific training methods and corresponding physiological adaptations of the players. Trained runners, competing in different running events, may serve as role models through the whole range of endurance capacities, from purely anaerobic to ultra-distance aerobic endurance. Therefore, the primary purpose of this study was to compare football players with runners, in parameters of an all-out incremental treadmill test with gas exchange measurements: peak oxygen uptake (VO2max), maximal heart rate (HRmax), maximal running speed achieved in the test (vmax), and speed (vAT) and heart rate (HRAT) at the anaerobic threshold.

Methods: Forty-eight national level male runners, competing in running events with predominantly aerobic (AE: 23 middle and long distance runners, 179.6±6.2 cm, 69.1±6.5 kg) or anaerobic (AN: 25 sprinters and 400m runners, 182.5±4.8 cm, 74.5±5.8 kg) metabolic demands, and 45 national/international level football players: 15 defenders (D, 184.4±5.7cm, 77.2±17.7kg); 15 midfielders (M, 179.7±7.0 cm, 76.1±6.8 kg) and 15 forwards (F, 180.9±6.0 cm, 77.7±8.3 kg) participated in the study. All subjects performed an

incremental treadmill test to exhaustion (speed increase 0.5 km/h every 30 s, 1.5% grade). ANOVA was used to determine differences in observed variables between the groups.

Results: As expected, VO2max was significantly higher in AE runners (66.4±4.4 ml/kg/min) than AN runners (58.0±4.1 ml/kg/min, $p<0.05$), whose values were similar to those in football players (D: 56.4±4.6 ml/kg/min; M: 57.2±5.1 ml/kg/min and F: 57.0±4.5 ml/kg/min). The HRmax differed significantly between AE and AN runners (191±9 : 198±7 bpm, $p<0.05$), while no difference was present between football players of various playing positions (D : M : F – 192±10 : 193±6 : 193±9 bpm). The AE runners had significantly higher values of vmax and vAT (21.5±1.2 and 16.7±1.5 km/h) than the AN (18.5±1.5 and 13.2±1.2 km/h)($p<0.05$). The values of vmax and vAT in football players (D: 18.5±1.1 and 13.6±0.6 km/h; M: 18.8 and 13.8±0.7 km/h; F: 19.3±1.5 and 13.9±0.9 km/h) were similar to the values of AN runners ($p>0.05$), and hence also significantly lower than in AE runners.

Conclusion

The results of this study indicate that, when comparing physiological parameters from an all-out incremental treadmill test between football players and trained runners, the values of football players approximate most closely those of the 400 m runners. This singles out the possible importance of the anaerobic capacity and a high level of sprint endurance in football players.

References

Vučetić, V. (2007). (Disseration), Zagreb: Faculty of Kinesiology, University of Zagreb.

IS THE FUNCTIONAL CAPACITY CRUTIAL FOR POSITION DETERMINATION IN THE FOOTBALL TEAM?

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Introduction: During past twenty years, many new elements introduced in the football game have significant changed the way it is played. There are many differences between the old type of playing football and today's modern view of football but the two most important are speed of the game and the game's dynamic. This is why significance of conditional component in football training is very important. Guided with this thought, we have asked ourselves if there are any differences in the functional capacity between defenders, middle field players and attackers.

Methods: Forty five football players (24.1±4.4 yrs; 182± 6.2 cm; 79.9 ± 7.5 kg) were divided in three groups: 15-defenders (DEF), 15-middle field players (MF) and 15-attackers (AT). Football players in this research were taken from the National team and the first Croatian football league. All subjects performed an incremental treadmill test (0.5 km/h speed increase per half minute, 1.5% grade) to volitional exhaustion, and walked at 5 km•h-1 during the first two minutes of recovery. The ANOVA was used to determine differences in observed variables between the groups.

Results: As expected, analysis showed no significant difference between players in basic morphological variables according playing position (DEF-184.9±5.8 cm and 83.6±7.5kg; MF=180.3±6.3 cm and 78.4±5.7 kg; AT=180.9±6.0 cm and 77.9±8.2 kg). In the same time, significant difference we didn't find in parameters of maximal heart rate (DEF=190.5±12.9 bpm, MF=190.5±7.3 bpm and AT=191.0±8.1 bpm), heart rate on the anaerobic threshold (DEF=149.0±11.7 bpm, MF=169.7±7.9 bpm and AT=170.5±8.8 bpm), maximal relative oxygen uptake (DEF=57.1±4.7 ml/kg/min, MF=56.6±3.4 ml/kg/min and AT=57.1±4.6 ml/kg/min) and relative oxygen uptake on the anaerobic threshold (DEF=48.8±4.4 ml/kg/min, MF=55.6±30.4 ml/kg/min and AT=48.7±3.7 ml/kg/min). Looking at research in general, such results we can ascribe last trends in modern football which from each player requirements equal energetic demand.

Conclusion: There are differences between defenders, middle field players and attackers, but they are not significant. Such results are consequence of requirements that modern football demands from football players. In modern football, each player participates in all phases of the game. So, we can say that the old style of playing football, that divides team into two main groups, defenders and attackers, is history.

References:

- Astrand, P.O., Rodahl, T. (1986). New York: McGraw-Hill, USA.
- Bangsbo, J, and Lindquist, F. (1992).. International Journal of Sports Medicine, 13, 125–132.
- Burke, E.R. (1995): Serious Cycling. Human Kinetics, USA
- Vučetić, V. (2007). (Disseration), Zagreb: Faculty of Kinesiology, University of Zagreb.

EVALUATION OF BODY COMPOSITION, MUSCLE STRENGTH AND BALANCE IN ADOLESCENTS SOCCER PLAYERS

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MARMARA UNIVERSITY

Purpose: Soccer requires high leg strength, fit body composition and good postural control especially unipedal posture. In this research, we aim to investigate whether there are relationship between strength (muscle strength and muscle lean mass) and balance (static and dynamic) in soccer players.

Materials and Methods: 17 soccer players (mean: age=15 height=168,5 weight=65,5 BMI=20,8 training years=4,6) were participated in the study. Legs strength was measured with leg dynamometer; body composition was measured x-scan body composition analyzer.

Balance (static and dynamic) was measured Prokin 5.0 Technobody. Static stabilometery tests were done as Opened Eyes (EO) and Closed Eyes (EC) with 30 second duration. Dynamic Stabilometery Tests: a) Slalom test (forward-backward) to one axis a time. The subject's scope is to hit objectives and follow the blue ideal line within 60 sn duration (a-hold with two hand and b-without hold) with 5 hard degree. b) Unilateral dynamic-stance tests (left and right leg) was done with the controlled load monoaxial test (antero-posterior) for right and left foot with 10 repetitions on an axis controlling player's load (5 hard).

Results: Correlation was done between strength (muscle strength and muscle lean mass) and balance (static and dynamic) in soccer players. There were significant relationship Static Romberg Test EC/EO Perimeter Ratio and Left leg, right leg, trunk lean mass. No significant correlations were found between dynamic tests and body composition.

There are high negative correlation between lean mass percent and fat percent of soccer players. Thus; this players have enough fit condition for their branches. Besides, there are high correlations among leg strength and legs (left and right), trunk lean mass.

Left and right leg lean mass, left and right leg perimeter error scores for anterior-posterior dynamic balance were compared with paired samples T-test. Left lean mass is better than right lean mass ($p<0.05$), similarly, left leg dynamic balance was greater than right leg dynamic balance ($p<0.01$).

Conclisions: As a result, increases back and leg muscle lean mass and strength is associated with better postural stability, there should be further research for the balance evaluations after the strength training program for different sports.

TAKING INITIATIVE IN SMALL-SIDED SOCCER GAMES

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Introduction: In many sports, players interact during a game. Dynamical systems theory provides tools to investigate these interactions by assessing phase relations. It has been suggested that a squash player with a lead phase relation has an advantage over the player with the lag phase relation with respect to rally outcome (McGarry et al., 2002). Therefore, phase delay between players might be a tool to investigate dominance during rally's in racket sports (Palut & Zanone, 2005). It can be hypothesized that in ball team sports like soccer, a lead phase relation of the attacker increases the chance to score. Therefore, the aim was to investigate initiative in attacker-defender dyads in small-sided soccer games

Methods: Ten young male elite soccer players (17.3 years ± 0.7) participated in three small-sided soccer games (4-a-side plus goalkeepers) of 8 minutes on a 28x36m pitch. Player positions were recorded at 45Hz per player by means of innovative technology, i.e. local position measurement (LPM) system. Cross-correlations and delays were calculated for acceleration profiles of all players 25Hz over a sliding 2,5s interval (NBody software, UMCG Groningen). To exclude less relevant couplings between players, a cross-correlation coefficient of 0.4 was set as threshold value. Only couplings between the attacker and defender prior to a goal or goal-scoring opportunity were included in the analysis. The attacker was the player that attempted to score, whereas the defender was the opponent of that particular attacker. All couplings were investigated through visual inspection.

Results: In total, 66 goal-scoring opportunities were notated of which 19 resulted in a goal. Preliminary results show that for 65% of the goals and goals-scoring opportunities the attacker holds initiative, with no difference between goals and goals-scoring opportunities. In addition, we found that the percentage of the attacker's initiative decreases with type of attack (100%, 85%, 55% and 33% for 1v1 situations, regular attacks, counter attacks and long distance shots respectively).

Discussion: Results indicate that attackers most frequently take initiative prior to goal-scoring opportunities. The absence of clear differences between goals and goal-scoring opportunities indicates that whether or not a goal is scored eventually, depends on other factors, e.g. technical ability, goalkeepers ability and luck. The trend we found for the attacker's initiative for the different types of attack is in line with the task of the attacker in the various types of attack. In 1v1 situations, the attacker has to take initiative, whereas that is less required in long distance shots. Based on this study, it can be concluded that encouraging attackers to take initiative increases the chance to score and therefore to win the game.

References

McGarry, T., Anderson D.I., Wallace, S.A., Hughes, M.D. & Franks, I.M. (2002). J Sports Sci, 20, 771-781

Palut, Y. & Zanone, P. G. (2005). J Sports Sci, 23, 1021-1032

13:00 - 14:00

Poster presentations

PP-TT03 Training and Testing 3

EFFECTS OF OFFICIAL YOUTH TAEKWONDO COMPETITIONS ON ALL-OUT PERFORMANCES OF ATHLETES

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Olympic Taekwondo is a very popular sport, considered appropriate for children also to educate their discipline, control, and respect (Yard et al., 2007). Although athletes start training and competing around 10 years of age, no information is provided on the demands of the youth competitions. In fact, research on youth Taekwondo focused mainly on injury (Beis et al., 2001; Yard et al., 2007; Shin et al., 2008) and the physiological profile of young athletes (Melhim, 2001), while heart rate and blood lactate responses to simulated (Bouhlel et al., 2006; Butios & Tasika, 2007) and official (Chiodo et al., 2008). Taekwondo competitions have been reported only on elite athletes. The unique chance of cooperation with the Italian Teakwondo Federation (FITA) presented us with an opportunity to have access to physiological and performance measurements on young athletes during the Italian Youth (i.e., Cadetti A) Taekwondo Championship. Therefore, the aim of the present study was to evaluate the cardiac load of youth Taekwondo matches, and the differences in the athletes all-out performances (countermovement jump and handgrip) assessed before and at the end of their competition.

Seven female and eleven male young (range 13-14 yrs) Taekwondo athletes participated in the study. During Taekwondo competitions mean heart rate (HR) was 187±11 beat.min-1, with no difference between rounds and gender. HR higher than 85%HRmax showed a 77±27% frequency of occurrence. A difference ($P<0.05$) for gender (females: 22±2 cm; males 27±6 cm) and its interaction with session was found for jump performances. Post hoc analysis showed no difference for female athletes while better performances after the match (28±6 cm) than those recorded before the match (25±6 cm) emerged for male athletes. Peak handgrip values were always found for the right limb ($P<0.001$), with differences ($P<0.01$) for gender and session. Lower grip strength values were observed after the match (females: 272±58 N; males: 297±67 N) with respect to pre-match values (females: 256±54 N; males: 275±64 N).

The findings showed that Taekwondo competition is a high intensity intermittent activity. It could be speculated that the repeated concussions on the upper limbs used to protect from the opponent's kicks and punches directed toward the scoring area of the torso might be responsible for the decrease in grip strength at the end of the match. The gender differences observed for jump performances at the end of match encourage further research in this area.

References

Beis K. et al. Eur. J. Sports Traumatol. Rel Res 2001; 23: 130-136.

Bouhlel E. et al. Science & Sports 2006; 21: 285-290.

Butios S. & Tasika N. J. Sports Med Physical Fitness 2007; 47: 179-185.

Chiodo S. et al. 13th Congress of the European College of Sport Sciences p. 457.
Melhim A.F. Br. J. Sports Med. 2001; 35: 231-234.
Shin Y.W. et al. Am. J. Sports Med 2008; 36: 158-61.
Yard E.E. et al. J. Sci. Med. Sport 2007; 10: 219-226.

TECHNIQUE AND BALANCE IN ELITE JUDO

RODRÍGUEZ-ROMO, G., STIRLING, J., ZAKYNTHINAKI, M., LÓPEZ DÍAZ DE DURANA, A., CORDENTE MARTÍNEZ, C., SILLERO QUINTANA, M., SAMPEDRO MOLINUEVO, J.

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Introduction: Balance is fundamental in judo, both in attack when trying to break the opponent's balance and in the defense of such attacks. Tools from dynamical systems have recently been used to model the process of regaining balance following a perturbation form quiet stance (Zakynthinaki et al, 2008; Stirling and Zakynthinaki, 2004). The aim of this study was to apply the model of Stirling and Zakynthinaki (2004) to look at the connection between the balance of elite judokas and their technique both in attack and defense.

Methods: 5 judokas of the Spanish National Team were studied. The ground reaction forces resulting from the judoka being perturbed from quiet upright stance, for the two legged and single legged condition (Zakynthinaki et al, 2008; Stirling et al, 2007) were modeled and analyzed. With the use of a force platform the maximum correctable angles between the resultant ground reaction forces and the vertical in the anteroposterior and mediolateral directions were obtained. A closed critical curve (Stirling and Zakynthinaki, 2004) was then fit through the maximum correctable angles (for greater angles than these the judoka falls over). The curve was analyzed to find asymmetries. Each judoka also completed a questionnaire regarding their preferred techniques, with video being taken both of these techniques and also all the experiments.

Results: It was observed that the favored side (in the case of the two legged experiment) or leg (in the case of one legged experiment) for balance was connected with technical features of the preferred techniques of the judokas. In some of the judokas this preference was shown to be strong.

Discussion: Non-symmetric behavior caused by muscle imbalances, postural problems, structural problems and differences in the ranges of motion on either side of the body have been identified via the critical curve (Zakynthinaki et al, 2008; Stirling and Zakynthinaki, 2004). Our research has shown how these methods can be used to identify competitive strengths and weaknesses for addressing and correcting via training in elite judo (Stirling and Zakynthinaki, 2005; A. López Díaz de Durana, 2009).

References

López Díaz de Durana A (2009). PhD thesis UCLM.
Stirling JR, Cordente Martínez CA, López Díaz de Durana A, Sillero Quintana M (2007). Technical Report, Consejo Superior de Deportes 07/UPB10/07.
Stirling JR, Zakynthinaki MS (2004). Chaos, 14(1), 96-105.
Stirling JR, Zakynthinaki MS (2005). Lecture notes of the ICB Seminar, Mechanical loads of the human motor system - Injury prevention, A. Wit and F. Vaverka (Eds.) 64, 39-47.
Zakynthinaki MS, Stirling JR, López Díaz de Durana A, Cordente Martínez CA, Sillero Quintana M, Sampedro Molinuevo J (2008). Comp Phys Comm, 179(8), 562-568.

BALANCE IN ELITE JUDO AND ITS RELATIONSHIP WITH INJURIES

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TECHNICAL UNIVERSITY OF MADRID

Introduction: Balance and posture in general is often affected by the history of injuries: different injuries affecting the balance or movement pattern of the individual in different ways. The converse of this is also true, in as much as irregularities in an individual's posture and balance can increase the likelihood of particular injuries. The aim of this study was to apply the model Stirling and Zakynthinaki (2004) and the tools presented in Zakynthinaki et al (2008) to examine the connection between injuries and the asymmetries in the balance of elite judokas.

Methods: 5 elite judokas took part in the study. Each judoka stood on a force platform and was perturbed from quiet upright stance, for the two legged and single legged position (Zakynthinaki et al, 2008; Stirling et al, 2007). The maximum correctable angles between the resultant ground reaction forces and the vertical in both the anteroposterior and mediolateral directions were obtained. A closed critical curve (Stirling and Zakynthinaki, 2004) was fit through the maximum correctable angles at which the judoka could lean. This critical curve was analyzed for asymmetries and the judokas completed a questionnaire regarding their history of injuries. Video was also taken of all the experiments in both the anteroposterior and mediolateral directions so as to allow us to observe some of the basic irregularities in the posture and movement patterns.

Results: A connection between the asymmetries in the critical curve and both the history of injuries and the current injuries was observed. In particular very strong asymmetries in the critical curve were shown to exist for those judokas who were injured when they completed the test.

Discussion: Injuries can result in muscle imbalances, postural problems, structural problems and hence as a result can cause asymmetric movement patterns which lead to differences in the ranges of motion on either side of the body. Such differences have been identified via the critical curve (Zakynthinaki et al, 2008; Stirling and Zakynthinaki, 2004). Our research has shown how these methods can be used to identify both current injuries and those which have occurred in the past (Stirling and Zakynthinaki, 2005).

References

Zakynthinaki MS, Stirling JR, Lopez Diaz de Durana A, Cordente Martinez CA, Sillero Quintana M, Sampedro Molinuevo J (2008). Comp Phys Comm, 179(8), 562-568.
Stirling JR, Cordente Martinez CA, Lopez Diaz de Durana A, Sillero Quintana M (2007) Technical Report, Consejo Superior de Deportes 07/UPB10/07.
Stirling JR, Zakynthinaki MS (2005). Lecture notes of the ICB Seminar, Mechanical loads of the human motor system - Injury prevention, A. Wit and F. Vaverka (Eds.) 64, 39-47.

Stirling JR, Zakynthinaki MS (2004). Chaos14(1), 96-105.

AN INTRACELLULAR WATER REDUCTION BEFORE A COMPETITION DECREASES GRIP STRENGTH IN ELITE JUDO ATHLETES

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FACULTY OF HUMAN KINETICS

PURPOSE: To analyze the effect of body composition changes, from a period of weight maintenance to before a competition, on forearm maximal strength in male judo athletes. METHODS: A total of 26 men, top-level athletes (age: 23.2±2.9 yrs), were evaluated at baseline (weight. 73.1±7.1 kg; percent fat mass (%FM): 12.2±3.1 %) and 1-2 days before a competition (Weight: 72.0±7.0 kg; %FM: 11.7±2.8 %), with approximately 1 month apart between moments. Before the competition some of these athletes lost weight through self-determined means while others remained or increased their weight. A 7-day recall of dietary food intake was recorded at baseline and before the competition. At both moments, and after an overnight fasting, total body water (TBW), extracellular (ECW), and intracellular water (ICW) were estimated by bioelectrical impedance spectroscopy while FM, fat-free mass (FFM), lean soft tissue (LST), and arms LST were assessed by dual-energy x-ray absoptiometry (DXA). At baseline and at before a competition, a handgrip was used to assess forearm maximal strength (FMS) of the dominant arm. Changes are expressed as a percentage of the baseline value; comparisons of means, bivariate and partial correlations were used. RESULTS: A significant mean reduction ($p<0.05$) in weight [-1.4±2.4 %, -6.2 to 2.8 % (mean ± SD, range)] and FM (-4.6±9.6 %, -21.9 to 14.0 %) was observed while no significant mean changes were found in FFM (-0.9±2.3 %, -5.4 to 3.1 %), LST (-0.9±2.4 %, -5.8 to 3.2 %), arms LST (-1.7±4.4 %, -9.9 to 4.2 %), TBW (-0.6±3.7 %, -9.2 to 5.9 %), ECW (-0.8±4.8 %, -15.8 to 5.9 %), ICW (-0.4±5.4 %, -10.9 to 8.6 %), energy intake (-6.2±27.9 %, -54.1 to 54.9 %), and FMS (0.7±7.5 %, -16.3 to 18.6 %). From all the above variations in body composition variables, changes in FMS were only significantly related with changes in ICW ($r=0.559$, $p=0.003$) but not with changes in TBW ($r=0.338$, $p=0.091$); the significant association of ICW and FMS alterations remained after controlling for weight and arms LST changes ($r=0.558$, $p=0.005$) which means that those athletes that lost water from the intracellular compartment were those that reduced forearm maximal strength, even after adjusting for the potential effect of variations in weight and arms LST observed before a competition. CONCLUSION: These findings highlight the need of assessing and tracking total-body water, specifically the intracellular water compartment, in elite Judo athletes to avoid reductions in grip strength when a target body weight is desired before a competition.

ANALYSIS OF TYPOLOGICAL STRUCTURES OF SITUATIONAL EFFICIENCY IN JUDO FOR FEMALE JUNIOR COMPETITORS

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Introduction: Efficient action of judo for female juniors comperitors, cannot be described as uncontrolled or unorganised, in the same manner as it is not possible that at a certain moment all these typological indicators are maximised at the same time (Kajmović at al., 2007). This research is intended to establish typological situational judo structures for female competitors, is focused on achievement of scientific fact which will have permanent character and which will be used in future as a solid ground for resolution of particularly applicative task in judo. Therefore, the problem and the subject of this work is clearly articulated, and is related to establishment of rules existing at the latent level of situational action in judo, for female competitors. Innovative technique in this work defines as entities the fights and not individual fighters, simply since in this way one can gain more detailed information on existing rules as well as interactions.

Methods: For the purpose of this work the sample used was 126 junior female competitors from 38 European countries, in all weight categories, coming up to 179 fights between female competitors at European championship U-20 for juniors held in Sarajevo, 2003. Each competitor was described with 133 parameters out of which, after the elimination of such variables with exclusively zero values, there were 74 left. Initial results were carefully recorded through watching of VHS tapes, what made the situational aspect of the research really credible.

Results: The data processing was performed in such a way which allowed production of useful information at all levels of analyses multivariant complex models, in which a special place belongs to relation model of action. Results of this research give us the right to see the situational efficiency of judo female competitors comprises one latent dimension, which is separate in: a) tactical action b) global and strategic action, and c) action focused on technical segment.

Discussion: Understanding is seen in the possibility of recognition of isolated latent action mechanisms in situational aspect. Through this the research involves interpretability and repetitiveness, as well as the possibility to compare the results with other patterns and populations. This situational model is composed out of individual building elements representing the wish to win, the knowledge of conditions of realisation of activity and accumulation of efficient actions. A special segment to this theoretical model is added by the fact that the judo fighter has to have a precisely combined match which will give as a result a maximisation of each individual structural element.

References

Kajmović H., Rađo I., Kapo S. (2007). Differences analysis of situational efficiency performances between three level of judo competition for female seniots. 12th Annual Congress of the European College of Sport Science (ECSS). Jyvaskyla, Finland, 11 - 14 July 2007.

EVALUATION OF THE RAPIDITY REACTION IN KARATE

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Introduction: The aim of the research is to evaluate the rapidity of reaction and action in karate techniques. We compared the speed of the techniques of the athletes of kata and kumite categories to confirm that the athletes who practise kumite are really more reactive than the others, as. We started the experimentation of the SOR test (reaction speed) which survey the actual rapidity of reaction in response to visual stimulus.

Methods: To perform the SOR test we used an ergotest which records the inputs coming from a photocell and a luminous starter, which allows to determine the reaction time for each technique. A piezoelectric footboard was placed nearby a punching bag to check the total time of the action, allowing to stop the chronometer of the ergotest when the athlete finishes his execution.

The experimentation was conducted over a group of 20 male athletes who practice karate (age:18/30; height:170/192; weight: 60/94; degree: brown/black), divided into 2 similar groups: 10 katà and 10 kumitè competitors. We examined 4 techniques: 2 attack techniques with hands, kizami tsuki and gyaku tsuki (leading punch and reverse punch) and 2 attack techniques with foots, kizami mawashi geri and

mawashi geri (front roundhouse kick and round kick). The objectivity was guaranteed by an accurate standardization of the protocol. The whole series of tests was repeated after two days to carry out the reliability study. It was also made a cross-comparison between the results of the group of the athletes performing kumitè and the group of athletes performing katà, in order to study the validity of the test and to check the ability to distinguish the athletes performing different disciplines. The reliability of such difference was studied through Anova Methods: Results: The reliability study (test-retest correlation) pointed out r values included between 0,80 and 0,91 ($p<0.01$) for both the groups and the 4 techniques analyzed. In the cross-comparison the group performing kumitè resulted significantly more rapid in responding to stimuli than the group performing katà, with high percentage differences (kizami tsuki = 31%, $p<0,0001$; gyaku tsuki = 32%, $p<0,0001$; kizami mawashi geri = 25%, $p<0,01$; mawashi geri = 27%, $p<0,01$). On the contrary, there wasn't a significant difference between the 2 groups in the overall time of execution of the techniques, with percentages varying from 3 to 7%.

Conclusions

The results of the experimentation allow us to state that karate's athletes performing kumitè speciality have a rapidity of reaction superior than those performing katà. Probably this is due to the fact that in katà responding rapidly to external stimuli is not so important as execution rapidity, as happens in almost every technical and combinatorial sport.

References

Villani R., Angiari P., Tomasso A. (2004), 9°Annual Congress of the ECSS, p.295, Clermont-Ferrand

Villani R., Ruggieri F., Tomasso A., Distaso M. (2005), 10°Annual Congress of the ECSS, p.419, Belgrade

HEART RATE VARIABILITY AT REST AND DURING EXERCISE OF CHEN-STYLE TAIJI QUAN PRACTITIONERS

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Taiji Quan (TJ), as a moderate physical activity, has an influence on resting heart rate (HR) (Lan et al. 2004), however, few articles deal with heart rate variability (HRV) (Vaananen et al. 2002).

Aim: Our aim was to measure HRV of advanced Chen-style (the root of all TJ styles) TJ practitioners at rest and follow their HR changes during a training session.

Subjects and Methods: Measurements were made in 10 males of the advanced group (age 34±5.2 yrs, years of practicing TJ 6.6±3.4 yrs, training time 11.2±5.5 hrs/wk). Resting HRV was measured before practice with a POLAR Vantage NV watch and belt and during the session they wore a Team POLAR belt. One training session includes a 30-min warm-up -10 min stretching, 15 min practice of kicks and punches and 5 min acupoints' stimulation – a 26-min 83-step form and finally a 34-min of push hands. Evaluation of results occurred with POLAR Precision Performance 2.0 and SW.

Results: At rest HR was found on the average 73±14.5 bpm. Index stda and stdb (standard deviation of instantaneous and long-term R-R interval variability) was 79.9 ms and 32.6 ms, only one person had low indices (12.7 ms and 2.6 ms). pNN50 (percentage of difference between adjacent R-R intervals that are >50 ms) values' distributed from 0% to 37%, avg:10.6%. Distribution among very low (VLF), low (LF) and high frequency (HF) power was 35.4%-45%-19.6%, respectively. Three practitioners had very high (over 1000%) LF/HF ratio. From the level of HR in warm-up part one (88±7.1 bpm), kicks and punches increased the HR to 124±17 bpm. During 83-step form the HR was 118±10.3 bpm, and during push hands it was 116±8.2 bpm.

Discussion: Based on HRV, subjects arrived to the class in a good average cardiac state. The first part of warm-up raised their HR to the level of 53-57% of their maximal HR reserve, the second part took the biggest load on individuals (until 61-71%), during the form everyone's HR decreased to 59-68% and curiously, though the 83-step form is a slow-form of Chen-style, in the fighting part practitioners' HR was significantly lower ($p<0,05$) than at the end of the form.

Conclusion: Though Chen-style TJ is an inner-style kung-fu, an advanced Chen-style TJ training differs from other TJ classes we can read about; it rather resembles to an outer-style kung-fu class. On the other hand, we are sure about that practicing the form alone, Chen-style TJ has the same effects as other authors has mentioned about other styles.

References:

1.C. Lan, S-Y. Chen, S. Lai: Relative Exercise Intensity of Tai Chi Chuan is Similar in Different Ages and Gender, The Am. J of Chin. Med. 2004, Vol. 32., No. 1, 151-160

2.J. Vaananen, S. Xusheng, S. Wang, T. Laitinen, H. Pekkarinen: Taichiquan acutely increases heart rate variability, Clin Physiol & Func Im (2002) 22,.2-3

13:00 - 14:00

Poster presentations

PP-TT04 Training and Testing 4

EFFECTS OF UPPER EXTREMITY PLYOMETRICS ON THROWING VELOCITY AND ISOKINETIC MUSCLE STRENGTH OF SHOULDER ROTATORS IN FEMALE HANDBALL PLAYERS

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Introduction: Purpose of this study is to investigate the effects of upper extremity plyometrics on throwing velocity and isokinetic muscle strength of shoulder rotators in female team handball players.

Methods: Sixteen subjects were volunteered to participate to this study. The subjects were randomized into plyometric exercises group (PG) (n=8) and daily training control group (CG) (n=8). Plyometric group (PG) performed plyometric exercises in addition to their daily training while control group (CG) just executed their daily training. Throwing velocities were tested in two types of throws which were standing throwing velocity (STV) and 3-step throwing velocity (3STV). Shoulder internal (IR) and external rotation (ER) peak torque were examined in 90, 300 ˚/s velocities before and after six weeks plyometric training period.

Results: Throwing velocities significantly increased in both PG and CG (P<0,05). Peak torque of IR (300 ˚/s) in dominant arm and peak torque of ER (90 ˚/s) in non-dominant arm were significantly increased in PG (P<0,05). Also, peak torque of IR and ER (300 ˚/s) in dominant arm and peak torque of IR (300 ˚/s) in non-dominant arm were significantly increased in CG (P<0,05). But when both groups compared there were no significantly difference neither throwing velocities nor peak torques. There was a significant positive correlation between STV and peak torques of IR (90, 300 ˚/s) (r=0,56 P=0,01, and r=0,52 P=0,01 respectively). There was a significant correlation between peak torque of ER (90 ˚/s) and 3STV (r=0,49 P=0,02).

Discussion: Upper extremity pylometrics are used commonly in handball training (Kvorning T., 2006) but there is no avialable study in the literature. Some findings of throwing velocities after plyometric exercises conflict with a research in baseball which is similar with overarm throwing (Carter et al., 2007). It seems to six weeks plyometric exercises have no additional improvements on throwing velocities and isokinetic muscle strength of shoulder rotators in female handball players in our study. Altough we could not show any additional effect of plyometrics, we think that it could integrated into the handball training as a sport specific exercise.

References

Kvorning T, (2006). 5th International Conference on Strength Training

Carter AB, Kaminski TW, Douex T, Knight CA, Richards JG, (2007). J Strength Cond. Res, 21(1), 208-215

JUMP CAPACITY AND THE ACL INJURY IN FEMALE HANDBALL PLAYERS

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UNIVERSITY OF PORTO

The risk of ACL injuries seems to be higher in adolescents and young female athletes in comparison to male athletes of the same age. In handball, the lower limb muscle strength is essential to perform faking movements, changes in direction, accelerations and jumps. These actions are also the most frequently implicated in the ACL injuries mechanism.

Purposes: to examine the influence of maturation, oral contraceptive status, previous knee injuries and handball exposure in jump performance.

Sample: 496 Portuguese female handball players, 16±4 years old, practicing handball for 6±5 years. A cross-sectional experimental design was employed in the 2006-07 season. The testing sessions included initial anthropometric measurements, including standing body height, body mass and percentage of fat mass (by bioelectrical impedance). A screening questionnaire was used to assess some vital data, previous knee injuries and sports related information. Vertical jump tests were used to assess lower limb muscle strength: the squat jump (SJ) and counter-movement jump (CMJ). A contact platform was used to assess the height jumped. The m-eccentric utilization ratio (mEUR) was defined as CMJ/SJ-1.

Results: A stepwise regression on the jump performance revealed that there is a significant dependence only on age, BMI and field position (p<3%).

The dependence on age is well described by 3rd degree polynomials (r2>79%) with a minimum at the start of the series (10 years) and a maximum at about 28 years. However, the CMJ and SJ evolve similarly (r2=0.75), what means that the elastic energy utilization, a frequent indicator of jump competence, has no significant trend during the players careers (r2=0.03). This is unexpected and in contrast with published data.

We have found a small increase in jump performance around the menarche age, not different from other improvements during other phases of the players' careers (average of 5cm in 4 years).

On BMI, the jump performance dependence is less clear. Both CMJ and SJ are best described by parabolas with peaks at around 22.6kg/m2 but the fits have low adherence (r2>40%). They are also almost parallel along all range.

There is a statistical relation between field position and jump capacity. While left and right back players, as well as left-wingers, tend to have the higher jump capacities, pivots and right-wingers tend to be on the opposite extreme.

Finally, we have observed that players without previous knee injuries have a lower SJ capacity than players with previous knee injuries (p<4%).

Conclusions:Maturation per se is not has decisive on jumping performance as training.

The absolute jumping capacity, the mEUR values and it's evolution along ages may all be interpreted as a sign of a conditionally under trained population, possible at higher risk of ACL injury due to low dynamic knee stabilization capabilities.

Hormonal therapy does not have a significant effect on jumping performance.

STRENGHT AND ENDURANCE PERFORMANCE IN TRADITIONAL ROWING

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The purpose of this study was to examine the performance factors between elite (ER) and amateurs (AR) traditional rowers and the relations between the measured variables to determine the best predictors of traditional rowing performance. Average power during the 20 minutes´ all-out test (W20min), average power output which elicited a blood lactate concentration of 4mmol•l-1(W4mmol•l-1), power output in 10 maximal strokes (W10strokes), maximal strength and muscle power output during a bench pull (BP) and anthropometric values were measured in 46 trained male rowers aged 21 to 30 with 8-15 years of rowing training experience. ER group showed higher body mass (5%, p <0.05), free fatty mass (5%, p <0.05), age (21%, p<0.001), training experience (43%, p<0.001), and lower time in 2000m test (4%, p <0.05) than AR group. Average power output and power output index were higher in ER group (from 6% to 13%; p<0.05-0.01) than in AR. ER group exhibited higher power output values in W10strokes (9%, p<0.01), and in average power during W20min (15.4%, p<0.01) compared with AR group. During W4mmol•l-1 the mean stroke power output was 17.8% higher (p<0.01) in the ER than in the AR group. Significant relationships were observed between W4mmol•l-1 and W20min (r = 0.65 and 0.80; p<0.01 in ER and AR, respectively). ER groups was characterized by having higher body mass, having a greater percentage of free fatty mass and obtain significantly better results in the rowing performance test than AR. The indices of rowing performance suggested that W20min, W4mmol•l-1, W10 stokes and 1RMBP were the most important predictors of traditional rowing performance in elite and amateur rowers.

STRESS AND RECOVERY OF NEW ZEALAND JUNIOR ROWERS PREPARING FOR THE 2008 WORLD CHAMPIONSHIPS: COMPARISON TO THE 1998 GERMAN NATIONAL ROWING TEAM

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WAIKATO INSTITUTE OF TECHNOLOGY

Introduction: Manipulation of training load is a key stimulus for improved performance, however overtraining can result in performance declines and burnout. Previously Kellmann et al [1] examined the stress, recovery and training duration of the German (GER) Junior Rowing Team preparing for the 1998 World Championships. The aim of the current investigation was to compare these results with the stress, recovery and training duration of the New Zealand (NZL) Junior Rowing Team preparing for the 2008 World Championships.

Methods: Athletes from the New Zealand Junior National Rowing Team volunteer for the study (N=24, mean±SD age: 17.4±0.5 years, height: 181.3±9.5 cm, weight: 81.3±10.1 kg, ∑8 skinfolds: 73.1±20.9). Athletes were monitored for 5 weeks of a training camp held immediately prior to the 2008 World Junior Championships. Athletes completed five Recovery-Stress Questionnaires for Athletes (RESTQ-Sport) and a daily training diary outlining mode, duration and intensity of training. Descriptive data (mean±SD) for each scale of the RESTQ-Sport and training duration was determined for each week. These data were compared with data presented for the German athletes via determination of z- or t-scores.

Results: No differences in training duration between the two groups was recorded (t=0.5) with average weekly durations of 1090 and 1109 hours reported for the NZL and GER athletes respectively. For the stress scales: NZL athletes reported significantly higher scores for emotional stress (z=5.6), social stress (z=3.16), conflicts/pressure (z=3.9), fatigue (z=4.9), lack of energy (z=12.5) and physical complaints (z=7.8). For the recovery scales: NZL athletes reported significantly lower social recovery (z=-11.6), physical recovery (z=-4.6), general well being (z=-4.8) and sleep quality (z=-10.0). For the sport specific scales: NZL athletes reported significantly higher scores for disturbed breaks (z=8.6), emotional exhaustion (z=12.0), and injury (z=10.1) and significantly lower scores for being in shape (z=-3.6) and self efficacy (z=-2.6). At their respective events the GER athletes placed in 14/14 A finals (14 crews), with the NZL athletes placing in 3/3 A finals (5 crews).

Conclusions: While comparisons indicated no differences in training duration, the NZL athletes demonstrated higher stress and less recovery compared to the GER athletes. It is possible this is the result of differences in training intensity not duration, which is demonstrated to be related to overtraining (Halson et al. [2]). Although it is difficult to compare the performance outcomes of the teams, the long term consequences of high stress: low recovery for the NZL athletes may be a concern with regards to athlete development, and progression to seniors, due to the relationship between stress- recovery and burnout.

References

[1] Kellmann et al. (2001). The Sport Psychologist, 15, 151-167.

[2] Halson et al. (2006). International Journal of Sports Physiology and Performance, 1, 65-9.

HEART RATE VARIABILITY AND VO2 MAX, DURING A ROWING TRAINING SEASON: IMPLICATIONS FOR MONITORING TRAINING ADAPTATION.

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FACULTY OF SPORT SCIENCES AND PHYSICAL EDUCATION OF COIMBRA

Objectives

In Sport Science it is generally accepted that aerobic training promotes higher Heart Rate Variability (HRV) and that intense training leads to lower HRV. The aim of this study was to analyze the utility of heart rate variability as a marker of training adaptation during a rowing training season and it's sensibility to training load variation.

Methods: 9 males of the national rowing team (22,2 ±2,0 years, 181,2±7,2cm height, 77,9±8,1Kg mass) were selected for this study. HRV time domain (SDRR) and frequency domain (LF, HF absolute, relative and normalized units as was the LF/HF) were measured at rest before a graded test conducted on a Concept II rower ergometer. VO2max, was evaluated and 4 time points controlled according to a year training plan. The first evaluation (t1) took place in the begging of the training season after a transitory period during which the athletes had been released for 5/6 weeks from their normal training. This allowed us to find out the basal values at the beginning of preparation for the sport season. The second evaluation (t2) was done after the first 14 weeks of training with great aerobic predominance and a gradual increment of training volume. The third evaluation (t3) took place at the 28th week, after a phase of intensity increment and a small decrease on training volume. The final evaluation (t4) coincided with a training phase with the highest mean weekly volume and intensity during the season and before a taper period. In this study we adopted a single group repeated measures design in which athletes served as their own control subjects. All ethical presuppositions that a study of this scope compels have been verified.

Results: During the season, VO2max values were: t1=61,49 ± 6,21 ml.kg.min-1; t2=65,37 7,9621 ml.kg.min-1; t3=66,72 6,8021 ml.kg.min-1 and t4 =64,82 8,3021 ml.kg.min-1.

The VO2 at t3 was significantly higher (p<0,05) than that observed at t1 and t4. Nevertheless the power at VO2max was from t1 to t4 respectively 334 34, 378 40, 377 52 and 387 45 Watts, higher at all moments when compared to t1 (p<0,05). Concerning HRV, we found SDRR higher at t3 (p<0,05) and lower at t4, and lower absolute HF(nu) and higher LF (nu) at t3 when compared to the initial values at t1. In summary, during the season at t3, when metabolic values of VO2max were higher, we also found the highest SDRR as marker of global variability, and the lowest LF and highest HF, which indicates a parasympathetic drive on autonomic control of the heart. Also the LF/HF shows a progressive increase during the season, although never attaining a significant variation.

Conclusions

Our results agree with those (1) who found a relationship between aerobic capacity development and the predominance of the parasympathetic on the sympatho-vagal balance, and confirmed the utility of at rest HRV control in monitor training adaptation on rowers during a training season.

References

Iellamo, F. et al. (2002) Circulation, 105(23), 2719-2724

DOES ELECTRICAL STIMULATION OF KNEE EXTENSOR AND FLEXOR MUSCLES INDUCE DOMS?

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UNIVERSITY OF LIEGE

Introduction: Neuromuscular electrical stimulations (NMES) are frequently used to improve muscle performance. It has been shown that the gains observed at the end of a NMES program depend on the intensity of the contractions that are electrically evoked during the training sessions. Therefore, it is suggested to prompt subjects to tolerate the highest current intensity as possible. The present work aimed to study the effect of an intense NMES session on muscle soreness and tightness.

Methods

Ten physically active men (24 ± 3 years, 181 ± 4 cm, 74 ± 11 Kg) underwent unilaterally, isometrically and consecutively 20 min of quadriceps (Q) and 20 min of hamstrings (H) NMES. The stimulator provided biphasic rectangular pulses (80 Hz, duration 0.35 ms, on-off ratio 6-6 s) and the current intensity was continually increased throughout the session at maximal tolerable level (~ 75 mA at the end of both bouts). Torque measurements were performed using an isokinetic dynamometer (Biodex3). Subjective perception of muscle soreness was evaluated by the Visual Analogue Scale (0-10 a.u.). Flexibility of the Q was tested with the prone quadriceps flexibility test (distance between heel and buttock with the knee maximally flexed) and the H flexibility was tested with the straight leg raising test (hip angle). Creatine kinase (CK) activity was measured from blood sampling. All parameters were evaluated before as well as 24 h (d1) and 48 h (d2) after the NMES provocation bout.

Results: During the NMES bout, the stimulated contractions reached, in mean, 31% and 19% of maximal voluntary torque (MVT) for the Q and the H, respectively. All measured variables were significantly modified after the electrostimulated exercise. The highest variations occurred at d2 (mean VAS scores = 3.15 ± 1.83 a.u.; mean reductions in Q flexibility = +3.2 cm; mean reductions in H flexibility = –13°; mean CK activity = 3021 ± 2693 IU/l).

Discussion: Generally, DOMS occur in skeletal muscle after strenuous exercise, especially when high peak forces are involved during eccentric contractions (Croisier et al., 2003). In the present study, we showed that one session including NMES of quadriceps and hamstrings muscles, realized isometrically and inducing sub-maximal contractions (~ 20-30% MVT), provokes muscle soreness and stiffness and increased CK activities suggesting the occurrence of DOMS. Those DOMS could be induced by the specificities of NMES i.e. temporal and spatial recruitment (Vanderthommen and Duchateau, 2007). The fact that a NMES session, realized in conditions close to the field conditions of training or rehabilitation in terms of stimulation parameters, electrodes positioning and intensity adjustment, can induce an alteration in muscle function constitutes a relevant information.

References

Croisier JL, Camus G, Forthomme B, Maquet D, Vanderthommen M and Crielaard JM. (2003). Isokinetics Exerc Sci, 11, 21-29.

Vanderthommen M, Duchateau J. (2007). Exerc Sport Sci Rev, 35, 180-185.

PROFILING ANTHROPOMETRIC AND ISOKINETIC STRENGTH CHARACTERISTICS IN 14-15 YEARS OLD BASKETBALL PLAYERS.

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Explosive muscle strength and muscular balance of the knee joint are important parameters to succeed in basketball. Isokinetic testing has been consistently used for assessment of concentric and eccentric strength of the knee joint musculature. The literature is more abundant for soccer players (Sangnier & Tourny-Chollet, J Strength Cond Res, 22: 2008) than for other team sports, in general, and basketball, in particular. In addition, isokinetic assessment has not been systematically considered in adolescent basketball players taking into account growth characteristics. The present study examines the isokinetic parameters of the knee joint musculature in 14-to 15-year-old basketball players by playing position.

A total of 51 basketball players (14.0-15.9 yrs; 2-11 years of training) were categorized as guards (n=16), forwards (n=21), and centers (n=14). Anthropometry included those measurements needed for estimation of leg volumes (Jones & Pearson, J Physiol, 204: 1969), plus stature and body mass. After a 5-min warm-up at 60 rpm in a cycle-ergometer (Monark) and stretching, subjects performed five maximum knee extensions (KE) and flexions (KF) in the isokinetic dynamometer (Biodex system 3, Biodex Corporation, Shirley NY, USA) programmed at 60 degrees/s (modes CON and ECC in both legs. Moments were corrected for the effect of gravity and the highest moment from the five trials for each contraction mode was retained for analysis. Parameters for analysis were absolute peak torque (PT), relative peak torque (PT per kg of body mass), 'functional' and 'conventional' hamstrings to quadriceps (H/Q) ratios and bilateral differences (Aagaard et al, Am J Sports Med, 26: 1998). Analysis of variance (ANOVA) was used to test position-related variation in body size and strength parameters. Significance level was set at p≤0.05.

As expected, centers were taller ($F=12.251$; $p < 0.01$) and heavier ($F=11.021$; $p < 0.01$) than guards and forwards, whereas forwards had similar stature and body mass as guards in this age group. Results in PT showed differences, from centers to both forwards and guards, in mean ECCKF in the dominant leg ($F=3.979$; $p<0.05$). Also in the non-dominant leg differences revealed in mean ECCKF ($F=4.203$; $p<0.05$) and ECCKE ($F=4.392$; $p<0.05$). No differences were found in mean CON PT, as well as H/Q ratios and bilateral differences.

The present studies showed a significant position-related variation of body size and absolute peak torque. When expressing isokinetic strength per unit of body mass the effect of playing position was not anymore significant. Future research including maturational assessments is needed during pubertal years. It would also be of interest to investigate the effect of playing position in players accumulating more years of basketball practice. The current ongoing project will report the relationship between isokinetic outputs and concurrent anaerobic tests.

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DIFFERENCES IN PROPRIOCEPTIVE QUALITIES OF THE FOOTBALL PLAYERS AT DIFFERENT LEVELS OF COMPETITION IN BOSNIA AND HERZEGOVINA

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Introduction: Football game comprise all forms of natural movements as running, stopping, turning, jumping, falling, throwing, pushing, and occur with different intensity, tempo and duration, with purpose of defending and attacking actions (Rađo et al., 2002). Balance abilities of players are very important for the function of maintaining adequate body posture while shooting, pushing, and landing, and especially for injure preventing. Purpose of the research was to find differences in balance ability, propriocetive qualities of players at different levels of competition in Bosnia and Herzegovina.

Methods: Study from the season 2007/2008, involved 129 players, seniors, from different level of competition (five levels): level-I (National team), level-II (Premier League), level-III (First League), level-IV (Second League) and level-V (Cantonal League). Biodex Stability System was used to test balance ability of players, stability level 4, duration of 20sec, stability index was recorded. T-test for independent samples was used for difference determination between levels.

Results: Results of the study has shown statistically significant differences between third (First League) and fourth (Second League) levels. $p<.05$, in favor of the level four, while between other levels there was no statistically significant differences recorded. Average value of the stability index were as follows: level-I (National Team) 6.1, level-II (Premier League) 6.8, level-III (First League) 7.3, level-IV (Second League) 5.4, level-V (Cantonal League) 6.7.

Discussion: Results of the study didn't show expected differences between levels of competition. Differences in balance ability were notable only between levels three and four. Differences between levels were expected to be in favor of quality of the competition, but that was not the case (Alic, 2008). We assume that proprioceptive training was disregarded at the all tested levels of competition and that is the reason why there were no differences between levels.

References

Alic H. (2008). Defining differences at levels of morphological characteristics, functional and motor abilities of football players at different levels of competition. Master dissertation, Faculty of Sports and Physical Education, Sarajevo.

Rađo, I., Talović, M., Dogan M., Bradić ,A. (2002). Speed training for soccer player. Faculty of Sports and Physical Education, Sarajevo.

CHANGES IN VERTICAL GROUND REACTION FORCES WITH FATIGUE DURING THE SERVE IN TENNIS

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Introduction: Recent biomechanical analyses of the tennis serve have focused on lower extremity kinematics, ground reaction forces (GRF) or EMG activity of selected leg muscles, underlying the importance of a forceful lower limb drive to produce efficient strokes. A decrease in isometric maximal voluntary strength capacity of both knee extensors and plantar flexors has been reported after prolonged tennis playing. However, strength losses with fatigue - as measured previously from isolated leg muscle contractions - do not necessarily reflect changes in lower limb involvement during dynamic/functional movements such as tennis strokes. Therefore, it is still unknown if fatigue alters the lower limb drive during the serve.

The purpose of this study was to examine the impact of prolonged tennis playing on vertical GRF during the serve.

Methods: Nine competitive tennis players randomly executed 10 flat (first, FS), 5 slice (first, SS) and 5 twist (second, TS) serves before and after a 2 h 30 min tennis match. All serve trials were completed from the deuce service court at match pace. Vertical maximal GRF (Fzmax) and post-impact ball velocity were determined for each trial by means of force platform (Captels, France) and radar (Stalker, USA), respectively.

Results/Discussion: Ball velocity did not change from pre- to post-exercise (FS: 158.7±11.5 vs. 154.7±11.5 km.h-1, -2.5%, P=0.099; SS: 138.2±21.6 vs. 136.5±20.8 km.h-1, -1.1%, P>0.05; TS: 126.3±20.2 vs. 124.9±15.3 km.h-1, -0.4%, P>0.05). In the literature, contrasting effects of fatigue on tennis serve efficiency have been reported depending on service type, nature of fatiguing protocol or subjects' characteristics. In the fatigued state, Fzmax was unchanged (P>0.05) in FS and SS (1.78±0.30 vs. 1.72±0.29 and 1.60±0.22 vs. 1.65±0.22 BW; -2.9 and +3.8%; before and after the tennis match, respectively). In line with these findings, no significant changes in explosive strength - as measured from squat and countermovement jumps - were observed after a tennis match protocol of the same duration. Unexpectedly, our results also displayed an increased Fzmax (1.62±0.25 vs. 1.75±0.23 BW; +8.2%; P<0.001; before and after the tennis match, respectively) in TS under fatigue. Since the ball velocity was unchanged, this stronger lower limb involvement during TS under fatigue might indicate that the contribution of other body segments participating to the kinetic chain (trunk, upper limbs) is modified. This is further supported by the absence of significant correlation between changes in Fzmax and ball velocity ($0.03 < r < 0.62$; P>0.05) from pre- to post-exercise.

Conclusion

After a prolonged tennis match, ball velocity remains unchanged while the effects of fatigue on the lower limb drive are different according to the service type. This indicates a modification in inter-segments coordination that requires further kinematic and kinetic analyses coupling.

13:00 - 14:00

Poster presentations

PP-TT05 Training and Testing 5

APPLICABILITY OF THE YOYO INTERMITTENT RECOVERY TEST LEVEL 2 FOR THE ASSESSMENT OF REPEATED HIGH-INTENSITY RUNNING CAPABILITY IN YOUTH PROFESSIONAL SOCCER PLAYERS

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Introduction: In soccer, the higher the level of performance, the greater is the amount of high-intensity running performed by the players. The YoYo Intermittent Recovery Test (YoYo IRT L2) is a reliable and valid measure for assessing repeated high-intensity running capability in elite adult soccer players. However, the applicability of this test in youth professional soccer players is apparently not yet evaluated. The aim of the study was to evaluate the applicability of the YoYo IRT L2 for the assessment of repeated high-intensity running in youth professional soccer players during different phases of a complete soccer season.

Methods

Twenty youth professional soccer players (mean ± SD: age, 17.5 ± 0.3 years; stature, 1.73 ± 0.04 m; body mass, 67.2 ± 7.5 kg) participated in the study. The participants completed a laboratory-based test of intermittent high-intensity on a motorized treadmill, the YoYo IRT L2 as a field-based test of intermittent high-intensity running, a repeated sprint ability (RSA) test on a non-motorised treadmill (6 × 6 s with 24 s recovery) and a field-based RSA test (8 × 20 m with 15 s active recovery) on three occasions (pre-season, early in-season and end mid-season) during the soccer season. The study also determined the work intensity during match play using heart rate (HR) monitoring for two matches during each phase of the competition season.

Results: Significant correlations ($p<0.05$) were observed between the laboratory test of intermittent high-intensity running (Range; $r = 0.53$-0.85) and performance in the YoYo IRT L2 (Range; $r = 0.55$- 0.81) with the amount of high-intensity work performed during match play (HR > 90% of HRmax for % of total playing time). Non-significant correlations were found between the tests of RSA and match play work intensity. Results also showed that the performance in the YoYoIRT L2 (distance covered, mean; 818, 950*, 1032 m; * significant change from the previous phase) and the amount of high-intensity work performed during match play (57.5, 69.5*, 58* %) changed through the soccer season

Discussion: The development and assessment of repeated high-intensity running capability should be of important concern for soccer scientists and coaches. The results strongly supported the validity of intermittent high-intensity running tests for the evaluation of match performance in youth professional soccer players in terms of high-intensity work performed during matches. However, the YoYo IRT L2 being field-based, simple to conduct, with the option of simultaneous multiple player testing and therefore is time economical. The YoYo IRT L2 has an advantage over the laboratory-based test that requires specialized facilities and manpower. Furthermore, the results showed that the YoYo IRT L2 was sensitive to the changes in the repeated high-intensity running capability through the playing season in youth professional soccer players.

COMPARISON OF ANTHROPOMETRIC, BODY COMPOSITION, AND PHYSIOLOGICAL CHARACTERISTICS OF IRANIAN NATIONAL TEAM AND PREMIER-LEAGUE FUTSAL PLAYERS

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UNIVERSITY

The purpose of this study was Comparison of Anthropometric, Body Composition, and Physiological Characteristics of Iranian National Team and Premier-League Futsal Players. A number of 16 Futsal players of Iran National Team (INT) (25.93± 3.88 age) and a number of 16 players present in Iranian premier-league (IPL) (26.12 ± 4.01 age) of Futsal were tested. As anthropometric characteristics, thigh circumference and length, calf circumference and length, and sitting height and as body composition characteristics, height, weight, body fat percentage, lean body mass, and BMI were measured. Physiological profiles were composed of aerobic and anaerobic power, speed (10 & 20m run), agility, and flexibility. For lean body mass, BMI, agility, and 10m speed, there is significant difference between INT and IPL groups (respectively, $p= 0.031$, $p= 0.017$, $p= 0.009$, $p= 0.005$). In summary, these results showed that some of body composition and physiological characteristics were higher in INT players than ILP players. These results can help coaches in players choosing.

TECHNICAL ABILITIES IN FEMALE FUTSAL

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Introduction: Despite the growing worldwide popularity of Futsal, few studies provided information on motion analysis (Barbero et al. 2008; Castagna et al., 2008) and tactical aspects (Amaral and Garganta, 2005), of men's players, while only one study reported the tactical situations relevant to score a goals in women's matches (Benvenuti et al., 2008). Since no data are available on technical abilities of female players, this study aimed to analyze the occurrence of individual's technical aspects in relation to the different zones of the pitch (i.e., zone 1-2, and zone 3-4 respectively for defensive and offensive mild field).

Methods: The performance of eight female players were analyzed during the Italian Futsal Cup 2008 Final Eight. When the team had the possession of the ball (PB), the following indicators were selected: Dribbling (D), Passing (P), Receiving (R), Shooting (S), and Free from marking (F). The indicators during phases of non possession of the ball (NB) were: Covering (C); Intercepting (I), and Anticipation (A). An ANOVA was applied to verify differences ($p<0.05$) between the following roles: central defenders (CD), defender wings (DW), offensive wings (OW), and pivot (PV).

Results: In relation to the field-zones, PB showed the highest occurrence of D, P, R, and F in zone 3 (45%, 40%, 41% and 52%, respectively), while S occurred most frequently in zone 4 (55%). During NB, C, I, and A occurred most frequently in zone 2 (43%, 40%, and 37%, respectively). Although no difference emerged between roles in the amount of technical actions, different specific characteristics emerged, with CD showing highest values of D (49%) and A (37%), P the highest values of A (50%) and F (47%), DW and OW the highest frequency of occurrence of P (30%) and R (DW:33%; OW: 29%). Furthermore, DW shooted most frequently (40%).

Conclusions: Although teams defend from zone 2, most of the technical aspects of the attacking teams occur in zone 3 and players tend to shoot from a reduced distance from the goal (i.e., zone 4), probably due to a limited strength in their lower limbs. The individual's indicators highlighted that CD needs more dribbling and anticipation capabilities to structure the offensive action. On the other hand, the players mainly involved in the tactical rotation (i.e., WD and WO) need more passing and receiving capabilities, while the PV places more efforts to get free form marking during attacking actions and to anticipate while defending.

References:

Amaral, Garganta, (2005) Rev. Port. Cien. Desp, 5 (1) : 298-310

Barbero-Alvarez et al., (2008) J Sport Sciences, 26 (1): 63-74

Benvenuti et al, (2008) 13° Ecss abstract, Estoril

Castagna et al., (2008) J Sci Med Sport, in press

THE EVALUATION OF PHYSICAL AND TECHNICAL CHRACTERISTICS OF AMATEUR SOCCER PLAYERS

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Introduction: The purpose of the current study is to evaluate the physical and technical characteristics of soccer players playing in regional amateur league.

Methods: 89 amateur soccer players has volunteered to the study from different positions (goal keeper (n=9), defense (n=25), midfielder (n=41) and striker (n=14). Subjects were familiarized with the testing protocol via two sub-maximal practice attempts (Jeremy et. all., 2007). 10, 20 and 30 m sprint scores have been measured. HUFA, which supplies information on both technical index and technical score, is a measurement station developed by Ozkara et.all. (2002). Measurement station is totally 30m including slaloms. The subjects performed two jumping protocols [(1) squat jump (SJ) and (2) countermovement jump (CMJ)] on BOSCO jumping mat. Each player performed 2 SJs and CMJs. The best jump of each jumping protocol was selected for analysis (Chamari, et all., 2004). Strength was determined isometrically for back pull-leg lift. The higher trial of two was used for analysis. Maximum voluntary back/leg strength was measured using a digital back/leg dynamometer (BCS-400, range: 0–500 kg, graduation: 1 kg). Flexibility test include sit and reach tests. The main function of sit and reach tests are to determine the hamstring and trunk flexibility. Body weight and height have been measured. Holtain calipers have been used to measure the skin thickness on four sites of the body. Body-density values was calculated from the by use of the Siri equation (1956).

Results: Sprint values consisting 10m, 20m and 30m has shown no statistical difference in terms of players' positions ($p>0.05$). Besides, there was no significant difference among the players' position from technical index aspect. However, a significant difference has been calculated ($p<0.01$) in between goalkeepers and defense players in terms of technical scores. The defense players have covered the distance in a shorter duration than goal keepers with ball. The same difference has been observed between goalkeepers and midfielders. No significant difference has been observed among amateur players in terms of the percentages of body fat values and body mass indexes (BMI), flexibility, SJ and CMJ and back-leg strength values ($p>0.05$).

Discussion: The amateur players didn't show the characteristics of their playing positions when compared with the literature. It can be concluded from the current results that the training program they have does not include the principle of training specificity.

References

Chamari K., Hachana Y., Ahmed Y.B., et. all. (2004) Field and laboratory testing in young elite soccer players. Br J Sports Med 38: 191–196.

Jeremy S., Rob N. & Mike M. (2007). The Effect of Accentuated Eccentric Load on Jump Kinetics in High-Performance Volleyball Players. International Journal of Sports Science & Coaching. Volume 2 • Number 3.

Özkara A. (2002). Tests and Specific Exercises in Soccer, Kuscu Printings, Ankara, 173-179.

OSCILLATIONS IN SMALL-SIDED SOCCER GAMES

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Introduction: The dynamical systems approach is increasingly adopted in performance analysis in sports. Mainly, the oscillatory behaviour of players in racket sports has been under investigation (Lames, 2006; McGarry et al., 1999; Palut & Zanone, 2005). However, team sports like rugby, basketball and soccer have not been subject of these analyses for various reasons. It is hypothesized that in soccer, attacking and defending is strongly coordinated between teams. Therefore, the aim of this study was to explore small-sided soccer games as a dynamical system by means of 2 collective variables, i.e. centroid position and surface area (Frencken & Lemmink, 2008). In addition, we tried to identify patterns in the development of goal-scoring opportunities through visual inspection.

Methods: Ten young male elite athletes (17.3 years ± 0.7) played three small-sided games (4-a-side plus goalkeepers) of 8 minutes on a 28x36 m pitch. Player positions were recorded at 45 Hz per player by means of innovative technology, i.e. local position measurement (LPM) system.

In total, three measures were calculated per team for the centroid position (forward/backward displacement, lateral displacement and radial displacement) and surface area (length, width and surface area). Correlation coefficients (r) were calculated for these measures to analyze coherence of time series data of both teams.

Results: Correlation coefficients of centroid measures were higher for the centroid position ($.57 < r < .95$) compared to surface area ($-.06 < r < .39$). Highest correlation coefficients were found for forward/backward displacement of the centroid ($r > .93$). For 10 out of 19 goals, a crossing of the centroid positions in forward/backward direction was present prior to the goal being scored.

Discussion: In this study, we analyzed small-sided soccer games from a dynamical systems perspective. Results indicate inphase oscillations for the centroid position. The strongest inphase pattern is found for the forward-backward displacement of the centroid position. Teams coordinate attacking and defending primarily in this direction. No specific oscillatory pattern was found for all surface area related measures. Although rules of these small-sided games were similar to 11 vs. 11, players behaviour is constrained differently when com-

pared to 11. vs. 11. This results in the absence of a clear pattern. Finally, we showed that deviations of the inphase pattern of centroid position indicate goal-scoring opportunities in small-sided games. We conclude that the small-sided soccer games can be considered a dynamical system and this approach opens up new types of analyses in performance analysis in team sports.

References

Frencken, W. G. P. & Lemmink, K. A. P. M. (2008). Science and Football VI, 161-166. Routledge, London.

Lames, M. (2006). J Sports Sci Med, 5, 556-560.

McGarry, T., Khan, M. A., & Franks, I. M. (1999). J Sports Sci, 17, 297-311.

Palut, Y. & Zanone, P. G. (2005). J Sports Sci, 23, 1021-1032.

ASSOCIATION OF PERFORMANCE PARAMETERS OF PROFESSIONAL ELITE SOCCER PLAYERS THROUGHOUT THE SEASON

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Introduction: The achievement and maintenance of an adequate level of physical fitness is a complex process, since adaptations to training and competition are specific to each individual. Thus, one of the central aspects of high performance training concerns the behaviour of the performance dynamics (Maia et al., 2001). Therefore, the purpose of this study was to analyze the association of soccer players' performance-related parameters throughout the season.

Methods: Twenty-two Portuguese elite professional soccer players were evaluated in four occasions throughout the season [prior pre-season (PPS), end pre-season (EPS), mid-season (MID) and end-of-season (EOS)] for counter-movement jump (CMJ), 5 and 30 m sprint (T5 and T30), agility (T-test), maximal concentric isokinetic knee extensor (KE) and flexor (KF) strength (90ºs-1), and intermittent endurance performance (YYIET2; no YYIET2 data were collected in MID due to Club match commitments). The association of soccer players' performance-related parameters throughout the season was analysed by the Pearson correlation coefficients (R).

Results: The SCM, T30, KE, KF and dominant leg hamstring/quadriceps ratio (H/Q-DL) R coefficients were high ($p<0.05$) between the different assessment moments (r ranging 0.7-0.9). In YYIET2, agility, and non-dominant leg H/Q (H/Q-NL) a lack of correlation between some season periods were observed ($p>0.05$). Concerning T5 performance, only a moderate correlation was found between PPS and MID.

Discussion: Although some parameters were sensitive to change throughout the season (SCM, H/Q-DL, YYIET2 and agility), there were differences regarding athletes' performance in the different moments. The SCM, T30, KE, KF and H/Q-DL tests had individual stability through the season, as observed by the high values of R between the different occasions. However, YYIET2, agility, H/Q-ND, and particularly T5, showed a high intraindividual variation throughout the season. This is particularly relevant as acceleration (Cometi et al., 2001) and intermittent endurance (Bangsbo et al., 2008) are essential variables to soccer high performance. Also, individual instability in H/Q ratio suggests that this parameter should be often controlled. In conclusion, data suggest that the continuous assessment of performance-related parameters throughout the season is a fundamental tool in the development of training programs suitable to the specificity of players' performance dynamics.

References

Bangsbo J, Iaia F, Krustrup P. (2008). Sports Med, 38 (1) 37-51.

Cometi G, Maffiuletti N, Pousson M, Chatard J, Maffulli N. (2001). Int J Sports Med, 22 (1), 45-51.

Maia J, Silva R, Seabra A, Lopes V. (2002). Portuguese J Sports Sci, 2 (4), 41-56.

RHYTHMIC TRAINING AND PERFORMANCE IN FEMALE FUTSAL

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UNIVERSITY OF ROME

Introduction: Futsal matches are characterized by fast passing, shooting, intercepting, dribbling and free for making actions. In particular, to get "free for marking" the players need very complex technical capabilities in choosing the proper timing to anticipate the opponent, and in selecting the appropriate field zone for correctly realizing the skill (Nuccorini, 2002). Rhythmic training proved to improve the locomotor and jumping abilities of children (Derri et al., 2001; Zachopoulou et al., 2004) and the technical abilities of young tennis players (Zachopoulou & Mantis, 2004). Thus, the aim of the present study was to evaluate the effects a rhythmic training on the "free for marking" capacity of female futsal players following a rhythmic training.

Methods: Sixteen female futsal players (25±5 yrs) involved in the Italian First League "Serie A" 2006-2007 Women's Futsal Championship participated in this study. They were equally divided in the experimental and control groups. For 16 weeks the experimental group performed a rhythmic training twice a week during which futsal drills with or without ball were performed according to the music. The exercises and music varied every two weeks. The ratio between the "free for marking" and the total performed actions during three-minute matches was used to evaluate the players' futsal ability. A video-analysis was performed at the beginning and at the end of the 16-week experimental period. ANOVA for repeated measures was applied to evaluate the differences ($p<0.05$) between pre and post training performances.

Results: At the end of the 16 experimental weeks, the experimental group significantly ($p=0.01$) improved the "free for marking" ability (pre=58±21%; post=67±9%), while no significant difference emerged in the control group (pre=58±21%; post=61±5%).

Conclusions

For a futsal player "free for marking" is one of the most important capabilities, often crucial to positively conclude the attacking actions (Nuccorini, 2002). The present findings showed that futsal players could benefit from a rhythmic training to improve this specific skill, which strongly rely on timing (Zachopoulou & Mantis, 2001).

References

Nuccorini A. (2002). Società Stampa Sportiva Publ.

Derri at al. (2001). Phy Edu Sport Ped, 6, 16-25

Zachopoulou, E. & Mantis K. (2001). Phy Edu Sport Ped. 6, 117-126

Zachopoulou, E. et al. (2004). Early Childhood Res. Quar. 19, 631-642

EFFECT OF COMPLEX VS. REPEATED SPRINTS TRAINING ON REPEATED SPRINT ABILITY AND ATHLETIC PERFORMANCE IN YOUNG ELITE SOCCER PLAYERS

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Introduction: Repeated sprint (RS) ability (RSA) is related to maximal speed and metabolic-related factors (e.g., PCr recovery, H+ buffering) (Bishop et al., 2004). RS training has been shown to improve RSA in adult soccer (Bravo et al., 2008) and adolescent handball (Buchheit et al., 2008) players. Nevertheless, the respective impact of a strength/speed (aimed at improving maximal speed) vs. a 'metabolic' (aimed at improving the ability to repeat sprints) training program is unknown. Thus the aim of the present study was thus to compare the effects of strength/speed vs. RS training on RSA in young elite soccer players.

Methods: Fourteen elite male adolescents (14.5±0.5 y; Tanner Stage III = 8, IV = 6; 64.1±7.7 kg; 1.77±0.9 m; 9 h.week-1 + 1 game) were assigned to either complex (C; n=7) or repeated sprint (RS; n=7) training groups. During 10 weeks; C consisted in 4 to 6 series of 4 to 6 exercises (e.g., counter movement jumps (CMJ), depth and plyometric jumps, agility drills, standing start and shuttle sprints), each repetition interspersed with at least 45 s of passive recovery; RS training consisted of 2-3 sets of 5-6 x 15-20 m shuttle sprints (interspersed with 14 s of passive or 23 s of active recovery [≈2 m.s-1 (Buchheit et al. 2008)]). The groups performed either C or RS once a week and maintained similar external training programs. Before and after training, performance was assessed by a CMJ, a hopping test (Hop), 10 and 30 m sprint times (10m and 30m), and best (RSAbest) and mean (RSAmean) times on a repeated shuttle sprint ability test (Buchheit et al. 2008).

Results: After training, except for 10m (P=0.22), all performances were significantly improved in both groups (all P<0.05). Relative changes in 30m (-2.1±2.0 %) were similar for both groups (P=0.45). C tended to induce greater improvements in CMJ (16.9±12.9 vs. 8.7±4.5 %, P=0.08, ES=0.9) and Hop height (27.5±19.2 vs. 13.5±13.2 %, P=0.08, ES=0.9) height compared with RS. In contrast, RS training induced greater improvement in RSAbest (-2.90±2.1 vs. -0.08±3.3 %, P=0.04) and tended to enhance more RSAmean (-2.61±2.8 vs. -0.75±2.5 %, P=0.10, ES=0.70) compared with C.

Conclusion

Both complex and repeated sprint training regimens represent effective means to increase physical performance in young elite soccer players. Nevertheless, changes in performance are likely training regimen-specific, with repeated sprint training being more effective at improving running performance (i.e., RSA) and complex training more effective at improving jumping ability.

References

Bishop D. and Spencer M., (2004). J Sports Med Phys Fitness, 44, 1-7.

Bravo D. F., Impellizzeri F. M., Rampinini E., Castagna C., Bishop D. and Wisloff U., (2008). Int J Sports Med, 29, 668-74.

Buchheit M., Millet G. P., Parisy A., Pourchez S., Laursen P. B. and Ahmaidi S., (2008). Med Sci Sports Exerc, 40, 362-371.

THE EFFECT OF EXTERNAL RESISTANCE METHOD ON THE CHANGE OF ELITE FOOTBALL PLAYERS' SHOOTING SPEED

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Introduction: Speed abilities belong to the most difficult trained abilities within coordination abilities and therefore it is necessary to look for such methods, means and forms that are effective for their development (Bompa, 1999). The research objective was to find out about the effect of external supplementary resistance usage on the speed of elite football players' instep kick and to find out possible changes in kinematical parameters of the kick.

Methods

All players were professionals (n = 8, age = 24,0 ± 4,7 years, height = 179,5 ± 4,1 cm and weight = 70,4 ± 5,1 kg). The sample was randomly divided into resistance group (RG) and control group (CG). Ankle weight resistance (0 % or 1 % from the body weight of player) was an experimental factor. The usage of ankle band weight was applied 2x / week in speed load, or in technical training focused on shooting. There was 383 minutes when training with ankle band weights totally, which means 8,09 % of total load 4732 minutes. We observed maximum speed of the ball after the kick and the chosen spatio-temporal characteristics of the kick. To gain data we used 3D kinematical analysis and radar device STALKER ATS. From evaluative methods we used ANOVA RM 2 x 2, Bonferonni correction for multiple average comparisons, effect size and magnitude of increasing (Thomas and Nelson, 1996).

Results: We discovered significant relation between interaction of both factors (time x resistance) $F(1,6) = 9.73$, $p < 0.05$, η2 = 0.40. The main effect of time was also significant $F(1,6) = 8.89$, $p < 0.05$, η2 = 0.36. The level of speed of the ball after the instep kick increased in RG from pre-test values (M1 = 31.62 m/s, SE1 = 0.69 m/s) to post-test values M2 = 32.73 m/s, SE2 = 0.88 m/s), $F(1,6) = 18.62$; $p < 0.01$. From the point of view of effect size evaluation, middle effect was discovered ESRG = 0.63. The importance of intervention increase is MOIRG = 3.51 %. The speed of the ball in CG did not show changes between pre-test values (M1 = 32.01 m/s, SE1 = 0.69 m/s) and post-test values (M2 = 31.99 m/s, SE2 = 0.88 m/s), $F(1,6) = 0.01$; $p = 0.93$. Regarding mater-of-fact significance there was no intervention effect indicated in the difference between averages of input and output values of speed of the ball when ESCG = 0.01 and importance of increase MOICG = 0.09 %. We did not find changes during evaluation of kinetic structure of the kick in any group.

Conclusion

It appears that the external resistance method may positively influence the shooting speed and the supplemented resistance is not terminal as the spatio-temporal characteristics did not change.

References

Bompa TO. (1999). Periodization Training for Sports. Champaign: Human Kinetics.

Thomas JR, Nelson, JK.(1996). Research methods in physical activity. Champaign: Human Kinetics.

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PERCEIVED STRESS AND RECOVERY IN OVERREACHED YOUNG ELITE SOCCER PLAYERS

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Introduction: A disturbed balance between stress and recovery is considered to be the cause of overreaching. Monitoring the stress recovery balance might prevent athletes from symptoms such as fatigue and disturbed mood, eating and sleeping patterns (Nederhof et al. 2008). Since overreaching is characterized by sport-specific performance decrement (Meeusen et al. 2006), research is needed that relates measures of stress and recovery to performance decrement. Therefore, the goal of this study was to investigate if stress and recovery can be used as a tool to prevent overreaching in elite soccer players.

Methods: Stress, recovery and performance were prospectively monitored in 94 young elite soccer players during two competitive seasons. The Dutch version of the Recovery Stress Questionnaire for athletes (RESTQ-Sport) was used monthly to assess the stress-recovery state of players (Nederhof et al. 2008).

Performance was monthly assessed by means of a submaximal Interval Shuttle Run Test (Lemmink et al. 2004; Brink et al. 2009). Subjects with a heart rate increase ≥ 5 b•min-1 of four up to eight weeks were classified as overreached. A sports physician screened all subjects to exclude other causes of performance decrement.

Individual differences in perceived stress and recovery over the previous two months of eleven overreached soccer players and six controls were analysed (mean ± SD: Age (years) 17 ± 1, Height (cm) 176.56 ± 5.33, Weight (kg) 69.50± 6.06). Positive stress scores indicated increased stress, whereas negative recovery scores indicated decreased recovery.

Results: Mann-Whitney tests showed that there were no significant differences between overreached and control soccer players in general stress (mean± SD: 1.5 ± 4.0 vs. 0.5 ± 1.3), general recovery (-0.7 ± 2.1 vs. 1.2 ± 2.5), sport-specific stress (-0.1 ± 1.5 vs. -0.1 ± 0.3) and sport-specific recovery (0.3 ± 1.9 vs. 0.8 ± 2.6).

Discussion: The results demonstrate no differences in perceived stress and recovery between overreached and control soccer players. However, there is a tendency that overreached soccer players experience more stress and less recovery. The large standard deviation indicates that some players do not report changes in stress and recovery, despite performance decrement. Possible explanations are the relative young age of the players and different psychosocial awareness of team sport athletes. This should be kept in mind when using these subjective ratings.

References

Nederhof E, Brink M, Lemmink K. (2008). Int J Sport Psych 39, (4), 301-311.

Meeusen R, Duclos M, Gleeson M, Steinacker J, Rietjens G, Urhausen A. (2006) Eur J Sport

Sci 6, (1), 1-14.

Lemmink K, Visscher C, Lambert M and Lamberts R. (2004). J Strength Cond Res, 18(4), 821-827.

Brink M, Nederhof E, Schmikli S, Visscher C, Lemmink K. (2009) J Strength Cond Res, (accepted).

13:00 - 14:00

Poster presentations

PP-PP03 Physical Education and Pedagogics 3

WHAT DOES YOGA MEAN TO YOU?

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Introduction: In Norway, as elsewhere in the western world, there has been an increase in the number of people participating in yoga in recent years. Yet the reasons for the increase in popularity of yoga are unclear and this remains an under-researched area. Definitions of yoga embrace physical, psychological and spiritual notions of health and well-being and reflect a view of yoga as a way of life rather than simply a form of physical exercise. This suggests that there may be very many different reasons why people engage with yoga.

This small scale, qualitative research study set out to explore why yoga teachers engaged in the practice of yoga by exploring the meanings they attached to the activity.

Methods: Thirteen yoga teachers were asked to participate in the study by responding to the question: What does yoga mean to you? They were asked to write their responses down. Yoga teachers were chosen because they were likely to have established views on yoga through their commitment to their regular and frequent practice.

Results: Eight yoga teachers participated in the study. Their qualitative responses were analysed thematically in order to identify key themes in their narratives. Preliminary analysis revealed that yoga was important in their lives at quite a fundamental level. For example, participants linked their own personal development as something beyond themselves; as an offering to the rest of the world. Participants also gave expression to the view that it was an activity that related to their body, soul and mind and connected it to both physical and mental health. Furthermore, it was evident that yoga was seen in terms of transformation, elevation and liberation.

Conclusion: While it's obvious that yoga is essential and a big part of the lives for the yoga teachers, the next step will be to explore what yoga means to yoga students.

THE EXCELLENCE IN SPORT. A CASE STUDY OF A TOP-LEVEL VOLLEYBALL COACH.

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Introduction: During the last years, the interest in studying the excellent coach has increased (Jones et al., 2002). Janssen & Dale (2002) and Orlick (2008) talk about some interesting topics, even though they deserve further research. This way, it becomes urgent to further investigate this issue, so that it becomes possible to gather more data concerning the coach's interpretation of his own professional

experience, the principles which guide his actions and the meaning of his behaviors (Jones, 2007; Jones et al., 2003). The aim of this study was to identify the values and the references that guide Professor Percy Oncken, a Brazilian volleyball coach and winner of various world-wide championships, in his work.

Methods: The research technique used was 'life stories'(Tierney, 2000). The data was collected by carrying out in-depth interviews and non-participative observation. The technique used for data analysis was content analysis (Strauss & Corbin, 1998). The computer programme of qualitative data analysis QSR NVivo 7 was used in coding the transcripts of the interviews.

Results and Discussion: Among the concerns that have followed his life-long career, we can highlight his great passion for his profession, respect for athletes and determination when facing difficulties. In terms of ambitions, we can point out the will to do his best every day and to one day train senior athletes. He regards difficulties that arise as being indispensable to a process of perfection. Having deprived his family of his attention is what has distressed him the most. The most important moments of his career were when he achieved good results and the ones that generate more suffering are those when he dismisses players from the national team. In terms of his social intervention, he is concerned with permanently carrying out his work with great quality and fully developing athletes.

References

Janssen, J. & Dale, G. (2002). The seven secrets of successful coaches. Tucson, AZ: The Mental Game.

Jones, R. (2007). Coaching redefined: an everyday pedagogical endeavour. Sport, Education and Society, Vol. 12, nº 2, May, pp. 159-173.

Jones, R.; Armour, K. & Potrac, P. (2003) Constructing expert knowledge: a case study of a top-level professional soccer coach. Sport, Education and Society, Volume 8, Issue 2, October, p. 213-229.

Orlick, T. (2008). In pursuit of excellence (4th Edition). U.K. Human Kinetics.

Potrac, P.; Jones, R. & Armour, K. (2002). 'It's all about getting respect': the coaching behaviors of an expert english soccer coach. Sport, Education and Society, Vol. 7, Nº 2, pp. 183-202.

Strauss, A. & Corbin, J. (1998). Basics of qualitative research: techniques and procedures for developing grounded theory (second edition). London: Sage Publications.

Tierney, W. (2000). Undaunted courage: life history and the postmodern challenge. In: Denzin, N. & Lincon, Y. (Eds), Handbook of Qualitative Research (2nd ed.) (pp. 537-553). London: Sage Publications.

FORMER TRACK AND FIELD EXPERIENCES INFLUENCE BEGINNERS' POLE VAULT LEARNING

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Introduction: One of the key points beginner pole-vaulters must deal with is whether their dominant hand is in consonance with their opposite-side takeoff foot. This cross-dominance (CD) is an integral part of the vaulting technique. However, if an athlete is same-side dominant (SD), e.g., a right-handed athlete uses the right foot for takeoff in long/high jump, he has to either use the non-dominant hand for upper (dominant) grip on the pole, or execute the takeoff from the non-dominant leg. The objectives of this study were to gain information of the participants' subjective feelings about the effect of their former track and field experiences on the learning process, to investigate the learners' decisions on the bilateral hand/foot issue, and to highlight the chosen approach length of the run-up.

Methods

Ninety-one well-trained physical education university students (47 women and 44 men) participated in an eight-week/eight-lesson unit on pole vaulting. None of the subjects had previous experience in this event, but all of them were proficient in relevant track and field and gymnastic skills. During the lessons they participated in traditional learning drills, followed by commonly accepted short-approach (4-6-8-10 running strides) vault attempts, and finally, a short-approach pole vault competition (8-10 running strides).

Besides registering their vaulting results, a questionnaire was administer in order to find out the subjects' opinion about the relationships between their learning progression and initial motor skills in track and field and gymnastics, their decision on the dominancy of hand/foot, and their preferred approach length.

Results: By the end of the eight weeks the women averaged 2.10+-0.17m, men's average result was 236+-0.20m. Fifty percent of the subjects indicated that their former high jump experience had the greatest positive intertask transfer on their learning progression.

The long jump was named as the most important even by 38.9% of subjects. In addition, 83.3% of the subjects appointed jumping ability to be more important than gymnastic abilities. Twenty-three participants were SD, but only 4 reported difficulties choosing the takeoff foot-upper hand combination. Eighteen (78.3%) of SD decided to change their hand position and to do the takeoff from their long/high jump takeoff foot in order to obtain the proper technique, while 5 (21.7%) performed the takeoff from their non-takeoff foot. The majority of the subjects (61.5%) felt the 8 strides as the most effective length for their approach, while others (20.9% and 15.4%) preferred 6 and 10 strides, respectively.

BECOMING A GOOD COACH

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Good coaching does not necessary mean good, in the sense of an effective and successful coach who receives good results. Good can also be viewed as doing what is morally right.

It is argued that sports coaching should be understood as an everyday encounter (Jones, 2007) where the practitioner is fully immersed in the activity. This emphasizes the importance of the coach reacting to situational events, which comprises flexible adoptions to cognitive anticipations and situational happenings.

Sports coaching then is viewed as a deliberate practice that is not only depended on facts and explicit coaching skills, but also of personal judgements and decisions. Both the ¨how to coach¨ text book recipes and much of the scientific knowledge which support coaches' work builds on a technical means-to-an-end thinking. In this case the coach becomes a ¨technican¨ expert. But, the means are not neutral but value-laden and therefore interaction in sports coaching is thus not a neutral process of applying means to ends, but should rather be viewed as a value-laden practice¨. For example considering a few examples:

1. In many instances, the coach makes decisions in an ethical twilight zone where the performance of the individual athlete and the team must be balanced with the well-being of the athlete.

2. Athletes are subjected to the coaches' power and they may go far in order to gain recognition and goods from the coach (e.g. sacrifice their future health).

In these examples there will be no formula that can tell the coach how to act. Rather, each situation calls for ethical judgements by the coach.

The Aristotelian notion of phronesis is useful in order to understand more clearly the ethical challenges involved in professional judgement in coaching. Phronesis is a form of practical wisdom that balances knowledge of universals with a sound appreciation of the particulars of each case (cf. Gallagher, 1992). The characteristic feature of practical rationality is judgement, which is a crucial aspect to take into account when you navigate within the complexities and context-dependent features that are in play in the messy sport coaching landscape.

We will discuss the relevance of phronesis to coaching, and ask if and how phronesis can be learned and practiced by coaches. For Aristotle practical knowledge in general and phronesis in particular can only be learned by taking part in the practice one is concerned with. This should suggest that for a coach phronesis could be learned through some form of apprenticeship in sports coaching, through following ¨the good example¨.

References

Gallagher, S. 1992. Hermeneutics and education. New York: SUNY Press.

Jones, R.L. (2007). Coaching redefined: an everyday pedagogical endeavour. Sport, Education and Society, vol.12, no2, pp. 159-173

STUDY OF TIME DURATIONS: "THE TRAJECTORY OF THE BALL IN TEAM SPORTS AND HYPOTHESIS ABOUT ITS EFFECT ON PERCEPTION'

RAIOLA, G., AIELLO, P., SIBILIO, M.

UNIVERSITY OF CASSINO, UNIVERSITY OF SALERNO

Introduction: Sport teams have been the subject of various research concerning the quantitative aspects of performance, strength, endurance, speed, the technical aspects of gestures, biomechanics, motor control, qualitative tactical aspects as game scheme and the strategy as well as the educational issues for an appropriate teaching and training. We consider that these aspects can also help to build up a theory about training methodology in team sports. It has never been studied how the ball is touched by the body: grasp, throw, the reject of the ball and the time that it takes between two consecutive touches by two different players. These aspects have never been searched or tested on the game court although they are present in all team sports. This affects the dynamics of the game as well as the movement. Knowing how the ball is touched by the body and the relationship between the time and the space in different team sports is related to perception and its effects on training methodology.

Objective : Measuring the time displacement of the ball between two consecutive touched by two players including the contact time for different sport teams

Methodology : Video analysis of the matches of same rank. Performance analysis software and time measurement by statistics central index as mean and mode, comparing time distance and contact with ball in different team sports

Results: Volleyball has the first lower time, basketball has the second lower time, handball has the third lower time and finally football has the last time

Discussion: Rejection is a very fast movement , the fastest one among those that are usually performed in team sports. The information is taken and processed in mind very quickly and the response must be equally fast. The small size of the playing field decreases the time with which the ball moves.

Conclusion : In order to correctly analyze the phenomenon, it is required to deepen the main theories on motor control. We need to take into account perception, aspects and include team sports training methodology.

References

Schmidt R.A., Wrisberg C.A.(2008), Motor learning and performance, Human Kinetics, USA

Latash M. (2008), Neurophysiological basis of movement, Human Kinetics, USA

Iacoboni M.(2008) Mirroring People. The new science of how we connect with others, Farrar Straus & Girox, USA

GYMNASTICS ACTIVITIES: A PROPOSITION OF ACTIVITY PHYSICAL ABOUT TO CHILDREN OF 4 THE 6 YEARS OLD

NABEIRO MINCIOTTI, A., OBARA, M.L.B., VOLPI, M.M., SOUZA, S.P., SANTOS, T.V., MAIO, L., GARE, T.R., ARAÚJO, L.M., SÁ, C.S.C.S.

UNIVERSIDADE MUNICIPAL DE SÃO CAETANO DO SUL

Introduction: The infancy is the period what the child develops at every the dimensions (motor, physics, affective, social or cognitive). The quality from the experiences lived by children this period they'll determine of certain forms, the adult on which they if they'll become. The gymnastics activities are practices beneficial about to the persons at every the period of life. On first infancy they contributory on encouragement and development from the body movements and the functions all-important, just as on skill control and body dominate in different situation and on acquisition of standards basic of movement. Owing to the multiples factors what can step in on performance motor of jobs of life diary, it works and/ or activities sporting realized for children this study object observe the influence from practice of gymnastics activities into the development motor of children among 4 the 6 years old.

Method: Twenty eight children between 4 and 6 years old, both the types from community of São Caetano do Sul have been appraised based on the Protocol of tests of balance and coordination (Lefêvre, 1976). After the appraisals initial the children they performed the practice gymnastics twice a day week with one hour of duration each class for 3 months. The practice gymnastics offers activities focused about to the development from the capacities physics, skills manipulativas and the parts gymnastics (stars, rolls, forwards, backwards, round off, flic flac, among another). The finish from the 3 months the children have been reappraising. For each test, observed the success or failure comparing the two appraisals.

Results and Discussion: The tax of success on the tests of balance static and dynamic was of 70% initially at every the ages, inferior the 75% description for Lefévre (1976). After the practice gymnastics observed 100% of success on the states tests for all the ages. The results indicates the importance from activity physical into the daily from the children for the purpose of develop the capabilities physics , skills manipulativas and bring up a lifestyle more healthy for the child.

References

Lefévre, A. B. (1976) Exame neurológico evolutivo. São Paulo: Savier.

A PROGRESSIVE APROACH TO MAP COMMUNICATION WITH CHILDREN - THE USE OF HAND-DRAWN MAP

GRÆSLI, J.A., BJERVA, T., SIGURJÓNSSON, T.

HEDMARK UNIVERCITY COLLEGE

Introduction: The ability to interpret map symbols and understand the relationships between maps and terrain is to a high degree a complex activity. It includes a number of sequences of processes that have not sufficiently been explored (Keates, 1996, Sigurjonsson, 2007). Progress in education within this topic has not sufficiently been based on how children can benefit from different maps. (last sentence difficult to intgerpret)

Methods: The results presented in this context ARE quantitative data related to the use of EMIT (electronic timer system). The task was to find 7 controls on the basis of a hand-drawn map. The children should decide in what order they would find the controls. The study involved 106 children, 53 boys and 53 girls, aged 5 to 12 years. The selected area was near a primary school. None of the children in the study were pupils at this school. This paper grew out of a larger project which includes both other quantitative data and qualitative data through participatory observation, where the children were shadowed in the terrain.

Results: Among 5-year-olds 17 out of 41 children found all the 7 controls. Furthermore 21 out of 30 children in lower primary school, and 26 out of 28 children in upper primary school completed the task. In the group with 5-year-olds who mastered the task, we find no clear strategies in relation to the order in which controls are found. Among pupils in lower and upper primary school, the results show that the children to a greater degree considered appropriate route choices. Among 5-year-olds who mastered the task, There are 47% boys and 32% girls. In the lower primary stage 85% of girls and 65% of boys mastered the task and on the upper primary stage there are no gender differences.

Discussion: The results show that children far down in the age group mastered expected complex tasks when they where presented with simple aids (Blades & Roberts, 2000, Sigurjónsson, 2007). The difference from the youngest children to the older is that a greater proportion of the older kids master the task. The data indicate an incremental development in mastery of the task. From 5 to 6 years there is a clear decline, while there from 6 to 8 years are no significant changes. Similarly, there is a clear distinction between the 8-year-olds and the 10-year-olds, while there are no differences between 10-year-olds and 12-year-olds. The results show minor gender-related differences among the smaller children.

References

Blades, M. & Roberts, K. (2000). Children's source monitoring.

Keates, J. S. (1996). Understanding maps.

Sigurjónsson, T. (2007). Barns kartlesing.

A PROGRESSIVE APROACH TO MAP COMMUNICATION WITH CHILDREN - THE USE OF DETAIL-PHOTO

BJERVA, T., GRÆSLI, J.A., SIGURJÓNSSON, T.

HEDMARK UNIVERSITY COLLEGE

Introduction: The ability to interpret map symbols and understand the relationships between maps and terrain is to a high degree a complex activity. It includes a number of sequences of processes that have not sufficiently been explored (Keates, 1996, Sigurjonsson, 2007). Progress in education within this topic has not sufficiently been based on how children can benefit from different maps.

Methods: The results presented in this context are quantitative data related to the use of EMIT (electronic timer system). The task was to find 10 controls on the basis of detail-photo distributed in two sets of 5 photoes. The first set was assumed easier, and the controls were initially closer. The study involved 106 children, 53 boys and 53 girls, aged 5 to 12 years. The selected area was near a primary school. None of the children in the study were pupils at this school. This paper grew out of a larger project which includes both other quantitative data and qualitative data through participatory observation, where the children were shadowed in the terrain.

Results: Boys (5-year-old) using on average 67 seconds to find the controls in the first set and 90 seconds in the next. The girls are using respectively 65 and 97 seconds. For boys and girls who are 6-year-old, the time has decreased to 39 and 42 seconds on the first set, and 67 and 64 seconds on the next. 8-year-old uses 37 and 67 seconds (boys) and 38 and 64 seconds (girls). The 10-year-olds have decreased the time to 21 and 33 seconds (boys) and 24 and 32 seconds (girls). Finally 12-year-olds uses 20 and 30 seconds (boys) and 24 and 30 seconds (girls). The boys in total spent an average of 37 (set 1) and 58 seconds (set 2). The girls spent an average of respectively 38 and 57 seconds.

Discussion: The results show that children far down in the age group mastered expected complex tasks when they where presented with simple aids (Blades & Roberts, 2000, Sigurjónsson 2007,). The difference from the youngest children to the older is consumed time per task. The 5- year-old spend, on average, nearly twice as much time in relation to pupils in the lower primary school. Pupils in the upper primary school using additional third less time per. task than the pupils in the lower primary school. The data indicates an incremental development in the time spent per. control. From 5 to 6 years there is a clear decline, while there from 6 to 8 years are no significant changes. Similarly, there is a clear distinction between the 8-year-olds and the 10-year-olds, while there are no differences between 10-year-olds and 12-year-olds. The results show no gender-related differences.

References

Blades M & Roberts K (2000) Children's source monitoring.

Keates J S (1996) Understanding maps.

Sigurjónsson T (2007) Barns kartlesing.

THE QUALITY OF TEACHING GYMNASTICS IN THE 7 TO 9TH GRADES OF ELEMENTARY SCHOOLS IN SLOVENIA

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In Slovenian elementary school curriculum, the gymnastic contents of physical education (PE) are defined. The aim of our study was to assess quality of the implementation of gymnastic curriculum at the PE in the last three years of elementary schools.

One houndred fourty-seven PE teachers involved in active teaching in the study year 2004/2005 were recruited to the study. The selection of recruited PE teachers was representative for Slovenian population. They were instructed to answer the questionnaire with 25 questions

divided in 4 main topics: socio-economical indexes, opinions about curricular gymnastic contents implementation, opinions about the work at specific school and opinions about minimal and optimal conditions for teaching gymnastics. Three and five point Likert's gradation was used to grade the answers. Also, there were yes/no questions and questions of the open type (a written answer) present in the questionnaire.
The majority of PE teachers expressed highly positive opinions about the presence of gymnastics in the physical education curriculum: they believe it is important and of positive impact for the psycho-physical development, it helps develop the sense of altruism, persistence and creativity and encourages mutual assistance, and it does not induce aggression. Despite this, teachers in average only performed 9.8 hours of gymnastics (out of 70 hours total per year) predominantly without performing the full curricular gymnastic content with pupils. Teachers ascribed the low rate of full gymnastics content realisation to poor material conditions, insufficient pupils' physical fitness and inappropriate curriculum (inappropriate gymnastic elements). According to the questionnare results, all these factors came before the teacher-dependent reasons (knowledge, motivation, lack of confidence at assisting with gymnastic elements).
According to this results, we conclude that there are diverse and numerous reasons for insufficient gymnastic teaching in elementary schools. Only in part could this problems be solved with a better continuing PE teachers' education and motivation. Especially as regards to the insufficient pupil physical fitness it is a fact, that they are often the consequence and not the reason of inadequate PE curriculum implementation. However the material conditions could also be improved to better perform the gymnastic contents of the curriculum.

SWIMMING ABILITIES ARE NOT ENHANCED BY USING A FLOTATION SUIT FOR ADVANCED BEGINNERS IN DEEP WATER SWIMMING TEACHING

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NORWEGIAN SCHOOL OF SPORT SCIENCE

Introduction:
There are few empirical data on the effect of using flotation aids in swimming teaching. Flotation aids, such as body suits - giving extra buoyancy, may have advantages: a safer child, more able to do exercises on their own, independently of the teacher, and possibly increasing the activity level. Disadvantages of using flotation aids in general are that children become dependent on the aid, not learning to float free and independently, and that self confidence of learning to swim unaided is not developed.
Purpose: The purpose of this study was to investigate the effect of wearing a flotation suit on swimming, arm stroking and leg kicking performance of children in a learn-to-swim program.
Methods: Ninety-nine (99) children, with previous swimming school experience, but not yet able to swim, were taught swimming once a week for ten weeks. Each group were randomised to use flotation aids (FL, n=40, mean age 7.4±1.1 years) in the form of a flotation suit, or to not use the suit (CON, n=59, mean age 7.4±1.0 years). The reported previous beginner-swimming teaching experience was 3 or 4, 10 hour courses for the CON or FL respectively ($p<0.03$). FL did also exercises at the end of each lesson without the suit to enhance their unaided abilities. Their skills after 10 lessons were observed through video recordings, using a modified Aquatic readiness assessment test (Langendorfer and Bruya 1995) with tagging of events in the Dartfish software. Combined swimming, leg kicking, arm recovery and arm propulsion were evaluated on a score ranging form 1 (no performance) to 5 (advanced skill). Additionally the leg kicking velocity was measured both pre and post intervention by use of a swimming velocity meter.
Results: The mean scores were for combined swimming 3.0±0.6 and 3.1±0.9, arm propulsion 2.6±0.5 and 2.7±0.5, arm recovery 2.2±0.7 and 2.3±0.7 and leg kicking actions 3.4±1.0 and 3.5±0.8 for FL and CON respectively (NS). Leg kicking velocity improvement (pre to post test) were 0.03±0.1 and -0.03±0.3 m/s for FL and CON respectively (NS). The inter observer reliability for combined swimming abilities were 86% exact agreement, and a Chronback's Alfa coefficient for reliability using the 4 skills were 0.87.
Discussion and Conclusions:
The results show that for none of the four skills, no statistical differences in performance existed after a 10 lesson course using a flotation suit compared to the control group. This finding is supported by the leg kicking speed measurements where there were no differences in improvement for the two groups. The results does thus not support a hypothesis of enhanced effect of using a flotation suit during swimming teaching for advanced beginners in a deep water setting.
References:
Langendorfer SJ, Bruya LD. (1995). Aquatic readiness: Developing water competence in young children. Champaign, IL: Human Kinetics

13:00 - 14:00

Poster presentations

PP-RE01 Rehabilitation 1

EFFECT OF THE WII SPORT BOXING VIDEO GAME ON HEART RATE IN CARDIAC PATIENT.

BLANC, P.
CENTRE DE REEDUCATION SAINTE CLOTILDE

Physical exercise is an important part of the rehabilitation (CR) program in cardiac patients. The new generations of active video games allow performing various recreational sport activities at home. However, the cardiac impact of virtual sport activities has been poorly investigated.
The purpose of this prospective study was to analyze the heart rate (HR) response of cardiac patients while playing a commercially available gaming system: Wii sports boxing game software.
27 voluntary patients (5 women, 22 men, mean age 50.6 +-13.3 years old) were included in the study after completion of a 6 week cardiac rehabilitation (CR) program. Causes of admission in CR were: percutaneous transluminal angioplasty (33%), coronary artery bypass grafting (19%), valve replacement (15%), dilated cardiomyopathy (11%), other (22%). Patients performed an exercise testing (ET) with gas exchanges measurement at the end of the CR program and before playing video game. The exercise testing allowed the determination

of the ventilatory threshold HR and the maximum HR. Participants played competitive boxing matches for 15 minutes, as recommended by Nintendo, with a five minute warm up. HR was recorded using a polar system (S610i) whilst playing Wii sports boxing and compared to ET measures. All participants had not previously used Wii and consented to the study.

During virtual sport activity, mean HR was 106+/-25 bpm and maximum heart rate was 190 bpm. Throughout the HR recordings, 49 +- 35 % of the game (8.24 min +- 6.22) was performed with a HR above the ventilatory threshold HR (107.0 +/-17.6 bpm). Finally, HR was higher than the ET maximum HR during 9% +- 16% of the game (1.52 min +-3.22).

Conclusion: In this preliminary study, the main part of the Wii sports boxing game lead to an HR above the anaerobic threshold, implying an important demand on anaerobic metabolism. Consequently, caution should be recommended to cardiac patients before playing virtual sport activities on video game.

THE IMPORTANCE OF THE CARDIOLOGY PREVENTION AND REHABILITATION IN THE MIRROR OF AN EXPERIMENTAL PROGRAM

NOÉ, J., DÓSA, A., PAVLIK, G.

SEMMELWEIS UNIVERSITY BUDAPEST AND UNIVERSITY OF PANNONICA AND FOURMED LTD VESZPREM

Introduction: Unfortunately there's a rising tencency in our contrys int he cardiology particulalry illnesses following previal (obesitas, DM, etc.). The curing three of its keystones, the classic triple partition is becoming interwoven (prevention, curing, and rehabilitation) today already it's a new thought. Though particulalry the prevention has the importance to call the attention, since the preventions possibly the most effective mannee for the rehabilitation.

Methods: The filtration, prevention, kinesitherapy present the opportunities of the linking of a treatment and aftercare in FourMed Ltd and program drawn up by the colleagues of PE Department University of Pannonica. Inside the framework of this the patients after he filtration (anamnesis, calmness and load examination with a bicycle Ergoline, with the Bruce protocol, risk factor research, then regular medical check) are collaborating whit the therapists actvely individuals, continuosly monitoring kinesitherapy trainings are made.

Results: For the most important result int he program because of the beginnings had bought the considerable improvement of the values of one (two years observing, weekly 3-4 times 45-60 minute trainings making his case) may consider, but very important to mention this finding, the forming of ther lifestyle, their health-conscious behaviour to the new patients optimal motion program, on which longer distance the decrease of the risk factors, easier stress treatment and –may serve having patience, calmer manner of living.

Summary: The improvement of the oxidative capacity at the weekly ones training 3 times under 5 weeks 50% was (rel.VO2 before a training 26,5, after a training=39,7 ml/kg/min). Who made an aerobic training two times weekly, 35%-kal the result was right. A calmness pulse and the blood pressure values improved. The patients reported on calmer sleep and the easier solution of the stress situations. Their better Latvian general general condition and their metabolism accelerated, the calorie input and consumption returned to normal. The anxiety decreased, the creativity increased. The parasympathetic tone and HR intensified variability, because decrease the risk of the sudden heart death.

Of the distinguished opportunities reduction of the cardiovascular risk factors the pulse control with the POLAR watches and personalprogram with aerobic (cardio) training, at least weekly 2-3 times, in an optimal case with 4-5 times weekly. Finally it's worthy to deliberate the economic viewpoints, believes for example the society gets reimbursed for each single dollar spent on this sixfold int he USA.

References:

Zallel J, (2004). Cardiologica Hungarica 34. S45-48.

Gaziano JM, Manson JE, Ridker PM. (2001) Heart Diseases 6th ed. Phil.:W.B. Saunders 1040-1065

American Herat Assostiation (2003) Stat.Fact Sheet-Populations.

Neumann N.U., Frasch K, (2008) Orvostovábbképző Szemle 3. 74-78.

Boniface DR, Cottee MJ, Neal D, Skinner A, (2001) Public Health 115.246-252

Steefen LM, Arnett DK, Blackburn H, et al.(2006) Med.Sci Sport Exerc 3.598-608

VARIATIONS IN ISOKINETIC STRENGTH LOSS FOLLOWING PLYOMETRIC EXERCISE

TWIST, C.

UNIVERSITY OF CHESTER

Introduction: A reduction in maximal voluntary isometric force is considered to be one of the most appropriate indirect markers of exercise-induced muscle damage (EIMD) (Warren et al., 1999). Although isometric force loss is known to demonstrate large between subject variations following eccentric-biased exercise (Hubal et al., 2007), the variations in isokinetic strength loss are less clearly understood. Furthermore, there is little known about the inter-subject responses to force loss induced by modes of eccentric-biased exercise commonly adopted in athletic training. Therefore, the purpose of this study was to investigate the variations in isokinetic strength loss following plyometric exercise.

Methods : Following ethical approval, 16 participants (age 21.9 ± 2.4 y, stature 1.76 ± 0.1 m, body mass 70.6 ± 11.2 kg) volunteered to participate in the study. Participants were recreationally active and had no history of resistance training in the previous 6 months. Peak isokinetic torque of the knee extensors was measured at 60 deg/s. In addition, perceived muscle soreness was recorded on a 0–10 visual analogue scale. All measurements were taken before and then at 24 and 48 h following 10 x 10 countermovement jumps. A cluster analysis of peak torque data at 48 h was used to objectively establish high (HR) and low responders (LR) to plyometric exercise.

Results: At baseline isokinetic strength was not significantly different between HR (n = 6; 207.9 ± 12.9 N•m) and LR (n = 10; 168.8 ± 20.2 N•m) (P>0.05). Although there were no differences between groups in body mass or age (P>0.05), stature was significantly higher in the HR group (t = -2.847, P<0.05). Moreover, sex distribution between groups was different (LR: 67% females cf. HR: 10% females). Consistent with the objective grouping, there was a significant group by time interaction for peak isokinetic torque (F=78.1, P<0.05). Reductions in isokinetic peak torque for HR was 22% (range 17-34%) and for LR 7% (2-14%). However, there was no difference in perceived muscle soreness between groups represented by the non-significant group by time interaction (F = 0.173, P>0.05).

Discussion: The results suggest that inter-subject variations in isokinetic force loss occur following plyometric exercise, even though no differences exist between HR and LR in the subjective markers of perceived muscle soreness. However, sex distribution might explain some of the observed variations, with a larger proportion of males in the HR group. In addition, the magnitude of relative force loss appears to be lower for both HR and LR compared to those previously reported for isometric strength (Hubal et al., 2007).

References

Hubal MJ, Rubenstein SR, Clarkson PM. (2007). Med Sci Sports Exerc, 39, 461–468.
Warren GL, Lowe, DA, Armstrong RB. (1999). Sports Med, 27, 43–59.

CONTRALATERAL CHANGES IN RANGE OF MOTION FOLLOWING UNILATERAL PROPRIOCEPTIVE NEUROMUSCLAR FACILITATION STRETCHING.

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UNIVERSITY OF BEDFORDSHIRE

Background: Carrol et al.'s (2006) meta-analysis indicates that unilateral resistance exercise will elicit strength gains in the unexercised contralateral limb at about 50% of the gains measured in the exercised limb. They suggest two forms of increased motorneuron output as likely routes to this contralateral gain: "spillover" from the central control mechanisms from the exercised to the unexercised limb; and, adaptations in the exercised limb that may be "accessed" by the unexercised limb. The present study was undertaken to test the hypothesis that the spillover effect may be present in proprioceoptive neuromuscular facilitation (PNF) stretching techniques allowing for contralateral gains in range of motion (ROM) from unilateral PNF stretching.

Methods : Thirty-six screened participants (F = 15) attended a familiarization and MVIC testing session and two, counterbalanced, experimental sessions. One experimental session consisted of the application of post-isometric relaxation (PIR) PNF: straight leg raise (SLR) to first point of bind, build from 30 to 70% of MVIC over 5 seconds, hold 70% MVIC for a further 7 seconds, draw to new point of bind, hold for 12 seconds; repeat cycle a further 2 times. Isometric contractions were resisted by an anchored strap with a strain gauge in-line for real-time %MVIC feedback. The second experimental session consisted of 3 unresisted SLR to point of bind, 24 seconds apart. ROM of both limbs were measured using a liquid goniometer pre-intervention and after each of the three experimental cycles. EMG was measured in the homologous muscle of the contralateral limb to measure level of concurrent (in)activity.

Results: Three participants were excluded from analysis: 1 due to injury and 2 due to EMG signals in excess of 2 SD above baseline, indicating concurrent contraction. No significant changes ($p = 1.000$) were found in the ROM of either limb for the unresisted SLR session. The limbs that underwent the PIR-PNF protocol showed significant increase in ROM (mean diff = 11.2 degrees; $p < 0.0001$). A lesser, but still significant, increase in ROM was also seen in the 'dormant' contralateral limb (mean diff = 5.9 degrees; $p < 0.0001$).

Discussion: The significant change in ROM in the unstretched contralateral limb indicates that some degree of neurological crossover had occurred. This may indicate a spillover of: GTO induced relaxation; suppression of muscle spindle fibre activation; and/or, alterations to the participants' stretch perception. These findings may have application in rehabilitation settings where stretching of one limb may be restricted by injury; some degree of flexibility may be maintained, decreasing the time necessary to return to full ROM once the injury has healed sufficiently to undertake direct rehabilitation.

References

Carrol TJ, Herbert RD, Munn J, Lee M, Gandevia SC. (2006) Contralateral effects of unilateral strength training: evidence a possible mechanisms. J Appl Physiol 101:1514-1522.

THE INFLUENCE OF AGE-RELATED CHANGES IN TACTILE SENSIBILITY AND MUSCULAR STRENGTH ON HAND FUNCTION IN OLDER ADULT FEMALES

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GRADUATE SCHOOL OF BIOMEDICAL SCIENCES, NAGASAKI UNIVERSITY

Introduction: The effects of aging on motor function include a marked decline in strength and muscle mass, leading to impairments of mobility and activities of daily living. Aging also affects human hand function. For example, a decline in manual dexterity often accompanies old age. This decline corresponds to age-related changes in muscle and/or tactile functions. This study investigated whether age-related changes in muscular strength and tactile sensibility are related to hand function in older adults.

Methods: The subjects were 49 older adult females (young-old, 27 females, 68.8 ± 3.7 years; old-old, 22 females, 80.2 ± 3.0 years). Hand function was assessed using the Perdue pegboard test. Handgrip strength was measured using a handgrip dynamometer. Tactile-pressure threshold on the distal palmar pad of the index finger was evaluated using Semmes-Weinstein monofilaments.

Results: Scores on the Perdue pegboard test showed significant differences between the two age groups ($p < 0.01$) and decreased with age. Tactile-pressure threshold was augmented with increasing age ($p < 0.05$), whereas handgrip strength did not differ between the two age groups. There was a significant relation between the Perdue pegboard test score and tactile-pressure threshold ($r = -0.513$), but not handgrip strength ($r = 0.255$).

Conclusions: These results suggested that manual dexterity in hand function was attenuated with increasing age. We considered that this attenuating effect was associated with a decline in tactile sensibility rather than a change in the muscular strength of the hand.

INFLUENCE OF LEG AND HIP STRENGTH ON LOWER BODY INJURIES IN ELITE SNOWBOARDING

PLATZER, H.P., RASCHNER, C., PATTERSON, C.
UNIVERSITY OF INNSBRUCK

INTRODUCTION: The overall injury incidence was 1.3 injuries per 1000 runs in the snowboarding FIS World Cup season 2002/2003 (Torjussen and Bahr, 2006). The most common injury location was the knee (18% of all acute injuries). Physical fitness is important for snowboard performance (Platzer et al. 2009), and could be a factor in injury prevention. The aim of this study was to determine the influence of different leg strength parameters on lower body injuries in elite snowboarders.

METHODS: 27 elite Austrian snowboarders took part in this study. The subjects mean values±SD for age, height and body mass were 24.1±4.8 years, 172.6±8.3 cm and 67.1±10.3 kg. All injuries in the season 2007/2008 were recorded during an interview. Concentric and eccentric leg/hip strength and power for flexors and extensors were measured on a Contrex leg press (closed kinetic chain). For statistical analysis t-tests were used to investigate differences between injured and non-injured athletes and to analyse the variation of strength and power between left and right leg/hip. A Phi test was used to correlate gender and standing position with the occurrence of injuries.

RESULTS: In the comparison of front and back legs, all athletes' back legs had greater absolute and relative eccentric strength and power ($p<0.01$) and lower H/Q-ratios ($p<0.05$). The back legs of the injured group were weaker in relative leg/hip extension ($p<0.05$) and had higher H/Q ratios than the non injured group ($p<0.05$). Injured athletes showed higher bilateral asymmetry in concentric leg/hip exten-

sion (p<0.01). There were no group differences in test front leg variables or in leg flexion (p>0.05). The Phi test did not show any correlation between gender (Phi=-0.031, p>0.05) or standing position (Phi=0.324, p>0.05) with lower body injury rate.

DISCUSSION: The results indicate that relative leg/hip extension strength may be important in the prevention of lower body injuries. Eccentric strength is important in the compression phase of the turn in slalom and giant slalom and landings in freestyle and snowboard cross events. The H/Q ratios in the injured group were better, but this could be due simply to the fact that the injured group was weaker in extension and similar in flexion strength. Athletes in alpine sports such as snowboarding and skiing typically have strong quadriceps and often neglect hamstring training. In conclusion, relative leg/hip strength and bilateral leg strength balance are beneficial in preventing lower body injuries.

REFERENCES

Platzer HP, Raschner C, Patterson C (2009). Comparison of physical characteristics and performance among elite snowboarders. J Strength Cond Res, in press.

Torjussen J, Bahr R (2006). Injuries among elite snowboarders (FIS Snowboard World Cup). Br J Sports Med, 40:230-234.

14:00 - 15:30

Oral presentations

OP-ST03 Sports 3

PROPELLING EFFICIENCY IN MASTER SWIMMERS

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UNIVERSITY OF VERONA

INTRODUCTION. When the swimming records in master competitions are evaluated, it becomes apparent that performance (e. g. maximal speed, vmax) decreases steadily as a function of age. In Italian front crawl swimmers the decrease is of about 0.2 m/s every 10 years of age in short distance (50 m) races and of about 0.1 m/s every 10 years of age over long distance (800 m) races. AIMS. The aim of this study was to investigate if this decrease could be related to a decrease in the propelling efficiency (ηP) of the arm stroke. This work stems from a previous study [1] where this parameter was investigated in children and adults (9-59 yrs of age) of good technical skill but where the adult swimmers were not attending master competitions. SUBJECTS. 61 male master swimmers were tested. They were divided into 4 classes of age: M1: 20-29 yrs (25.9±3.2, n = 17); M2: 30-39 yrs (34.8±2.7, n = 22); M3: 40-49 yrs (44.3±3.1, n = 12); M4: 50-59 yrs (54.1±3.0, n = 10). No major differences in the anthropometric characteristics were found in these subjects even if stature tended to decrease (1.81 vs. 1.77 m) and body mass to increase (72 vs. 78 kg) from M1 to M4. PROTOCOL. The subjects were asked to swim a 25 m pool length at constant speed and to repeat the swim at six different, incremental speeds (from slow, to moderate, to maximal). During each trial, average speed (v) and stroke frequency (SF) were measured in the middle 10 m of each lane. The distance per stroke (DS) was calculated from the ratio v/SF and ηP was estimated according to the simple model proposed by [2], on the basis of values of v, SF and of the shoulder to hand distance. RESULTS. The values of v (1.48, 1.42, 1.34, 1.06 m/s), SF (0.87, 0.86, 0.85, 0.69 Hz) and DS (1.74, 1.70, 1.61, 1.52 m) attained at vmax (in M1, M2, M3 and M4, respectively) show a steady decrease as a function of age. In M1, M2 and M3 both DS (1.9-2.0 m) and ηP (0.28-0.30) show a plateau at slow to moderate speeds whereas in M4, DS and ηP show a continuous decrease with increasing speed and are, even at their top (1.7 m and 0.23, respectively), lower than in the other classes of age. DISCUSSION. Between 20 and 50 yrs, ηP at vmax decreases of about 2% per decade (the decrease in vmax is similar: about 3% per decade). Between 50 and 60 yrs, ηP decreases to a larger extent (about 14%) yet less than the decrease in vmax (about 21% in this decade). This suggest that in masters up to 50 years of age the decrease in performance can be essentially attributed to a decrease in propelling efficiency but that, after this age, also other factors should be taken into account to explain the decrease in swimming performance.

REFERENCES

[1] Zamparo P, DR Pendergast, J Mollendorf, A Termin, AE Minetti. (2005) An energy balance of front crawl. Eur J App Physiol 96: 459-470

[2] Zamparo P (2006) Effects of age and gender on the propelling efficiency of the arm stroke Eur J App Physiol 97: 52 – 58

COMPARATIVE METHOD TO ESTIMATE PROPELLING ABILITY

KARSAI, I., SILVA, A., GARRIDO, N., LOURO, H., LEITAO, L., MAGYAR, F., ÁNGYÁN, L., ALVES, F.

UNIVERSITY OF PÉCS

INTRODUCTION: Producing propelling force in an efficient way in the right swimming direction is one of the key factors in competitive swimming. During the action the extremities of the swimmer give energy to the water molecules to accelerate them, to generate flow around and along the hand-arm complex to achieve the highest pressure difference in the right time and space. There are differences in morphological and physical characteristics between swimmers and there is an infinite number of possible motion variations to perform the crawl arm stroke. Difference should exist between swimmers, and in the way they can exploit the potential of the fluid environment. Direct force measurement is impossible during free swimming and the analitical investigations up to date did not provide a useful method to calculate the force production, therefore a special approach is necessary to express the level of the propelling ability.

METHODS: 8 internationally recognised male swimmers (19,8 ±0,9 yrs, 73,9 ±6,0 kg, 181,7 ±5,5 cm) were asked to perform the non-breathing, only arm task on a special device which recorded the force (f=200). The legs were tied and supported. The starting frequency (FR) was set at f=0,5 Hz and was increased with f=0,083 Hz steps till the swimmer could maintain the stabil rhythm. 4 underwater cameras (50 Hz) were used to record the kinematic parameters and the APAS system was employed to calculate the 3D data for the analysis. Reference forces were calculated based on anthropometric and kinematic data with a 3-segment simple model concerning the drag equation without the C value and a projection to the swimming direction were related to the measured force data. The Pearson correlation was employed between the 100m sprint velocity and the result to test the suitability of the method.

RESULTS: The main force at the starting FR were 50,6 ±21,9 N. The force production increased almost in a linear fashion and peaked at the f=0,65 Hz: 76,2 ±24,5 N and dropped considerably at the highest FR value. The ratio between the measured and the reference force

at the starting FR: 2,04 ±0.68 the value is almost constant for the individuals across the FR increments, with a little peak around the 3rd step. Free swimming velocity was measured in 100m distance v=1.92 ±0.07 m/sec. The study showed significant correlation between the calculated ratio and the velocity swam in 100m (r=0.749, p<0.05).

DISCUSSION: The measured force difference caused by the unsteady effects of this dinamic experimental setup showed a litle higher value as it was reported by other experimental and analitical studies (CFD), where the quasy-steady and unsteady effects were investigated.

The result indicates that this method fits the requirement to estimate the propelling ability of individuals, whereas the result can provide the magnitude which can differentiate between swimmers but not the way they do it.

DOES THE KICK FREQUENCY AT THE SURFACE AFFECT THE PHYSIOLOGICAL RESPONSES IN INTERNATIONAL MONO-FIN-SWIMMERS ?

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1. UFR STAPS, UNIVERSITÉ DE TOULON-VAR, LA GARDE, FRANCE, 2. IMNSSA, HÔPITAL ST ANNE, TOULON, FRANCE

Introduction: The criteria which determine the relationship between the energy demand and the movement pattern in terrestrial activities depend strongly on the locomotion mode (Cavanagh & Williams, 1982; Marsh & Martin, 1997). In the context of aquatic locomotion, a great fraction of the energy demand is utilized to overcome drag. In monofin-swimming during which the subject produces continuously local forces during up and down movements at the surface from his fin, it has been hypothesized that one of the variables on which swimmers can work for improving performance is the kick frequency (Nicolas et al., 2007). The large variations of this parameter might affect the propelling characteristics at the surface and thereby, the drag and the associated energy demand. The objective of this study was to evaluate the effect of kick frequency on the energy demand and physiological responses induced in monofin-swimmers of international calibre.

Methods: Eight international monofin-swimmers (mean age: 18 ± 2.5 yr; mean weight: 70.5 ± 9 kg; mean height: 171 ± 8.8 cm) completed two testing sessions in a 50-m outdoor swimming pool. The first session consisted of a maximal test performed on a distance of 600-m in order to determine the oxygen uptake at the end of exercise (i.e. VO2 600m) but also, the mean speed obtained on the test (V600m). The second session was performed at a constant swimming intensity of 90% V600m composed of five bouts at different kick frequencies (600m exercise, 3-min rest). The first bout was systematically conducted at the freely chosen kick frequency (FCKF) and the other bouts (FCKF-15%, FCKF-10%, FCKF+10%, FCKF-20%) were presented in a random order. During the incremental and constant conditions, gas exchange was measured breath by breath with a portable system (K4b2, Cosmed, Rome, Italy) connected to a snorkel (Aquatrainer; Cosmed).

Results: Mean values for oxygen uptake (Vo2) were significantly reduced at FCKF+10% compared to FCKF-15% and FCKF-20%. However, no significant variations in heart rate (HR), ventilation (VE) and blood lactate concentrations ([La-]b) were observed between the conditions.

Discussion: The main results of this study indicated that the kick frequency selected by elite monofin-swimmers affects the energy demand during a constant swimming trial. Interestingly, the reduction of VO2 observed at the FCKF+10% suggests that the organisation of the movement pattern is different than those induced in terrestrial activities (e.g. Cavanagh & Williams, 1982; Marsh & Martin, 1997). Given the lack of significant variations in ventilatory parameters among the conditions, the differences in energy demand between the FCKF+10% bout and sub-frequencies might derive from different intrinsic muscular mechanisms.

References

Cavanagh PR, Williams KR (1984). Med Sci Sports Ex, 14, 1518-1522.

Marsh AP. Martin PE (1997). Med Sci Sports Ex 29, 1225-1232.

Nicolas G, Bideau B, Colobert B, Berton E (2007). Hum Mov Sci 26, 426-442.

CORRELATION BETWEEN OXYGEN UPTAKE KINETICS IN SEVERE INTENSITY SWIMMING AND ENDURANCE PERFORMANCE

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FACULTY OF HUMAN KINETICS, LISBON

Introduction: Faster O2 kinetics has been associated with a lower O2 deficit and greater tolerance to fatigue but it is unclear whether it is a determinant of endurance performance. This study investigated the relationships between VO2 kinetics parameters within constant load severe intensity swimming, and 400m swimming performance.

Methods: Fourteen national level Portuguese swimmers (age 20.5 ± 3.0 yr.; mass 75.4 ± 12.4 kg) performed first a discontinuous incremental freestyle test (FS_EXT) and then two 7-min constant velocity freestyle swims (FS_CTA and FS_CTB), in a 50m pool, over a 10 day period. Cardiorespiratory analysis of expired air was performed in all three tests, which were each separated by at least 24h rest, using a breath by breath analyser (K4b2, Cosmed, Italy) and swimming snorkel (Aquatrainer, Cosmed, Italy).

The discontinuous incremental test (FS_EXT, Roels et al., 2005) comprised 5 x 200 m swims with 30 s rest intervals. Speed was increased by 5-10% for each stage, the last of which was performed at maximal speed (vVO2max). Maximal oxygen uptake (VO2max) was taken as the highest 30 s VO2 average; the ventilatory threshold (VT) was established by the V-slope method, and the OBLA was determined from fingertip blood lactate concentration ([La], obtained between each 200m stage using a Lactate Pro analyser), in FS_EXT).

The two 7-min constant velocity exercise bouts (FS_CTA and FS_CTB) were each performed at Δ70% [= VT + 0.70 x (VO2max - VT)].

Performance was taken as official 400m completion time (T400) within a freestyle swimming competition that took place within one month of FS_EXT, FS_CTA and FS_CTB.

The breath-by-breath data of FS_CTA and FS_CTB were 1-s interpolated, time-aligned and averaged. The parameters of the VO2 kinetics (td1, τ1, A1, td2, τ2, A2; i.e. time delay, time constant and amplitude of the primary phase and slow component, respectively) were modelled with two exponential functions.

Results: τ1 (15.8 ± 4.7 s) was significantly correlated with T400 (251.4 (Mean) ± 12.4 s (SD); r = 0.61; p = 0.02), absolute VO2max (4.2 ± 0.76 L.min-1; r = -0.66; p = 0.01) and vVO2max (1.46 ± 0.07 m s-1; r = -0.61; p = 0.02). None of the other measured VO2 kinetics parameters (td1: 12.2 ± 2.7 s; A1: 40.6 ±4.7 ml.kg-1.min-1; td2: 167 ± 67 s; τ2: 115 ± 172.4 s; A2: 3.6 ± 2.5 ml.kg-1.min-1).were significantly correlated with T400. T400 was significantly correlated with absolute VO2max (r = -0.70, p = 0.01); and speed at both OBLA (1.34 ± 0.01 m.s-1; r = -0.88; p = 0.00) and VT (1.26 ± 0.08 m.s-1; r = -0.80; p = 0.00).

Conclusion: The shorter time constant for the primary phase of the VO2 response in swimming (but not the amplitude of the slow component) appears to be associated with higher aerobic fitness and performance.

Reference: Roels et al. (2005). Specificity of VO2 max and the ventilatory threshold in free swimming and cycle ergometry: comparison between triathletes and swimmers. Br J Sports Med 39:965-968

THE USE OF NUTRITIONAL SUPPLEMENTS BY ELITE PORTUGUESE SWIMMERS

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UNIVERSITY OF PORTO

Introduction: A well-planned diet provides the athlete with adequate levels of nutrients; however, there are many sportsmen/sportswomen taking nutritional supplements (NSs) in spite of their possible contamination with prohibited compounds and the unproved efficacy of the majority of them. In Portugal, no official data regarding the consumption of NSs is available. This study aimed to determine the prevalence and determinants of the use of NSs by elite Portuguese swimmers.

Methods: Thirty six swimmers (14 women; 17.3 years), belonging to the Portuguese national team, volunteered to participate in this study. Between January and March, subjects were asked to complete a questionnaire that included questions to characterise the use of NSs, and a semiquantitative food-frequency questionnaire.

Results: The prevalence of the use of NSs was 91.7%, with a mean consumption of 3.7 NSs per swimmer (between 1 and 10). Regarding the type of supplements and fluids ingested, the most used were sport drinks (75.8%), magnesium (60.6%), multivitamins/minerals (57.6%), proteins (27.3%) and vitamin C (21.2%), with no significant gender and age category (<18 years vs. ≥18 years) differences. The most frequent reasons for the intake of NSs were: 'to improve sports performance' (57.6%), 'to have more energy/to reduce fatigue' (57.6%), 'to accelerate recovery' (42.4%), "to have more focus" (15.2%, with an age-based difference: <18 years=23.6%; ≥18 years=64.3%; p=0.034) and "to prevent/to treat diseases or injuries" (15.2%). Physicians (57.6%), coaches (30.3%), family (24.2%) and the swimmer him/herself (21.1%) were the main source of information and advice, with no statistical differences between gender and age groups. The estimated intakes for most nutrients (16 studied) were above the recommendations. For girls between 19 and 30 years (n=4), the estimate mean ingestion of potassium (4305 mg/day), calcium (938 mg/day), folate (385 mcg/day), vitamin D (3.6 mcg/day) and vitamin E (10.8 mg/day) was under the recommendations. For boys with 14-18 years (n=11), the estimate mean intake of potassium (4392 mg/day), vitamin D (4.8 mcg/day) and vitamin E (13.2 mg/day) was under the recommendations. For males with ages between 19 and 30 years (n=11), only the estimated mean intake of vitamin E (12.9 mg/day) was under the recommendations.

Conclusions: The prevalence of the consumption of NSs was high and not justified due to an adequate nutrient intake by swimmers. In general, the type of NSs used and their determinants were not associated with gender or age group. Therefore, dietary education could be beneficial to maximize elite swimmers' performance and health benefits that result from optimal nutrition.

PHYSIOLOGICAL AND PSYCHOLOGICAL ASPECTS OF SWIMMERS IN DIFFERENT TRAINING PERIODS

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FEDERAL UNIVERSITY OF MINAS GERAIS, BRAZIL

Introduction: Even though many investigations have studied the psychological and physiological responses of athletes to periods of intensified training, only sparse information is provided regarding the interactions of these responses during the recovery period (Steinacker et al. 2000). Therefore, we aimed to investigate the effects of different training loads on stress and recovery perception (SRP) and on plasma activity of creatine kinase (CK).

Methods: Subjects were highly trained, male swimmers (17.7 + 1.3 y.o.). SRP and CK were evaluated after two distinct training phases. On the first, subjects swam approximately 50.000 meters in the week during 5 weeks. On the second, swimmers covered an average of 25.000 meters in the week, for 2 weeks. 05 ml blood were obtained from the antecubital vein for determination of CK. SRP was evaluated using the questionnaire RESTQ-Sport for the Portuguese language (Costa & Samulski, 2005). The Student's t-test and Pearson's product moment correlation were used for statistical analysis. Significance level was $p<0.05$.

Results: After the second training phase, a significant reduction of CK was observed when compared to the first measurement (261.66 + 120.04 U/L; 167.92 + 57.14 U/L), along to a reduction of scale scores in RESTQ-Sport Conflicts/Pressure (2.42 + 0.79; 1.98 + 0.9), Fatigue (2.28 + 1.07; 1.12 + 0.71), Lack of Energy (2.02 + 0.83; 1.5 + 0.61), Perturbations on Intervals (2.00 + 0.69; 1.23 + 0.75) e Lesions (2.5 + 0.91; 1,57 + 1,04). Furthermore, significant increases were seen on scales Physical Recovery (3.07 + 1.23; 3.75 + 1.08) and Being in Shape (3.23 + 1.23; 4.00 + 1.12). However, no significant correlations between scores and CK were observed in any of the sampling phases. Conclusion: Sharp training volume decreases after a period of high training loads may cause improvements on psychological and physiological profiles of the athletes investigated. However, these aspects may not necessarily be correlated.

STEINACKER, J. M.; LORMES, W.; KELLMANN, M.; LIU, Y.; REIBNECKER, S.; OPTIZGRESS, A.; BALLER, B.; GUNTHER, K.; PETERSEN, K.G.; KALLUS, K.W.; LEHMANN, M.; ALTENBURG, D. Training of junior rowers before World Championships: effects on performance, mood state and selected hormonal and metabolic responses. Journal of Sports Medicine and Physical Fitness, 40, p. 327-35, 2000.

COSTA, L. O. C.; SAMUSLKI, D. M. Processo de validação do questionário de estresse e recuperação para atletas (RESTQ-Sport) na língua portuguesa. Revista Brasileira de Ciência e Movimento, 13, p. 79-86, 2005.

14:00 - 15:30

Oral presentations

OP-HF04 Health and Fitness 4

AGE-RELATED CHANGE IN KNEE EXTENSORS AND FLEXORS RATE OF FORCE DEVELOPMENT AND ITS RELATION TO POSTURAL STABILITY

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Introduction: The ability to develop force rapidly, assessed as the rate of force development (RFD), in the knee extensors declines significantly with increasing age with negative impact in controlling posture 1. Little research has examined the age-related change in knee flexors RFD and its association with postural control. The aim of this study was to examine whether knee extensors and flexors RFD changes differently across lifespan and the relationship between knee flexors RFD and postural control, in both men and women.

Methods: Traditional centre of pressure (COP) and stabilogram parameters were examined on hard and soft surfaces with eyes open and closed. The RFD of knee extensors and flexors was assessed in static knee extension and flexion. Three groups of healthy volunteers, aged 18-30 (YG), 40-50 (MG) and 60-77 (OG) years, with 10 males and 10 females in each were recruited from local populations. General linear model multivariate analysis with group and gender as fixed factors were performed to compare the between group RFD differences, and bivariate correlations were used to examine the relationship between RFD and COP. Testing procedures were approved by the Human Research Ethics Committee of the University and written informed consent was obtained from the subjects.

Results: Significant lower RFD was found in OG compared with YG and MG in knee extensors ($p < 0.001$ and $p < 0.05$) and flexors ($p < 0.01$ and $p < 0.001$) RFD. The ability to develop force rapidly was higher in males than females in all age-groups ($p < 0.001$). Both MG and YG were significantly better from OG in COP mean distance in anterior-posterior (AP) direction ($p < 0.05$) and COP mean velocity in AP and medial-lateral (ML) directions ($p < 0.001$). Moderate negative correlations were found between COP mean velocity in ML and knee extensors ($r = -0.30$ to -0.37, $p = 0.05$) and flexors ($r = -0.32$ to -0.40, $p = 0.05$ to 0.01) in all posture testing conditions.

Discussion/conclusion: Results showed significant age-related decreases in RFD of knee extensors and flexors. However, the ability to develop force is maintained until the fifth decade. The increased amount of postural sway in ML appears to be the best marker for risk of falling 2. Both knee extensors and flexors RFD showed significant negative correlations with COP mean velocity in ML. It appeared that the higher RFD the better the postural control performance. It is suggested that RFD be further examined for its validity as a good indicator in postural control, particularly in the knee flexors.

References

1. Izquierdo, M., et al., Maximal and explosive force production capacity and balance performance in men of different ages. European Journal of Applied Physiology & Occupational Physiology, 1999. 79(3): p. 260-7.

2. Maki, B.E., P.J. Holliday, and A.K. Topper, A prospective study of postural balance and risk of falling in an ambulatory and independent elderly population. Journal of Gerontology, 1994. 49(2): p. M72-84.

DO ADHD CHILDREN WITH HIGHER PHYSICAL ACTIVITY HAVE WEIGHT PROBLEMS?

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NATIONAL CHENG KUNG UNIVERSITY

Introduction: Children with Attention deficit hyperactivity disorder (ADHD) are characterized by higher level of physical activity (PA), which often disturbs the life of these children and their families. Many studies have addressed the negative influences caused by their too much PA. However, few articles explored the possible positive effects produced by the higher level of PA. Appropriate amount of PA was known as an important factor of healthy physical status, such as proper body weight. Since the children with ADHD tended to have higher level of PA, we would like to explore its influences on the body weight. We hypothesized that the percentage of obesity or overweight of the children with ADHD, who have higher level of PA, would be less than the typically developing children.

Methods: 17 boys with ADHD (ADHD group), diagnosed by DSM IV, and 17 typically developing boys (control group) participated in the study. The informed consent was obtained from each participant and their parents. The height, weight, body mass index (BMI), and age in the ADHD group were 134.66+-19.53 cm, 34.94+-15.10 kg, 18.31+-3.20, and 103.29+-33.45 months, respectively. The height, weight, BMI, and age in the control group were 132.96+-11.33 cm, 35.66+-12.20 kg, 19.59+-3.85, and 109.24+-23.22 months, respectively. BMI was calculated by square height (m2) divided by weight (kg), and the weight status was determined by BMI and age. In order to confirm that our ADHD group had higher level of PA, each child was asked to wear a uni-axial accelerometer (ActiGraph GT1M) during the waking time of one week to measure the objective PA in daily life.

Results: PA in ADHD group (1.62+-.11) was confirmed to be higher than the control group (1.46+-.10) as indicated by the metabolic equilibrium (MET) per minute during one week ($p < .01$).The prevalence of normal weight, overweight, and obesity in the ADHD group were 58.82%, 29.41%, and 11.76%, respectively. The prevalence of normal weight, overweight, and obesity in the control group were 64.71%, 17.65%, and 17.65%, respectively. No significantly statistic difference between the two groups in the weight status (chi square =.748, $p = .79$).

Discussion: The study indicated that the children with ADHD did not have benefit on the weight status by their higher level of PA. We found that the ADHD group has the similar percentage of overweight and obesity with the control group. Our study suggested that the issue of obesity should be also of concerns for children with ADHD, although they demonstrated higher level of PA than their control peers.

References

ActiGraph. (2004). GT1M and ActiLife Desktop Software User's Manual. Florida: ActiGraph, LLC.

American Psychological Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: Author.

Cole, T. J., et al. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ, 320(7244), 1240-1243.

SUSTAINED BENEFITS OF YOUTH SPORT FOR METABOLIC SYNDROME IN ADULTHOOD

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Introduction

The effect of sustained youth sport on metabolic syndrome (MetS) in adulthood is not well investigated using longitudinal design. This study aims to examine the association between sustained youth sport and adult MetS over a period of 21 years in a population-based cohort of young adults.

Methods: Data were obtained from the Cardiovascular Risk in Young Finns Study in which 1493 young subjects participated in the study in 1980, 1983 and 2001. The participants were 9-, 12-, 15-, and 18-year-olds in 1980, and 30-, 33-, 36- and 39-year-olds in 2001. Participation in organized youth sport was assessed using a self-report questionnaire completed in connection with a medical examination in 1980 and 1983. By summing two items (participation in sport-club training and competitions) an index was formed for both measurement points according to which the participants were classified into four groups: Persistently athletic, Starters, Leavers and Non-athletic. MetS risk in 2001 consisted of fasting insulin, waist circumference, serum triglycerides, inverted HDL cholesterol, systolic blood pressure, diastolic blood pressure, and plasma glucose, which was defined as a categorical variable according to the guidelines of the European Group for the Study of Insulin Resistance (EGIR) and as a continuous MetS-score variable by summing the z-scores of single metabolic variable.

Results: In both males and females, sustained intensive sport participation in youth during 3 yr was inversely and significantly associated with clustered MetS-score and prevalence of MetS defined by the EGIR in adulthood ($p < 0.05$). Persistently athletic and Starters during 3 yr were less likely to have MetS than Non-athletic in both genders. Subjects who dropped out from organized sport were more likely to have MetS-score compared to persistently athletic subjects. Similar associations were found using EGIR MetS as an outcome. These associations remained significant after adjustment for age and baseline clustered MetS-score and after additional adjustments for adult leisure-time physical activity.

Discussion: We conclude that participation in, particularly sustained participation in organized sport in youth is associated with reduced the risk of developing MetS in adulthood. Organizers of youth sport may have a great impact on public health by paying attention to the factors which increase adherence in youth sport.

THE EFFECT OF EXERCISE ON FALL-RELATED PHYSICAL FITNESS AND VARIOUS CHARACTERISTICS OF CHRONIC PAIN IN OLDER ELDERLY

KANG, H.

SOONCHUNHYANG UNIVERSITY

Introduction: Falls are a leading cause of mortality and morbidity among elderly age 75 and older. Preventing and delaying the onset of physical frailty is an increasingly important goal because more individuals are living well until their 8th and 9th decades. Exercise is recommended to elders in aspect of improving physical fitness significantly. The purpose of this study was to investigate fall-related physical fitness and the various characteristics of chronic pain in the older elderly who have the degenerative arthritis symptoms.

Methods: Twenty two elderly people, age 80(±3.8) were randomly selected. Fall-related physical fitness consisted of the 7 performance test items, which were muscle strength (grip strength), muscle endurance (standing up and sitting on a chair), flexibility (chair sit and reach), agility (timed up and go), cardiovascular endurance (2min walking), balance (one leg balance with eye opened) by Rikli and Johns (2001)'s Senior Fitness Test Manual. Pain score was measured by static and dynamic visual analog scale (VAS sore: 0=no pain, 10= extremely unsatisfactory). The falls prevention program performed for about one hour per day, 4 times a week over a period of 10 weeks in 60-80% HRR.

Results: The result showed that significantly improved on flexibility (-.05±7.9cm vs 3.7±7.6cm, $p<0.05$), agility (12.1±3.6sec vs 10.3±4.1sec, $p<0.05$), balance (right: 10.0±8.3sec vs 23.6±23.6sec, $p<0.05$). Chronic pain scale at 10 week showed significant decreased on pain symptom (4.73±2.0 vs 3.5±2.0, $p<0.001$), pain symptoms when walking (4.9±3.0 vs 3.7±2.8, $p<0.05$), pain symptom when sitting (5.0±3.4 vs 3.7±2.8, $p<0.01$), pain symptom in daily living (4.4±2.7 vs 3.3±2.3, $p<0.01$).

Discussion: In conclusion, there has been a substantial improvement in 10 weeks by falls prevention program, but exercise program should be recommended to elders in aspect of increasing cardiovascular endurance and muscle strength. We also suggest that the unresolved issues include development of optimal strategies for motivating and applying in older elderly to begin and maintain exercise program.

Reference

Best-Martini E., Botenhagen-DiGenova KA (2003). Exercise for Frail Elders, 120-131, Human Kinetics

Kim HJ., Kim SW (2005). Korea Sport Research, 16(6), 641-652

Yoo EJ., Jun TW., Park H (2008). J Korean Physical Education Association for Girls and Women, 22(4), 101-115

USING CHALLENGING, NATURAL ENVIRONMENTS TO ENHANCE BALANCE PERFORMANCE IN THE ELDERLY

ADLER, H., NAGEL, V., LIPPENS, V.

HIS E.V.

Introduction: Maintaining individual mobility and independence in later life belongs to the prior concerns of aging individuals and whole populations. An age-related decline of the ability to modulate posture according to environmental and task-specific demands has been observed, falls often are the consequence. Impacts and outcomes of public health approaches cannot be described as successful yet, mainly not reaching the main target groups and hence leaving room for improvement. Contents of effective fall prevention programs have been identified (e.g. Oddsson et al. 2007), but often unvarying, standardized exercises are being offered to improve strength or balance, regardless of everyday functional demands. A complex environment is known to enhance physical activity and neurogenesis (cf. Schaefer et al. 2006), diverse natural surroundings should therefore be considered as potential settings to interventions.

Methods: During a 10-day course a constraints-led approach (cf. Araújo et al., 2004) was used in a group of elderly participants (n=11, mean age 58.36; SD 5.39) in a challenging, natural environment with the aim to enhance smart balance performance in everyday situations. To enable transfer of acquired balance strategies to individual everyday-surroundings, transfer-supporting methods were used

(Nagel 1997). As one parameter for postural adaptation, balance performance was measured monopedal on a balance disc with a suprapostural task before, after, and three months after the course.

Results: In contrast to the control group (n=22), the intervention group showed an improvement in balance performance by 25% after the course, remaining stable over three months. A group-effect (F(1,56)= 6.901, p=.01) could be revealed by an ANOVA.

Discussion: Movement patterns emerge according to personal, environmental and task constraints (Newell, 1986). The modulation of task and environmental constraints is an underestimated method to provoke appropriate movement task solutions and enhance motor competence in the elderly. Natural surroundings can be a motivating and economic setting to meaningful movement not only for purposes of public health.

References

Araújo D, Davids K, Bennett SJ, Button C, Chapman G (2004). Emergence of sport skills under constraints. In AM Williams & NJ Hodges (Eds.) Skill Acquisition in sport. New York: Routledge, 409-433

Nagel V (1997). Fit und geschickt durch Seniorensport. Sportartenüberschreitendes Training für Alltagssituationen. Hamburg: Czwalina.

Newell KM (1986). In MG Wade & HTA Whiting (Eds.) Motor Development in Children: Aspects of Coordination and Control. Dordrecht: Nijhoff, 341-360

Oddsson L, Boissy P, Melzer I. (2007). How to improve gait and balance function in elderly individuals - compliance with principles of training. Eur Rev Aging Phys Act 4, 15-23

Schaefer S, Huxhold O, Lindenberger U. (2006). Healthy mind in healthy body? A review of sensorimotor-cognitive interdependencies in old age. Eur Rev Aging Phys Act, 3, 45-54

POST-EXERCISE PRESSURE RESPONSES IN ELDERLY PRE-HIPERTENSE WOMEN ARE INFLUENCED BY NITRIC OXIDE

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CATHOLIC UNIVERSITY OF BRASÍLIA

Introduction: Exercise has been proposed to treatment and/or control of hypertension. Thus, the aim of this study is to verify blood pressure responses after different intensities of aerobic exercise in elderly pre-hypertensive women, verifying metabolites liberation related to it.

Methods: Thirty elderly women (70.5±6.0yrs, 60.4±8.5kg) realized: 1stday - 20min in rest (R) measuring blood pressure (BP) and began an incremental test (IT) in bicycle that was used as well to measure the anaerobic threshold (AT). Then, they remained sated for 1h for recovery measuring the BP every 15min; 2ndday: they did the same pre/post test procedures and measurements, and exercise for 20min in 90% AT; 3rdday: they did the same procedures, and remained sated (control-CONT) for 20min. Saliva was collected in the same moments of measuring BP and right after exercise (RAE) for measurement of nitrite (NO2-, product of oxidation of Nitric Oxide). All sessions were realized in random order.

Results: The SBP values were IT (R=127.5±15.9mmHg vs. 1hMean=122.0±14.2mmHg; p<0.01), 90%AT (R=121.4±12.4mmHg vs. 1hMean=119.3±13.2mmHg; p>0.05) and CONT (R=120.8±14.9mmHg vs. 1hMean=124.0±14.0mmHg; p<0.01). For DBP occurred in IT (R=76.8±7.9mmHg vs. 1hMean=77.5±8.2mmHg; p>0.05), 90%AT (R=74.2±6.4mmHg vs. 1hMean=75.3±5.9mmHg; p>0.05) and CONT (R=73.6±7.4mmHg vs. 1hMean=76.4±7.3mmHg; p<0.01). And the MAP results were IT (R=93.7±9.7mmHg vs. 1hMean=92.3±9.5mmHg; p>0.05), 90%AT (R=89.9±8.0mmHg vs. 1hMean=90.0±7.8mmHg; p>0.05) and CONT (R=89.3±9.1mmHg vs. 1hMean= 92.3±9.0mmHg; p<0.01). ANOVA showed difference in the variation among sessions of SBP (CONT∆=3.2±6.6mmHg vs. IT∆=-5.6±7.6mmHg; p<0.01 and 90%AT∆=-2.1±7.5mmHg; p<0.05) and MAP (CONT∆=3.0±3.5mmHg vs. IT∆=-1.4±5.6mmHg; p<0.01 and 90%AT∆=0.1±4.9mmHg; p<0.05). NO2- values were in IT (R=278.9±166.1μM vs. RAE=359.0±228.2μM; p<0.01), 90%AT (R=267.9±175.0μM vs. RAE=338.8±283.7μM; p=0.07) and CONT (R=279.7±163.3μM vs. RAE=292.9±234.5μM; p>0.05). Differences also occurred in NO2- (CONT∆=13.3±185.1μM vs. IT∆=80.2±146.9μM (p<0.01) and 90%AT∆=70.9±199.1μM (p<0.01).

Discussion: Only on IT occurred PEH on the SBP, otherwise both IT and 90% AT offers protective effect on the SBP and MAP when compared with CONT group. This study, bringing a different population – elderly, agrees to other studies showing the benefits of exercise in moderate intensities for control of BP (MacDonald et al., 2001). Although elderly people have an impaired capacity of the vasculature to increase nitrite (Lauer et al., 2008), what might had prejudice a PEH in 90% AT in our study. However, a difference between the groups occurred, showing the importance of the exercise in higher intensities (IT) to promote PEH and the protective effect of aerobic exercise not leading the BP increase like in CONT.

References

MacDonald JR, Hogben CD, Tarnopolsky MA, MacDougall. (2001). J Hum Hypertens, 15, 567–571.

Lauer T, Heiss C, Balzer J, et al. (2008). Basic Res Cardiol, 103, 291–297.

14:00 - 15:30

Oral presentations

OP-PS05 Psychology 5

ADULTS WITH ADHD RATE EXERTION LOWER

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SOGN OG FJORDANE UNIVERSITY COLLEGE

Introduction.

There are many anecdotal stories about how restless and inexhaustible persons with attention deficit/hyperactivity disorder (ADHD) are. The name of the diagnosis itself also indicates this with the word hyperactivity. We wanted to know whether adult patients with ADHD differed in fitness and reaction to exercise compared to patients without this disorder. To investigate this we used the participants in

clinical exercise intervention project for patients with substance abusers or dependence, since these patient groups have a high prevalence of ADHD.

Methods: Thirty adults with substance dependence, of which 13 had DSM-IV ADHD, were tested on the treadmill for lactate threshold and maximal oxygen uptake (VO2max). The threshold testing protocol consisted of several five min long exercise bouts separated with 30 s resting periods for blood collection with a LP1710 lactate analyser (Arkray Inc, Japan). The lactate threshold was defined as the speed giving a blood lactate concentration (BLC) 1.5 mmol•L-1 above resting BLC value. The Bruce protocol was used for establishing VO2max with a MetaMax CBS (Cortec Biophysik, Germany) metabolic cart analysing the expired air. Rating of perceived exertion (RPE) according to the15-point Borg scale was recorded at the end of each exercise bout and RPE at threshold point (RPELT) was calculated using linear regression.

Results: Subjects with ADHD rated the RPELT significantly lower than the non-ADHD group, 10.9 vs. 13.0 (p=0.009). This despite having a higher Threshold heart rate (HRLT), 151 vs. 141 beats•min-1 (p=0.022) and blood lactate concentration (BLC) at threshold, 2.8 vs. 2.4 mmol•L-1 (p= 0.009). The maximal oxygen uptake was 46 vs. 44 ml•kg-1•min-1 (p=0.409) for the ADHD and non-ADHD groups respectively, and thus adequate for performing heavy physical work.

Discussion: The self-presentation theory of Goffman may be useful to understand the differences seen in RPE scores: The goal of the self-presentation is to achieve acceptance from the "audience". This can be done through manipulation and playing a role. If the "actor" succeeds, the audience will view the actor as he or she wants to be viewed. Another aspect of self-presentation is "self-constructive self-presentation", aiming at making people believe that they are what they would like to be. The ADHD person might feel more inclined to "show him/herself" in a positive way in a social setting, and thereby reducing the experienced effort from the test to appear more fit. Further research is needed to verify the findings of this study and try to elaborate the mechanisms of reduced RPE scores here seen in adults with ADHD and substance dependence.

References

Goffman, E. The presentation of self in everyday life. Garden City, N.Y.: Doubleday, Anchor Books, 1959

AGEING, WELL BEING AND BODY IMAGE IN FRENCH ELDERLY PEOPLE PRACTISING PHYSICAL ACTIVITY REGULARLY: A SELF-DETERMINATION THEORY PERSPECTIVE AND A QUALITATIVE STUDY

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UFR STAPS CRIS, UNIVERSITÉ LYON 1 AND CENTRE HOSPITALIER LYON SUD, UNIVERSITÉLYON 1

Including regularly physical activity in our daily lives leads to a multitude of physical, psychological, and social benefits (Warburton, Nicol, & Bredin, 2006), particularly for elderly people. The aim of this study was to achieve a better understanding of the motives used by elderly people for maintaining an active lifestyle, and to rely on self-determination theory as a useful framework (Deci & Ryan, 1985). It looks at highly self-determined elderly people practising voluntarily physical activities in an association managed by them in order to explicate the motivational mechanisms impacting the management of their successful ageing.

Method: The target population consists of 19 elderly people belonging to an association called « CODAPRS » which organizes physical activities for retired people above fifty years in urban area. Participants were selected randomly from whose who had indicated a willingness to participate and who had had high scores on the self-determination index (SDI), reflecting a more self-determined motivational orientation (Brière, Vallerand, Blais & Pelletier, 1995). Thus, nine women and ten men (Mage = 74.59, SD = 4.64) practising around 8 hours of physical activity per week signed the consent form and accepted to be interviewed. All interviews were audiotaped, transcribed verbatim and returned to the participants. Sources of triangulation were literature reviews related to ageing and physical activity, health professionals and the use of peer researchers as an external audit.

Results and Discussion: Inductive content analysis was used to analyse the interview transcripts, and yielded three themes (namely well being, relational and body image benefits) with six subthemes including in each theme: a) Escape daily concerns and experience good emotions, relate to physical and mental capacities, keep a physical autonomy for a long time, keep in contact with nature, intrinsic pleasure to physical activity, better quality of sleep; b) Increase contact with other participants, avoid loneliness, share conviviality time, take part in activity with spouse, seek emulation though the group, get involved in voluntary work; and c) Keep in shape, better understand and push back the physical limits,self-fulfilment, proving one's continuing ability, increase effort and seek a dynamic image with a lot of vitality and energy. This study showed the psychological importance for these elderly people to remain active, and practising physical activities was a mean to preserve a social aspect and resist the powerlessness of ageing. Thus, these behaviours contribute to give a new image of retired people.

References

Briere, N. M., Vallerand, R. J. Blais, M. R. & Pelletier, L. G. (1995). Sport motivation scale. International Journal of Sport Psychology, 26, 465-489.

Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. Plenum Press, New York.

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. Canadian Medical Association Journal, 174, 801-809.

MENTAL FATIGUE AS A TOOL IN SPORTS AND EXERCISE: EVALUATION OF PERFORMANCE, PERCEPTION AND BRAIN ACTIVITY

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Purpose: Mental fatigue seems to be an underestimated and not well evaluated part of sports and exercises. When people become mentally fatigued, they usually experience difficulties in maintaining the task performance at an adequate level. Interventions which induce mental fatigue may help us to understand the complexity of fatigue and its influence in sports and exercise.

Mental fatigue leads to temporary deterioration of attentional functioning, response readiness and increases in the number of behavioral errors. The working memory (WM) plays a prominent role in this context and can be measured by EEG (frontal Theta related to attention and parietal Alpha-2 spectral power related to information processing). The aim of this pilot study is to see if prolonged cognitive performances with high demands lead to mental fatigue demonstrated by changes in task performance, fatigue perception and EEG power values.

Methods: Eight male, right-handed volunteers (26.4±4.1 years; 86.7±4.8 kg; 189.4±2.1 cm) were required to repeat five Rapid Visual Information Processing (RVIP) tasks (5x5 min). The RVIP task provides performance scores (reaction times, correct/incorrect/missed responses). After each block the participants were asked to rate their mental fatigue using visual analogue scales. Before (rest) and during the tasks the EEG was measured in accordance with standards of the international 10:20 system from 13 scalp locations (Fz, F3, F4, Cz, C3, C4, Pz, P3, P4, T3, T4, T5, T6) and divided into different frequencies: Theta (4.75–6.75 Hz), Alpha-1 (7–9.5 Hz), Alpha-2 (9.75-12.5 Hz) and Beta-1 (12.75–18.5 Hz). EEG power values were calculated and log-transformed.

Results: Statistical analysis showed significant slowing of reaction times over time (F4,28=3.985; p≤.011; part.η2=.361). This was associated with an increase in fatigue perception (F4,28=9,231; p≤.001; part.η2=.568). Right hemispheric temporal Alpha-2 frequency (T3) demonstrated a fatigue effect with an increase in spectral power (F4,28=3.058; p≤.033; part.η2=.304).

Frontal Theta and parietal Alpha-2 power values demonstrated an activation compared to rest (p≤.01), but showed no significant effect according to mental fatigue.

Conclusion: In accordance with our aims, the participants did appear to be mentally fatigued as described by a decrease in performance and an increase in fatigue perception. This was in accordance with significant increased temporal Alpha-2 power which is discussed in terms of a decrease in mental activity specifically a reduction of symbolic/verbal activity. The EEG frontal Theta and parietal Alpha-2 power demonstrated an activation pattern (WM), but show no changes in relation to the fatiguing task. The authors speculate that a longer task performance over time would lead to changes in this EEG power values. Therefore to induce mental fatigue as a tool it may be necessary to demonstrate mental fatigue not only in performance and perception but additionally at the brain level.

GOAL ORIENTATION AND PERSISTENCE IN YOUTH ICE HOCKEY

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KIHU RESEARCH INSTITUTE FOR OLYMPIC SPORTS

Introduction: Achievement Goal Theory (Nicholls, 1984) states that there are two dispositional perspectives, which determine how subjective success is evaluated. Task orientation refers to self-referenced perception of ability, whereas ego orientation means that a person's focal concern is mainly towards demonstrating superior competence based upon normative comparisons. It has been suggested that a task orientation more often than the ego orientation protects the athlete from disappointments and a lack of motivation (Duda, 1989). Emphasis on task orientation can be expected to lead to a stronger persistence when an athlete's performance is exceeded by others. The purpose of the present study was to gain additional insights into this issue focusing on the relationship between goal orientation and involvement in organized youth sports.

Methods : The participants were 2,813 Finnish junior level ice hockey players. A longitudinal follow-up design was applied. A valid racing license of the Finnish Ice Hockey Association was used as the indicator of persistence 3,5 years after the initial survey questionnaire, when the participants ranged in age between 14 and 15 years (Mean; S.D: age 14.90; 0.29 years). Goal orientation was examined with the Finnish version of the Perception of Success Questionnaire or POSQ (Liukkonen, 1998; Roberts, Treasure, & Balague, 1998) . The dependence of persistence on goal orientation (task and ego) and perceived ability in ice hockey (low, intermediate, high) was studied with forward stepwise logistic regression with LR test in removing variables.

Results: It appeared that the players who scored high on task orientation were more likely to continue their participation in ice hockey than the players who scored low on task orientation. High ego orientation combined with high perceived ability was also associated with sustained involvement in ice hockey, whereas high ego orientation combined with low perceived ability appeared to be detrimental to the continuation of involvement.

Discussion: The results lend support for the view that goal orientation is related to sustained sport participation over the time span of several years. As expected, emphasis on task orientation appeared to lead to a stronger persistence. Interestingly, the results also showed that the likelihood of withdrawal from ice hockey increased, if a player whose goal was to win others (high ego orientation) experienced little success (low perceived competence). The results suggest that the investigation of goal orientation provides valuable additional information concerning a youth player's persistence for training in the face of failures and disappointments.

References

Nicholls, J.G. (1984). Psychological Review, 91, 328-346.

Duda, J. (1989). International Journal of Sport Psychology, 20, 42-56.

Liukkonen, J. (1998). LIKES – Research Reports on Sport and Health, 131.

Roberts, G.C., Treasure, D., & Balague, G. (1998). Journal of Sports Sciences, 16, 337-347.

DIFFERENCES BETWEEN YOUTH ATHLETES AND THEIR PARENTS PERCEPTIONS OF SELF AND OTHERS' AGGRESSIVE BEHAVIOUR IN ICE HOCKEY

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UNIVERSITY OF REGINA

Introduction: For lay people, aggression is often seen as a coveted characteristic of the successful athlete. Sport psychologists define it as an overt behaviour in which the athlete intends to harm another person either physically or psychologically (Silva, 1980). Many intra- and inter-personal factors affect perceptions of whether an act is or is not aggressive. For example, in what context did the aggressive behaviour occur, how psychologically close is the observer to the actor or the victim of the action, and/or was the victim injured? To date, most studies examining perceptions of aggressive behaviours have (a) tended to examine the physical aspects of aggressive behaviours excluding the psychological component, (b) relied heavily on adult observers, and (c) not included familial units. The purpose of this study is to focus on these three limitations.

Methods: Responses from a sample of 510 Atom-aged (ages 9 and 10, majority were male) and parents/guardians (N = 834; 415 fathers, 419 mothers) were examined. The athletes were randomly selected from the registration lists of two provincial ice hockey associations in Canada. Cohorts were recruited to the project via telephone over the course of 3 years. Athletes and their parents were invited to complete a survey either on-line on a secure website or, by receiving a paper copy in the mail. The data were analysed using the family as the unit of analysis (N = 321 families with 3 members). Using a scale of 1 (Never) to 9 (Always), each participant was asked to indicate how often they perceived acts or encouragements of physical and psychological aggression to be committed by themselves, their parent/child, their coach, teammates, teammates' parents, opponents, opponents' parents, and opponents' coaches.

Results: Overall, mean scores for the 16 questions ranged from: athletes 1.12 (SD = .61) to 4.37 (SD = 2.26); fathers 1.11 (SD = .57) to 4.16 (SD = 2.14); and mothers 1.05 (SD = .27) to 4.69 (SD = 2.22). Even though the data was positively skewed, most questions spanned the entire range of responses. Friedman tests were conducted to analyse differences among the three family members. Significant differences ($p < .05$) were found for 11 of the 16 questions with the majority (8) finding the child to be significantly different from the parents.

Discussion: In general athletes and their parents report that aggressive behaviours do not occur very often. All three groups do not admit to encouraging or being encouraged to physically harm (lowest mean value of all scenarios). All groups agreed that most aggressive behaviours were committed by opponents with mothers perceiving this behaviour to occur more often than fathers and athletes.

References

Silva, J. M. (1980). Understanding aggressive behavior and its effects upon athletic performance. In W. F. Straub (Ed.), Sport psychology: An analysis of athlete behavior. Ithaca, NY: Mouvement.

REACTION TIME TO PERIPHERAL VISUAL STIMULI DURING EXERCISE UNDER HYPOXIA

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KYOTO PREFECTURAL UNIVERSITY OF MEDICINE

Introduction: Reaction time (RT) to peripheral visual stimuli increases during exercise at high workloads (Ando et al., 2008). However, physiological mechanisms underlying the detrimental effects of exercise on RT to peripheral visual stimuli remain to be elucidated. The purpose of this study was to test if hypoxia affected reaction time (RT) to peripheral visual stimuli during exercise. We expected that if decrease in oxygen availability is responsible for the increase in RT to peripheral visual stimuli during exercise, RT to peripheral visual stimuli would, to a greater extent, increase during exercise under hypoxia as compared with exercise under normoxia.

Methods: Ten male participants performed RT tasks at rest, during and after cycling with three different workloads [40 %, 60 %, and 80 % peak oxygen uptake (VO_2)] under either blinded normoxic [inspired fraction of oxygen (FIO_2) = 0.21)] or hypoxic (FIO_2 = 0.16) conditions. Visual stimuli were randomly presented at 10° to either the right or left of the midpoint of the participant's eyes. Cerebral oxygenation was continuously monitored over the right frontal cortex using near-infrared spectroscopy. In this study, RT was fractionated into premotor and motor components (Premotor time and Motor time) base on the onset of electromyogram recorded over the right forearm. We used Premotor time to assess the efficiency of central information processing.

Results: Under normoxia, Premotor time was significantly longer during exercise at 80% peak VO_2 (mean ± SE; 214.2 ± 10.4 ms) relative to that at rest (201.0 ± 8.6 ms) ($p < 0.05$). Under hypoxia, Premotor time was significantly longer during exercise at all workloads (40%: 216.3 ± 8.8 ms, $p < 0.05$; 60%: 216.1 ± 9.1 ms, $p < 0.05$; 80%: 221.5 ± 9.5 ms, $p < 0.01$) relative to that at rest (202.9 ± 9.4 ms). Increase in Premotor time during exercise was negatively correlated with corresponding cerebral oxygenation ($r2 = 0.85$, $p < 0.01$) when data from normoxia and hypoxia were combined together.

Discussion: The results of the present study indicate that the increase in Premotor time to peripheral visual stimuli during exercise is closely associated with decrease in cerebral oxygenation. It is possible that decrease in oxygen availability and/or alteration of neurotransmitters turnover contributed to the detrimental effects of exercise under hypoxia. We conclude that cerebral oxygenation influences visual perceptual performance during exercise.

Reference

Ando S, Kokubu M, Kimura T, Moritani T, Araki M (2008). Int J Sport Med, 29, 994-998.

14:00 - 15:30

Oral presentations

OP-HF03 Health and Fitness 3

'YOU NEED TO GET OUT MORE!': SOCIAL AND PHYSICAL ENVIRONMENTS OF SEDENTARY AND ACTIVE BEHAVIOURS OF YOUTH IN TWO CENTRAL-EASTERN EUROPEAN COUNTRIES

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Introduction: There has been an increase in the study of sedentary behaviours in young people. Evidence shows that time spent in some sedentary behaviours may be associated with negative markers of health. However, in addition to studying the prevalence of sedentary behaviours, it is important to ascertain where such behaviours are taking place and whether different sedentary behaviours are intercorrelated. The main aim of this study, therefore, was to investigate the social and physical context of sedentary behaviours, as well as the interrelationships between behaviours.

Methods: Secondary school students (n=440), aged 13-18 years, from two countries (Romania n=313 and Slovakia n=127) were assessed. Ecological momentary assessment was used in the form of a free-time diary and was administered across three weekdays in 2006-2007.The temporal factors and correlates of the key sedentary behaviours, the locations and the social context were analysed using SPSS 15.0 software package.

Results and Discussion: Temporal and location Results: TV viewing (97.45 min, s=65.14) occupied the most time of any single behaviour, followed by doing homework (91.51 min, s=60.91), active transport (40.68 min, s= 29.14), and sitting and taking (27.61 min, s=32.59). Playing computer/ video games had a low mean score (15.0 min, s=34.84). Students spent most of their time in the bedroom (309.70 min, s=109.49) and living room (75.15 min, s=84.69), and much of their time alone (322.89 min, s=124.76), but also with friends (140.41 min, s=100.02), or with family (140.0 min, s=101.75).

Correlates of behaviours

TV viewing negatively correlated with reading (r=-0.29*), active transport (r=-0.28*) and doing homework (r=-0.23*). Active transport also negatively correlated with using a computer (r=-0.22*). Playing computer/ video games positively correlated with cognitive hobbies (e.g.,

doing puzzles, playing cards) (r=0.20*) (* p<0.001). Being outside was associated with more active behaviours (rs=0.21-0.44*) while being inside was associated with more sedentary behaviours.
Conclusion. Young people need to be encouraged to spend more time outside to reduce sedentary behaviours and increase physical activity.

THE EFFECTS OF A 2 YEAR SCHOOL-BASED PHYSICAL ACTIVITY AND DIETARY INTERVENTION PROGRAM ON PHYSICAL FITNESS AND BODY COMPOSITION

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INTRODUCTION: Overweight and obesity due to physical inactivity and unhealthy diet has become a widespread problem among children worldwide. The school setting has been suggested as an ideal platform to implement interventions that may tackle this problem. This study compared BMI, body fat % and physical fitness (PF) level between two study groups of children born in 1999 (7 years old at baseline) before and after a two-year intervention period.
METHODS: Six elementary schools in Reykjavik Iceland were randomly assigned into either an intervention group or to serve as controls. In 2006 children entering second grade at each participating school were invited to take part in the study. Participation of 268 children in some or all parts of the study produced 86% participation rate. At baseline and after a two-year intervention period the children's height and weight was measured. Whole body DEXA scans were run providing data on body composition, including body fat % and PF was assessed with a cycle ergometer, measured as watts/kg. Reliable data was observed from 170 children who participated in the three measurements at both time points. The main objective of the physical activity intervention was to better integrate physical activity and the schools' curriculum. Further, to increase physical activity up to at least 1 hr/day each school day. Hence, between fall of 2006 and fall of 2008 the physical activity level at the intervention schools was progressively increased via teacher-led daily activities. A two-way repeated measure ANOVA was performed to assess a change in outcome measures with time in both groups. Data was analyzed using R version 2.6.2.
RESULTS: The mean BMI and body fat % were slightly, yet significantly lower among children in the intervention group at both time points, but there was no significant interaction between group and time for either variable. However, there was not a significant difference in PF between the groups at baseline. A group by time interaction was demonstrated when comparing pre and post intervention PF (p=0.048). Children in the intervention group increased their PF capacity by 10% (2.49±0.58 watts/kg in 2006 to 2.74±0.53 watts/kg in 2008), while children in the control group increased their PF by 5% (2.36±.49 watts/kg in 2006 to 2.48±0.47 watts/kg in 2008). Similar yet not significant trends were observed when stratified by sex.
DISCUSSION: Our study suggests that the two-year school-based intervention program may have had positive effects on children's PF while no apparent effect was on children's BMI or body fat %. These results may add weight to the body of knowledge on how the school setting can effectively keep its children more active and healthier. Further analysis of the data may provide more specific reasons for this effect on children's fitness.

ASSOCIATION BETWEEN BODY FAT, SCREEN TIME AND PHYSICAL ACTIVITY IN 8-10 YEAR OLD CHILDREN EXCEEDING ELECTRONIC MEDIA GUIDELINES

GRAVES, L.E.F., RIDGERS, N.D., STRATTON, G.

LIVERPOOL JOHN MOORES UNIVERSITY

OBJECTIVE: Previous associations between body fat, and, physical activity (PA) and screen time (ST), both predisposing factors for obesity (Myers, 2005), are limited by the use of body mass index as an indicator of adiposity, and pedometry or self-report as measures of PA (Kautiainen et al., 2005; Laurson et al., 2008). Using more sensitive methods this study examined associations of television viewing (TV), video gaming (VG), ST and PA on the percent total body fat (%BF) of children exceeding the daily recommended 2 hours of engagement with electronic media (American Academy of Pediatrics, 2001).
METHODS: A total of 47 primary school children (age mean 9.2, SD 0.6) provided at least 9 hours of accelerometry-derived habitual PA information on a minimum of 3 weekdays and 1 weekend day. Data were analysed using individually calibrated activity count thresholds for PA at 4km∙h-1 (PA4) and 8km∙h-1 (PA8), and a sedentary threshold of 100 counts per minute. Dual-energy x-ray absorptiometry (DEXA) was used to measure %BF. Weekday and weekend day TV and VG time were self-reported using a questionnaire, allowing calculation of a weekly estimate of each and ST (VG + TV). Correlations evaluated the strength of relationships between variables. Only significantly correlated variables were used in multiple linear regression and partial correlation analysis. This analysis helped explain the variance in %BF whilst controlling for age. Statistical significance was set at p<0.05.
RESULTS: Based on body fat reference curves (McCarthy et al., 2006), 19.5% of the group were overfat (≥85th <95th centile) and 40.4% obese (≥95th centile). VG, TV and ST were not significantly correlated with %BF (r < 0.2) or any PA variable (r > -0.23), except TV (r = -0.41) and ST (r = -0.26) with PA8. %BF was significantly correlated with sedentary time (r = 0.264), PA4, PA8, PA>4 and total PA (r < -0.3). Regression analysis showed only PA>4 and total PA significantly predicted %BF. Subsequent partial correlations indicated PA>4 and total PA explained 7.8% and 6.9% of the variance in %BF, respectively. A 1-minute increase in activity of intensity greater than 4km∙h-1, and total PA, is associated with a 0.062 (95% CI: -0.118 to -0.005) and 0.044 (95% CI: -0.087 to -0.001) decrease in %BF, respectively.
DISCUSSION: Stronger associations with %BF for PA variables compared to screen time variables suggest PA is a more important risk factor for overfat in children who exceed electronic media guidelines. Increasing total PA, and PA of intensity greater than 4km∙h-1, which is equivalent to walking, should be targeted in interventions seeking to reduce %BF in children who report high media usage.
REFERENCES:
American Academy of Pediatrics (2001) Pediatrics 107 423-26
Kautiainen et al. (2005) Int J Obes 29(8) 925-33
Laurson et al. (2008) J Pediatr 153 209-14
McCarthy et al. (2006) Int J Obes 30 598-602
Myers (2005) J Am Diet Assoc 105 S79

IMPROVEMENT IN CHILDREN'S CARDIO-RESPIRATORY FITNESS FOLLOWING A TWO-YEAR SCHOOL-BASED DAILY PHYSICAL ACTIVITY INTERVENTION

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SOGN AND FJORDANE UNIVERSITY COLLEGE

INTRODUCTION: Cardio-respiratory fitness is strongly associated with good health in children as well as in adults. There are conflicting results concerning the effect of increased physical activity (PA) on cardio-respiratory fitness in children. This may be due to the duration of studies or the volume of PA performed, among other things. The school provides an excellent setting in which to enhance levels of PA, and thereby possibly increase fitness. Few interventions in school assess VO2peak directly, which is a methodological weakness. We therefore started a 60-minute two-year school-based PA intervention for nine-year-olds in two Norwegian towns assessing fitness directly. To our knowledge the present study breaks new ground by being the first teacher-controlled daily PA intervention of this magnitude with direct measurement of VO2peak. The aim of the present study was to describe changes in children's cardio-respiratory fitness following a daily physical activity intervention in two Norwegian rural towns. METHODS: In total, 259 children (age 9.3±0.3 years) were invited to participate, of whom 256 participated. The intervention group (63 boys, 62 girls) carried out 60-minute teacher-controlled daily physical activity over two school years. The control group (62 boys, 69 girls) had the standard amount of physical education (45 minutes twice each week) in school. 188 (73.4%) children successfully completed both pre- and post-peak oxygen uptake test (VO2peak). VO2peak was directly measured during a continuous progressive treadmill protocol where the children ran until exhaustion. Body mass and height were collected from all 256 children at baseline. There was no difference in BMI between those included (188) or those excluded (68). Change in VO2peak was analysed with a General Linear Model with sex and location as fixed factors, and baseline VO2peak as a covariate. RESULTS: Mean baseline values were 52.8±6.5 ml kg−1 min−1 (boys) and 46.9±7.2 ml kg−1 min−1 (girls). The intervention group significantly increased their VO2peak (4.3±4.0 ml kg−1 min−1), while the control group did not (0.4±3.5 ml kg−1 min−1) ($p<0.001$). DISCUSSION: The main finding is that a two-year school-based 60-minute daily physical activity intervention significantly improved cardio-respiratory fitness in children. The present study suggests that increased PA levels and increased fitness in children should be taken into consideration when designing school policies. Establishing a lifestyle of regular exercise, and thereby contributing to a higher level of fitness in children, is important in many ways, including short- and long-term health benefits.

STRENGTH TRAINING AND THE MENSTRUAL CYCLE: EFFECTS OF FOLLICULAR- AND LUTEAL PHASE-BASED TRAINING ON MUSCULAR STRENGTH AND MUSCLE DIAMETER IN SUBJECTS WITH ORAL CONTRACEPTION

HAN, A., SUNG, E., HINRICHS, T., PLATEN, P.

RUHR-UNIVERSITY BOCHUM

Purpose: Modern monophasic oral contraceptives (OC) contain fixed doses of estrogen (E) and progestogen (P) which are taken for 21 consecutive days, followed by 7 days without any hormone intake. There wouldn't be any differences in blood concentrations of estradiol (E2) and progesterone (Prg) during the first 21 days of the menstrual cycle. The regulation of other interacting hormones like hGH, IGF-1, testosterone, and DHEAs, all of them possible anabolic hormones on the level of the muscular cell and important regulating factors during strength training, is not clear so far in OC users. Therefore, we investigated possible different effects of "quasi follicular phase-based" versus "quasi luteal phase-based" strength training (qFT and qLT) on strength parameters and muscle volume in oral contraceptive users.

Methods: 16 healthy untrained or moderately trained women (age: 22.5 ± 2.3 yrs, height: 167.2 ± 6.4 cm, weight: 64.0 ± 9.1 kg) using OC completed a strength training program of the m. quadriceps femoris for each leg on the Leg Press for 3 menstrual cycles (approx. 12 weeks). The subjects were divided into group A and group B. Group A performed qFT with the right leg and qLT with the left leg and vice versa for Group B. qFT was organized 4 times a week in qFO and once in qLU, and qLT was organized 4 times a week in qLU and once a week in qFO. Blood samples were taken on 11th day in qFO and on 25th day in qLU of the menstrual cycle to analyze values of E2, progesterone (Prg), FSH, LH, total testosterone (tT), free testosterone (fT), IGF-1, DHEA-S and hGH. Maximum isometric force (Fmax-iso) was measured for each right and left leg prior to, during (2 times per cycle), and after training. Muscle diameters (Mdm) were measured by means of ultrasound for M. quadriceps prior to and after training, and sum of Mdm of M. rectus femoris, M. vastus intermedius and M. vastus lateralis was calulated.

Results: E2, LH, FSH, tT and DHEAs were significant higher in qFO as compared to qLU, and Prg, hGH, IGF-1 and fT were not significantly different between the two phases. Fmax-iso increased significantly by 24.9 ± 13.6 kg (+29.0 %) after qFT and by 25.6 ± 11.9 kg (+31.9 %) after qLT without any difference between the effects of qFT and qLT. Mean value of Mdm increased significantly by 0.41 ± 0.43 cm (+6.8 %) after qFT and by 0.49 ± 0.41 cm (+8.5 %) after qLT without any significant difference between both interventions

Conclusions: Both, qFT and qLT showed significant effects on muscle strength and muscle diameter after 3 months of intervention without any differences between both interventions. This is in contrast to findings in women without use of oral contraception, who clearly showed a higher increase of muscle strength and muscle diameter after FT as compared to LT. The underlying mechanisms for these different effects have to be analyzed in further studies.

EXERCISE HABITS THROUGH THE LIFE IN THE COMMUNITY-DWELLING JAPANESE ELDERLY

KOZAKAI, R., DOYO, D., KIM, H.Y., ANDO, F., SHIMOKATA, H.

NATIONAL CENTER FOR GERIATRICS AND GERONTOLOGY

Introduction: Physical activity is one of the most important health behaviors especially in later life. Previous studies suggested that sports activities early in life affected to the exercise habits for the future. However, little is known about the participation, type and transition of exercise habits through life in the elderly.

Purpose: The purpose of the present study was to describe the exercise habits across the life course in the community-dwelling Japanese elderly.

Methods: The subjects consisted of 523 males (aged 70.0±6.6 years) and 461 females (aged 69.8±6.7 years). They were the participants aged 60 years and over in the 4th study of the National Institute Longevity Sciences - Longitudinal Study of Aging (NILS-LSA). Exercise habits were assessed using questionnaire and interview by trained staff. The subjects were asked to answer the type, frequency and duration of their exercise habits at the age of 12 years and later. Physical exercise or sports that were engaged in at least once a week and for 20 minutes over 1 year were defined as exercise habits. The life course was divided into five age periods: 10s (teens); 20s (20-29

years); 30s (30-39 years); 40s (40-59 years), 60s (60 years and over). The participation rate in exercise habits was calculated as the percentage of subjects who engaged in exercise by each age period. The Chi-square test was used to examine the difference between males and females. The relationship between participation rate in 60s and that in each 10s-40s was analyzed using the McNemar test.

Results: The participation rate in exercise habits in 10s, 20s, 30s, 40s and 60s were 59.5%, 33.1%, 29.6%, 44.6% and 65.4% in males, while 43.0%, 6.3%, 13.5%, 44.0% and 57.1% in female, respectively. Percentage of males who had exercise habits was significantly larger than that of females through the life excepted in 40s ($p<0.05$). A large drop in the percentage of participation in exercise occurred between 20s among females. The percentage of subjects who had never participated in exercise was 11.1% in males and 20.8% in females. The subjects who had exercise habits in each of 10s, 20s, 30s and 40s were more likely to participate in exercise in 60s in both genders ($p<0.05$). The most males had exercise habits either across life course or only in 60s. The most females had exercise habits in 40s or over for the first time. The popular exercise was totally different in males and females and by each age period. The most popular exercise in 10s was baseball in males and volleyball in females, while that in 60s was walking in both males and females.

Conclusion: Males or people who had exercise habits in early in life were more likely to participate in exercise. There were also the people who started exercise activities in middle-aged and elderly. The popular exercise was different by sex and each age period. These results may help to discern how physical activity behaviors are constituted in later life.

14:00 - 15:30

Oral presentations

OP-PP01 Physical Education and Pedagogics 1

SHARED LEADERSHIP IN TOP SPORTS COACHING: FROM RHETORIC TO REALITY?

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Sports coaching is a complex domain of professional practice which until recently has been informed mainly by approaches modelled within the natural sciences paradigm (Gilbert & Trudel, 2004; Stelter, 2005). Due to the complexity of the sports coaching field it has been argued that it rather should be viewed as an essentially pedagogic and educational endeavour (Jones, 2007). The traditional approach has also been criticised for the hierarchical power relationships between coach and athletes, and for not allowing athletes greater equity. Although recent studies have begun to emphasise the importance of empowerment and athlete autonomy (cf. Jones & Standage, 2006), there are few empirical longitudinal studies in the sport coaching field on this topic.

The purpose of the study was to give insight into and a better understanding of how such ethos can be realistically viewed within the top sport coaching process. The analysis builds on a longitudinal in-depth case study with a National Team during two seasons. In addition more than 20 qualitative interviews with coaches and players were conducted.

The case is especially interesting because in rhetoric, it builds on a more pedagogical-philosophical thinking, than the more traditional technical approach. The coaching philosophy in the team emphasise the importance of shared leadership and autonomy to the players.

Even though the notion of shared leadership and allowing more autonomy to the athletes may be attractive the study also highlights some critical aspects to such democratic ethos. Especially the uneasy interplay between power relations is addressed. The study gives insight into constraints and possibilities with shared leadership, and how the team worked to overcome the gap between idealism and reality.

The positive change both in player involvement processes and in the communication processes seemed possible because both players and coaches were self-reflective and focused on personal growth. Another crucial dimension was that the team actively and critically engaged with the question: ¨What can make us better? This was regarded not only a technological question but much more a pedagogical one.

References

Gilbert, W. & Trudel, P. (2004) Analysis of Coaching Science Research Published From 1970-2001 in Research Quarterly for Exercise and Sport, Vol 75, no. 4, pp. 388-399

Jones, R.L. (2007). Coching redefined: an everyday pedagogical endeavour. Sport, Education and Society, vol.12, no2, pp. 159-173

Jones, R.L. & Standage, M. (2006). First among equals. Shared leadership in the coaching context, in The Sports Coach as Educator. Reconceptualising sports coaching, R. Jones, ed., Routledge, London, UK, pp. 65-77.

Stelter, R. (2005). New Approaches to Exercise and Sport Psychology – Critical Reflections and Useful Recommendations. In Stelter, R. & Roessler, K.K., New Approaches to Sport and Exercise Psychology. UK: Meyer & Meyer Sport (UK) Ltd. Pp. 13-30

STUDYING THE MAP-READING PROCESS AS A ECOSYSTEM; MAP-READING REGARDED AS A WHOLE, COMPRISING THE MAP-READER, THE MAP AND THE TERRAIN

SIGURJONSSON, T.

HEDMARK UNIVERSITY COLLEGE

Introduction: A main intention of the data collection in orienteering research, based on ecosystem thinking, is to provide data that approximately mirrors the performer's experiences during the movement with a map in the terrain. Through this point of view I attempt to understand meaningful, specific relationships that are present in a experience in particular situations in a specific contexts. With Gibson's ecological perspective (1979) I got the opportunity to focus on this natural context where the environment is considered to be rich and meaningful information that a map-reader, based on his/her perception, can pick out.

Methods: In the design of data collection my goal was to obtain access to the participants lived experience with the map-reading ecosystem 'without' disrupting the ongoing process. To illuminate my specific research the collection of data was carried out in a qualitative methodological approach manner. The empirical material was generated from audio and video-taped fieldwork in a naturalistic setting

with follow-up conversations where specific situations from the fieldwork were watched on a television. The techniques of head-mounted-camera were used.

Results: The data collection gave some major challenges and the empirical study revealed to me that it is important to develop methods based on the phenomenon to be studied so that it should not be contradiction between method and phenomenon. This demanded that the selected methods had to be used to decide the method's ability to provide the real-world situation in orienteering justice. Another important factor is to obtain a deviation in the selection of participants to produce a variation in aspect ratio to illuminate the problem formulations.

Discussion: Through this concept I got the opportunity to collect data from orienteering in natural real world settings where my role was in the background although I now and then had to appear in the forefront, for example when the informants did not understand the task at all.

The contribution of this method is that it gives a clear advantage in the way that the camera focuses on the environment rather than the informant. It reduces self-awareness and reinforces the psychological into the initial events (Omodei & McLennan, 1994; Unsworth, 2001). An unequivocal benefit with the use of head-mounted camera is that it provides images from the same visual perspective that the bearer has

Through my research I have experienced the methodological challenges in studying of a phenomenon in natural real world setting. It would be interesting to discuss further with the participant's on the ECSS.

References

Gibson, J. J. (1979). The ecological approach to visual perception.

Omodei, M. M., & McLennan, J. (1994). Perceptual and Motor skills, 79, 1411-1425.

Sigurjónsson, T. (2007). Barns kartlesing.

Unsworth, C. A. (2001). American Journal of Occupational Therapy, 59, 31-40.

SPREAD IN RUNNING TIMES AS A MEASURE OF ORIENTEERING COMPLEXITY FOR BEGINNERS

OTTOSSON, T., ERFORS, A.

KRISTIANSTAD UNIVERSITY COLLEGE

With few exceptions (e.g., Ottosson, 1987; Sigurjónsson, 2007), how beginners in orienteering manage the tasks they are presented is far from well researched. In Swedish orienteering clubs, beginner instruction is normally administered according to a well established pedagogy, most often talked about as a ladder of difficulty. This system builds on many years of collected experiences of instruction, and appears to be generally effective. However, if this pedagogy could be validated by empirical data, its application would be even further motivated. On the other hand, data could, alternatively, point to a more or less different ranking of orienteering difficulties, and thus provide indications of need of revisions of the pedagogy. In this study, split times between control points on courses for children (aged 10 and younger) on regular orienteering events provide data for analysis. It is assumed that more difficult legs would result in greater spread in running times. In other words, a correlation between complexity of orienteering tasks and spread in running times is hypothesised. Different measures of spread are examined, and related to the orienteering tasks accomplished by the children. Greater spread is interpreted as greater complexity of a task, and the pattern of measures of spread, as related to characteristics of the orienteering tasks, is discussed.

Ottosson, T. (1987). Map-reading and wayfinding (Göteborg Studies in Educational Sciences, 65). Göteborg, Sweden: Acta Universitatis Gothoburgensis.

Sigurjónsson, T. (2007). Barns kartlesing: Et samspill mellom kartleser, kart og terreng. Oslo, Norway: Norges Idrettshøgskole.

WHO STOPS – WHO CONTINUES? A STUDY OF PARTICIPATION IN CLUB SPORTS DURING ADOLESCENCE.

THEDIN JAKOBSSON, B., ENGSTRÖM, L.M.

THE SWEDISH SCHOOL OF SPORT AND HEALTH SCIENCES

Nowadays most Swedish children are members of a sports club at some time during their childhood or teenage years. Participation is greatest at the age of twelve. By the end of the teenage years many have ceased to be club members. The overall aim of the study is to investigate changes in sports participation during adolescence. The following questions are of special interest: What characterises those who leave sport and those who continue? Which sports contribute to the retention of participants and which do not? The survey is part of a Swedish multi-disciplinary project called School–Sport–Health 2001, 2004 and 2007, in which 600 girls and boys from Years 3, 5 and 9 participated. It is based on self-reported questionnaires relating to social background, physical education and leisure time activities. The results have been analysed by SPSS, a computer program designed for statistical analysis. The results indicate that about 60 percent of the survey groups are members of sports clubs in Year 9, which is 20 percent less than in Year 6. Boys are more often members than girls, and report a higher training intensity. The most popular club sports in both Years 6 and 9 are horse riding for girls and football for boys. Members of sports clubs report higher grades in Year 9 and often choose academic programmes at upper secondary school. The conclusion is that teenagers who continue to participate in club sports seem to achieve high grades in the subject Physical Education and Health, have a high merit rating in Year 9, are prepared for upper secondary school studies and regard themselves as physically active. The presented data will be discussed from a critical pedagogic perspective in the context of existing research, with a focus on social and cultural resources (values and capital) and participation in organised sport for children and youth.

Blomdahl, U. & Elofsson, S. (2006): Hur många motionerar/idrottar för lite och vilka är dom? En studie av den unga befolkningen i Stockholm Haninge, Helsingborg, Jönköping och Lidingö. Ung livsstil Nr 7. Idrottsförvaltningen Forskningsenheten.

Coakley, Jay (2003): Sports and Children. Are Organized Programs Worth the Effort? in Sport in society Issues & Controversies. Eight Edition. New York. Mc Graw Hill.

De Knop, P. Engström, L-M., & Skirstad, B. (1996): Worldwide Trends in Youth Sport. Human Kinetics.

Engström, L-M. (2004): Rapport nr 1 i serien Skola – Idrott – Hälsa: Stockholm: Idrottshögskolan.

Larsson, B. (2008): Ungdomarna och idrotten. Tonåringars idrottande i fyra skilda miljöer. Stockholm, Pedagogiska institutionen Stockholm universitet.

STUDY ON THE RELATIONSHIP BETWEEN ENERGY EXPENDITURE OF STUDENTS AND TEACHING METHODS OF MOTOR AND SPORTS ACTIVITIES IN PRIMARY SCHOOL IN ITALY

CARLOMAGNO, N., LIPOMA, M., D'ELIA, F., BALDASSARRE, G., SGRÒ, F., SANGIORGIO, A., SIBILIO, M.

(1) UNIVERSITY

Introduction.

The latest indications from the Ministry of Education recall the need that experiences leading to a correct and healthy lifestyle, will be in the curriculum of primary school (PS). They include the prevention of diseases related to hypokinesia, through the enhancement of school and extra-school motor and sport experiences (Ministerial Directives, 2007). In PS the methodological choices are left to the teachers who decide the type of motor and sports activities to be proposed to the students, referring to the objectives and educational programmes and the Directives of the Ministry. The type of motor activity and the energy expenditure (EE) associated with it then depend only on the methodology of the teacher.

Objective.: The objective of this research was to analyze the relationship between teaching methods of motor and sports activities and EE in classrooms of a PS. The study was to determine the difference in EE between the different teaching approaches used independently by each PS teachers and the use of a common teaching methodology.

Methods: The research involved 18 classes for a total of 260 pupils in a PS of Naples. For each pupil has been prepared in advance an information grid collecting data on age, weight, height, the dietary habits, motor or sport practiced actions and some details about life-styles. 18 teachers have been entrusted with the task of leading a lesson in 45 minutes on a common theme while a calorimeter, put on the arm of the students, was measuring energy expenditure during the lesson, through a system of multi-sensor monitoring. Subsequently formative activities, conducted by the University of Salerno and the University Suor Orsola Benincasa of Naples, were carried out to give to the 18 school teachers a shared methodology for the motor activity. In the second phase of the work teachers were asked to propose the activity to the students on whom the calorimeters were set.

Results: The acquisition and the processing of the data using the software Sense Wear and the comparison of these data made possible to measure and compare the differences in EE in the presence of different approaches and in the presence of a single goal, while a greater homogeneity was found when the same methodology was used by teachers. In perspective, the adoption of shared didactic methodologies and protocols for motor activities will allow to pursue the objectives of the Ministerial Directives related to children health.

References

- Ministry of Education (2007). Ministerial Directives for the curriculum of primary school
- Ekelund, U., Yngve, A., Sören, B., Westerterp, K. & Sjöström, M. (2004). Body movement and physical activity energy expenditure in children and adolescents. American Journal of Clinical Nutrition, Vol. 79, No. 5, 851-856.
- Dollman, J., Norton, K. & Norton, L. (2005). Evidence for secular trends in children's physical activity behaviour. British Journal of Sports Medicine 2005;39:892-897

REDESIGNING THE 'SPORT MULTIMEDIAL' E-LEARNING APPLICATION

LESER, R., BACA, A., EDER, C., KARALL, E., MIKO, C., UHLIG, J.

CENTRE OF SPORT SCIENCE, UNIVERSITY OF VIENNA

'Sport Multimedial' is an e-learning platform designed to make theoretical sports-scientific content available within an interdisciplinary network so this content can be used alongside with and as a complement to practical sports courses at the Faculty of Sport Science of the University of Vienna (Baca, Kolb & Eder, 2009). This web application has been in practical use for about three years and was added to the curriculum during that period. Current formative evaluation procedures show, however, that students and instructors have not accepted the platform to the degree desired. This paper discusses known reasons for this and proposes approaches to solutions for the planned further development of the system.

The platform is currently based mainly on a cognitivistic approach to learning. The subject matter is presented using various media (text, video, animation, etc.) and the primary goal is simply to convey information. Particularly in motor learning, such components as experimentation and trying things out are also meaningful in the context of a constructivist approach. Target-oriented implementation of interactive elements is to place more emphasis on these aspects in the future. In this context, enhanced functions for communication between students and between students and instructors are being planned, too. With these functional expansions to the learning platform, the authors hope above all to acknowledge the primacy of situated learning. It is hoped that this will lead to an intensified transfer of knowledge whose effect will last far beyond the teaching situation.

Although it was desired to use Sport Multimedial in all courses at the Faculty of Sport Science, this turned out to be quite difficult because it was not possible to motivate enough instructors of practical courses to join the project. The authors feel that this is mainly due to the extra time instructors need to spend before they can begin to use the medium, while a possible added value for their courses will not materialize until later on.

For the next project phases, the authors succeeded in motivating two instructors of practical courses, who are responsible for many of the relevant courses, to join the inner circle of the development team. These persons are employed by the Faculty of Sports Science as senior lecturers for tasks that transcend pure teaching. Accordingly, they take over coaching and quality monitoring activities within the Sport Multimedial project. As a first step, the courses of these two senior lecturers will be adapted to the new concept. This is expected to cause a snowball effect that the students visiting courses integrated in the system should transfer to practical courses not yet integrated.

References

Baca, A., Kolb, M. & Eder, C. (2009). Sport Multimedial – Entwicklung, Implementierung und curriculare Einbindung. In C. Igel & A. Baca (Eds.), Update eLearning. Hamburg: Czwalina, in Press.

14:00 - 15:30

Invited symposia

IS-SM04 Prevention of Sport Injuries (ECSS Position Statement Symposium)

PREVENTION OF SPORT INJURIES I/IV

STEFFEN, K.

NORWEGIAN SCHOOL OF SPORT SCIENCES

To maximize the health benefits of sports and exercise and minimize the direct and indirect costs associated with injuries, developing and adopting injury prevention strategies is an important goal. The aim of this ECSS consensus paper on injury prevention is to review current evidence on injury prevention methods and training programs aimed at reducing the most common or severe types of acute injuries. The target audience is everyone involved in protecting the health of the athlete, i.e. coaches, referees, medical staff, sports governing bodies, as well as athletes themselves. Effective sports injury prevention requires successful implementation of efficacious interventions. This paper reviews the main mechanisms and risk factors for acute injuries to the head, shoulder, elbow, hand/wrist, groin, thigh, knee and ankle, as well as the evidence supporting various strategies to prevent them. Approaches that have been proven successful include: 1) using equipment designed to reduce injury risk, 2) adopting the rules of play, and 3) specific exercise programs developed to reduce injury risk. Sports organizations should adopt available injury prevention strategies as part of their policies.

[Please note: This paper is part of the ECSS Position Statement: Prevention of Sport Injuries, K. Steffen, T.E. Andersen, T. Krosshaug, W. van Mechelen, G. Myklebust, E. Verhagen, R. Bahr and will be published in the European Journal of Sport Science (EJSS)]

PREVENTION OF SPORT INJURIES II/IV

VERHAGEN, E.

EMGO-INSTITUTE/VU UNIVERSITY MEDICAL CENTER

To maximize the health benefits of sports and exercise and minimize the direct and indirect costs associated with injuries, developing and adopting injury prevention strategies is an important goal. The aim of this ECSS consensus paper on injury prevention is to review current evidence on injury prevention methods and training programs aimed at reducing the most common or severe types of acute injuries. The target audience is everyone involved in protecting the health of the athlete, i.e. coaches, referees, medical staff, sports governing bodies, as well as athletes themselves. Effective sports injury prevention requires successful implementation of efficacious interventions. This paper reviews the main mechanisms and risk factors for acute injuries to the head, shoulder, elbow, hand/wrist, groin, thigh, knee and ankle, as well as the evidence supporting various strategies to prevent them. Approaches that have been proven successful include: 1) using equipment designed to reduce injury risk, 2) adopting the rules of play, and 3) specific exercise programs developed to reduce injury risk. Sports organizations should adopt available injury prevention strategies as part of their policies.

[Please note: This paper is part of the ECSS Position Statement: Prevention of Sport Injuries, K. Steffen, T.E. Andersen, T. Krosshaug, W. van Mechelen, G. Myklebust, E. Verhagen, R. Bahr and will be published in the European Journal of Sport Science (EJSS)]

PREVENTION OF SPORT INJURIES III/IV

MYKLEBUST, G.

NORWEGIAN SCHOOL OF SPORT SCIENCES

To maximize the health benefits of sports and exercise and minimize the direct and indirect costs associated with injuries, developing and adopting injury prevention strategies is an important goal. The aim of this ECSS consensus paper on injury prevention is to review current evidence on injury prevention methods and training programs aimed at reducing the most common or severe types of acute injuries. The target audience is everyone involved in protecting the health of the athlete, i.e. coaches, referees, medical staff, sports governing bodies, as well as athletes themselves. Effective sports injury prevention requires successful implementation of efficacious interventions. This paper reviews the main mechanisms and risk factors for acute injuries to the head, shoulder, elbow, hand/wrist, groin, thigh, knee and ankle, as well as the evidence supporting various strategies to prevent them. Approaches that have been proven successful include: 1) using equipment designed to reduce injury risk, 2) adopting the rules of play, and 3) specific exercise programs developed to reduce injury risk. Sports organizations should adopt available injury prevention strategies as part of their policies.

[Please note: This paper is part of the ECSS Position Statement: Prevention of Sport Injuries, K. Steffen, T.E. Andersen, T. Krosshaug, W. van Mechelen, G. Myklebust, E. Verhagen, R. Bahr and will be published in the European Journal of Sport Science (EJSS)]

PREVENTION OF SPORT INJURIES IV/IV

KROSSHAUG, T.

THE NORWEGIAN SCHOOL OF SPORT SCIENCES, OSLO SPORTS TRAUMA RESEARCH CENTER

To maximize the health benefits of sports and exercise and minimize the direct and indirect costs associated with injuries, developing and adopting injury prevention strategies is an important goal. The aim of this ECSS consensus paper on injury prevention is to review current evidence on injury prevention methods and training programs aimed at reducing the most common or severe types of acute injuries. The target audience is everyone involved in protecting the health of the athlete, i.e. coaches, referees, medical staff, sports governing bodies, as well as athletes themselves. Effective sports injury prevention requires successful implementation of efficacious interventions. This paper reviews the main mechanisms and risk factors for acute injuries to the head, shoulder, elbow, hand/wrist, groin, thigh, knee and ankle, as well as the evidence supporting various strategies to prevent them. Approaches that have been proven successful include: 1) using equipment designed to reduce injury risk, 2) adopting the rules of play, and 3) specific exercise programs developed to reduce injury risk. Sports organizations should adopt available injury prevention strategies as part of their policies.

[Please note: This paper is part of the ECSS Position Statement: Prevention of Sport Injuries, K. Steffen, T.E. Andersen, T. Krosshaug, W. van Mechelen, G. Myklebust, E. Verhagen, R. Bahr and will be published in the European Journal of Sport Science (EJSS)]

14:00 - 15:30

Invited symposia

IS-BC01 Satellite cells and regulation of muscle mass

THE BEHAVIOUR OF SATELLITE CELLS IN RESPONSE TO LOADING AND UNLOADING IN YOUNG AND OLD

MACKEY, A.

BISPEBJERG HOSPITAL AND UNIVERSITY OF COPENHAGEN

Of the many different populations of cells residing in adult skeletal muscle, satellite cells are critical where processes of muscle growth, hypertrophy and repair are concerned. Increased life expectancy and associated sarcopenia have resulted in an increased effort to understand the function or dysfunction of satellite cells with ageing. It has now repeatedly been shown that heavy strength training and myofibre injury lead to proliferation of this cell population, in healthy young and old individuals, to varying extents. The purpose of these new myonuclei is to maintain an expanding cytoplasm or new muscle tissue in the case of hypertrophy or repair, respectively. Furthermore, it is apparent that satellite cells are subject to a strong regulatory influence by the niche in which they reside. Studying satellite cell activity with the aid of different markers, such as CD56 and Pax7, in the context of the local environment thus provides further insight into the behaviour of satellite cells in response to different stimuli. To provide some balance to the popular heavy loading models, muscle unloading is an interesting model for monitoring the behaviour of satellite cells. In addition, the ability to introduce pharmacological agents, such as anti-inflammatory medication and growth factors, directly into the muscle contributes further to the relatively limited selection of tools available for the study of satellite cells.

SATELLITE CELLS AND THE MYOGENIC RESPONSE TO DAMAGING EXERCISE

RAASTAD, T.

NORWEGIAN SCHOOL OF SPORT SCIENCES

It is well documented that satellite cells play an important role in the regeneration process after muscle damage in mammalian skeletal muscle [2]. In animal models, severe muscle damage results in necrosis of muscle fibres and an inflammatory response is initiated. In the repair process the satellite cells are activated and start to proliferate. Later, a phase of differentiation and fusion of satellite cells leads to the formation of new myotubes that replace the once lost in necrosis. In the case of exercise-induced muscle damage, it is probably only segments of fibres that undergo necrosis and need to be replaced. The importance of satellite cells for full regeneration is demonstrated in studies where satellite cell activation is reduced [1].

Although the role of satellite cells in regeneration after damaging exercise is well described in animal models, the events of regeneration have so far not been shown in human muscles. The main reason is probably that necrosis rarely occurs after muscle-damaging exercise in humans. However, in a recent experiment we have observed extensive necrosis after high-force eccentric exercise with the elbow flexors [5]. Analysis of repeated biopsies obtained in the days and weeks after exercise demonstrated a similar regeneration process as earlier described in animal models. The different phases of the satellite cell response can be followed by using markers for proliferation and differentiation. A number of different proliferation markers can be used, but so far the myogenic regulatory factors have been used most extensively to mark both proliferation and differentiation phases. Also in studies with no apparent fibre necrosis, activation of satellite cells has been indicated [3, 4]. The role of the satellite cells in recovery processes without necrosis is less clear, but addition of nuclei may help the reconstruction of damaged structures within surviving fibres as well.

The inflammatory process initiated after severe muscle damage seems to be important both for removing debris and in the activation of satellite cells [6]. Consequently, administration of anti-inflammatory drugs may actually hamper regeneration after muscle damage. So far this potentially negative effect of anti-inflammatory drugs on the recovery processes is reported in animal models [1]. In humans, administration of NSAIDs reduced the increase in satellite cells after running exercise [4]. Surprisingly, in our recent study with extensive necrosis, the administration of a COX-2 inhibitor did not seem to affect the satellite cell response detectably [5]. Consequently, more studies are needed to further explore the interaction between the inflammatory process, activation of satellite cells and the orchestration of the recovery processes in humans.

1. Bondesen. Am.J Physiol Cell Physiol 2004; 287:C475-C483
2. Charge. Physiol Rev. 2004; 84:209-238
3. Dreyer. Muscle Nerve 2006; 33:242-253
4. Mackey. J Appl Physiol 2007; 103:425-431
5. Paulsen. Scand J Med Sci Sports 2009 (In Press)
6. Tidball. Am.J.Physiol 2005; 288:R345-R353

THE BEHAVIOUR OF YOUNG AND OLD HUMAN MYOBLASTS

HARRIDGE, S.

KING'S COLLEGE LONDON

Twenty years ago Carlson and Faulkner (1989) made the interesting observation that if a muscle from an aged rat was transplanted into a young host the recovery potential of that muscle, in terms of mass and force production, was similar to that of a transplanted young muscle. Conversely, both young and old muscles recovered less well if they were transplanted into an aged as opposed to young host. This study provided the first evidence of a negative of the systemic environment, rather than on the tissue itself, on skeletal muscle regen-

eration. More recently these observations have been supported by work on parobiotic mice, animals which share a conjoined circulation. Using this model, recovery to a damaged older muscle was markedly improved if the aged animal shared its circulation with a younger animal (Conboy et al. 2005). Recent studies (Carlson et al. 2008) suggest that this age related impairment to recovery from damage relates to changes in a number of signalling pathways (Notch, TGF-beta, pSmad3). These pathways regulate the proliferation and the myogenic commitment of satellite cells which are required not only for repair, but also for adaptation and hypertrophy. Whilst age-related impairments in the recovery of muscle from damage have been demonstrated in rodent studies, human exercise studies have shown that even the muscles of very elderly people are able to increase satellite cell number and hypertrophy in response to overload. We have recently used a primary cell / serum model to study the effects of the age of systemic environment on the behaviour of human cells extracted from muscle biopsies in culture. We have shown that committed myoblasts show similar abilities to both proliferate and differentiate when cultured in either a young or old serum. Furthermore, the cell itself (i.e. whether it originates from a young of elderly donor) shows no age-dependent behaviour. These findings would therefore suggest that a sufficient number of satellite cells are able to successfully progress through the myogenic lineage and can contribute to adaptation, even in an apparently hostile aged milieu.

Carlson BM & Faulkner JA. (1989) Muscle transplantation between young and old rats: age of host determines recovery. Am J Physiol. 256:C1262-6.

Carlson ME, Hsu M & Con boy IM. (2008) Imbalance between pSmad3 and Notch induces CDK inhibitors in old muscle stem cells. Nature 454:528-32

Conboy IM, Con boy MJ, Wagers AJ, Girma ER, Weissman IL & Rando TA. (2005) Rejuvenation of aged progenitor cells by exposure to a young systemic environment. Nature.433:760-4.

THE REGENERATIVE POTENTIAL OF HUMAN SKELETAL: EFFECTS OF EXERCISE ON TELOMERES.

PONSOT, E.

ÖREBRO UNIVERSITY

The length of DNA telomeres is an important parameter of the proliferative potential of tissues. Recent data also suggest that the rate of telomere shortening is accelerated by external factors such as oxidative stress. A recent study reported abnormally short telomeres in skeletal muscle of athletes with exercise-associated fatigue. This important report raises the question of whether long-term practise of exercise might have deleterious effects on muscle telomeres, and thus on skeletal muscle tissue regenerative capacity.

Recent data suggest that skeletal muscle telomere length is not altered during healthy aging as no significant differences in telomere are found between healthy active old men and women and young men and women with comparable physical activity level (Ponsot et al., 2008). In addition, in well-trained athletes with long history of strength training but free from symptoms of overtraining, there are no deleterious effects on telomeres, and on the contrary, telomere length in these subjects tend to be longer than in subjects with no history of strength training (Kadi et al., 2008). In accordance with data found in skeletal muscle, recent findings suggest that physical activity can be a positive regulator of telomere length in leukocytes (Cherkas et al., 2008; Ludlow et al., 2008). These results set the basis for a new hypothesis suggesting that, rather than being deleterious, well-designed exercise training may have a positive effect on in vivo regenerative capacity of skeletal muscle in healthy individuals.

References

Cherkas LF, Hunkin JL, Kato BS, Richards JB, Gardner JP, Surdulescu GL, Kimura M, Lu X, Spector TD & Aviv A. (2008). The association between physical activity in leisure time and leukocyte telomere length. Arch Intern Med 168, 154-158.

Kadi F, Ponsot E, Piehl-Aulin K, Mackey A, Kjaer M, Oskarsson E & Holm L. (2008). The effects of regular strength training on telomere length in human skeletal muscle. Med Sci Sports Exerc 40, 82-87.

Ludlow AT, Zimmerman JB, Witkowski S, Hearn JW, Hatfield BD & Roth SM. (2008). Relationship between physical activity level, telomere length, and telomerase activity. Med Sci Sports Exerc 40, 1764-1771.

Ponsot E, Lexell J & Kadi F. (2008). Skeletal muscle telomere length is not impaired in healthy physically active old women and men. Muscle Nerve 37, 467-472.

EXERCISE TRAINING, SATELLITE CELLS AND THE REGENERATIVE POTENTIAL OF SKELETAL MUSCLE

KADI, F.

ÖREBRO UNIVERSITY

Human skeletal muscle is a dynamic tissue characterised by a remarkable ability to continuously respond to environmental stimuli. Experiments in humans clearly show the great ability of skeletal muscle to regenerate after loading or injury or both. Satellite cells in human skeletal muscle enter proliferation in response to light and heavy resistance training or endurance exercises both in young and old individuals. Enhancement of satellite cell pool in response to training is another health benefit of exercise. The proliferative capacity of skeletal muscle is influenced by the length of DNA sequences located at the end of chromosomes called telomeres. A dramatic shortening of telomeres is associated with a reduction in tissue regenerative potential. Rather than considering skeletal muscle as a stable tissue in term of regenerative events, muscle biologists start to learn that under harmful circumstances an abnormal shortening of telomeres might occur and that when training is properly performed the telomere length can be positively regulated. No doubt that new mechanisms relating the effects of exercise on the regenerative capacity of skeletal muscle and the regulation of telomere length will emerge in the near future.

14:00 - 15:30

Oral presentations

OP-PH03 Physiology 3

INFLUENCE OF EXERCISE VARIATION ON THE RETENTION OF A PACING STRATEGY

MAUGER, A., JONES, A., WILLIAMS, C.A.

EXETER UNIVERSITY

Background: In competitions where time to completion is the measure of success, pacing strategy exerts an important influence on performance. The Theory of Teleoanticipation and the Central Governor Model, proposes that a pacing strategy is set in a feedforward manner, based on distance or duration, prior to the onset of an exercise bout. Prior experience of an exercise bout allows the construction of a pacing schema, which is utilised for subsequent, similar bouts of exercise. During exercise, distance or time remaining is judged by an 'internal clock' that is located in the brain. It is proposed that this timing mechanism works in a scalar fashion, using relative rather than absolute quantities. Despite the apparent importance of the scalar clock to the maintenance of a pacing strategy, knowledge in this area is presently limited.

Aims: To establish whether the introduction of an exercise bout of different distance, in the absence of distance feedback, would affect the retention of the pacing schema stored from a prior exercise bout. Furthermore, to identify whether the internal clock has an ability to calibrate to absolute distance, and whether this mechanism is disrupted by an exercise requiring a different pacing strategy.

Methods: Sixteen highly-trained male cyclists were randomly split into a control (CON) or experimental group (EXP) and completed four time trials (TT) of two different distances (2x4 km and 2x6 km) in varying orders, separated by 17 minutes. The participants in the CON group completed both distances in a sequential order (i.e. half performed 4 km, 4 km, 6 km, 6 km, and the other half performed 6 km, 6 km, 4 km, 4 km). The EXP group completed both distances in a variable order (i.e. half performed 4 km, 6 km, 4 km, 6 km, and the other half performed 6 km, 4 km, 6 km, 4 km). During each TT, power output, VO2 and heart rate were recorded. Participants in both groups were asked to call out their RPE for every km they thought they had completed.

Results: No significant differences were found between or within groups for completion time or PO ($p > 0.05$). The CON group showed a significant improvement in their estimation of distance completed in both the 4 km (24.6 ± 18.2 % vs. 8.2 ± 5.5 %) and 6 km (15.2 ± 7 % vs. 8.6 ± 3 %) distances ($t7 = 2.791$, $t7 = 3.118$, $p < 0.05$). No significant differences in distance estimation were observed in the EXP for either of the TT distances ($p > 0.05$).

Conclusion: The primary finding of this study is that participants who did not receive an exercise interruption displayed a significant improvement in their judgement of distance completed, despite no improvement in completion time. This suggests that a learned pacing schema is robust and not negatively affected by subsequent pacing variation and can be retrieved when required. The internal clock shows an ability to be calibrated to absolute distance, although this does not improve performance.

UNRAVELLING THE MECHANISMS OF EARLY-MORNING CEREBRAL EVENTS: THE IMPORTANCE OF DIURNAL VARIATION IN ORTHOSTATIC TOLERANCE

LEWIS, N.C.S., LUCAS, S.J.E., GRANT, E.J.M., ATKINSON, G., JONES, H., AINSLIE, P.N.

LIVERPOOL JOHN MOORES UNIVERSITY, AND THE UNIVERSITY OF OTAGO

Introduction: The most common form of syncope is explained by vasovagal mechanisms. Hypotension during pre-syncope is probably precipitated by sympathetic nervous system withdrawal (Mosqueda-Garcia et al., 1997) but loss of consciousness is caused by cerebral hypoperfusion. The risk of neurally-mediated syncope peaks in the morning (van Dijk et al., 2007), coinciding with the time of resuming upright posture and the beginning of physical activity. It is critical that the relative importance of orthostatic- and exercise-related challenges are unravelled to gain an understanding of why cerebral ischemia events peak in the morning. This study is the first to examine the extent to which orthostatic-induced reductions in blood pressure (BP) and cerebral blood flow may differ with time of day. It was hypothesised that orthostatic tolerance is impaired in the morning due to a diurnal failure to maintain BP and thus cerebral hypoperfusion.

Methods: Nine male and six female participants aged 27±5 yrs (mean±SD) completed two trials starting at 06:00 h and 16:00 h. Continuous beat-to-beat measurements of cerebral blood flow velocity (CBFv; transcranial Doppler), BP (Finometer), heart rate (HR), and end-tidal PCO2 were obtained during 15 min of supine rest and during 60° head-up tilt with lower body negative pressure in 5-min increments of -10 mmHg, until pre-syncope. Pre-syncope was terminated on participants' request due to subjective symptoms associated with fainting, or when systolic BP reduced to <80 mmHg for more than 10 s. Data were analysed using paired t-tests and reported as mean±SD.

Results: During supine baseline, mean BP was 5±1mmHg higher, and CBFv was 7±3 cm/s lower in the morning compared with the afternoon ($P<0.05$). Baseline measurements of HR and end-tidal PCO2 did not differ between times of day ($P>0.05$). Time to pre-syncope occurred faster in the morning (1634±633 s) than in the afternoon (1988±475 s) with the 95% confidence limits for the mean difference between times of day being 25 to 684 s ($P=0.04$). Despite the diurnal variation at baseline, mean BP, CBFv, HR and end-tidal PCO2 at pre-syncope did not differ significantly between times of day ($P>0.05$).

Discussion: A marked reduction in orthostatic tolerance is evident in the early morning, resulting in an earlier onset of pre-syncope. Although the sequence of haemodynamic adjustments is similar between the two times of day, the adjustments are accelerated in the early morning, presumably via impairment in the bar reflex control of BP at this time of day. This study shows that postural changes independent of an exercise effect can increase the risk of vasovagal syncope in the morning in young, healthy and physically-fit people.

References

Mosqueda-Garcia R, Furlan R, Fernandez-Violante R, Desail T, Snell M, Jarai Z, Ananthram V, Robertson RM, Robertson D. (1997). J Clin Invest, 99, 2736-2744.

van Dijk N, Boer MC, Santo TD, Grovale N, Aerts AJJ, Boersma L, Wieling W. (2007). Europace, 9, 823-82.

THE EFFECT OF BICARBONATE INFUSION IN CEREBRAL METABOLISM DURING MAXIMAL EXERCISE

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AALBORG UNIVERSITY

Exercise lowers the cerebral metabolic ratio of O2 to carbohydrates (glucose + ½ lactate). Metabolic acidosis increases cerebral lactate uptake and exacerbates the cerebral metabolic ratio in vitro. However, the influence of pH on cerebral lactate uptake and the cerebral metabolic ratio during exercise in humans is not known.

PURPOSE: To evaluate the influence of pH on cerebral metabolism during maximal exercise. METHODS: Sodium bicarbonate (Bic, 1 M; 350-500 ml) or an equal volume of saline (Sal; 1 M) was infused intravenously at a constant rate during a '2,000-m' maximal ergometer row in six male oarsmen (23 ± 2 yrs). Comparisons between the two conditions were made using two-way ANOVA with repeated measures. RESULTS: During the Sal trial, pH decreased from 7.41 ± 0.01 at rest to 7.02 ± 0.02 but only to 7.36 ± 0.02 ($P < 0.05$) during the Bic trial. Arterial lactate increased to 21.4 ± 0.8 mM (mean ± SEM) and 32.7 ± 2.3 mM during the Sal and Bic trials, respectively. The arterial-jugular venous (a-v) lactate difference increased from -0.03 ± 0.01 mM at rest to 3.2 ± 0.9 mM ($P < 0.05$) and 3.4 ± 1.4 mM ($P < 0.05$) following the Sal and Bic trials, respectively. The cerebral metabolic ratio decreased equally during the Sal and Bic trials from 5.8 ± 0.6 at rest to 1.7 ± 0.1 and 1.8 ± 0.2, respectively.

CONCLUSION: The enlarged blood-buffering capacity after infusion of Bic attenuated the metabolic acidosis but did not affect the cerebral lactate uptake or the cerebral metabolic ratio during maximal exercise.

EFFECTS OF PRIOR EXHAUSTIVE LEG OR ARM EXERCISE ON SUBSEQUENT PERFORMANCE, POWER AND EMG ACTIVITY IN A DIFFERENT MUSCLE GROUP

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UNIVERSITY OF CAPETOWN

Introduction: A prior bout of exhaustive exercise is known to result in early exhaustion being reached during a subsequent bout of maximal exercise. Much of the research to date has examined peripheral factors for this phenomenon. Therefore, the aim of this study was to investigate the contribution of central regulation on the performance of maximal exercise preceded by a bout of exhaustive exercise using a different muscle group.

Methods: Ten healthy men (5 well-trained cyclists and 5 well-trained canoeists) were recruited for this study and all completed two exercise trials. In trial 1, subjects performed an incremental leg ergometry test to exhaustion (LEG A), followed 15 minutes later by an incremental arm ergometry test to exhaustion (ARM B). In trial 2, the order was reversed (ARM A followed 15 minutes later by LEG B). The two trials were separated by at least 3 days and the order in which the subjects performed the trials was randomised. Time to exhaustion (TE), power output (PO), heart rate (HR), rating of perceived exertion (RPE), oxygen consumption (VO2), ventilation rate (VE), plasma lactate (LA) and electromyography (EMG) of two lower (rectus femoris and vastus lateralis) and two upper limb (triceps and biceps) muscles were measured during all trials.

Results: During the A trials, subjects reached exhaustion faster and at a higher PO during legs compared to arms. While HR and RPE were similar in the leg and arm tests at exhaustion, VO2 ($p = 0.018$) and VE ($p = 0.008$) were lower in the arm test. Performance during ARM B was unaffected by prior LEG A. However, prior ARM A significantly reduced TE ($p = 0.011$) and peak PO ($p = 0.011$) during subsequent LEG B. There were no changes in maximal VO2, HR, RPE, VE and LA between trials A and B of each muscle group. LA was higher at the beginning of LEG B ($p < 0.001$) and ARM B ($p = 0.001$) exercise compared to their respective A trials. Prior LEG A affected subsequent ARM B HR for the first 40% of the trial. During LEG B, however, HR differed only at the start and 20% of the test. EMG increased linearly during all the trials and maximal EMG activity measured during the tests was only 55% of previous MVC. RPE rose linearly during all tests, regardless of different levels of LA and HR. None of the measured physiological/neuromuscular variables measured showed a plateau at exhaustion.

Conclusion: Prior arm exercise reduced peak power output during a subsequent bout of exhaustive leg exercise without altering the physiological or EMG variables measured in this study. In contrast, prior leg exercise did not alter peak power output during subsequent arm exercise. These results suggest that during the tests RPE was set in anticipation, being independent of the amount of muscle mass activated, HR or LA. These data are difficult to interpret according to traditional peripheral models of exercise fatigue and deserves further investigations.

IMPACT OF TRAINING STATUS ON MAXIMAL OXYGEN UPTAKE CRITERIA ATTAINMENT DURING CYCLING

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Objectives: The aims of this study were to assess whether training status influenced maximal physiological and perceptual responses and whether certain maximal criteria were more sensitive for individuals with different levels of training. Methods: Females who were either trained (N = 10) or untrained (N = 10) underwent a maximal cycle ergometer test to assess whether the criteria to indicate VO2 max were training-specific. Results: Expectedly, VO2 max was significantly higher in the trained (50.09 mlO2.kg-1.min-1) compared to the untrained group (35.21 mlO2.kg-1.min-1) while the oxygen uptake plateau criterion was met by only 40% of the participants. Peak workload (W) was significantly higher (234 W compared to 174 W) and total test time significantly longer (7 minutes compared to 5 minutes) in the trained group. Peak lactate values did not reach maximal criteria and on completion of the test were not significantly different between the groups (7.8 mmol.L-1 in the trained group and 8.1 mmol.L-1 in the untrained group). Likewise, maximal heart rates, respiratory exchange ratio (RER) values and ratings of perceived effort were not different between the groups. Noteworthy is that none of the subjects achieved all of the criteria indicating a maximal effort. The criteria most achieved in both samples were RPEmax and RERmax with the latter being the most attained in the untrained group and RPEmax being mostly attained by the trained group. Conclusions: The criteria used to indicate attainment of VO2 max may be limited and may differ when comparing a heterogeneous training sample. Although VO2 max was significantly higher in the trained group, all the other responses were similar. However, the number of trained and untrained subjects reaching particular criteria was different suggesting that certain criteria may be more sensitive for individuals with different levels of training.

HIGH INTENSITY EXERCISE <HIT> IN CHILDREN: RESULTS FROM DIFFERENT DISCIPLINES

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GERMAN SPORT UNIVERSITY COLOGNE, THE GERMAN RESEARCH CENTRE OF ELITE SPORT, GERMAN SPORT UNIVERSITY COLOGNE, GERMANY

INTRODUCTION: Recent studies of high intensity training (HIT) in different endurance related sports (GIBALA et al. 2007, FAUDE et al. 2008, MacMILLAN 2004) with adult athletes document that HIT leads to similar or even the same physiology adaptations in respectively shorter exercise time compared to high volume training (HVT). Current publications show positive effects on mitochondrial efficiency and lipid metabolism after HIT (DAUSSIN et al 2008). Studies regarding HIT in children are rare. The goal of the study was to compare HIT vs HVT in two different disciplines with different metabolic demands on physiological and performance related parameters in children.

METHOD: Two studies in swimming (A, n= 27, 9-12yrs) and soccer (B, n=19, 14 yrs) were conducted: In both studies the participants were divided into two groups in order to compare the effects of HIT vs HVT. A: Before and after the training intervention maximal oxygen uptake and power output at 4 mmol/L lactate (Lac) were assessed. All participants performed a 2km-test, a 100m test with logging of post lactate kinetics as well as a 6x50m interval-test in a 50m pool. B): Before and after the mesocycle maximal oxygen uptake was assessed. All participants performed a 1km run, as well as a 20m, 30m and 40m sprints. Jumping performance was measured in a drop and counter movement jump. RESULT: A): Training: Workload for HIT was set at ~93% of personal best time corresponding to average lactate values of 5.2±1.2 mmol/l Lactate. HVT was set at 83% of personal best time with average lactate values of 2.3±0.5 mmol/l Lactate. HIT training volume was set at 57x50m, 57x100, 15x200m and 3x300m intervals (total: 27,3 km, time per session:60 minutes). HVT training volume was: 89x100m, 62x200m, 53x300m, 19x400m and 4x800m intervals (57,3km, time per session:90 minutes). No statistical differences were found for any physiological variable between the groups. Competition performance showed an increase of 9% for HVT and 14.3% for HIT.

B): Mean HR during HIT was 25.3% at 90-100% HRmax, 39.3% at 80-90% HRmax, 20.7% at 70-80% HRmax, 11.6% at 60-70% HRmax and 3.2% <60% HRmax. For HVT HR was set at 0.8% at 90-100%, 27.0% at 80-90% HRmax, 42.5% at70-80 HRmax, 9.7% at 60-70 HRmax and 9.9% below 60% HRmax. Mean Lac-values in HIT were 8.74±3.20mmol/L Lac and 2.17±1.09mmol/l. Oxygen uptake increased depending on recovery time.

Summary: The results indicate that HVT is not necessarily beneficial as trainings strategy compared to HIT in swimming and soccer at the age of 9-14 years.

In the presented studies, HIT showed similar effects compared to HVT achieved in less training time. The data also reveals performance enhancing effects depending on time of recovery. This saving in time may favor training contents such as technical and strength drills as well as recovery in the long term development of performance.

14:00 - 15:30

Oral presentations

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POST-RESISTANCE EXERCISE HEMODYNAMICS IN ELDERLY

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UNIVERSITY OF SAO PAULO - FEDERAL UNIVERSITY OF SAO PAULO

Introduction: Aging process reduces muscle mass, strength and power; and resistance training has been recommended to delay this process. It's known that each session of resistance exercise promotes post-exercise hypotension in young subjects. However, aging is accompanied by many cardiovascular alterations that might change hemodynamic responses after exercise. Thus, the purpose of this study was to investigate blood pressure (BP) and its hemodynamic mechanisms after a single bout of resistance training in elderly subjects.

Methods: Sixteen normotensive elderly (63±1 years; 123±2/79±1 mmHg), who were already participating in a strength training program for 12 weeks, underwent two experimental sessions in a random order: Control (C) – remain seated for 90 min, and Exercise (E) – 7 resistance exercises (3 sets of 8 RM). Auscultatory BP, cardiac output (CO-CO2 rebreathing) and heart rate (HR-ECG) were measured before and at 30 and 60 minutes after interventions. The responses (difference between values measured post and pre interventions: Δ30-pre and Δ60-pre) were compared by a 2-way analysis of variance for repeated measures. Data are presented as means±SE.

Results: Systolic and mean BP increased in the C (greatest increases = +8.4±1.4 and +4.4±0.9 mmHg, P<0.05, respectively), and did not change in the E session. Diastolic BP did not change after both sessions. Systemic vascular resistance increased similarly in both sessions, while CO decreased significantly only in the E (greatest decrease = -0.5±0.1 l/min, P<0.05). Stroke volume decreased, while HR increased significantly in the E session (greatest responses = -9.6±1.9 ml/beat and +3.7±1.5 beat/min, P<0.05, respectively).

Conclusion: In trained elderly, each session of resistance training promoted post-exercise hypotensive effects, since BP increased after the C session, which was prevented by the E session. This effect was due to a CO decrease that is not compensated by an increase in systemic vascular resistance. CO reduction after resistance exercise was mediated by a stroke volume decrease that was not compensated besides the HR increase.

Financial support: FAPESP and CNPQ.

CHANGES IN MUSCULAR STRENGTH: FROM BIRTH TO DEATH

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UNIVERSITY OF TARTU

Introduction: It is well known that there are gradual, progressive and regressive changes in body structure and function from birth to death. These progressive changes are rapid during the intensive growth period but slow down from the fourth decade of life, particularly

skeletal muscle mass and strength (Herndon et al., 2002). Protein synthesis in skeletal muscle, particularly contractile protein myosin heavy chain (MyHC), has been found to be a predictor of locomotory function. A reduction of contractile proteins contributes to the decline muscular strength (Seene et al., 2008). The purpose of the present study was to assess changes in muscle strength from one month to 80 years old age, and find the relations with changes in locomotory function through the life-span.

Methods : Under assessment were persons from one month till 80 years of age. Pediatric assessment techniques were used for physical examination during the preschool period. Arm and leg strength (1RM), muscle fiber types, cross-section area, myonuclear domain size and the myosin heavy chain isoform pattern were measured as described earlier (Seene et al., 2008).

Results: Strength development starts at birth in the form of movements in gravitational field. Taking into account that a infant's head is 2/3 of its total mature size and muscle mass comprises about 20% of the total bwt, these movements have to exert a force of attraction. After the fourth decade of life, muscle strength slowly begins to decline. Between 30 and 40 years of age, the decline was ~5%, 40 and 50 ~14%, 50 and 60 ~16%, 60 and 70 ~26%, and 70 and 80 ~30%. The decrease of muscle strength is accompanied with the decrease of FT muscle fibers and IIx isoform relative content of MyHC.

Discussion: It is a widely accepted standpoint that the best time for strength development starts from late puberty. In reality, a newborn infant starts to fight with gravitation at birth and this process is actual strength development. The development of posture control across the life-span and its integration with locomotory function show dependence on the muscle strength. When balancing, older adults as well as like young children, use antagonist muscles more often in coactivation with agonist muscles (Woollacott et al., 1986). Muscle weakness is the main factor in the dysfunction of locomotor acitvity and balance through the life-span. A decline in muscle strength is in good agreement with the decrease of proportion of FT muscle fibers and IIx MyHC isoforms relative content in skeletal muscle. Locomotory dysfunction in infants and elderly people is the result of insufficient muscle strength.

References

Henderson L, Schmeissner P, Dudaronek J, et al. (2002). Nature, 419, 808-814. Seene T, Umnova M, Kaasik P, et al. (2008). Skeletal Muscle Damage and Repair, 173-184. Human Kinetics.

Seene T, Kaasik P, Alev K, et al. (2008). 6th Int Conf on Strength Training, 41-42. NSCA.

Woollacott M, Shumway-Cook A, Nashner L (1986). Int Aging Hum Dev, 23, 97-114.

THE EFFECT OF THREE DIFFERENT TRAINING MODALITIES ON MUSCLE STRENGTH, MUSCLE MASS AND FUNCTIONALITY, AMONG ELDERLY

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NORWEGIAN SCHOOL OF SPORTS SCIENCES

Introduction: Muscle strength and muscle mass will decrease with age (Melton, III et al., 2000; Doherty et al., 1993). As a consequence it becomes harder to perform everyday activities (Jette & Branch, 1981). It is well recognised that physical training has the potential to counteract these changes. However, what kind of training that is optimal for both regaining strength and function is still unclear. The aim of this study was therefore to compare the effect of three training modalities on muscle strength, muscle mass and functionality.

Methods: A total of 51 elderly men and women (aged 69-88) were randomly divided into three training groups and one control group (CG). The training groups exercised 3 times pr week for 12 weeks while the CG just continued their normal activity. The training groups were a resistance training group (RTG) following a progressive resistance program consisting of 8 exercises (3 leg exercises) performed with one to three 4-12 RM sets, a functional resistance training group (FTG) training 8 exercises simulating movements in everyday activities (4 leg exercises) performed with one to two 12-15 RM sets and one endurance training group (ETG) which trained Nordic walking, aerobics and walking. All subjects were tested in 1 RM knee-extension, stair climbing without- with 10kg and 20kg external loading, chair raise, counter movement jump, maximal gait velocity and body composition with DEXA.

Results: RTG increased performance in knee-extension (mean±SEM:37±4.5%), stair climbing with 10kg (12±3.4%) and chair raise (9±2.3%). FTG increased performance in knee-extension (29±5.6%), all stair climbing tests (17±2.5%,19±2.1% and 15±2.5%) and chair raise (12±2.8%). ETG increased performance in knee-extension (24±3.5%) and CG increased performance in knee-extension (16±4.4%) and stair climbing with 10kg (8±2.2%) and 20kg (6±2.6%). RTG, FTG and ETG all increased lean body mass (respectively 3±0.8, 2±0.5 and 4±0.8%), but only FTG increased total body mass (0.9±0.2%). RTG increased knee-extension performance more than CG, FTG increased stair climbing performance more than ETG and chair raise performance more than CG. RTG, FTG and ETG increased lean body mass more than CG.

Discussion: In our study we compared three different training modalities and found that all the training groups increased lean body mass and muscle strength. In the tests of functionality only the RTG and FTG increased their performance, especially in the stair climbing tests. Surprisingly the CG also improved their muscle strength and two out of three stair climbing tests. A possible explanation may be that also the CG increased activity level because they participated in the study. In conclusion the RTG and FTG increases muscle mass, muscle strength and functionality in a similar manner.

Reference List

Doherty, et al. (1993). Can.J.Appl.Physiol, 18, 331-358.

Jette, & Branch (1981). Am.J.Public Health, 71, 1211-1216.

Melton, et al. (2000). J.Am.Geriatr.Soc., 48, 625-630.

INFLUENCE OF TRAINING FREQUENCY AND ADVANCING AGE ON THE HISTO-MORPHOLOGY OF ADRENAL MEDULLA IN RATS

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LABORATOIRE MOUVEMENT SPORT SANTÉ (M2S)

Introduction: Aging induces alterations of sympathoadrenergic system (Zouhal et al. 2008). It could be explained by an increase in the sympathetic nervous activity with advancing age and/or by a compensatory mechanism related to the fall of the organization sensitivity to sympathoadrenal stimulation (Mazzeo et al. 1997). It is well known that endurance training induces an increase in adrenal gland (AG) and adrenal medulla (AM) volume in young rats (Stallknecht et al. 1990). Previous internal study showed that high frequency of endurance training is more efficient in young rat (Poulain et al. 2008). In old rat, the endurance training frequency efficient to modify the volume of AG and AM remained to be clarified. The purpose of the present study was to compare the effects of two endurance training programs with different frequencies (endurance training session per week) on AG and AM in old rats.

Methods

16 old Wistar rats were randomly assigned to one of the three groups: untrained (UT), trained 2 times per week (T2) and trained 5 times per week (T5). Training consisted in 8 weeks of endurance training (1h/day on a treadmill at a speed of 20 m/min up a 10 degrees inclineon). All rats were weighted at the beginning and the end of the protocol. 24h after the last training session, animals were killed and AG were removed, weighted and frozen for subsequent analysis. The method of volume determination is based on the measurement of the elliptical surface of every cut of 10μm thicknesses spaced out by 99 cuts. Formula used was vol (mm3) = Σ each surface x 0,1. The ImageJ software calculates the surface from the number of present pixels. The surface delimitation is determined manually. The results are given as mean ± SD.

Results: T2 (489 ± 46 g) and T5 (495 ± 35 g) had not significantly different of body mass to UT (485 ± 6 g) at the end of the endurance training program. The volume of AG is not significantly different between the three groups. However, T2 and T5 have a lower volume of MS (1.53 ± 0.52 mm3 and 1.88 ± 0.43 mm3, respectively) than UT (2.48 ± 0.36 mm3). Also, AM/AG volume is higher in sedentary rats (0.112 ± 0.008) compared to T2 (0.088 ± 0.020) and T5 (0.089 ± 0.031).

Discussion

Amazingly, in older rat, it seems that two endurance training session per week induce a decrease in AM volume without changing the AG volume. This data shows an opposite effect of endurance training between young and old rats. This could be explained by an initial higher volume of AM in old untrained rat and the endurance training could have a beneficial effect at this level by reducing. So, training seems to give « a second youth » to the older rats at AM area. In conclusion, endurance training one hour per day realized two times per week seems sufficient to induce such adjustments in the AM of older rats.

References

Mazzeo et al. J. Appl. Physiol. 82:1869-1874, 1997

Poulain et al. 15th World congress of Sports Medicine, Barcelona 2008

Stallknecht et al. Am. J. Physiol. 259 R998-R1003, 1990

Zouhal et al. Sports Med. 38(5):1, 2008

AGE-SPECIFIC AND TRAINING-INDUCED MUSCLE ACTIVATION PROFILES DURING REPETITIVE HOPPING

HOFFRÉN, M., ISHIKAWA, M., KOMI, P.V.

UNIVERSITY OF JYVÄSKYLÄ

Neural activation strategies play an important role during the dynamic movements by controlling the fascicle behavior and therefore also the fascicle-tendon interaction and movement efficacy. There are indications that the muscle activation profiles (1) and fascicle-tendon interactions (2) are age-specific. This information has been obtained during dynamic movements performed by young and older individuals using the same exercise intensities in absolute scale. This may not be a preferred protocol since activation strategies are modified by the movement intensity (3). The purpose of the present study was to investigate whether the age-specific muscle activation profiles exist in repetitive hopping exercise and whether the hopping training modifies the activation profiles in elderly. The exercise intensities for younger and elderly subjects were adjusted according to their individual maximal hopping performance.

12 elderly and 8 young subjects performed repetitive bilateral hopping with different intensities (50%, 65%, 75%, 90% and maximal) of the maximal vertical ground reaction force. EMG activation of the soleus (SOL), gastrocnemius medialis (GM), gastrocnemius lateralis (GL) and tibialis anterior (TA) muscles were investigated during hopping. RMS values of EMG were calculated for the preactivation (100ms prior to contact), braking and push-off phases. The measurements were repeated for the Elderly after 2 weeks and 12 weeks of hopping training that was performed 3 times per week.

When the ratio preactivation to braking phase activation (pre/brak-ratio) was calculated, Elderly showed signicantly higher values in SOL, GM and TA muscles than Young. The trend for the same was also seen in GL (p=0.053). This ratio did not change in Elderly during hopping training. However, when another EMG ratio (braking to push off) showed originally lower values among Elderly, the specific hopping training increased this ratio especially in high exercise intensities (90% and max hopping) in SOL, GM and GL muscles.

It is likely that age-specific muscle activation profiles exist in repetitive hopping exercise. As compared to Young, Elderly have high preactivation of the agonist muscles, then less activation in the braking phase and increasing activation towards the end of push-off phase. This activation in elderly may affect the stiffness regulation and utilization of tendinous tissue elasticity. However, the activation strategies are trainable also in elderly since the short-term hopping training shifted the activation from the push-off phase towards the braking phase resembling the activation of young individuals.

References

1. Hoffrén et al. (2007) J Appl Physiol. 103: 1276-1283

2. Mian et al. (2007) Acta Physiol. 189: 57-65

3. Sousa et al. (2007) J Appl Physiol. 102: 382-389

CARDIORESPIRATORY RESPONSES DURING SIX MINUTES WALKING TESTS IN TRAINED AND UNTRAINED ELDERLY SUBJECTS

YÁZIGI, F., REIS, J., ALVES, F., ARMADA-DA-SILVA, P.

FACULTY OF HUMAN KINETICS

Although several studies used the Six Minutes Walking Test (6MWT) in order to evaluate the functional capacity of special populations, there is a lack of information regarding the cardiorespiratory parameters obtained during this test in healthy elderly subjects, as well as its sensitivity to the effect of exercise training. The purpose of this study is to characterize the cardiorespiratory responses during the 6MWT by comparison of two groups of elderly subjects (trained and untrained). Methods: Twenty eight subjects divided into two groups: trained (T) (n=20; age: 73.1 ± 6.7 yrs (SD); height: 1.61 ± 0.1 m; weight: 68.3 ± 11. kg) and untrained (UT) (n=8; age: 69.0 ± 7.3 yrs (SD); height: 1.60 ± 0.1 m; weight: 73.2 ± 9.0 kg) performed the 6MWT with cardiorespiratory responses assessed by a portable gas analyzer (Cosmed K4b2). Subjects were instructed to walk as fast as possible and the distance (d) and gait speed (v) were recorded. The maximal oxygen uptake (O2) and heart rate (HR) achieved were calculated as the average of the first 3 minutes (O2_3') and the last 3 min of the test (O2_6'). The relation between the HR obtained by each subject and their theorical maximal heart rate according to Tanaka's formula was established (%HR). The training process consisted in 8-months multicomponent training, developed according the ACSM guidelines. Independent and paired T-tests were used to compare means between and within groups, respectively. Pearson's product moment

coefficient was used to correlate variables. Results: Trained group presented higher d (T = 660 ± 83 m; UT = 520 ± 82 m; p = 0.00), v (T= 1.83 ± 0.2 ms-1; UT = 1.44 ± 0.2 ms-1; p = 0.00), O2 (T = 19.9 ± 8.0 ml min-1kg-1; UT = 14.3 ± 4.3 ml min-1kg-1; p = 0.03) and %HR (T = 83 ± 11%; UG= 70 ± 14%; p = 0.01). The difference between O2_6' and O2_3' was 2.6± 2 ml min-1kg-1 in T (p= 0.000) and 0.4± 0.9 ml min-1kg-1 in UT (p= 0.24) also suggesting higher exercise relative intensity in the former group. Also, significant correlations were found between d and O2 (r = 0.68; p = 0.00) and between %HR and O2 (0.67; p = 0.00). The results demonstrate that 6MWT is a valid instrument to assess aerobic capacity in elderly individuals, confirming the higher aerobic performance in trained individuals. The T group increased the oxygen consumption until the end of test either due to increased walking speed or due to higher intensity exercise and occurrence of a slow component of O2 consumption kinetics. No such phenomenon was observed in the UT group.

14:00 - 15:30

Oral presentations

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CORTICOSPINAL EXCITABILITY DURING CONCENTRIC AND ECCENTRIC MAXIMAL VOLUNTARY CONTRACTION

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UNIVERSITÉ LIBRE DE BRUXELLES

Introduction: During submaximal plantar flexion, it has been reported that the excitability of the spinal and and corticospinal pathway, evaluated respectively by the H-reflex and by motor evoked potentials (MEP) elicited by transcranial magnetic stimulation, was lower during eccentric compared with concentric contraction (Sekiguchi et al., 2003). In a previous study, we showed that the depression of the H-reflex amplitude during eccentric compared with concentric maximal voluntary contractions (MVC) was only observed in the soleus (SOL) muscle while no muscle contraction type effect was obtained for the medial gastrocnemius (MG) H-reflex (Duclay et al., 2008). Our findings suggested that, during eccentric MVC, the neural control mainly act at spinal level (Duclay and Martin 2005). The aim of the current study was therefore to investigate cortical and spinal neural mechanisms involved in the neural modulations observed during eccentric MVC in two muscles (SOL and MG) which could be differently affected by peripheral inhibitory mechanisms.

Methods: Experiments were performed on 9 healthy men. Maximal H-reflexes, M-waves and MEP were evoked in both SOL and MG at an ankle angle of 90° during concentric and eccentric MVC (i.e., Hsup, Msup and MEP, respectively). The MEP / Msup and Hsup / Msup were calculated to investigate the corticospinal and spinal excitability.

Results: During MVC, both SOL Hsup / Msup and MEP /Msup ratios were lower during eccentric contraction (P<0.01) as compared with concentric contraction (0.39 ± 0.04 vs. 0.54 ± 0.04 and 0.13 ± 0.01 vs. 0.17 ± 0.01 respectively) while corresponding MG ratios were not affected by the muscle contraction type (P>0.05). To evaluate the specific neural control at corticospinal and spinal level during eccentric MVC as compared with concentric MVC, differences between concentric and eccentric values of the amplitude for MEP / Msup (ΔMEP) and Hsup/Msup (ΔH) were fitted into linear regression. For the SOL, significant correlation was observed between ΔMEP and ΔH (P<0.05). When ΔH was increased, a decrease of ΔMEP was obtained.

Discussion: The SOL results indicate that the excitability of the corticospinal pathway is reduced during eccentric compared with concentric MVC. The relation between ΔMEP and ΔH, observed for the SOL, suggest that, during eccentric MVC, cortical excitability was increased in order to compensate for spinal inhibition. Despite this increase, the MEP / Msup ratio was lower during eccentric MVC, suggesting that the corticospinal pathway seems to be mainly modulated at spinal level. In the same way, when the amount of inhibition was less at spinal level (i.e. MG's data) (Duclay et al 2008), the corticospinal excitability was similar during eccentric compared with concentric MVC.

References

Duclay J, Martin A (2005). J Neurophysiol 94: 3555-3562

Duclay J, Robbe A, Pousson M, Martin A (2008). J Electromyogr Kinesiol. Jun 12.

Sekiguchi H, Nakazawa K, Suzuki S (2003). Brain Res 977: 169–179

ELITE CROSS-COUNTRY SKIERS' ADAPTATIONS OF THE DIAGONAL STRIDE TECHNIQUE AT DIFFERENT INCLINATIONS

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UNIVERSITY OF SALZBURG, AUSTRIA

3. Swedish Winter Sports Centre, Department of Health Sciences, Mid Sweden University, Östersund

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Introduction: Despite the equal relevance of classic and freestyle in modern cross-country skiing, the main focus of biomechanical studies has mainly been on the latter technique. Diagonal stride [DIA] as a main classical technique has further developed over the last 20 years. There is still a lack of biomechanical data describing DIA and adaptations to different inclinations. A previous study showed that skiers increased cycle rate rather than cycle length as the strategy to adapt to increasing inclinations (Bilodeau et al. 1992). However, no kinetic or joint kinematic data were presented. The aim of the present study was to identify kinetic and kinematic adaptations in DIA at different inclinations.

Methods: Twelve elite XC skiers (Swedish National Team; VO2max-DIA: 72.3 ± 3.8 ml·kg-1·min-1) performed DIA roller skiing at treadmill inclinations of 3°, 6° and 9° at 11 km·h-1 for biomechanical analyses. Leg and arm joint angles (goniometers), pole force (strain gauge), both at 2000 Hz, and plantar force (Pedar Mobile) at 100 Hz were recorded. Repeated measures ANOVA were calculated in order to examine the biomechanical differences between the named inclinations. The statistical level of significance was set at P<0.05.

Results: Cycle time [CT] (P<0.01) and relative (%CT) arm recovery time (P<0.05) decreased at higher inclinations. Cycle rate and relative poling time both increased (both P<0.01). No differences were found for the relative durations of leg-ground contact and leg swing. All the force values measured were greatest at the steepest inclination, including peak pole and leg forces, forefoot force in ground position and impulses of pole and leg push-off (all P<0.01). Elbow [EA], hip [HA] and knee [KA] angle minima, EA at pole plant, KA at ski plant and HA maximum before push-off decreased (all P<0.01). The elbow extension range of motion [ROM] and knee (both P<0.01), as well as hip

push-off extension ROM (P<0.05), increased with inclination. Angular push-off flexion velocity (P<0.01) decreased, along with higher angular push-off extension velocities in the ankle (P<0.05), knee and hip joints (both P<0.01) at steeper inclinations.

Conclusion: Elite skiers adapt the DIA technique to increased inclinations through substantial changes in pole and leg kinetics and joint kinematics, with only minor changes in specific phase durations. Arm and leg actions show larger amplitudes, higher angular velocities, longer poling times, higher forces and impulses generated at higher frequencies. We suggest that XC skiers should use technique, endurance and strength training at different inclinations in order to train these aspects specifically.

References:

Bilodeau B, Boulay M, Roy B. (1992). Propulsive and gliding phases in four crosscountry skiing techniques. Med Sci Spor Exer, 24, 8, 917-925.

KNEE JOINT LOADING DURING LEVEL WALKING WITH MBT SHOES IN OVERWEIGHT MEN

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UNIVERSITY OF SALZBURG

Felson (1996) identified obesity and overweight as main risk factors for the onset of knee osteoarthritis (OA). According to Gushue et al. (2005) high body mass initiates primarily greater dynamic loads on the medial joint compartment as assessed by a higher peak external knee adduction moment during walking. Furthermore DeVita & Hortobágyi (2003) stated reduced knee flexion excursion in healthy obese adults, which indicates not only 'quadriceps avoidance' but also higher co-activation between antagonistic muscle pairs (Childs et al. 2004). The aim of the present study was to determine whether an MBT shoe alters walking kinetics and muscle coordination in overweight men with regard to knee OA prevention.

Ten healthy overweight men (32.0±7.9 yr, 179.2±5.8 cm, 91.3±7.0 kg, 28.4±1.8 kg/m2), familiar with MBT, participated. Subjects were instructed to walk 6 trails with their own and MBT shoes at their preferred speed (±0.2 km/h), which was controlled by a wireless Brower timing system. Kinetics and kinematics were obtained simultaneously with an AMTI force platform (2000 Hz) and a Vicon MX13-system consisting of eight cameras (250 Hz). Surface EMG activities of 6 right-leg muscles were recorded with a 16 channels Biovision measurement system (2000 Hz). Data were synchronised by an external trigger signal and processed by Nexus 1.2 (Oxford Metrics) and IkeMaster 2004 (Ike Software Solutions). Paired sample t-test and Cohen's effect size dz were used to compare peaks of 3D external knee net joint moments, IEMG of vastus lateralis (VL), rectus femoris (RF) and biceps femoris (BF) as well as average VL/BF co-activation during stance phase.

No relevant differences in average VL/BF co-activation (t(9) = -.54, p = .60, dz = .17), muscle intensities (IEMG) of VL (t(9) = -.41, p = .69, dz = .13), RF (t(9) = -.01, p = .99, dz = .00) and BF (t(9) = .39, p = .71, dz = .12) were observed between the control and MBT situation. Similar results could be obtained for peak knee flexion moment (t(9) = .58, p = .58, dz = .18) and peak knee external rotation moment (t(9) = -.78, p = .46, dz = .25). However, concerning peak knee adduction moment strong significant effects were found. In comparison to the control shoes this variable demonstrated an average reduction of 10% (t(9) = 2.64, p = .03, dz = .83) for the MBT condition.

First data exhibit decreased knee joint loads using MBT. In fact, this shoe seems to be advantageous for knee OA prevention in overweight men. Further kinematic and kinetic analysis is warranted to find biomechanical reasons for the smaller adduction moment. Due to its construction and referring to Kälin & Segesser (2004) a lateral shifting of the centre of pressure and thus a reduced frontal knee moment arm are presumed as main factors for this result.

Childs et al. (2004) Clin Biomech, 19

DeVita & Hortobágyi (2003) J Biomech, 36

Felson (1996) Ann Rheum Dis, 55

Gushue et al. (2005) J Pediatr Orthop, 25

Kälin & Segesser (2004) Orthopädie Schuhtechnik, 12

RELATIONSHIP OF REARFOOT MOTION TO VERTICAL AND LEG STIFFNESS IN RUNNING

ELTARVÅG, B., ERIKSRUD, O., SMITH, G.

NORWEGIAN SCHOOL OF SPORT SCIENCES

During running, the lower extremities function much like a mass-spring system. Near the middle of stance, the leg spring is maximally compressed. This is approximately the time of maximal pronation, commonly described by rearfoot eversion. Few studies have explored the relationship between rearfoot motion and leg stiffness (Viale, 1998). The current study which focuses on foot motion was part of a larger project evaluating the influence of lower extremity joint kinematics on leg and vertical stiffness.

Methods: 15 female subjects were all tested while running over a 20 m lab runway at a target speed of 3.8 m·s-1. Three dimensional kinematic data were obtained from reflective markers on the lower extremity using a Pro-Reflex motion capture system (Qualisys AB, Sweden). Three-dimensional kinetic data were measured using three floor mounted force plates (AMTI, USA) in sequence placed midway in the runway. Three or more successful trials within a 5% range of 3.8 m·s-1 were analyzed using MatLab and Visual3D. Vertical and leg stiffness were calculated based on the method by McMahon and Cheng (1990). Rearfoot angle was calculated from tracking markers in Visual3D as the relative angle between the foot and shank segments with 0° taken as the positioning in a static, standing trial. Maximum rearfoot eversion (EvMax) along with eversion range of motion (EvROM: angular change from heelstrike to EvMax) were determined. The relationships of EvMax and EvROM to vertical and leg stiffness were evaluated using Pearson's product moment correlation (r).

Results: Mean EvROM during early stance of running was 14.4 ± 4.2° while EvMax was 11.5 ± 2.7°. Vertical stiffness for the runners was 31.8 ± 4.7 kN·m-1 while leg stiffness averaged 10.3 ± 1.5 kN·m-1. EvRom and EvMax were not significantly correlated with neither vertical nor leg stiffness.

Discussion: The mass-spring model applies to the whole running leg as a system which collectively exhibits elastic properties. The model does not attempt to identify which anatomical structures produce these characteristics. However, it is likely that structures surrounding ankle, knee and hip all contribute in some amount to this response. Foot kinematics during stance may help to absorb shock during impact with the ground, but in addition, foot motion provides a mechanism for partially explaining the elastic characteristics of the running leg. EvROM was not found to be significantly related to leg stiffness. This is only one plane of a complex foot motion and only one of several joints which could contribute to leg stiffness. Further analysis of the ankle and foot in other planes of motion as well as other joints needs to be analyzed to better understand this important fraction of leg mechanics.

References

McMahon TA & Cheng GC (1990) The mechanics of running: how does stiffness couple with speed. J Biomech 23:65-78
Viale F et al. (1998). Leg stiffness and foot orientation in running. Foot & Ankle 19:761-765

CHANGES IN MOTOR UNIT CHARACTERISTICS AFTER ECCENTRIC ELBOW FLEXOR EXERCISE

PIITULAINEN, H., HOLOBAR, A.,3, AVELA, J.

1. UNIVERSITY OF JYVÄSKYLÄ, 2. POLITECNICO DI TORINO, 3. UNIVERSITY OF MARIBOR

Introduction: Morphological evidence suggests that predominantly fast-twitch fibers are prone to sarcolemmal disruption during eccentric exercise (Jones et al., 1986). However, it is unclear if the function of motor units (MUs) is selectively affected.

Methods: High-density surface electromyographs (sEMG) were recorded with 5×13 electrode array (LISiN-OT Bioelettronica, Torino, Italy, inter-electrode distance of 8 mm) and decomposed with Convolution Kernel Compensation approach (Holobar and Zazula, 2004) to examine MU characteristics in m. biceps brachii after eccentric elbow flexor exercise (50 repetitions, 20 s intervals). Nine healthy subjects were measured at wide range of isometric contraction levels: 10%, 20%, 30%, 40% 50% and 75% of maximal voluntary contraction (MVC) before (BEF) the exercise, and two hours (2H), two days (2D) and four days (4D) post-exercise. Number of extracted MUs per session was: BEF: 471 MUs, 2H: 228 MUs, 2D: 426 MUs and 4D: 470 MUs. The following MU characteristics were extracted for each identified MU: mean instantaneous discharge rate (IDR), mean muscle fiber conduction velocity (CV) (McGill and Dorfman, 1984), and mean power frequency (MNF).

Results: As a result of the exercise, MVC force decreased by 21.3 ± 5.6 % 2H ($p < 0.001$) and by 12.6 ± 11.1 % 2D ($p < 0.01$) post-exercise. 2H after the exercise, IDR increased from 19.5 ± 4.4 pps (BEF) to 22.6 ± 5.0 pps and from 24.5 ± 5.6 pps (BEF) to 28.3 ± 3.0 pps in 50% ($p < 0.01$) and 75% ($p<0.05$) of MVC contraction, respectively. When IDR was plotted against the absolute force level, the regression slope was significantly steeper at 2H than BEF, suggesting increase in the rate coding of MUs. In contracts to IDR, a reduction in CV was observed in 40% (from 4.4 ± 0.3 m/s to 4.2 ± 0.3 m/s, $p < 0.05$), 50% (from 4.5 ± 0.3 m/s to 4.2 ± 0.3 m/s, $p < 0.01$) and 75% (from 4.4 ± 0.3 m/s to 4.2 ± 0.3 m/s, $p < 0.01$) of MVC contraction levels at 2H (BEF vs. 2H). MNF showed reduction only in 75% of MVC contraction (from 102.0 ± 18.6 Hz (BEF) to 91.1 ± 20.4 Hz (2H), $p < 0.05$). When CV and MNF were plotted against absolute force level, the steepness of both regression slopes was significantly reduced at 2H with respect to BEF, implying possible impairment in sarcolemmal conduction. No changes were observed in these variables when the experiment was repeated without the exercise in seven control subjects.

Discussion: Based on Henneman's size principle, the present results suggest that intensive exercise can selectively disturb the function of high-threshold MUs. These impairments seem to be related to slowing of sarcolemmal action potential conduction and presumably force production of the affected MUs. Thus, the increased rate coding of active MUs seems to be an attempt to compensate this force reduction.

References

Jones D et al. (1986). J.Physiol. 375: 435-448.
Holobar A, Zazula D (2004) Med.Biol.Eng.Comput. 42: 487-495.
McGill K, Dorfman L (1984). IEEE Trans.Biomed.Eng. 31: 462-468.

THE RELEVANCE OF SUBTALAR-JOINT-ANATOMY ON THE INCIDENCE OF CHRONIC OVERUSE INJURIES IN THE LOWER LIMBS.

REULE, C.A., ALT, W.W.

UNIVERSITY OF STUTTGART

Introduction: Chronic overuse injuries (COI), frequent in the Achilles tendon, are of major importance to athletes, especially high performance athletes. Little is known about the predisposing factors of these injuries. Therefore, the aim of this study is to identify the relationship between individual anatomical factors of the subtalar-joint and COI through the use of a measurement system for determination the spatial orientation of the subtalar-joint-axis (SJA) and a treadmill-analysis.

Methods: An ultrasonic pulse-echo based measurement system (Zebris®) determined the spatial orientation of SJA in-vivo and in real-time. The arch-index and the angle of gait were also determined by a treadmill that enables plantar pressure measurement (Zebris®). Video-analysis allowed for investigation of the rolling motion of the foot during walking. Information about previous injuries and running performance was collected with a questionnaire. Measurements were taken from 495 subjects, mainly consisting of long distance runners with a running distance of at least 25 km per week and a running history of 3 years. Data from 307 subjects was included.

Results: Of 307 subjects, 69% had previously been injured. A total of 664 injuries were counted. 22% of these injuries were located at the ankle, 21% at the knee and 14 % at the Achilles tendon. By means of the Arch-index, it was found that 42% of subjects with Achilles tendon problems also had high arches. In subjects without Achilles tendon problems, only 34% had high arches. The average of the inclination angles of 614 SJA was 42° ± 16° and the average deviation angle (DA) was 11° ± 23°. There was a significant difference ($p= 0.002$) between the mean DA of people with Achilles tendon problems (18° ± 23°) and people without (10° ± 23).

Conclusion: The injury-rate in this study was 69% higher than that stated by Mayer (1999). The Results of Arch-index analysis confirmed the conclusion by Lohrer (2006), that a high arch is a common cause for Achilles tendon injuries. The mean inclination angle of the SJA found in this study approximates the results of Isman (1969). In contrast, the mean DA measured in vivo was smaller and the SJA was closer to the foot bisection than measured by Isman (1969). However, the DA (18°) of subjects with Achilles tendon problems was higher than recorded by Isman (1969). Based on these results, long distance runners with higher DA are at a higher risk to suffer from Achilles tendon problems.

Literatur:

Alt, W. (2001) Biomechanische Aspekte der Gelenkstabilisierung, Maurer Druck & Verlag, Geislingen
Isman, R. E., & Inman, V. T. (1969) Anthropometric studies of the human foot and ankle. Bulletin of prosthetics research, 10/11, 97-129
Lohrer, H. (2006) Die Achillodynie – Ein Überblick. Orthopädieschuhtechnik 7/8, 34-41
Mayer, F. et al. (1999) current changes in running injuries, int j sports med 20, 103

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16:15 - 17:30

Plenary sessions

PS-PL01 Born to move? Perspectives from evolutionary biology and the social sciences

HUMAN ADAPTABILITY TO MOVE: INTERNAL AND EXTERNAL RESOURCES.

MINETTI, A.E.

UNIVERSITY OF MILAN

Differently from other species that, apart from long migrating animals, are optimized in their body design to move within a given habitat, humans have always struggled to adapt to all sorts of environments, ranging from level to steep terrain, at all latitudes, in a variety of climates, even on different planets. Also, within the same environment and penalized by the bipedal, erect posture, man has always tried to push the muscle powered locomotor performance to the limit, by inventing tools capable to better exploit the same engine and machinery. Achieving a higher speed at a manageable metabolic cost and expenditure promoted the development of paved roads, optimally steep paths, prepared snow surfaces, calm (sometimes frozen) water ways, and a variety of locomotion aids like carts and bicycles, skis/skates and sleds, canoes and rowing boats, up to human powered submarines and aircrafts.

By reviewing the history of an often fortuitous 'symbiosis' of physiology and engineering in the different forms of locomotion (see References below), some of which dates back to prehistory, the invariant characteristics of the propeller (muscle) emerge and the most frequent winner, i.e. the pedalling paradigm, is the modality of choice in many forms of modern propulsion.

REFERENCES

Minetti A. E. Optimum gradient of mountain paths. J. Appl. Physiol. 79(5): 1698-1703, 1995.

Minetti A. E. Walking on other planets. Nature 409: 467-469, 2001.

Minetti A. E., J. Pinkerton and P. Zamparo. From bipedalism to bicyclism: evolution in bioenergetics and biomechanics of historic bicycles. Proc. R. Soc. B 268: 1351-1360, 2001.

Zamparo P., D. R. Pendergast, A. Termin and A. E. Minetti. How fins affect the economy and efficiency of human swimming. J. exp. Biol. 205: 2665-2676, 2002.

Minetti A. E. and L. P. Ardigò. Halteres used in ancient Olympic long jump. Nature 420: 14-15, 2002.

Minetti A. E. Passive tools for enhancing muscle-driven motion and locomotion. J. Exp. Biol. 207: 1265-1272, 2004.

Ardigò L. P., V. L. Goosey-Tolfrey and A. E. Minetti. Biomechanics and energetics of basketball wheelchairs evolution. Int. J. Sports Med., 26: 389-397, 2005.

Formenti F., Ardigó L. P. and A. E. Minetti. Human locomotion on snow: determinants of economy and speed of skiing across the ages. Proc. R. Soc. B, 272(1572): 1561-1569, 2005.

Minetti A. E. , Formenti F., and Ardigò L. P. Himalayan porter's specialization: metabolic power, economy, efficiency and skill. Proc. R. Soc. B, 273: 2791- 2797, 2006.

Formenti F. and A. E. Minetti. Human locomotion on ice: the evolution of ice skating energetics through history. J. Exp. Biol., 210: 1825-1833, 2007.

Formenti F. and A. E. Minetti. The first humans travelling on ice: an energy saving strategy? Biol. J. Linnean Soc. 93: 1-7, 2008

BORN TO MOVE? PERSPECTIVES FROM THE SOCIAL SCIENCES.

FASTING, K.

NORWEGIAN UNIVERSITY OF SPORT

Human beings not only are born to move but also have the right to move. UNESCO'S International Charter of Physical Education and Sport, (Article 1) states that: "The practice of physical education and sport is a fundamental right for all". In spite of the fact that people are born to move and have the right to do so, it often doesn't seem to be put into practice. As a result people's participation in leisure time physical activities and sport varies between and within cultures particularly in relation to gender, but also in relation to religion, sexuality, social class, disability, race, ethnicity and immigrant status. A further perspective from the social sciences on this issue will therefore be to discuss and explain this variation. Due to the time available the focus of the presentation will mainly be on the relationship between gender and sport in a social constructionist perspective, with a focus on 'doing gender'. Gender refers to cultural meanings and connections associated with one's biological sex, and what is appropriate behaviour for women and men (Lorber 1994). Historically there has been a strong relationship between sport and hegemonic "masculinity", while the opposite has been true for sport and "femininity". The societal gender stereotypes have therefore functioned as barriers for many girls and women. This has led to gender based discrimination in sport (United Nations 2007). Many of these barriers have been overcome over the last few years since both sport and the concepts of "masculinity" and "femininity" are constantly changing. The presentation will close with some examples of how people have met the challenges they have faced through sport, how they have overcome discrimination, and how involvement in sport has challenged the gender stereotypes and discrimination, and how involvement in sport can be a vehicle for gender equality and empowerment.

Lorber, Judith (1994), Paradoxes of Gender.Yale University Press, London

United Nations (2007), Women , gender, equality and sport.

Thursday, June 25th, 2009

08:30 - 10:00

Invited symposia

IS-NU01 Nutrition and training adaptations (GSK Symposium)

THE EFFECT OF NUTRITION ON THE ADAPTATION TO TRAINING

MILLER, B.

COLORADO STATE UNIVERSITY

Exercise training initiates a series of signals that permit the remodeling of cells to be better equipped to deal with that stimulus in the future. To optimally adapt to the signals put in motion, amino acid building blocks must be provided to construct the proteins of interest. Post-exercise protein provision is well documented to increase protein synthesis after a bout of resistance training. Less explored is the effect of post-exercise protein on endurance training adaptation. However, it is important to recognize that post-exercise protein intake might be just as important for endurance-specific adaptation. In this talk, the importance of post-exercise protein ingestion will be discussed in the context of strength and endurance training. Further, gaps in current research will be identified to optimize training adaptations.

DO ANTIOXIDANTS ENHANCE OR SUPPRESS TRAINING INDUCED ADAPTATIONS?

PHILP, A.

UNIVERSITY OF DUNDEE

Exercise involves a complex series of cellular events, which combine to mediate skeletal muscle adaptation. Muscle contraction evokes signal transduction pathways regulated by calcium and ATP fluctuations as well as a stress response leading to systemic release of hormones, and the muscle specific generation of reactive oxygen species and cytokines. As a general process, this response can be termed exercise specific inflammation and recent research suggests that this transient inflammatory response is a key factor in exercise adaptation (Petersen and Pedersen, 2005). If inflammation is prolonged however, such as during repetitive periods of intense training, or sustained exhaustive exercise, deleterious effects develop within the working muscle suggesting that the range over which inflammation is beneficial is small. Radicals and reactive oxygen species (ROS) are molecules that initiate damaging oxidation reactions within the cell (Powers et al., 2004). ROS generation has been linked with exercise induced oxidative injury and muscle fatigue due to an imbalance between oxidant production and the antioxidant capacity of the cell (Powers and Jackson, 2008). There are a number of enzymatic and non-enzymatic defence systems, or antioxidants, in mammalian skeletal muscle which reduce free radicals and reactive oxygen species production. Importantly, dietary antioxidants work in synergy with these endogenous antioxidants to offset ROS induced oxidative stress. With this in mind, recreational and elite athletes supplement with antioxidant agents, in the belief that they will protect the athlete against exercise-induced damage, local inflammation and enhance post exercise recovery. However, recent research suggests that dietary antioxidants may in fact suppress ROS mediated signalling essential for exercise-induced adaptation (Powers and Jackson, 2008). Specifically it appears that ROS generation is important for kinase activity of the AMP-dependent kinase (AMPK), the mitogen activated protein kinases (p38 and p42/44) and their downstream targets NF-κB and the transcriptional co-activator PGC-1α (Gomez-Cabrera et al., 2005; Irrcher et al., 2009). Therefore, whether antioxidants enhance or interfere with training adaptation and whether training regimes and nutritional interventions should be adjusted to account for ROS action in response to exercise remains a controversial issue.

References

Petersen, AM and Pedersen, BK (2005) J. Appl. Physiol. 98(4): 1154-62.

Powers, SK et al., (2004) J. Sports Sciences. 22: 81-94.

Powers, SK and Jackson, MJ (2008) Physiol. Rev. 88: 1243-76

Gomez-Cabrera, M-C et al., (2005) J. Physiol. 567.1: 113-20

Irrcher, I et al., (2009) Am. J. Physiol. Cell Physiol. 296: C116-23

CARBOHYDRATE AND TRAINING ADAPTATIONS

JEUKENDRUP, A.

UNITED KINGDOM

Without abstract submission

08:30 - 10:00

Oral presentations

OP-HF06 Health and Fitness 6

THE DECLINE OF VO2MAX FROM 20 TO 84, THE HEALTH SURVEY OF NORD-TRØNDELAG

ASPENES, S., ULRIK, W.

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Introduction: Maximal oxygen uptake (VO2max) declines with increasing age in both men and women. In cross-sectional studies the decrease has been found to range between 0.40-0.50 mL∙kg-1∙min-1∙year-1 in men and 0.20-0.35 mL∙kg-1∙min-1∙year-1 in women (Jackson et al., 1995). However, most studies use the term VO2peak thereby indicating a submaximal measurement of oxygen uptake, or estimate aerobic capacity from an indirect measurement. We aim to investigate the decline of true VO2max in a large population from measurements on treadmill.

Methods: As a part of the third part of the Health Survey of Nord-Trøndelag (HUNT3), 5641 healthy individuals between 20 and 93 was recruited for testing maximal oxygen uptake. From these, 4060 individuals (2017 women and 2043 men, age 20 to 84) tested their maximal oxygen uptake and during this test reached a respiratory quotient of 1.05 or more. The test was performed with the MetaMax2 and it was brought out with an individualized protocol.

Normality was investigated by Q-Q-plot and histogram with normal distribution curve, and the regression of the relationship between VO2max as dependent variable and age as the independent variable.

Results: VO2max declined from 54.3 ± 8.4 mL∙kg-1∙min-1 in the agegroup 20-29 years to 35.5 ± 6.8 mL∙kg-1∙min-1 in the agegroup above 70 years in men and from 43.0 ± 7.6 mL∙kg-1∙min-1 in the agegroup 20-29 years to 27.9 ± 5.1 mL∙kg-1∙min-1 in the agegroup above 70 years in women. The slope of regression was -0.379 with an R squared of 0.308 in men, and the slope was -0.309 with an R squared of 0.288 in women. The regression was highly significant ($p < 0.001$) for both men and women. The decline in percent per decade is 9.6, 4.3, 10.1, 8.3 and 11.2 in men and 7.0, 4.8, 11.1, 9.2 and 12.4 in women.

Discussion: The decline of 0.379 mL∙kg-1∙min-1∙year-1 in men was slightly lower than earlier reports while the decline of 0.309 mL∙kg-1∙min-1∙year-1 in women was similar to earlier findings. The highly significant p-value of the regression underlines the strength of the relationship while the low R squared indicate that age explains only 30.8% and 28.8% of the decline in men and women, respectively.

The decline is not a steady one, comparing percents decline between decades suggest a decline of shifting steepness. A likely explanation for these shifts is different patterns of physical activity. Unfortunately this was not studied this time in our study. We find that in a healthy Norwegian population, the natural decline from age 20 will be approximately 0.7% per year in both men and women, but the steepness of decline is shifting between the decades and the relationship between VO2max and physical activity should be investigated further in our population.

References

Jackson AS, Wier LT, Ayers GW, Beard EF, Stuteville JE, Blair SN (1995) Med Sci Sports Exerc, 28(7), 884-891.

LONGITUDINAL PREVENTIVE-SCREENING CUTOFFS FOR METABOLIC SYNDROME IN ADOLESCENTS

BOUZIOTAS, C., FLOURIS, A.D., CHRISTODOULOS, A.D., KOUTEDAKIS, Y.

UNIVERSITY OF WOLVERHAMPTON

Introduction: The metabolic syndrome is highly prevalent within adults (Ford & Li 2008; Hu et al. 2004), whereas the coexistence of its components becomes increasingly apparent in young populations (Steinberger & Daniels 2003), suggesting that the syndrome has its roots early in life (Katzmarzyk et al. 2001). Therefore, it is necessary to introduce strong prevention strategies and comprehensive screening in childhood and adolescence. The aim of the present study was to generate longitudinal preventive-screening cut-offs for the metabolic syndrome in adolescents by detecting demarcation points in key and easy to monitor parameters that enable – as early as five years in advance – the successful detection of metabolic syndrome that develops at the age of 17 years (MS17). The variables of interest covered MS risk factors as well as fitness, habitual physical activity, and dietary elements.

Methods: The present study adopted a 6-year design incorporating 4 data collection time points (TPs). Volunteers were assessed prospectively at the ages of 12, 13, 14 and 17. A total of 210, 204, 198 and 187 schoolchildren volunteered at the first (TP1=12 years old), second (TP2=13 years old), third (TP3=14 years old) and fourth (TP4=17 years old), data collection TP, respectively. At each data collection TP, anthropometrical, biological and lifestyle data were obtained. Identical protocols were used for each assessment conducted by the same trained investigators. MS was defined using criteria analogous to the Adult Treatment Panel III definition (Alberti et al. 2006; De Ferranti et al. 2004).

Results: 12% of the participants were diagnosed with MS17, the majority of them being boys (16% vs. 7%, $p<0.033$). The prevalence of the syndrome increased directly with the degree of obesity. Using body mass index (BMI), adiposity and/or aerobic fitness levels in both genders, MS17 could be correctly diagnosed as early as TP1. No such cutoff points were found for high-density lipoprotein cholesterol, triglycerides, blood pressure and fasting plasma glucose levels.

Discussion/Conclusion

With respect to the data presented, it has been established that the calculated longitudinal preventive-screening cutoffs allow successful diagnosis of metabolic syndrome in adolescents using BMI, adiposity or aerobic fitness levels in both sexes. Adoption of such pediatric guidelines may help mitigate future increase in the prevalence of metabolic syndrome.

References

Alberti KG, Zimmet P, Shaw J (2006). Diabet Med, 23, 469-480.

De Ferranti SD, Gauvreaub K, Ludwig DS, Neufeld EJ, Newburger JW, Rifai N (2004). Circulation, 110, 2494-2497.

Ford ES, Li C (2008). Ann Epidemiol, 18, 165-171.

Hu G, Qiao Q, Tuomilehto J, Balkau B, Borch-Johnsen K, Pyorala K (2004). Arch Intern Med, 164:1066-1076.
Katzmarzyk PT, Perusse L, Malina RM, Bergeron J, Després JP, Bouchard C (2001). J Clin Epidemiol, 54, 190-195.
Steinberger J, Daniels SR (2003). Circulation, 107, 1448-1453.

BIO-PSYCHO-SOCIAL CORRELATES OF PHYSICAL FITNESS IN CHILDHOOD AND ADOLESCENCE

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Introduction: Although children and youth currently form the most active segments of the population in the westernized world, there is a marked trend towards an increase in sedentary lifestyle and a decrease in physical fitness among school-age children. In order to counteract the suspected degradation, potential determinants must be known. Previous studies are based on non-representative samples mostly and are only conditionally comparable. Therefore, reliable findings on the determinants of physical fitness are not available. The purpose of the study is the identification of correlates of physical fitness in childhood and adolescence. It is assumed that physical fitness is associated with intrapersonal, behavioural and ecological factors.

Method: Data were obtained from the "Luxembourg project", a representative sample of the 9, 14- and 18-year-old boys and girls from Luxembourg (N = 1188). Physical fitness was measured on the basis of ten motor description categories such as aerobic endurance and flexibility by using a standardised test profile. Intrapersonal (e.g. BMI, sports interest), behavioural (e.g. extent of physical activity; p.a.) and ecological (e.g. peer-group behaviour, socio-economic status; ses) factors were assessed by using a standardised questionnaire (cf. Bös et al., 2006).

Results: Ten multiple regression equations with sequential entry of the model levels help to confirm the suspected relation for eight out of ten motor description categories. Percentage of declared total variance is between 8.0% (fine motor abilities on precision tasks; F=5.19; p=.000; adjusted R^2=.080) and 58.1% (speed of force development in lower extremities; F=67.70; p=.000; adjusted R^2=.581). The identified effects and their directions can be clarified by the example of gross motor abilities under time pressure (F=35.98; p=.000; adjusted R^2=.241). The performance in jumping sideways rises with increasing age (Beta=.64; T=17.52; p=.000), sports interest (Beta=.12; T=4.19; p=.000) and ses (Beta=.10; T=3.51; p=.000) as well as under the influence of an increased extent of p.a. in sports club (Beta=.15; T=5,10; p=.000), whereas lower performances become obvious with increasing BMI (Beta=-.12; T=-3.95; p=.000).

Perspectives

The results delimit the spectrum of potential correlates of physical fitness. However, the related design does not permit any causal conclusions. To receive reliable statements about the determinants of motor development in childhood and adolescence, the individuals included here will be examined prospectively in the context of a longitudinal section study.

References

Bös, K., Brochmann, C., Eschette, H., Lämmle, L., Lanners, M., Oberger, J., Opper, E., Romahn, N., Schorn, A., Wagener, Y., Wagner, M. & Worth, A. (2006). Health, physical fitness and physical activity of children and adolescence in Luxembourg [Gesundheit, motorische Leistungsfähigkeit und körperlich-sportliche Aktivität von Kindern und Jugendlichen in Luxemburg]. Luxembourg: MENFP.

EFFECT OF RAMADAN FASTING ON PLASMA LEPTIN AND ADIPONECTIN CONCENTRATIONS AND BODY COMPOSITION IN TRAINED YOUNG MEN

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Purpose: To evaluate the effect of Ramadan fasting on parameters of insulin resistance in trained athletes at rest and after aerobic exercise. Methods: Nine male rugby players (age 19 ± 2 yr, height 1.78 ± 0.74 m) were tested three times: one week before observance of Ramadan (C), at the end of the first week (R1), and during the fourth week (R2). They performed a progressive cycle ergometer test at each visit. Data collected at rest and at the end of aerobic exercise included simple anthropometry (body mass, BMI, body fat, fat free mass), biochemical parameters (serum glucose, cholesterol, HDL-cholesterol, triglycerides, creatinine, and serum proteins) and selected hormone concentrations (plasma insulin, leptin and adiponectin) Results: Ramadan fasting was associated with a reduction of body mass and body fat (R2 vs. C, $p<0.01$) without significant change in leptin or adiponectin levels. Conclusion: Lipolysis may have occurred because of increased plasma triglycerides and HDL-cholesterol concentrations.

THE ASSOCIATION BETWEEN CYCLING TO SCHOOL AND BEING OVERWEIGHT IN ROTTERDAM (THE NETHERLANDS) AND KRISTIANSAND (NORWAY)

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UNIVERSITY OF AGDER

Introduction: Internationally, the prevalence of overweight and obesity is rising. At the same time rates of active commuting are declining. Those who cycle to school have been reported to be more physically fit than those walking or travelling by motorized transport (Andersen et al., in press; Cooper et al., 2006). However, no clear association between weight status and cycling to school has been reported. The purpose of the present study was therefore to assess the potential association between cycling to school and weight status in two cities in where active commuting to school still is common - Rotterdam (the Netherlands) and Kristiansand (Norway).

Methods : Data from the projects ENDORSE (Rotterdam) and YOUTH IN BALANCE (Kristiansand) are used. A total of 16 and 12 secondary schools participated in the surveys, including 1361 and 1197 participants, respectively. Survey years (2004-2006) and age group (12-15 years) were comparable. Commuting to school was self-reported in questionnaires in both studies. The participants were categorised into main mode of commuting. Pupils categorised as cyclist were compared to non-cyclists (walkers, car commuters, public transportation commuters and those not categorised into mode of commuting due to inconsistent reporting). Weight and height were measured by project staff, and overweight was calculated according to sex and age specific international cut-off values for body mass index. Distance from home to school was calculated from postal codes in Rotterdam, but were self reported in Kristiansand. Sex and ethnicity (dichotomized into native Dutch/Norwegian and not native) were self reported.

Results: A total of 35 and 31%, respectively in Rotterdam and Kristiansand, were categorised as cyclists. Bivariately, fewer cyclists were overweight than non-cyclists both in Rotterdam (18 vs. 28%; 95%CI were 14-22% and 25-32%) and Kristiansand (12 vs. 21%; 95%CI were

8-16% and 18-24%). When adjusting for distance to school, sex and ethnicity, cyclists were still less likely to be overweight than non-cyclists both in Rotterdam (OR=0.59; 95%CI were 0.42-0.82) and Kristiansand (OR=0.53; 95%CI were 0.36-0.79).

Discussion: In Rotterdam and Kristiansand cyclists were less frequently overweight than those not cycling to school. However, longitudinal studies are needed in order to assess the aetiology: Are cyclists leaner because they cycle to school, or do adolescents cycle more often because they are leaner (and more fit)?

References

Andersen LB, Lawlor DA, Cooper AR, Froberg K, Anderssen SA (in press). Scand J Med Sci Sports. DOI: 10.1111/j.1600-0838.2008.00803.x

Cooper AR, Wedderkopp N, Wang H, Andersen LB, Froberg K, Page AS (2006). Med Sci Sports Exerc, 28, 1724-1731.

A 1-HOUR BOUT OF MODERATE-INTENSITY EXERCISE LEADS TO A CLINICALLY SIGNIFICANT REDUCTION IN BLOOD PRESSURE DURING SUBSEQUENT NIGHT-WORK, IRRESPECTIVE OF MEAL SCHEDULE

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LIVERPOOL JOHN MOORES UNIVERSITY

Introduction: About 15-20% of European workers are involved in shiftwork, which is a significant risk factor for heart disease and hypertension (Atkinson et al., 2008). Previous research indicates that the blood pressure (BP) of diurnally-active people is reduced for several hours after exercise (Jones et al., 2008). However, no researcher has explored whether post-exercise hypotension occurs when participants are active and eating at night, which is the case for shift-workers. Thus, our aims were to (i) examine the acute effects of evening exercise on BP monitored throughout a subsequent night-shift, (ii) explore whether such effects are moderated by meal frequency, and (iii) examine the relation between exercise-mediated changes in BP and core body temperature (Tc). The primary hypothesis was that exercise reduces BP throughout subsequent night-work.

Methods: Nine participants, aged 20-42 y, completed at least two crossover trials beginning at 18:00 h. Between 19:00-20:00 h, participants either rested or exercised at 50% VO2peak and then remained awake throughout the night, completing various tasks until 05:15 h. Six participants completed a total of four trials in which they exercised or rested while either one meal (60 kJ.kg-1 body mass) was eaten at 22:00 h or two smaller meals (30 kJ.kg-1 body mass) were eaten at 22:00 and 02:00 h. Systolic and diastolic BP, mean arterial pressure (MAP) and heart rate (HR) were recorded every 30 min. Wrist activity and intestinal temperature were also recorded throughout each trial with an accelerometer and a thermometric pill, respectively. Data were analysed with two-factor (trial x time) repeated measures linear mixed models and described as mean (SD).

Results: Following exercise, BP was significantly ($P<0.0005$) lower throughout the night-shift compared with no prior exercise (95% confidence limits for reduction in MAP: 4 to 7 mmHg). The post-exercise reductions in systolic BP and MAP were not moderated by meal frequency, but the reduction in diastolic BP was 6 (2) mmHg when only one larger meal was eaten compared to the reduction of 3 (2) mmHg when two smaller meals were eaten ($P<0.0005$). Like BP, Tc was lower following exercise ($P=0.008$), even though wrist activity and HR were significantly higher following exercise ($P<0.0005$).

Discussion: These novel data clearly indicate that prior exercise lowers BP throughout a subsequent 8-hour night-shift, irrespective of meal schedule. An unexpected finding was that prior exercise mediated a larger reduction in Tc during the night. From a health perspective, our data indicate that regular low-intensity exercise has the potential to attenuate the longer-term increase in blood pressure in this unique population.

References

Atkinson, et al.,(2008). Sports Med 38:671-85.

Jones et al., (2008).. Eur J Appl Physiol 104: 481-489.

08:30 - 10:00

Oral presentations

OP-SO01 Sociology 1

MASCULINE MEN PLAYING A WOMAN'S SPORT? MEDIATED REPRESENTATIONS OF MALE HANDBALLERS IN A NORWEGIAN CONTEXT.

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Introduction: No matter how rough and physically demanding the game of handball is; unlike many other European countries, the common Norwegian perception of handball defines it as a woman's sport (Lippe, 2001). This is very much due to their huge international successes and the extensive and positive media coverage. When Norwegian handball is constituted as a women's sport, how are Norwegian male handballers portrayed by the media? By the means of a discourse analytic approach; this paper seeks to uncover symbolic gendered meanings in the Norwegian media's (Tv2) portrayal of men's handball.

Methods: The data was collected by recording 5 games from the 2007 World Championship for men and 5 games from the 2008 European Championship for men. The play-by-play commentators were the same two men for all games recorded and their presentation of the games was transcribed and explored by means of a discourse analysis. Phillips & Jørgensen (1999) argues that communication/discourse is structured and patterned. This paper utilizes a discourse analytic approach focusing on gendered structures and patterns.

Results: The analysis uncovered that the play-by-play commentators' discursive representations of Norwegian men's handball was producing images of Warrior Athletes and elevating this particular form of masculine construction. By the use of analogue references to popular culture at large (intertextuality), applying gendered stereotypes, masculine rhetoric, and warlike metaphors; the athletes' bodies where fuelled and armoured with masculine symbols.

Discussion: The media's portrayal of women's and men's handball does not mirror the sport, our world, social relations or identities in a neutral manner (Phillips & Jørgensen, 1999). Viewer ratings and commercial interests, gendered structures and norms shape the mediated (re)productions of sport events (Rowe, 2004). Mediated depictions of male athletes doing power and performance sports commonly use intertextuality, warlike metaphors and gendered stereotypes (Dahlén, 2008). Although Norwegian handball is constituted as a women's sport, Norwegian mediations of male handball follows the general patterns reifying masculine stereotypes within the media-sport-complex. Media depictions of the Handball Warrior link "fictional" masculine symbolism (resonating among its gendered viewers) to the bodily performances on the field, hence cementing gendered stereotypes as embodied identities. The mediation defines handball as a sport for, not only men, but men with a Warrior attitude.

References

Dahlén, P. (2008). Sport och medier, En introduktion. Kristiansand: IJ-forlaget.

Lippe, G.V.D. (2001). Idrett som kulturelle drama, Møteplasser i idrettssosiologi og idrettshistorie. Oslo: Cappelens.

Phillips, L. & Jørgensen, M. (1999). Diskurs analyse som teori og metode. Fredriksberg: Roskilde universitetsforlag.

Rowe, D. (2001). Sport, Culture and the Media 2nd ed. London: Open University Press.

PROFESSIONALISM AND FATHERHOOD: PASSION AND ALLURE OF BECOMING AND BEING AN OUTDOOR GUIDE/EDUCATOR

VEREIDE, V.

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Professionalism and Fatherhood: Passion and Allure of Becoming and Being an Outdoor Guide/Educator

Vereide, V1 & Gurholt, K2

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Introduction: Male gender research shows that for many males, type of work and inherent work culture are central components for personal identity (Morgan 1992). Another important theme in this field of research is the new ideal perception of a more domestically present father (Brandth & Kvande 2003). The purpose of this study was to acquire insight into how young, male outdoor guides/educators describe and interpret their professional lives after having established family lives involving childcare.

Methods: The analysis is based on qualitative research interviews of five full-time outdoor guides and educators aged between 33 and 40 (born between 1969 –1975). The informants estimate about 70 to 200 working days per year spent away from home. Other key figures are an average professional history of 8,4 years, married or living together with an average of 1,5 children of mean age 5,6 years old. These families produce a mean total of 1,8 human-labour years, varying between 1,35 to 2,15 human-labour years. The informants have an average of 6,4 years university college education in outdoor life and specialized outdoor training through courses.

Analysis/Discussion: These professional outdoor guides/educators all describe a self-perceived inherent need to be active in the outdoors and the type of work is extremely time consuming. A pattern emerges showing that the driving force for choice of profession is a passion for being outdoors and an allure of doing outdoor activities. The informants have chosen a lifestyle and type of work that commits them to full-time mentoring, guiding and teaching others in demanding 'natural' environments; often synonymous with high mountainous areas. A passion has become professionalized. Their subjective experiences during work substantiate the amount of time used at work. Also fatherhood is expressed to be important; they want to be present and to develop close relationships with their children. The everyday challenge is how to cope with combining the two roles and life spheres. This material reveals four different strategies for balancing between an alluring form of work and the ideal of being a present father: 1) Change in work patterns, 2) Change around work patterns, 3) Departure from the distinctive character of this work, and 4) tending toward a re-orientation away from work as a fulltime outdoor educators as primary.

References

Morgan, D.H.J. (1992). Discovering men. New York: Routledge.

Branth, B. & Kvande, E. (2003). Fleksible fedre. Oslo: Universitetsforlaget

THE NEW MEDIA AND HOOLIGANISM: CONSTRUCTING MEDIA IDENTITIES.

AAGE, R.

SPORT SCIENCES

This paper will focus on the new media, for the most part Internet. The main target is the production of the picture of hooliganism on Internet, as well as the consumption of this "picture". The paper, will thereby, examine the relation between "the new media" and "hooliganism". This discussion will be related to an analysis of the website www.sverigescenen.com, a Swedish online magazine. A central question is: How are different pictures/images of the hooligans constructed and described in the new media landscape.

In this respect, Nordic criminologists have informed about the power and the influence of media. They have - close to a moral panic - uphold various social evils that have normally and frequently been related to the power of media in general. This power can be used to induce a fear amongst ordinary people; a fear of criminal act. This influence on the moral discourse could, in the extension, maintain a fear that is out of all proportion to actual risks. Previous research has in general indicated that mass media has a great impact on the (re-)production of the "narrative stories" of hooliganism and hooligans.

Importantly, the new media landscape creates new conditions for this "narrative picture" of hooliganism, due to the fact that both supporters and the hooligans themselves are active and vigorous media producers. This 'new' situation of participation/engagement involvement in the media production will expand and transform the research on the media process, focusing both on producing and consuming media. In this light, he modern media construction of hooliganism stand out as an important subject.

GENDERED DISCOURSES OF WOMEN'S GOLF: MICHELLE WIEUPSTART SHUTDOWN

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In February of 2003, Annika Sorenstam was invited to play in the Bank of America Colonial PGA event in the United States. It was the first time since 1945 that a woman played in a PGA (Professional Golf Association) golf event—a tour reserved for male play. Also in 2003, Michelle Wie was invited, with an exemption, to play in the 2003 Boise Open on the male-only Nationwide Tour. Michelle Wie's continued attempts on the PGA Tour, in addition to other exclusively male tournaments, posed a sustained challenge to the conventionally gendered discourse of golf. This paper investigates the gendered rhetorical construction of golf within U.S. public discourses to understand how challenges to and transgressions from the dominant sport narrative are negotiated and managed in the public discourse.

My primary methodological tool is feminist rhetorical criticism informed by critical theoretical approaches. Through identifying gendered patterns, performances, narratives, and themes of Michelle Wie, along with intersections of gender with race, class, ethnicity, age, and sexuality, I assess the ways in which the U.S. public discourse characterized her play against men and track how the established character of golf—as fundamentally a discourse of privileged white heterosexual masculinity—was positioned in relation to Wie. The texts that I analyzed came from various arenas of U.S. public discourse. They include: (a) newspapers, such as The New York Times (b) magazines, including Sports Illustrated and Golf Magazine (c) televised tournaments (d) and PGA and LPGA promotional literature. The time frame for analysis is from January 2002 to December 2007, which covers the span of time prior to Wie's first invitation to play against men and after one of the last times that she competed against men. By analyzing a variety of texts over a long period of time, I can identify rhetorical patterns and strategies pervasive in the U.S public discourse.

In the case of Michelle Wie, traditional strategies designed to minimize the presence of female athletes, were not employed. Instead, other rhetorical strategies were apparent with regard to how the public discourse of golf rhetorically constituted Wie's gender as it intersected with race, class, and sexuality. Analysis revealed five major themes/patterns: First, Wie was portrayed as a publicity stunt; second, she was portrayed as an interesting, anomalous "specimen" in ways that negated her status as a "real" golfer; third, her youth and naïveté were portrayed as the basis of her career, and thus inevitably transient; fourth, she was made into a moral "spectacle" in ways that eroded her depth and substance, personally and professionally, as well as alluded to her "difference"; and finally, she was articulated as a political token, a mechanism or vehicle for others' (especially her parents') ambitions and agendas.

DISCURSIVE CONSTRUCTIONS OF GIRLS IN A SPORTS INITIATIVE.

SVENDER, J.
INSTITUTION OF SPORT AND HEALTH

The Swedish Sports Confederation has a long-standing and implicit contract with the state to the effect that sport receives national resources in exchange for the staging of activities that are open to all and organised in such a way that children and young people are brought up to be good and democratic citizens (SOU, 2008). One social issue expressed in the sports movement's programme, and one of the premises for state support, is gender equality. Several plans and projects have been carried out in order to provide equal sporting opportunities for men and women. The research project investigates one of these initiatives, in which local sport clubs were encouraged by the state to promote girl's sports participation.

Singling out girls – and not boys – as special targets is reasonable considering that sport has been, and still is, discursively positioned as a masculine practice (e.g. Chase, 2006; Larsson, 2003). In addition, quite often different forms of problematic issues have been linked with girls' sports participation. This motivates a study on ideas of girls and their sports participation. The presentation will scrutinise issues associated with girls' sports participation that legitimise special promotion.

The aim of the study is to analyse the discursive constructions of girls in projects designed by local sports clubs in three traditional female-dominated sports: equestrian sport, figure skating and gymnastics. The framework is inspired by a feminist Foucauldian perspective in which concepts of power and governmentality are central (Foucault, 1994). Governmentality implies a complex relationship between the exercise of power and knowledge about the object of governing. The study question relates to ideas and knowledge about girls portrayed by the sports clubs. The methodology undertaken is discourses analysis of the project applications, written and submitted by local sports clubs. Different ways of framing girls and their sports participation are sought by identifying patterns and regularities in the applications, and considering which different actions are legitimised, promoted or imposed in the texts. The result shows that the project presupposes certain kinds of girls, namely, those linked with notions about what becoming a teenage girl means.

Chase, L. F. (2006). (Un)Disciplined bodies: A Foucauldian analysis of women's rugby,
Sociology of Sport Journal, 23 (3), 229-247.
Foucault, M. (1994). The subject and power. In P. Rabinow (Ed.). Trans., R. Hurley., Power. (pp. 326-348). New York: New Press.
Larsson, H. (2003, January 9). A History of the present on the 'sportsman' and the'sportswoman'. Forum: Qualitative Social Research, 4 (1).
SOU (2008). Föreningsfostran och tävlingsfostran. En utvärdering av statens stöd till idrotten: Betänkande av idrottsstödsutredningen. [Democracy and competitive education. An evaluation of the state's sponsoring of sport: Findings of the Sport Sponsorship Commission]. (Swedish Government Official Reports 2008:59). Stockholm: Fritze.

FOOTBALL - SCIENCE OR PLAY AND PASSION: NORWAY WITH OR WITHOUT 'DRILLO'

SKOGVANG, B.O.
HEDMARK UNIVERSITY COLLEGE

Football has been linked to science for a long time through that traditional sciences' like psychology, medicine, pedagogy etc. have been applied on football. To change football from play and passion to science has been seen as negative both in Norway and England, and the football practice has in general been seen as conservative and negative to theory (Larsen 2001). Publications from the conferences 'Science and Football' and Richard Giulianotti (1999) bring voices to this debate. I will bring in findings in the project; 'Elite football – a field of changes' (Skogvang, 2006) where I have done observations in international championships, observations of practices, meetings, and matches in three elite football clubs through a year, plus interviews with 22 players (11 of each sex) and eight coaches in women's and men's football. The project discuss different areas within Norwegian elite football; like professionalism, the media and commercialisation, the players' experience of their own and others football practice etc. Here I will put focus on the ongoing debate in the Norwegian field (Bourdieu 1993) of football, where often a dichotomy between two poles is visual. On the one hand football is seen as play, emotions,

entertainment and passion. On the other hand we have the scientific football. I will discuss this and connect it to the link between science and practice and how science can influence the football practice for women and men both at elite and grass root level.

Goksøyr and Olstad (2002) describe how elite football in Norway did turn from 'self-taught practitioners' to more accept for theory and science. Egil "Drillo" Olsen, who was educated and employed at the Norwegian School of Sport Sciences, was a skilled football player, and is seen as 'the embodied' person for football science in Norway. Olstad and Goksøyr (2003) call him 'the Fridjof Nansen of the 1990s', and describe the three waves of intense discussion about how football is to be played in Norway. In January 2009 "Drillo" again became the manager of the Norwegian male national team. The 0-1 victory away against Germany in Drillo's first match actualised the debate about football and science or the passion and play with the ball again.

References:

Bourdieu, P. (1993) The Field of Cultural Production. Cambridge/Oxford: Polity Press.

Giulianotti, R. (1999) Football-a sociology of the global game. Oxford:Polity Press.

Goksøyr, M. and Olstad,F. (2002) Football! Norges Fotballforbund 100 år. Oslo: Norges Fotballforbund.

Larsen, Ø. (2001) Charles Reep:A major Influence ob British and Norwegian Football. Soccer and Society, Vol. 2, No.3, 58-78.

Olstad, F. & Goksøyr, M. (2003) Revolution and Resistance. The Rise and Fall of the Norwegian Playing Style? Moving Bodies, Vol.1, No.2, 1-18.

Skogvang, B.O. (2006) Toppfotball-et felt i forandring(Elite football-a field of changes).Oslo: The Norwegian School of Sport Sciences.

08:30 - 10:00

Oral presentations

OP-SM01 Sports Medicine 1

URINARY CC16 LEVELS IN WINTER VERSUS SUMMER SPORT ATHLETES AFTER EUCAPNIC VOLUNTARY HYPERPNOEA

BOLGER, C., TUFVESSON, E., STENFORS, N., DEVEREUX, G., AYRES, J.G., HOLMBERG, H.C., BJERMER, L., SUE-CHU, M., KIPPELEN, P.

UNIVERSITY OF ABERDEEN

Exercise−induced bronchoconstriction (EIB) is highly prevalent in elite athletes, especially in those training in cold dry environments (1). Dehydration of the airways plays a key role in this process (2). EIB has recently been linked to airway epithelial injury in asthmatic individuals (3).

The aim of the study is to determine whether a short period of hyperpnoea of dry air causes airway epithelial disruption in winter and/or summer sport athletes. We hypothesise that urinary level of the Clara cell protein (CC16) – an indirect marker of permeability/cellular integrity of the lung epithelial barrier (4) – will be increased after a eucapnic voluntary hyperpnoea (EVH) test and that this increase will be larger in winter compared to summer athletes.

Forty two female athletes – 28 summer athletes (age 31.1+/-1.7yr (SEM), training volume 9+/-1.1h/wk) and 14 winter athletes (age 21.4+/-0.8yr, training volume 12.0 ± 1.10h/wk) – took part in this study. They all performed an 8-min EVH test at a target ventilation rate of 30 times their baseline forced expiratory volume in one second (FEV1). After the challenge, FEV1 was measured in duplicate at 2, 5, 10, 15, 20, 30, 60 and 90min. A sustained decrease in FEV1 of at least 10% from baseline was considered positive. Urine samples were collected at baseline and at 30, 60 and 90min recovery. CC16 concentration was measured by enzyme immunoassay.

Ten summer athletes had a positive test (max FEV1 fall = 19.6+/-2.4%), whilst eighteen of the summer athletes and all the winter athletes were negative (max FEV1 fall = 5.7+/-0.7% and 5.3+/-0.7%, respectively). CC16 increased significantly after the challenge in all three groups (P<0.01) with no difference between groups: delta CC16 (max post-EVH minus baseline) in summer EVH negative athletes was 0.241+/-0.1 ng/μmol creatinine, 0.292+/-0.085 ng/μmol creatinine in summer EVH positive athletes, and 0.123+/-0.047ng/μmol creatinine in winter EVH negative athletes (P=0.415).

In conclusion, a short period of hyperpnoea of dry air is associated with an increased rate of CC16 excretion in urine in both winter and summer athletes. This suggests that the integrity of the airway epithelium might be compromised by loss of airway surface lining fluid when athletes inhale dry air at high flow rates. This appears to occur irrespective of the degree of bronchoconstriction or regular training environment.

1. Rundell KW, Jenkinson DM. Exercise-Induced Bronchospasm in the Elite Athlete Sports Med. 32(9): 583 (2002)

2. Anderson SD, Holzer K. Exercise-induced asthma: Is it the right diagnosis in elite athletes? J Allergy Clin Immunol. 106(3): 419 (2000)

3. Hallstrand, TS, Moody MW, Aitken, ML, Henderson, WR. Airway immunopathology of asthma with exercise-induced bronchoconstriction. J Allergy Clin Immunol. 116(3):586 (2005)

4. Broeckaert F, Bernard A. Clara cell secretory protein (CC16): characteristics and perspectives as lung peripheral biomarker. Clin Exp Allergy. 30(4):469 (2000)

NO EFFECT OF AGE, GENDER AND PHYSICAL ACTIVITY LEVEL ON HUMAN MONOCYTE TOLL-LIKE RECEPTOR 4 EXPRESSION IN AN ACTIVE POPULATION

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Several studies have reported that some immune cell functions including monocyte Toll-like receptor (TLR) expression are temporarily reduced after a prolonged acute bout of strenuous exercise, and that several months of moderate exercise training in previously sedentary individuals results in reduced levels of TLR expression (Gleeson et al. 2006). Over the long term these effects may be beneficial to health due to associated reductions in chronic inflammation, and consequently reducing the risk of developing chronic metabolic and cardiovascular diseases. To date, there has been little research on the effect of habitual activity level on human monocyte TLR expression

or the influence of age or gender apart from one study (McFarlin et al. 2006) that showed a lower TLR4 expression in active compared with sedentary subjects in both a young and an elderly population.

The purpose of this study was to examine the effects of the volume of self-reported moderate-strenuous exercise training on human monocyte TLR4 expression in a large cohort of active subjects (minimum of 3 hours moderate-strenuous training per week). With local ethics committee approval 85 healthy subjects aged 18-53 yrs, body mass 52-112 kg; BMI 18-35 kg/m2 completed a self-report questionnaire of weekly exercise training load and a resting venous blood sample (following an overnight fast) was taken for analysis of circulating monocyte counts and TLR4 expression (corrected for non-specific binding using an isotype control) as described by Lancaster et al. (2005). TLR4 expression was compared in males and females matched for habitual activity level, young and older subjects matched for habitual activity level and subjects classed according to hours of training per week (3-7 , 8-14 and 15-25 h/week). T-test and ANOVA were used to analyse the data.

Monocyte counts were in the normal range for all subjects and were not influenced by age, gender or habitual activity level. Monocyte TLR4 expression (geometric mean fluorescence intensity, GMFI, mean [SEM]) was not affected by age (GMFI: 20.4 [1.5] in 47 subjects aged 18-24 yrs versus 23.7 [2.3] in 23 subjects aged 30-53 yrs, P=0.240) or gender (GMFI: 19.7 [1.2] in 52 men versus 23.7 [2.3] in 31 women, P=0.096). There was no significant main effect for physical activity level for TLR4 expression (F = 0.805, P=0.451) which was 22.2 [2.1], 21.8 [1.6] and 18.6 [1.3] (GMFI) in subjects exercising for 3-7, 8-14 and 15-25 h/week, respectively.

This study showed that TLR4 expression is not affected by exercise training load, gender or age in a physically active population.

References

Gleeson M, et al. (2006). Exerc Immunol Rev 12: 34-53.

Lancaster GI, et al. (2005). J Physiol 563(3): 945-955.

McFarlin BK, et al. (2006). J Gerontol 61(4): 388-393.

VALIDATION OF INFRARED THERMOGRAPHY AS INJURY PREVENTION METHOD IN PROFESSIONAL SOCCER PLAYERS.

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Introduction.

Tensiomiography (TMG) is been used as an injury prevention method in professional soccer players. It records the muscle response to a known electrical stimulus intensity [1,2]. In other hand, Thermography (TG) is a technique used for detecting and managing injuries [3], in which a camera records the infrared radiation released from the metabolic activity of human body for estimating temperatures on different areas [4]. This study attempts to correlate both techniques in order to validate the TG as an injury prevention method in professional footballers.

Methods: Using a Tensiomyographer (TMG 100 Measurement System, TGM - BMC Ltd.) and a Thermographic camera (ThermaCAM TM SC640, FLIR SYSTEMS), 20 professional Spanish soccer players were assessed the day after the weekly competition. They were recorded 5 variables by TMG (Delay Time [DT], Contraction Time [CT], Sustain Time [ST], Relaxation Time [RT] y Maximal Displacement [MxD]) in both Femoral Biceps (dominant [DFB] and non-dominant [NDFB]). Previously, it had been obtained the mean temperatures (T) of those areas by TG.

Results: Student T-test showed lack of significant differences between DFB and NDFB for all recorded variables (DTDBF = 26.7, DTNDBF = 27.5; CTDBF = 32.2, CTNDBF = 34.3; STDBF = 191.5, STNDBF = 199.8; RTDBF = 56.5, RTNDBF = 56.0; MxDDBF = 5.8, MxDNDBF = 5.7; TDBF = 33.8, TNDBF = 33.9). Indirect significant correlations were found between T and CT ($r = -0.35$; $p < 0.05$) and DT ($r = -0.39$; $p < 0.05$) considering together the results of both Femoral Biceps and, dividing the data in DFB and NDFB, they were found indirect significant differences between T and STDBF ($r = -0.50$; $p < 0.05$) and between T and CTNDBF ($r = -0.45$; $p < 0.05$) and DTNDBF ($r = -0.49$; $p < 0.05$). Considering individual cases, TG reach similar results compared with TMG on the injury risk for each player.

Discussion and Conclusion.

Differences on the significant variables for the dominant leg may be due to different contraction pattern or function during the game or to different injuries prevalence for each leg. However, TG may be considered as a valid method in order to assess the injury risk of a professional soccer player.

References.

1. D. Križaj, et al. (2008) Short-term repeatability of parameters extracted from radial displacement of muscle belly. Journal of Electromyography and Kinesiology,18 (4) pp 645-651.

2. http://www.tensiomyography.com/our-star-users/tmg-references.html

3. Garagiola, U. & Giani, E. (1990). Use of telethermography in the management of sports injuries. Sports Medicine. 10(4): 267-272.

4. Barnes, R.B. (1967). Determination of body temperature by infrared emission. J. Appl. Physiol. 22:1143-1146.

INFLUENCE OF COLD WATER FACE IMMERSION ON POST-EXERCISE PARASYMPATHETIC REACTIVATION

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Introduction: A delayed parasympathetic reactivation after exercise is associated with an increased risk of sudden cardiac death. Thus, means of improving post-exercise parasympathetic reactivation are now receiving greater interest. Hayashi et al. (1997) showed that cold water face immersion (CWFI) can increase vagal activity (i.e., inferred from heart rate (HR) variability (HRV)) at rest, but whether this beneficial effect is preserved during recovery after exercise is not known. Therefore, the aim of the present study was to investigate the effect of CWFI on parasympathetic reactivation following exercise.

Methods: Eleven men (21.6±1.3 yr; 1.80±0.06 m; 76.1±13.0 Kg) performed, on two different occasions, an intermittent exercise (i.e., a cycling 30-s Wingate test (to reduce vagal activity) followed by a 5-min run at 60% of maximal aerobic velocity, interspersed with 5-min of seated recovery). Immediately after the 5-min run, participants underwent a seated passive recovery with either CWFI or without (C) condition. Participants breathed through a snorkel in both recovery conditions. In CWFI condition, water temperature was kept at 10-12°C. Parasympathetic reactivation was assessed through beat-to-beat HR collection (Polar Electro, Kempele, Finland) during the 5-min following the submaximal exercise (Buchheit et al., 2007). Absolute HR recovery was calculated from the immediate 60s period after exercise

(HRR60s), and HRV vagal-related indices (i.e., natural logarithm of high frequency, LnHF and the root mean square of successive R-R interval differences, RMSSD) were calculated on the last stationary 3-min segment. Data were compared by paired t-test.

Results: CWFI induced faster HRR60s compared to C (44.4±4.1 vs. 31.4±2.7 bpm, p=0.008). Compared to C, all vagal-related indices were significantly higher during CWFI (LnHF: 4.5±0.6 vs. 2.9±0.4 ms², p=0.004; RMSSD: 24.4±11.7 vs. 8.8±2.0 ms, p=0.02).

Discussion: This study is the first to assess the effect of CWFI immediately after exercise on parasympathetic reactivation. In accordance with previous studies showing CWFI to trigger parasympathetic heart control at rest (i.e., with no previous exercise, (Hayashi et al., 1997)), our results showed a faster increase in post-exercise vagal-related indices in the CWFI compared to the control condition. CWFI appears to be a simple and effective means to accelerate post-exercise parasympathetic reactivation.

References

Buchheit M., Papelier Y., Laursen P. B. and Ahmaidi S., (2007). Noninvasive assessment of cardiac parasympathetic function: post-exercise heart rate recovery or heart rate variability?, Am J Physiol Heart Circ Physiol, 23, 23.

Hayashi N., Ishihara M., Tanaka A., Osumi T. and Yoshida T., (1997). Face immersion increases vagal activity as assessed by heart rate variability, Eur J Appl Physiol Occup Physiol, 76, 394-9.

EXERCISE-BASED SPORTS INJURY PREVENTION: A SYSTEMATIC REVIEW

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Introduction: Sports injuries are often associated with increased morbidity and disability, and therefore constitute a major public health burden. Although exercise programs targeting the enhancement of proprioceptive and neuromuscular abilities have widely been considered for injury prevention, uncertainty remains about the most appropriate types of exercise and their (relative) effectiveness. Therefore, the aim of this systematic review was to assess the effectiveness of proprioceptive/neuromuscular training in preventing sports injuries by using the best available evidence from methodologically well-conducted randomized controlled trials (RCTs) and controlled clinical trials without randomization (CCTs).

Methods: At least 2 independent researchers performed a search for articles published between 1966 and 2008 in Cochrane, MEDLINE, EMBASE and PEDro databases. The reviewers independently assessed articles for eligibility, extracted data, and assessed methodologic quality using the van Tulder criteria list. Relative Risks (RR) and 95% confidence intervals (CI) were used to estimate treatment effects. Heterogeneity between studies was examined by using the Q and I-squared statistics. Where applicable, fixed effects and random effects models were used for meta-analysis.

Results: From a total of 32 relevant studies, 7 methodologically well-conducted RCTs (i.e. studies that adequately fulfilled and reported at least 50% of the quality criteria) of adolescent and young adult athletes (7633 participants) practicing ball sports were considered for this review. Exercise interventions included balance training or multi-intervention-programs comprising balance training, stretching, plyometrics, running exercises, cutting and landing technique and strength training. Pooled analysis revealed that multi-intervention training was effective in reducing the risk of acute knee injuries (RR 0.46, 95% CI 0.28-0.76; p<.01), and ankle sprain injuries (RR 0.50, 95% CI 0.31-0.79, p<.01). While balance training was also effective in reducing the risk of ankle sprain injuries (RR 0.64, 95% CI 0.46-0.9; p<.01), it showed a non-significant risk reduction for injuries overall (RR 0.49, 95% CI 0.13-1.8; p=.28). Individual studies found that exercise interventions were more effective in athletes with a history of sports injury than in those without.

Discussion: This systematic review and meta-analysis comprises data from 7 high-quality RCTs that may be the basis for evidence-based sports injury prevention. The results suggest that balance exercises and multi-intervention training programs alike can be effective in reducing the incidence of certain types of sports injuries among adolescent and young adult athletes during pivoting sports. Future research should focus on the conduct of comparative trials to identify the most appropriate and effective training components for preventing injuries in different sports and populations.

Supported by the Federal Institute of Sport Science.

COMPARISON OF SEMINAL SUPEROXIDE DISMUTASE <SOD> ACTIVITY BETWEEN ELITE ATHLETES, ACTIVE AND NON ACTIVE MEN

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Introduction: Superoxide dismutase as an important element of seminal plasma superoxide anion scavenging capacity plays an essential role in maintaining the balance between ROS generation and degradation, and hence male fertility. The purpose of this study was to evaluate the seminal plasma SOD activity of individuals with different level of physical fitness.

Methods: A total of 40 semen samples were obtained from 3 groups of men, including elite athletes (mean age 23.1±1.3 yrs, n=15) who had regular training (4-5 days per week), physically active (mean age 23.4±0.9 yrs, n=13) who were participating in educational or recreational physical activities for 4-5 h per week, and sedentary controls (mean age 22.0 ±2.0 yrs, n=12) who did not participated in any exercise program for at least 6 months prior to study.

Results: The result showed significantly higher SOD activity in seminal plasma of elite athletes, as compared with those of recreationally active (P= 0.001) and control (P=0.004) groups. No statistically significant difference was observed between active and control groups (P=0.139).

Discussion: Therefore, the results of the present study demonstrate that, compared to sedentary and recreationally active men, elite athletes develop an increased seminal antioxidant capacity in term of SOD level, suggesting that spermatozoa from elite athletes may be less susceptible to ROS- induced peroxidative damage, and hence, infertility. Further studies are warranted to detail the antioxidant capacity of seminal plasma and spermatozoa of individuals with different levels of physical fitness as well as the effect of various exercise programs on seminal antioxidant capacity.

References

Agarwal A, Kartikeya M, Sharma R. (2008). Clinical relevance of oxidative stress in male factor. American Journal of reproductive immunology, 59 (208), 2-11

Sanocka D, Miesel R, Jedrzejczak P, Chelmonska-Soyta AC, Kurpisz M. (1997). Effect of reactive oxygen species and the activity of antioxidant systems on human semen; association with male infertility. Int J Androl, 20, 255–264.

Smith R, D.Vantman, J.Ponce, J.Escobar and E.Lissi. (1996). Total antioxidant capacity of human seminal plasma. Human Reproduction, 11, 1655-1660

Banfi G, Malavazos A, Iorio E, Dolci A, Doneda L, Verna R, Corsi MM. (2006). Plasma oxidative stress biomarkers, nitric oxide and heat shock protein 70 in trained elite soccer players. Eur J Appl Physiol, 96(5), 483-6

Dekany M, Nemeskeri V, Györe I, Harbula I, Malomski J, Pucsok J. (2006). Antioxidant status of interval-trained athletes in various sports. Int J Sports Med, 27(2), 112-6

08:30 - 10:00

Invited symposia

IS-SS03 Performing under pressure in sport

CHOKING AS THE WORLD IS WATCHING: EVIDENCE FROM MAJOR FOOTBALL PENALTY SHOOTOUTS

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NORWEGIAN SCHOOL OF SPORT SCIENCES

CHOKING AS THE WORLD IS WATCHING: EVIDENCE FROM MAJOR FOOTBALL PENALTY SHOOTOUTS

Jordet, G.

Norwegian School of Sport Sciences, Oslo, Norway

The football (soccer) penalty shootout is used to identify a winner when two teams are tied in tournaments. Given that this event is known as a vast pressure situation where shooters typically are assumed to have an advantage over the keeper (goals are typically scored on 70-80% of the shots), the shooters' failure to live up to expectations of scoring may indicate that choking has taken place. In this presentation, I present multiple studies that document different aspects of choking under pressure in international penalty shootouts. First, in-depth interviews with 10 players who took part in a European Championships penalty shootout indicate that a large majority of the players experience competitive anxiety in this situation, and that a considerable number of them experiences little control over the outcome (which is linked to both high anxiety intensity and negative directional interpretation of anxiety symptoms). Second, match record and video evidence from all penalty shootouts ever held in the World Cup, European Championships, and UEFA Champions League suggests that the number of misses increases with elevated shot importance. In addition, the number of misses becomes even higher on shots with negative valence (i.e., shots where a miss instantly produces a loss) as compared to shots with positive valence (i.e., shots where a goal instantly produces a win). Players also engage more in avoidance based coping strategies (diverting their gaze away from the goal and rushing their preparations to get the situation more quickly over with) when they perform in these high-pressure situations. Third, players with high public status score fewer goals than players with less status, suggesting that high egotism can precipitate choking on this task. The same is found with respect to team status, where players on teams with high international status score fewer goals and engage more in escape strategies than players on other teams. In conclusion, the results from these studies are consistent with a view of choking under pressure as related to favourable views of self under threat. Performers then underachieve when they engage in self-defeating self-regulation strategies initiated to escape from the unpleasant affect associated with the pressure. The presentation is ended with a discussion of a real-world intervention where some of the knowledge generated from this research was put to practice by the Dutch U21 team in a penalty shootout in the 2007 European Championships.

TO BE OR NOT TO BE? SELF-CONSCIOUSNESS, EXPLICIT MONITORING AND SKILL FAILURE UNDER PRESSURE

JACKSON, R.C., ASHFORD, K.J., KINRADE, N.P, ADAMS, D.

BRUNEL UNIVERSITY

Baumeister (1984) proposed that, under pressure, performers attempt to control their skills consciously but that "consciousness does not contain the knowledge of these skills, so that it ironically reduces the reliability and success of the performance" (pp. 610-611). Over the past 25 years, considerable support for this idea has been found by researchers examining 'choking' in motor skills, couched in terms such as reinvestment and explicit monitoring. In this presentation, I will further examine the role of conscious processing in skill failure by considering (i) the function of the explicit focus, (ii) individual propensity for reinvestment, and (iii) the nature of the task. First, I will consider the function and level of conscious control that is implicated in skill failure by looking at the different types of process goal and their effect on skilled motor performance. From the applied perspective, I will also consider the complex nature of foci described by elite performers, and whether they are deemed to be facilitative or debilitative. I will discuss these data in terms of their implications for preventing skill failure under stress. Second, I will present data regarding the relationship between dispositional self-focus and performance under pressure in cognitive tasks of varying complexity. In so doing, I will consider the possibility that reinvesting conscious control can also have a detrimental effect on the more cognitive or perceptual elements of skilled performance. This has implications for skilled decision making in sport, which requires accurate judgments to be made in a time-constrained environment.

Reference

Baumeister, R. F. (1984). Choking under pressure: Self-consciousness and paradoxical effects of incentives on skilful performance. Journal of Personality and Social Psychology, 46, 610-620.

STRESSORS, SOCIAL SUPPORT, AND PERFORMANCE

REES, T.

UNIVERSITY OF EXETER

When faced with the pressure surrounding competing in sport, some athletes may feel they should "go it alone." The recommendations from the sport psychology literature are, alternatively, that athletes should be encouraged to be proactive in harnessing social support from those around them. Although research on social support in sport has tended to be limited to its influence on sport injury, there is an emerging literature base focusing on its influence within performance settings (for a review, see Rees, 2007). For example, there is recent

evidence that social support may explain as much as 24% of the variance in performance over and above the variance explained by performance-related stressors (Rees, Hardy, & Freeman, 2007). This offers a very powerful indication of the impact social support may have in relation to sports performance. Generally, two principal models identify the conditions under which different kinds of social support influence outcomes (and thus performance): the stress-buffering model, and the main (or direct) effect model. The main effect model proposes that social support has a beneficial effect irrespective of whether persons are under stress. Stress-buffering is tied to models of the stress process, appraisal and coping. The stress-buffering influence of social support might operate by leading to benign appraisal of the stressful events, through a direct transfer of resources, or by promoting better coping behaviors. The role of social support in this process will be discussed in relation to recent work within sports performance, which has demonstrated that the stress-buffering model may be mediated by self-efficacy (Rees & Freeman, 2009), that social support may operate through challenge and threat appraisals (Freeman & Rees, in press), that both perceptions and receipt of support should be taken into account (Freeman & Rees, 2008), and that focused interventions can lead to increased social support and improved performance (Freeman, Rees, & Hardy, in press). Future research directions and the applied implications for sportspeople performing under pressure will then be discussed.

Rees, T. (2007). In S. Jowett, D. Lavallee, Soc Psy Sport (223-231). Champaign, IL: Hum Kin.

Freeman, P., Rees, T. (2008). European J Sport Sci, 8, 359-368.

Freeman, P., Rees, T. (in press). J Appl Sport Psy.

Freeman, P., Rees, T., Hardy, L. (in press). J Appl Sport Psy.

Rees, T., Freeman, P. (2009). J Soc Clin Psy, 28, 245-264.

Rees, T., Hardy, L., Freeman, P. (2007). J Sports Sci, 25, 33-42.

08:30 - 10:00

Invited symposia

IS-SM02 Physical activity and ageing

STRATEGIES FOR THE PROMOTION OF PHYSICAL ACTIVITY AMONG OLDER PEOPLE IN EUROPE - THE EUNAAPA PROJECT

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INSTITUTE OF SPORT SCIENCE AND SPORT, FA UNIVERSITY ERLANGEN-NUREMBERG, GERMANY

The European Network for Action on Ageing and Physical Activity (EUNAAPA) project pursued the identification of successful strategies for the promotion of physical activity among older people. The project was funded by the Directorate General Health and Consumer Protection of the European Commission, 21 institutions from 16 European nations (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Greece, Italy, the Netherlands, Norway, Poland, Portugal, Spain, and Sweden) took part in the project work from 2006 to 2008.

In order to assess existing policies for the promotion of physical activity among older people in participating nations, a mini-survey with a total of 248 policymakers was conducted. A sampling matrix was developed to define policy sectors (e.g. sports, health, social welfare) and governance levels from which respondents were recruited for interviews. The matrix was developed to allow for structural equivalence in the comparison of policies across nations. The survey contained questions on goals, obligations, resources and opportunities that policymakers perceived for the development of policies in the area of physical activity promotion among older people. These four determinants of policy making are based on a theoretical model developed by v. Wright (1976) that has been adapted to assess determinants of health promotion policies (Rütten et al. 2000).

Results of the survey indicated that determinants of policy outcomes for physical activity promotion among older people varied starkly among participating nations. Across nations, policy makers rated available resources as most critical compared to the other the determinants. Interestingly, policy makers in some nations reported lacking concrete goals for policy development. Policy makers in a number of nations indicated that opportunities (e.g. interest of the media in the topic of ageing and physical activity) had improved in recent years. National workshops with policymakers were utilized to discuss, based on results of the survey, strategies for policy development for physical activity promotion among older people.

References:

Rütten A, Lüschen G, von Lengerke T et al. (2000). Health Promotion Policy in Europe. Rationality, Impact, and Evaluation. München: Oldenbourg.

Von Wright, G.H. (1976). Determinism and the study of man. In Manninen, J. and Tuomela, R. (eds.), Essays on Explanation and Understanding (pp. 415-435). D Reide, Dordrecht.

DO'S AND DONTS IN PHYSICAL ACTIVITY RESEARCH AMONG CHRONICALLY ILL OLDER PERSONS

HOPMAN-ROCK, M.

TNO QUALITY OF LIFE AND BODY@WORK RESEARCHCENTER TNO VU UNIVERSITY MEDICAL CENTER

From literature reviews on research in physical activity (PA) and exercise in chronically ill older persons it is known that a lot of the published research has not the highest scientific standard. What is the reason for that finding and how may we improve that? Because evidence based interventions are important to ensure implementation effects in sports and exercise practice, these are important questions. During the presentation reasons will be explored why randomized controlled trials in this area are relatively difficult to perform. Examples from own experiences will be given from research on PA and exercise in older persons with dementia, mild cognitive impairment, osteoarthritis of the hip and/or knee and incontinence problems.

PROMOTING PHYSICAL ACTIVITY IN OLDER ADULTS: A LIFESTYLE APPROACH OR A STRUCTURED EXERCISE INTERVENTION?

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FACULTY OF KINESIOLOGY AND REHABILITATION SCIENCES

INTRODUCTION: Several studies have shown that older persons benefit from a supervised, center-based, exercise program in terms of improved functional performance and fitness (Delecluse et al., 2004; Dunn et al., 1998; Fahlman et al., 2007). However, these supervised center-based programs are expensive, which limits their implementation possibilities and hence their public health impact. Moreover, for sedentary older adults in particular, a number of important barriers exist to attend such supervised center-based exercise program, for example lack of access or transportation to the facilities, financial considerations and a lack of affinity with the culture of fitness centres (Schutzer & Graves, 2004). In order to deal with these barriers, home-based and lifestyle interventions were developed. However, it is not yet clear whether the effects of such home-based and lifestyle interventions equal the effects of supervised center-based exercise interventions. The aim of this study was to evaluate the effects of traditional fitness training intervention versus a home-based lifestyle intervention on physical activity, physical fitness and cardiovascular risk factors in older adults.

METHODS: One hundred and eighty-six sedentary men and women aged 60 to 83 volunteered to participate and were randomized in one of three groups. A fitness training intervention (STRU, N = 60), consisting of three supervised sessions weekly, and a home-based group (LIFE, N = 60), including an individualized lifestyle program supported by a limited number of booster phone calls, were compared with an 'assessment only' control group (N = 66). Physical activity, cardio-respiratory fitness, muscular fitness, functional performance and cardiovascular risk factors were recorded before (pretest) and after 11 months of intervention (posttest).

RESULTS and CONCLUSIONS: The STRU and the LIFE intervention were equally effective in increasing physical activity in older adults. Both intervention groups improved in physical fitness, but STRU increased more than LIFE for cardio-respiratory and muscular fitness, whereas LIFE increased more than STRU for functional performance. In general however, although STRU showed a limited effect on body composition and total cholesterol/HDL ratio, eleven months of structured exercise and/or lifestyle physical activity had only limited effects on cardiovascular risk factors,. Therefore, interventions aiming to reduce cardiovascular risks should focus on long-term changes in physical activity behaviour.

REFERENCES

Delecluse, C., Colman, V., Roelants, M., Verschueren, S., Derave, W., Ceux, T. et al. (2004). Prev.Med., 39, 823-833.

Dunn, A. L., Marcus, B. H., Kampert, J. B., Garcia, M. E., Kohl, H. W., III, & Blair, S. N. (1999). JAMA, 281, 327-334.

Fahlman, M. M., Topp, R., McNevin, N., Morgan, A. L., & Boardley, D. J. (2007). J.Gerontol.Nurs., 33, 32-39.

Schutzer, K. A. & Graves, B. S. (2004). Prev.Med., 39, 1056-1061.

08:30 - 10:00

Invited symposia

IS-PH01 Skeletal muscle blood flow regulation during exercise

EXERCISE HYPEREMIA: PARTITIONING THE PERIPHERAL AND CENTRAL FACTORS

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Numerous factors contribute to the essential increase in blood flow to active skeletal muscle at the onset of exercise, ensuring the adequate supply of oxygen and removal of metabolic by-products. Central and peripheral factors, which may include the skeletal-muscle pump, mechanically induced vasodilation, mechanical distortion of arterioles, flow mediated dilation, and cardio-acceleration resulting from muscle mechanoreptor and chemoreceptor feedback, all have substantial support for their role in this hyperemic response. However, as a result of the copious factors, it is difficult to experimentally partition them allowing one to determine the magnitude of effect and temporal nature of any single mechanism. Thus, the aim of this presentation will be first to examine the blood flow response to exercise and then to subsequently highlight the, second by second, kinetics of central and peripheral factors that influence hyperemia at the onset of limb movement, providing mechanistic insight into the regulation of exercise hyperemia.

ROLE OF INTRAVASCULAR SIGNALS ON THE CONTROL OF MUSCLE PERFUSION

GONZÁLEZ-ALONSO, J.
BRUNEL UNIVERSITY

The matching of skeletal muscle oxygen supply and demand is a fundamental principle in Physiology. Recent studies suggest that the oxygen carrying erythrocyte plays a role in this process by sensing and signaling the amount of oxygen bound to hemoglobin, i.e., oxyhemoglobin (O2Hb). In this construct, adenosine triphosphate (ATP) release from erythrocytes in association with the offloading of oxygen from the hemoglobin molecule is thought to play an important role in the matching of oxygen delivery to local muscle metabolic demand. In vitro and in vivo observations support this hypothesis by demonstrating that i) erythrocytes release ATP in association with the offloading of oxygen from the hemoglobin molecule, ii) plasma ATP is tightly correlated to alterations in O2Hb with exposure to hypoxia, hyperoxia and carbon monoxide inhalation, and iii) ATP, when infused intra-arterially, causes both marked muscle vasodilatation and complete inhibition of alpha-adrenergic vasocontriction. ATP exerts its vasodilatory effect directly and not via degradation compounds, as comparison of the relative vasoactive potencies of ATP, and other nucleotides (ADP, AMP), adenosine and UTP, reveals the following rank order of vasoactive potency: ATP (100) = UTP (100) >> adenosine (5.8) >ADP (2.7) >AMP (1.7). Furthermore, both ATP and UTP, but not ADP, AMP or adenosine infusions, fully inhibit alpha-adrenergic vasoconstriction in a manner similar to exercise and hypoxia. Human skeletal muscle expresses mainly P2Y2 purinergic receptors located in the vascular endothelium. The P2Y4, the only common ATP/UTP receptor, cannot be detected at the mRNA level in skeletal muscle. Taken together, these findings support that erythrocyte-derived ATP acts as an important mediator of oxygen sensing transduction between the erythrocyte and the muscle vascular endothelium causing both vaso-

dilatation and sympatholysis by binding to endothelial ATP selective P2Y2 purinergic receptors and stimulating the vascular endothelium to release vasodilator-sympatholytic substances, including nitric oxide, prostaglandins and endothelium-derived hyperpolarization factors.

Support: Copenhagen Hospital System, Novo Nordisk Foundation and Lundbeck Foundation.

ROLE OF ENDOTHELIUM AND SKELETAL MUSCLE DERIVED VASODILATORS

HELLSTEN, Y.

UNIVERSITY OF COPENHAGEN

Role of endothelium and skeletal muscle derived vasodilators
in exercise hyperaemia
Ylva Hellsten
Copenhagen Muscle Research Centre, Department of Exercise and Sport Science, University of Copenhagen, Universitetsparken 13, DK-2100 Copenhagen Denmark

In skeletal muscle, blood flow may increase more than 30-fold from rest to exercise, with a close match between the rate of flow and oxygen demand. The precise regulation is achieved by a balance between sympathetic vasoconstriction and locally formed vasodilators, but also vasoconstrictors and compounds that induce sympatholysis are involved . Studies using pharmacological inhibition of single or multiple vasodilator systems in humans have revealed that the compounds nitric oxide (NO), prostaglandins (PG's), 11, 12 eicosatrienoic acid (11, 12 EETs), adenosine and ATP are regulators of muscle blood flow. Such studies have also demonstrated that there is interaction between vasodilators where a specific vasodilator can compensate for the impaired release of another, i.e. redundancy. Evidence for redundancy exists between NO and PG's and between NO and 11, 12 EETs. In addition, some compounds exert or extend their vasoactive effects by inducing the release of vasodilators. Examples of this are the effects of ATP and adenosine in causing the release of NO and PG's. In fact, evidence point at that release of nitric oxide and prostaglandins is the primary mechanism by which adenosine regulates exercise hyperaemia and that a direct effect of adenosine on adenosine receptors on smooth muscle cells appear to be of less importance. Thus, several vasodilators of importance for muscle blood flow control have been identified and evidence point at that the precise regulation of flow is the result of a close interplay between these vasodilators. Nevertheless, simultaneous inhibition of multiple known vasodilator systems has only been found to reduce exercise hyperemia in humans by ~30%, which could suggest the existence of yet unidentified vasodilators.

Support: Danish Medical Research Council, Novo Nordisk Foundation, Lundbeck Foundation

08:30 - 10:00

Invited symposia

IS-BM08 Laterality and assymetries in sports

MECHANISMS UNDERLYING FUNCTIONAL CHANGES IN THE PRIMARY MOTOR CORTEX IPSILATERAL TO AN ACTIVE ARM

PEREZ, M.A.

UNIVERSITY OF PITTSBURGH

Performance of a unimanual motor task results in functional changes in both primary motor cortices (M1s). The neuronal mechanisms controlling the corticospinal output originating in the M1 ipsilateral to a moving arm remain poorly understood (1). Gaining insight into these mechanisms may contribute to a better understanding of how unimanual and bimanual movements are controlled (2,3,4,5).

During this presentation I will review several electrophysiological markers of motor cortical function measured at rest and during different levels of unilateral and bilateral finger, wrist and elbow voluntary movements by using transcranial magnetic stimulation (TMS). These electrophysiological markers include: motor-evoked potential (MEP) recruitment curves, short-interval intracortical inhibition (SICI), interhemispheric inhibition measured by a paired-pulse TMS paradigm and by the ipsilateral cortical silent period (iSP), and the influence of interhemispheric inhibition over SICI.

Our results have shown activity-dependent changes in SICI in M1 ipsilateral, interhemispheric inhibition from M1 contralateral to M1 ipsilateral, and in the influence of interhemispheric inhibition over SICI. Differences are observed between responses evoked from distal and proximal representations in the primary motor cortex (4,5). Altogether our findings indicate that interactions between GABAergic intracortical circuits mediating SICI and interhemispheric glutamatergic projections between M1s partly contribute to control activity-dependent changes in corticospinal output in the M1 ipsilateral to a moving arm during voluntary movement by the opposite arm.

1. Carson RG. Brain Res Brain Res Rev 49:641–662, 2005
2. Hortobágyi et al. J Neurophysiol 90: 2451-2459, 2003
3. Muellbacher W et al. Clin Neurophysiol 111: 344-349, 2000
4. Perez and Cohen. J Neurosci 28: 5631-5640, 2008
5. Perez and Cohen. Cortex (in press), 2009

MECHANISMS OF CHANGES IN EXCITABILITY OF THE PRIMARY MOTOR CORTEX DURING UNILATERAL MUSCLE CONTRACTIONS: IMPLICATIONS FOR CROSS EDUCATION

HORTOBÁGYI, T., HOWATSON, G., RIDER, P., SOLNIK, S., DEVITA, P.

EAST CAROLINA UNIVERSITY

There is strong evidence suggesting that unilateral exercise increases motor function not only in the muscles of the exercised limb but also in the homologous unexercised muscles of the contralateral limb, producing the phenomenon of cross education (10, 13). Such adaptations occur under a variety of conditions, including exercise with voluntary isometric, concentric, eccentric, and electrical stimulation-evoked contractions (2, 4, 8, 11). The mechanisms of these adaptations are unknown but most likely reside in the nervous system and not in the contralateral muscle itself (1, 3). The purpose of this presentation is to examine candidate mechanisms of cross education in the motor cortex and spinal cord. One possible mechanism is that neural drive in the "uninvolved" motor cortex increases due to its repeated activation during unilateral muscle contractions (7, 12, 14). The magnitude and specificity of cross education are probably related to the magnitude of activation of the ipsilateral motor cortex, which was shown to increase with intensity (7, 9, 12) and vary by type (shortening vs lengthening) (5) of contralateral muscle contraction as determined by magnetic brain stimulation. Another possibility is that chronic exercise reduces interhemispheric inhibition and the increased cross-hemispheric flow in turn increases the excitability of the uninvolved motor cortex (6). Finally, spinal mechanisms cannot be excluded but evidence for cross-segmental effects appears weak or our methods are inadequate to detect such effects (7, 9). In conclusion one of several independent mechanisms or perhaps a combination of these may mediate increased motor output in the unexercised muscles of the contralateral limb after chronic unilateral exercise. After identifying the exact mechanisms of cross education the next step is to determine if it is an effective method for the rehabilitation of unilateral movement impairments in patients with a stroke or unilateral orthopedic injuries.

Supported in part by NIH AG024161

1. Carroll TJ et al. J Appl Physiol 101: 1514-1522, 2006
2. Farthing JP et al. Brain Topogr 20: 77-88, 2007
3. Hortobágyi T IEEE Eng Med Biol Mag 24: 22-28, 2005
4. Hortobágyi T et al. Med. Sci. Sports Exerc. 29: 107-112, 1997
5. Hortobágyi T et al. ACSM. Seattle, WA, May 27-30, 2009
6. Hortobágyi T et al. J Neurosci, Submitted, 2009
7. Hortobágyi T et al. J Neurophysiol 90: 2451-2459, 2003
8. Howatson G et al. Eur J Appl Physiol 101: 207-214, 2007
9. Muellbacher W et al. Clin Neurophysiol 111: 344-349, 2000
10. Munn J et al. J Appl Physiol 96: 1861-1866, 2004
11. Munn J et al. J Appl Physiol 99: 1880-1884, 2005
12. Perez MA et al. J Neurosci 28: 5631-5640, 2008
13. Zhou S. Exerc Sport Sci Rev 28: 177-184, 2000
14. Zijdewind I et al. J Neurophysiol 85: 1907-1913, 2001

NEW PERSPECTIVES ON CROSS EDUCATION: IS THERE A POTENTIAL BENEFIT OF UNILATERAL TRAINING DURING RECOVERY FROM UNILATERAL SPORTS INJURIES?

FARTHING, J.P.

UNIVERSITY OF SASKATCHEWAN

Cross education is the strength increase observed in the untrained contralateral limb after a period of unilateral strength training. Although cross education was first documented over a century ago, there is still much to learn regarding the precise neural mechanisms that control the effect and the potential utility of it during recovery from unilateral injury (1,5). Cross education is evident after a variety of unilateral training regimens with an average magnitude of 8% or about half of the strength gain observed in the trained limb (1,8). However the effect varies immensely, ranging from no significant effect up to 77% after voluntary training (6,11). There is now evidence that cross education is asymmetrical, where dominant arm training elicits much greater cross education than non-dominant training in right-handed individuals (2). This suggests that there is a preferential dominant to non-dominant direction of strength transfer in the upper limbs, which might explain some of the variation in the literature regarding the magnitude of effect. This asymmetrical transfer of strength is similar to what has been shown for cross education of skills and suggests involvement of higher order motor learning mechanisms (1,2,7). A follow-up functional MRI study provided initial evidence of changes in brain activation patterns associated with the untrained left limb, particularly in sensorimotor cortex and temporal lobe (3). While several studies have aimed to reveal mechanisms, there are few attempts to apply cross education in a rehabilitation setting (9, 10). The purpose of this presentation is to discuss the potential for cross education to be used as a strategy during rehabilitation from unilateral injuries (particularly those requiring immobilization) and to discuss the implications of asymmetry of cross education in this context. A recent study demonstrated that unilateral strength training was effective for preserving strength in an opposite immobilized limb (4). These findings suggest that there might be a therapeutic benefit of cross education during recovery from unilateral sport injuries or in other clinical settings that involve unilateral immobilization.

Supported by the Saskatchewan Health Research Foundation (SHRF)

1. Carroll TJ et al. J Appl Physiol 101: 1514-1522, 2006 2. Farthing JP et al. Med Sci Sports Exerc 37: 1594-1600, 2005 3. Farthing JP et al. Brain Topogr 20: 77-88, 2007 4. Farthing JP et al. J Appl Physiol In Press, 2009 5. Hortobágyi T IEEE Eng Med Biol Mag 24: 22-28, 2005 6. Hortobágyi T et al. Med Sci Sports Exerc 29: 107-112, 1997 7. Lee M and Carroll TJ. Sport Med 37: 1-14, 2007 8. Munn J et al. J Appl Physiol 96: 1861-1866, 2004 9. Stromberg B. Am J Phys Med 65: 135-143, 1986 10. Stromberg B. South Med J 81: 989-991, 1988 11. Zhou S. Exerc Sport Sci Rev 28: 177-184, 2000.

08:30 - 10:00

Oral presentations

OP-PH07 Physiology 7

AGING AND RESISTANCE TRAINING INDUCED INCREASE IN MUSCLE SIZE

HULMI, J.J., SALMIJÄRVI, H., KATAJAVUORI, M., AHTIAINEN, J.P., HOLVIALA, J., SELÄNNE, H., KOVANEN, V., HÄKKINEN, K., MERO, A.A.

UNIVERSITY OF JYVÄSKYLÄ

Introduction: Resistance training (RT) increases muscle size but aging may (5) or may not (1) decrease this response. The present study investigated muscle hypertrophy and gene expression adaptations to heavy RT in young and old healthy men.

Methods

Twenty-one previously untrained young men (26.0+-4.3 yrs) and 18 older men (61.2+-4.1) participated in a 21-week RT period, comprising whole-body exercises twice a week. The training loads increased from 60 to 85% of 1RM, and the number of repetitions in each set decreased from 15-20 to 5-6 during RT. Nineteen men (42.5+-20.0) served as controls (no RT). Vastus lateralis (VL) muscle fiber cross-sectional area (CSA), expression of muscle hypertrophy regulating genes (by Real-Time RT-PCR), and muscle force were analysed before and after the 21-week period. Muscle biopsies were obtained 4-6 days after the last RT workout. Macronutrient intake was not controlled but it was registered by 4-day diaries at weeks 0, 10.5 and 21.

Results: RT led to 1.2-1.4 -fold increases in strength of leg extensors and muscle fiber CSA ($P<0.05$). Concentric leg extension 1RM increased similarly in young and old whereas isometric leg extension force increased more in young men ($P<0.05$). Type-I and mean (type I+II) muscle fiber CSA increased two times more in young men ($P<0.05$). Young men habitually ingested 1.3-1.4 times more energy and protein per body mass during RT than old men ($P<0.05$). Basal mRNA response to RT of activin receptor IIb, FLRG, MyoD, myogenin, p21, cdk2 and MAFbx were not different between young and old. However, myostatin and myogenin mRNA increased in old compared to young men ($P<0.05$).

Discussion: Larger muscle hypertrophy took place after RT in the young men. The present twice weekly heavy whole body RT may have been too demanding for some previously untrained older individuals. This may have been associated with relatively lower energy and protein intake observed in the old men. Protein and energy undernutrition among the elderly is common (3) and may be especially problematic with RT that increases need for dietary protein (4). On the other hand, it is also possible that the adaptation capacity to RT simply decreases with increasing age. It can be speculated that the increase in muscle myostatin gene expression in the old compared to the young could be related to the observed smaller muscle hypertrophy in the old, as myostatin is a negative regulator of muscle size (2).

In conclusion, aging decreased the enlargement of muscle size during 21 weeks of training. This may be explained by smaller protein and energy ingestion or by an increase in myostatin gene expression in the old.

References

1. Häkkinen K, et al. JGBSMS 53:B415-23, 1998

2. McPherron AC and Lee SJ. PNAS 94:12457-12461, 1997

3. Sullivan DH, et al. JAMA 281:2013-2019, 1999

4. Tarnopolsky MA, et al. JAP 73:1986-1995, 1992

5. Welle S, et al. JGBSMS 51:M270-5, 1996

ENDURANCE TRAINING FAILED TO STIMULATE MITOCHONDRIAL BIOGENESIS IN AGED RAT SKELETAL MUSCLE

DERBRÉ, F., GOMEZ-CABRERA, M.C., DOMENECH, E., NASCIMENTO, A.L., MARTINEZ-BELLO, V.E., SANCHIS-GOMAR, F., DE-LAMARCHE, P., GRATAS-DELAMARCHE, A., VINA, J.

LABORATORY MOVEMENT, SPORT, HEALTH (RENNES) / LABORATORY FRAG (VALENCIA)

BACKGROUND: During aging, skeletal muscle undergoes sarcopenia, a condition characterized by a loss of muscle cell mass and alterations in contractile function. The origin of these decrements is unknown, but evidence suggests that they can be partly attributed to a decrease in the mitochondrial bioenergetic capability. It is well known that endurance training up-regulates mitochondrial biogenesis pathway in young skeletal muscles. By stimulating this pathway, endurance training could also constitute a possibility to prevent the decrease of mitochondrial energy production in aged skeletal muscles.

OBJECTIVE: This study was designed to determine the effect of endurance training on the mitochondrial biogenesis pathway in skeletal muscle of aged rats.

DESIGN: 24 young (5 months) and aged (22 months) male Wistar rats were exercised for 3 weeks following endurance training. The intensity of the training was set at 75% VO2max. Expression analyses were realized in soleus (fiber type I) and gastrocnemius (intermediate fiber type) muscles.

RESULTS: Expression of key transcription factors involved in mitochondrial biogenesis (PGC-1α, NRF-1) and of cytochrome c (a marker of mitochondrial content) increased significantly in response to training in young rat soleus muscle but remained unchanged in aged rats. Aging is associated with a decrease of protein content of cytochrome c oxidase subunit II (COX II) and an increase of mitochondrial transcription factor A (TFAM) in soleus muscle suggesting a mitochondrial dysfunction. Endurance training didn't modify COX II and TFAM in both young and aged rats. Neither age nor training altered all theses protein expressions in gastrocnemius muscle.

CONCLUSION: Our study confirmed that fiber type I muscle appears more affected by age-related mitochondrial alterations than intermediate fiber type muscle (Pesce et al. 2005). Short-term endurance training failed to stimulate mitochondrial biogenesis and to reduce mitochondrial dysfunction in skeletal muscle of aged rats. This incapacity to stimulate mitochondrial biogenesis could result from age-related decrease of AMP kinase activity in skeletal muscle (Reznick et al. 2007).

Pesce, V., A. Cormio, F. Fracasso, A. M. Lezza, P. Cantatore and M. N. Gadaleta. (2005). J Gerontol A Biol Sci Med Sci 60(6): 715-23.

Reznick, R. M., H. Zong, J. Li, K. Morino, I. K. Moore, H. J. Yu, Z. X. Liu, J. Dong, K. J. Mustard, S. A. Hawley, D. Befroy, M. Pypaert, D. G. Hardie, L. H. Young and G. I. Shulman. (2007). Cell Metab 5(2): 151-6.

CARDIAC STEM CELL ACTIVATION AND ENSUING MYOGENESIS AND ANGIOGENESIS CONTRIBUTE IN CARDIAC ADAPTATION TO INTENSITY-CONTROLLED EXERCISE TRAINING.

WARING, C., TORELLA, D., ELLISON, G.

LIVERPOOL JOHN MOORES UNIVERSITY

Traditionally, it was thought that exercise improved cardiac function by increasing myocardial mass and contractility through physiological hypertrophy of existing myocytes and enhanced coronary perfusion. Recent data on myocardial cell homeostasis and the identification of cardiac stem cells (CSCs), in the adult mammalian heart, could challenge this concept. We sought to assess if CSC activation and ensuing myocyte and capillary formation participates in cardiac remodeling induced by intensity-controlled exercise training. To this aim, 42 male Wistar rats (226.5±1.5g) were exercised at either a Low (LI; 55-60% VO2 max) or High (HI; 85-90% VO2 max) intensity for 30 mins/day, 4 days/week for up to 4 weeks on motorized treadmills. Fifteen untrained rats acted as age-matched sedentary controls (CTRL). To track myocardial proliferation, BrdU was administered (i.p.) twice daily. Hearts were arrested in diastole and the Left Ventricles (LV) were processed for immunohistochemistry and confocal microscopy analysis. Results showed an increase ($P<0.05$) in average myocyte diameter in the LV following both LI and HI exercise training, compared to CTRL. The distribution of myocytes sizes showed the presence of both larger (hypertrophied) and smaller myocytes (myogenesis) in the ventricular wall of the exercise trained vs. CTRL hearts. Indeed, there was a significant ($P<0.05$) increase in the % of small myocytes that were BrdU (3.4±0.2 LI, 7.4±0.3 HI) and Ki67 positive (0.8±0.1 LI, 1.0±0.1 HI), following LI and HI exercise training, compared to CTRL (BrdU, 0.01±0.01; Ki67 0.05±0.02). These data document the presence of small newly formed myocytes in the LV of intensity-controlled exercising rats. The number of capillaries in the LV in the LI (2709.8±103.5) and HI (4109.5±347.7) exercise trained animals was significantly ($P<0.05$) greater than CTRL (1531.6±99.5). Many of these capillaries were BrdU positive exhibiting their recent formation. To address the source of new myocytes and capillaries, we evaluated c-kit positive (c-kitpos) CSC myocardial activation. The number of c-kitpos CSCs significantly ($P<0.05$) increased in the ventricular wall of the Exercising vs. CTRL rats. Many CSCs were proliferating (BrdU and/or Ki-67 positive) and many expressed the cardiac transcription factor, Nkx2.5, representing myocyte progenitor cells. Also, some CSCs expressed the transcription factor Ets-1, indicative of their differentiation into the endothelial lineage. These data provide a link between a primitive c-kitpos CSC and amplifying myocyte and endothelial progenitors. In conclusion, intensity-controlled treadmill exercise training in adult rats results in myocardial mass remodeling through myocyte hypertrophy, and new myocyte and capillary formation. The latter is due to the activation and ensuing differentiation of CSCs into newly-formed myocytes and capillaries. Finally, these effects were dependent on exercise training intensity.

THE EFFECT OF HIGH INTENSITY RUNNING ON INFLAMMATION, IRON STATUS AND HEPCIDIN ACTIVITY IN MODERATELY TRAINED ENDURANCE ATHLETES.

PEELING, P., DAWSON, B., SWINKELS, D., TRINDER, D.

THE UNIVERSITY OF WESTERN AUSTRALIA

Hepcidin is a liver produced hormone that acts to internalise and degrade the iron transport channels in the intestine and on the cell surface of macrophages, ultimately reducing the absorption and transport of iron in the body. Hepcidin expression is controlled by the level of circulating IL-6 and the current iron status of the body. To date, it is unknown as to the effect of high intensity exercise on the activity of this hormone within 24 h of recovery. As such, this investigation examined effect of high intensity running on inflammatory markers, iron status, and urinary hepcidin activity in male and female athletes at 3 and 24 h post-exercise.

Eleven moderately trained runners (6 male and 5 female) participated in three laboratory testing sessions including: (1) A graded-exercise test to determine maximal oxygen consumption (VO2max) and peak heart rate (HRpeak). (2) A 60-min trial of running (RUN) involving 15 min at 75-80% HRpeak and 45 min at 85-90% HRpeak. (3) A 60-min trial of seated rest (REST). The RUN and REST trials were applied in a randomised, counterbalanced order, and were separated by a minimum of 28 days, ensuring all female participants were in the follicular phase of the menstrual cycle.

Throughout the RUN and REST trials, venous blood and urine samples were collected pre-trial, immediately post-trial, and at 3 and 24 h post-trial. Blood samples were analysed for circulating levels of Interleukin-6 (IL-6), C-Reactive Protein (CRP), serum iron and serum ferritin. Urine samples were analysed for urinary hepcidin concentration. A repeated measures ANOVA for time, trial and time*trial effects was conducted between the RUN and REST trials, with post-hoc, paired samples t-tests applied in the event of a significant main effect. The alpha level was accepted at $p<0.05$.

Blood analysis revealed that three participants were classified as iron deficient, and were therefore removed from the analysis. For the remaining eight healthy iron status subjects, the immediate post-RUN levels of IL-6 and 24 h post-RUN levels of CRP were significantly increased from baseline, and when compared to REST ($p<0.05$). Hepcidin levels in the RUN trial after 3 and 24 h of recovery were significantly greater than the pre- and immediate post-RUN levels, and also when compared to the 3 h time point of REST ($p<0.05$). Serum iron was significantly increased post-RUN from baseline ($p<0.05$), but had returned to normal by 3 h of recovery. There were no significant changes in serum ferritin levels.

This study has shown that urinary hepcidin levels are significantly elevated post-exercise in moderately trained athletes with a healthy iron status. Here, elevated hepcidin activity occurred approximately 3 h subsequent to an increase in IL-6 and serum iron. As such, it is possible that the post-exercise activity of this hormone is driven by inflammation and hemolysis.

A ROLE FOR SATELLITE CELLS IN THE ETIOLOGY AND TREATMENT OF SARCOPENIA?

VERDIJK, L.B., VAN LOON, L.J.C.

MAASTRICHT UNIVERSITY

Satellite cells (SC) are the only source for the generation of new myonuclei in skeletal muscle tissue. As such, SC play a key role in muscle fiber atrophy and/or hypertrophy. We suggest that SC represent an important factor in the etiology and treatment of the age-related decline in muscle mass and strength, or sarcopenia.

Sarcopenia is characterized by the loss of type I and II muscle fibers, and specific type II muscle fiber atrophy. In accordance, recent data from our lab show that type II muscle fiber atrophy is accompanied by a specific reduction in type II muscle fiber SC content in elderly versus young males. However, it remains to be elucidated whether muscle fiber characteristics are predictive of the actual amount of skeletal muscle mass and strength in the elderly. Therefore, we correlated various skeletal muscle fiber characteristics (from muscle biopsies) with muscle mass (CT) and strength (1RM) within a population of 41 healthy, elderly males (>65y). Greater muscle fiber cross-sectional area (CSA) was associated with more myonuclei and more SC per muscle fiber (0.50≤r≤0.56 for type I and II

fibers). The number of myonuclei per fiber correlated with the number of SC per muscle fiber (r=0.40 for type I and II fibers). Furthermore, type I and II muscle fiber CSA correlated with leg muscle strength, and with quadriceps CSA. These data imply that muscle fiber size is predictive of muscle mass and strength. Furthermore, SC content is closely related to myonuclear content and is predictive of muscle fiber size. The latter provides further support to the idea that SC content is a key regulator of muscle fiber size and, as such, muscle mass and strength. Thus, to enable a substantial increase in muscle mass and strength, it seems imperative to effectively increase SC content. The latter was achieved following 3 months of resistance type exercise training in 13 healthy, elderly males. Substantial improvements in muscle mass, strength, and type II muscle fiber size were accompanied by a type II muscle fiber specific increase in SC content.

Collectively, our findings suggest that the muscle fiber type-specific decline in SC content represents a key factor in the gradual loss of muscle mass and strength with aging. The latter can, at least partly, be reversed by resistance type exercise training. Future studies should focus on optimizing SC activation, proliferation, and differentiation. The latter will be instrumental to define more effective exercise, nutritional, and/or pharmacological interventions to counteract the loss of muscle mass and function with aging.

INFLUENCE OF ACE I/D AND ACTN3 R/X POLYMORPHISMS ON MUSCLE FUNCTION AND BODY COMPOSITION OF OLDER CAUCASIAN MEN

MCCAULEY, T., FOLLAND, J.P., MASTANA, S.S.

LOUGHBOROUGH UNIVERSITY

Advancing age is associated with a progressive decline in muscle strength and function largely due to sarcopenia. Healthy older individuals have age related deficits in muscle power that are even greater than muscle strength (1) leading to compromised mobility and an increased risk of falls. ACE I/D and ACTN3 R/X polymorphisms have been suggested to influence variations in skeletal muscle function (2,3) and body composition (4). ACTN3 has been proposed as a metabolically thrifty gene thought to improve energetic efficiency (5), promote energy storage and fat accumulation. This study investigated the influence of ACE and ACTN3 genotypes on body composition and muscle function phenotypes in older Caucasian men.

Following ethical approval a range of muscle function measurements were taken from 100 healthy non strength trained UK males (60-70yrs) on two occasions. A conventional strength testing chair was used to measure maximal isometric knee extensor and elbow flexor strength. Maximum twitches were electrically evoked (Digitimer DS7AH, UK) in the quadriceps to assess time to peak tension (TPT) and half relaxation time (HRT). Isokinetic knee extensor peak torque was measured at three velocities (0, 30 and 240°.s-1) using isokinetic dynamometry (Cybex Norm, USA). Relative strength at high velocity (240°.s-1:30°.s-1) was calculated. A Dual-energy X-ray Absorptiometry (DXA) scan (Lunar Prodigy Advance DXA machine, GE Lunar, Madison, WI) was used to assess non-skeletal lean mass and fat mass. ACE I/D and ACTN3 R/X genotype were determined from whole blood samples using polymerase chain reaction, and serum ACE using spectrophotometry.

ACE and ACTN3 genotype distributions were in Hardy Weinberg Equilibrium (II 25, ID 48, DD 27; RR 43, RX 41, XX 16). Physical characteristics were independent of ACE genotype (height, body mass, lean body mass, body mass index). ACTN3 XX genotype individuals had a higher fat mass (P = 0.04), and a trend for greater body mass (P=0.09) than RR individuals. The muscle function phenotypes assessed were found to be independent of ACE and ACTN3 genotypes. Serum ACE activity was negatively correlated with the relative torque at high velocity (R =-0.23; P =0.03). There were trends for serum ACE to correlate with quadriceps (R=0.19; P=0.07) and elbow flexor (R=0.20; P=0.06) isometric strength.

ACE ID and ACTN3 RX polymorphisms did not influence muscle function phenotypes in this cohort. Serum ACE activity appeared to have a small effect on muscle function. The association of ACTN3 genotype with fat mass suggests that this polymorphism affects the accumulation of body fat over the life span of Caucasian men.

1. Skelton, D. et al (1994). Age and Ageing, 23 (5),371-377

2.Williams, A. et al (2005). MSSE, 37 (6),944-948

3. Clarkson et al (2007). Journal of App Physiol, 99,154-163.

4. Charbonneau et al (2008). MSSE,40 (4),677-683.

5. McArthur et al (2004). BioEssays, 26,786-795.

08:30 - 10:00

Oral presentations

OP-CS01 Computer Sciences and Statistics

VISMO - A PROTOTYPE SOFTWARE SOLUTION FOR INTEGRATION OF VESTIBULAR, OCULOMOTOR, SPINALMOTOR AND 3D-KINEMETRIC DATA IN SPORTS

VON LAßBERG, C., REIMANN, M., KRUG, J.

UNIVERSITY OF LEIPZIG

Introduction: There are few studies concerning the relationship between vestibular load and oculomotor and spinalmotor activation during complex sport specific movements. Up to now no commercial software tool has been able to fulfil the combined exposure of kinematic, electromyographic and oculomotor signals in the field of sports. The development of the multimodal prototype software tool "VISMO" tries to close this gap to enable a better understanding of oculomotor, neuromuscular and kinematic interaction and their consequences for motor learning and technomotor modelling in sports. The aim of this publication is to present the functions of this tool.

Methods and Results: The measurement components consist of 3D-Video-kinemetry or a Vicon system, telemetric electromyography (Noraxon) and a videonystagmography system (Interacoustics) combined with a prototype of a sport specific videonystagmography goggle. The software is able to integrate these components, to calibrate and synchronize the data and to calculate a frame based 6-field view of various multifunction graphic tools and data plots. The software itself (developed by von Laßberg, C. & Reimann, M., 2008) presents 6 onscreen windows for simultaneous view or for presentation in various combinations of the windows.

The windows show a virtual athlete based on a 15 segment lattice model in virtual space. The virtual room can be exactly adapted to the real dimensions of the athlete's environment. Gaze lines and gaze spots are integrated into the virtual space. The spots represent the resulting coordinates, calculated by the head related eye data and the heads position in space. The diameter of the spots correlates with the visual fixation time on theese gaze spots. Occulomotor gain of nystagmus can also be calculated. In the model, all muscles being registered by the EMG are depicted using coloured matrices. The higher the activation level, the darker the colour with which they are visualized. Onset threshold can be defined for all muscles separately. The virtual model and room can be zoomed or moved along and around all axes. Vectors of vestibular load can be visualized within the head-model, separately. Optionally the subjective visual view of the athlete in the virtual room can be visualised and screened in helmet mounted displays for the use in further research concerning visuo-mental training methods. All data plots calculated by the software are visualized synchroneously in a separate window: The plots can be selected as required and be exported to other programs (e.g. for further statistical analysis).

Conclusion

To better understand the complexity of human movement, it is necessary to have a deeper insight into human control processes. The benefit of this software is the ability to combine the extrinsic view with intrinsic data of movement control to better understand their relationships in sports and daily life.

A SIMULATOR FOR RACE-BIKE TRAINING ON REAL TRACKS

DAHMEN, T., SAUPE, D.

UNIVERSITY OF KONSTANZ

We develop methods for data acquisition, analysis, modeling and visualization of performance parameters in endurance sports with emphasis on competitive cycling. For this purpose, we designed a simulator to facilitate the measurement of training parameters in a laboratory environment, to familiarize cyclists with unknown tracks, and to develop models for training control and performance prediction.

The simulator is based on a Cyclus2 ergometer (RBM Elektronik-Automation GmbH, Leipzig, Germany), which provides a realistic cycling experience since one can mount arbitrary bikes and its elastic suspension even allows for a sway pedal stroke. The eddy current brake guarantees non-slipping transmission of a braking resistance up to 3000 W.

Operating the Cyclus2 in the gradient mode, we impose arbitrary slopes by our own platform independent PC-based control software at a sampling rate of 2 Hz. The height profiles for various tracks were recorded using a commercial GPS device.

The Cyclus2 has two major constraints with respect to simulating real tracks: We must focus on tracks without downhill accelerations since it has no engine and the eddy current brake requires a minimum rotation velocity of the flywheel to accurately generate the brake force. Therefore, we fixed the derailleurs to a heavy gear and mounted four electronic buttons to the handlebar which act like shift levers of virtual gears. Our software incorporates the virtual gear into the gradient so that the cyclist feels a correct resistance while the flywheel exceeds the minimum rotation velocity in all realistic uphill scenarios. Moreover, we can simulate arbitrary gears easily and record them over time. As the physical flywheel rotation is faster than in the simulation, our software must correct the related performance data.

The simulation includes a video playback that is synchronized with the cyclist's current position on the track. In addition, time, distance, speed, cadence, heart rate, power and gears are monitored, a 2D-projection of the course gives feedback on the progress and a gradient profile indicates the slope in the surrounding of the current position.

Comparative outdoor tests with an SRM power meter (Schoberer Rad Messtechnik, Welldorf, Germany) show that the simulator gives reasonable estimates for different pacing strategies (constant power/speed/heart rate).

In future, we strive to integrate a more precise mechanical model (Martin et al., 1998), extend the palette of physiological measurements (oxygen consumption, ECG, lactate etc) and implement models for these parameters. The whole system shall indicate the optimum pacing strategy as Gordon derived in 2005 for simple models and synthetic data. Using sophisticated biofeedback visualization, cyclists shall be able to optimally prepare themselves even for unfamiliar tracks on our simulator.

Martin JC, Milliken DL, Cobb JE, McFadden KL, Coggan AR. (1998). J Appl Biomech, 14, 276-291.

Gordon S. (2005). J Sport Sci, 8, 81-90.

ANALYZING THE AIMING PROCESS IN BIATHLON SHOOTING USING SELF-ORGANIZING MAPS

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1. UNIVERSITY OF VIENNA, 2. UNIVERSITY OF MAINZ

Introduction: The aiming strategy in biathlon shooting is a crucial factor for success. Because of the preceding high exertions of the athletes a well controlled motion of the barrel just before shooting is essential (Zatsiorsky and Aktov, 1990). Methods are required for analyzing the stability of the aiming process with a special focus on exertion. The aim of this study was to investigate the applicability of special self-organizing maps to identify and compare patterns in the aiming motion in standing shooting.

Methods: A video based system (Baca and Kornfeind, 2006) was used to track the motion of the muzzle of the barrel in two dimensions (left-right, up-down) automatically. Six parameters were calculated describing the motion in ten time intervals of 0.2 s length before the shot. Four athletes (I, II, III, IV) (I, III, IV: Austrian national "B" team, II: "C" team) participated in the study. Each athlete performed four series of five shots before and after exertion making 160 shots altogether.

Based on these data a special self organizing map (Perl et al., 2006) consisting of 400 neurons was trained and data sets were generated on the neurons. The attribute values of those data sets represent the six components describing a motion of a muzzle in a 0.2 s time interval. Similar neurons were combined to clusters.

The ten successive data-sets describing each shot were then mapped to the corresponding neurons of the net. The sequence of the related clusters in the respective succession was then used as 1-dimensional representation (a pattern) of the complex aiming motion.

Results: Regarding intra-individual stability, some peculiarities were found. The number of a shot within a series of five shots clearly influenced the pattern observed. This was particularly the case after exertion. Moreover, in this condition less stable shot types were found. Subjects were able to maintain their pattern before the exertion to a different degree. Subject II, who showed the largest deviations, scored worst.

Although inter-individual variability was difficult to assess, some similarities (e.g. in timing) could be identified.

Discussion: The method is promising to analyze inter- and inter-individual similarities and differences. One shortfall might be that only a restricted set of parameter values originating from a 2-dimensional recording of the muzzle has been considered. Time series data

describing the 3-dimensional motion of the barrel would probably increase the explanatory power. In addition, alternatives not based of a fixed time interval for analysis (2 seconds before the shot) are conceivable.

References

Baca A, Kornfeind P (2007). IEEE Perv. Comp., 5, 70-76.

Perl J, Memmert D, Bischof J, Gerharz C. (2006). Int J Comp Sci Sport, 5, 33–37.

Zatsiorsky VM, Aktov AV (1990). J Biomech., 23 (Suppl. 1), 35-41.

ANALYSIS OF SEQUENTIAL BEACH VOLLEYBALL ACTIONS

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Introduction: In recent years experts have criticized the analysis of single actions in sports games (Carling et al., 2005). Simple tally counts of observed single actions do not represent the process of sport games sufficiently. The missing consideration of game interactions leads to information out of context which limits useful conclusions for practitioners. Therefore, the aim of this study was to analyse the action sequences in beach volleyball by using a database with single action descriptions and subsequent specific database queries. Deduced from sports practice the following questions were of interest: How does the service technique affect the reception performance? How does the setting quality affect the attack performance? Do men and women perform similar?

Methods: The basis of action sequence analysis is a systematic notational analysis of single actions out of video recordings. The behaviour of male and female world league players (29 matches during a world tour tournament) was described and registered with the game analysis software "Statshot" concerning technique, quality, location of action, direction and type of movement (Tilp et al., 2006). During the analysis the collected actions (approx. 16000) were classified regarding their affiliation to rallies and their temporal position during the rallies. Subsequently, database queries allowed the analysis of actions sequences. Chi-square tests were used to test statistical significance ($p<0.05$).

Results: The relationship between service technique and reception performance was observed to be gender specific. Female athletes received 44% of all float serves without a jump in poor (low ball trajectory or imprecise) or bad (mistake) quality (men: 30%). In contrast, 39% of all jump serves received by male athletes were of weak quality (women: 37%). Gender differences could also be detected in the relationship between setting quality and attacking technique. While men and women used the same distribution of the two attacking techniques (smash and shot) following excellent and poor setting actions, a different behaviour could be observed following setting actions of medium quality. While women played much more shots (72%) than smashes (28%), men used both techniques equally. All mentioned differences were statistically significant.

Discussion: The presented and additional results indicate that the analysis of sequential beach volleyball actions allows more specific conclusions in the game context than the analysis of single actions. It is possible to gain new and useful results for structure- and team analysis. Further research should reveal if stereotypic behaviour of teams can be identified with this method.

References

Carling C, Williams M, Reilly T, (2005). Handbook of soccer match analysis. Routledge, Oxon.

Tilp M, Koch C, Stifter S, Ruppert G, (2006). Int J Perform Analysis, 6(1), 140-148.

BEIJING IN PERSPECTIVE

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The 2008 Beijing Olympic competition is into historical perspective. China's 100 medals represent an increase by the host nation of 59% over the 63 medals won four years earlier. This is superior to the 44% average home-nation advantage for the 11 most recent fully-attended Games.

In spite of the remarkable Usain Bolt, only 50% of 34 comparable athletics winning performances at Beijing were better than at Seoul in 1988, an improvement over 44% for the 2004 Olympics vs. Seoul and 32% for the 2000 Olympics. Following the 1988 Olympics in which Ben Johnson (Canada) was disqualified in the 100 m run, due to a doping violation and a Canadian government report concluding rampant doping in athletics and weightlifting, international anti-doing measures were significantly increased. The World Anti-Doping Agency website indicates that the downturn in some athletics performances in the 1990s were due to those anti-doping measures. It is a hopeful sign that the number of adverse finding dropped from 26 in the 2004 Olympics to 6 at Beijing. It appears that the more-or-less drug free performances of 2008 are at about the level of the drug-enhanced performances of 1988. Cumulative improvement is charted for Olympic winning athletics performances from 1924-2008. The influences of WW2, the cold war, boycotting and drug-enforcement are clear.

By the end of the Beijing Olympics, Michael Phelps had set 32 world records while Mark Spitz (USA) had set 33. Johnny Weissmuller (USA), a swimmer from the 1920s, set 67 world records (more than Phelps and Spitz combined) and was undefeated in competition, arguably making Weissmuller the best of all time. The improvement in winning swimming times by 1.8% over those in 2004 represents more of a return to past levels of improvement than breaking any new ground. It is noted that 3 m deep pools were used in 2004 (Olympics) and 2005 (FINA worlds) without an avalanche of world records but 3 m pools in 2007 (FINA worlds) and 2008 did have many world records. It is suggested that the maturing of swimmers who were enticed to enter serious swimming competition at the time of the 1996 and 2000 Olympics is the reason for current improvements.

The drag of a swim suit is measured passively in a smooth fluid flow environment while competitive swimming provides much more turbulence. It is estimated that actual drag reduction in competition is less than 1%. The cumulative improvement in Olympic swimming winning performances is charted from 1924 to the present. The affects of WW2, the cold war and boycotting are clear. One downturn is discussed for 1996 when drug testing was expanded. Swimming improvement has been steadier than in athletics. Greater improvement is noted for swimming, jumping and throwing (leverage events) than for running events.

XIII PARALYMPIC GAMES 2008 IN BEIJING: THE ANALYSIS OF RESULTS: BARYAEV, A., SHELKOV, O., EVSEEV, S.

ST PETERSBURG RESEARCH INSTITUTE OF PHYSICAL CULTURE

Introduction. Paralympic games are the second on social importance-after Olympic games-world sports event. The attention to them from world community increases every year. The quantity of participants on this sports forum constantly grows. So, if on Paralympic games in Rome (1960) 400 athletes have taken part that on last games in Beijing there were already 4017 athletes.

Methods. Employees of the St.-Petersburg research institute of physical culture accept active participation in scientifically-methodical maintenance of Russian paralympic national teams. In article presented the analysis and comparison of statistical data received following the XIII Paralympic games 2008 in Beijing results and participations in it Russian national team.

Results. Total of the world records established in Beijing-298 (136-swimming, 115-track and field athletics, 7-shooting, 8-archery, 10-powerlifting). The considerable superiority on these indicators the national team of China, more than in 2 times outstripped Ukraine, USA, Great Britain. What achievements of the countries-leaders in Paralympic movement? We made results comparison of 15 leading teams on last 3 games. The most important changes in the program of competitions: inclusion in it rowing, and also reduction of medals sets for 10 percent in comparison with Athens. In 2008 only 7 teams have kept the first 10 places in comparison with previous (China, Great Britain, USA, Ukraine, Australia, Canada and Spain). The greatest progress from 2004 for 2008 reached South Africa, Russia, Ukraine, Brazil, Tunisia and Korea. For definition of the reasons and conditions of successful performance we have compared team ranks on gold medals, the sum of medals and quantity of participants. It has turned out, that team's occupied first 3 places in the general table; include about 200 athletes (China-332), Great Britain and USA (on 209 in everyone). It is necessary to notice, that two teams: Ukraine (124) and South Africa (61) achieve high sports results with a small amount of participants. In this context it is interesting to consider quantity of the athletes who have won more than one medal (multimedallists). The obtained data show that fact, which South Africa has successfully acted at the expense of five 'gold' multimedallists who have won 15 gold awards, the made 71 % from number of all gold medals won by athletes of this country.

Discussion. The received results allow ascertaining, that in paralympic training process, all takes root into designing and creation of means a science more actively. Special interest represents increase in the importance of multimedallists achievements in various kinds of sports. The increase in quantity of the countries and the athletes who are taking part in paralympic games, expansion of 'geography' of medal winners say that the focused humanistic concept of the states relation more and more clearly admits the world community and a society to disabled persons.

10:15 - 11:45

Oral presentations

OP-NU01 Nutrition 1

EFFECT OF BETA-ALANINE SUPPLEMENTATION ON SUSTAINED ISOMETRIC MUSCLE CONTRACTIONS IS INTENSITY-DEPENDENT

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UNIVERSITY OF CHICHESTER

Introduction: The dipeptide carnosine (β-alanyl-L-histidine) acts as an intramuscular proton buffer. Beta-alanine supplementation increased muscle carnosine content and high intensity cycling performance (Hill et al., 2007) potentially by postponing muscle fatigue. It is unknown whether the performance enhancing effect of β-alanine supplementation is intensity dependent. Therefore, the purpose of this study was to examine the performance of sustained isometric contractions of the quadriceps femoris muscles at two different intensities.

Methods: 24 physically active subjects (3 females, 21 males, 20±3 years; 76.6±11.3kg; 1.77± 0.08m) participated in a placebo-controlled triple-blind study. Subject's upper body was restrained and hip and knee joint angles were kept at 90°. Subject's ankle of the non-dominant leg was connected to a force transducer (sampling frequency 1000Hz). In two sessions, maximal voluntary isometric force (MVIF), time to task failure during 20%MVIF and 70%MVIF and MVIF 20 seconds after task failure, for calculation of fatigue index, were measured before and after supplementation. Post-supplementation testing of 20%MVIF and 70%MVIF was performed at pre-supplementation MVIF values. Subjects were supplemented with 6.4g/day of beta-alanine (n=11) (8 x 2 capsules, Carnosyn™, NAI, San Marcos, CA) (Harris et al., 2006) or placebo (n=13) (8 x 2 capsules Maltodextrin) (supplementation period 38±7 days). Two-way ANOVA with post-hoc paired samples t-tests were used for data analysis with significance level set at $P < 0.05$.

Results: In both groups, there was no change in MVIF after supplementation. Both groups increased the time to task failure during 20%MVIF by 12-16%. The increase in time to task failure during the 20%MVIF in the placebo group was associated with an increase in the fatigue index (pre: 31.6±10.5%; post: 39.7±14.7%). No change in fatigue index occurred following a 20%MVIF after beta-alanine supplementation (pre: 42.9±20.3%; post: 47.5±20.3%). For the 70%MVIF, there was a significant 30% increase in time to task failure (pre: 42.4±11.9s, post 55.0±21.0s) with no change in the placebo group (pre: 43.1±9.2s, post 47.3±13.1s). In both groups, there was no change in fatigue index following the 70%MVIF.

Discussion: Beta-alanine supplementation in physically active individuals 1) had no effect on the force-producing capability during maximal isometric muscle contractions, 2) had no effect on the calculated muscle fatigue index following sustained isometric muscle contractions at both low and high intensities, 3) enhances muscle isometric endurance but the effect is intensity-dependent. Beta-alanine supplementation may be beneficial for performance of high-intensity exercise.

References

Harris RC, Tallon MJ, Dunnett M, Boobis L, Coakley J, Kim HJ, Fallowfield JL, Hill CA, Sale C, Wise JA. (2006). Amino Acids, 30, 279-289.

Hill CA, Harris RC, Kim HJ, Harris BD, Sale C, Boobis LH, Kim CK, Wise JA. (2007). Amino Acids, 32, 225-233.

THE EFFECT OF ORAL L-ARGININE SUPPLEMENTATION ON LEG SPEED, ANAEROBIC CAPACITY AND MUSCULAR STRENGTH.

ZACHAROGIANNIS, E., PARADISIS, G., KOLIFA, M., GERAKAKI, M., SMIRNIOTOU, A., ROUSOPOULOS, V.

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L-arginine is widely used by athletes as an ergogenic aid to improve physical performance for three main reasons: 1) its role in the increase of the secretion of growth hormone; 2) as a precursor for creatine synthesis and 3) its most important role as a precursor for the

biosynthesis of nitric oxide who serves as a messenger to trigger blood vessel dilation and increase blood flow. However, only little information on its real efficacy is available from controlled studies.

Purpose: We evaluated the effects of prolonged supplementation of L-arginine on 35m performance time (t35m), anaerobic capacity (AC) and leg knee extensors (PE) and flexors (PF) maximal power and explosive leg strength (ELS) using a double blind placebo-controlled trial.

Methods: Sixteen healthy sprint and endurance trained subjects nine male and seven female (27.5±8.1 years) performed: the running anaerobic speed test (RAST), knee extensors and flexors maximal power test and a vertical jump to evaluate leg explosive strength before and after intake of L-arginine (3 grams per day) or placebo for a period of three weeks.

Results: After intake of L-arginine mean ±sd (5.26±0.36 v 5.11±0.29, arginine group AG) 35m-performance time (t35) improved (decreased) 2.85% ($p<0.05$) compared with 0.35% improvement in placebo group (PG). Fatigue index AC test (% speed drop between first and sixth sprint) did not change significantly ($p>0.05$) after arginine supplementation (10.61±3.78 v 9.4±3.74) compared with PG values (11.5±5.56 v 10.15±5.89). No significant differences were also observed between groups in body composition, PE, PF or ELS.

Conclusions: L-arginine supplementation appears to influence positively sprinting ability but did not influence body composition, anaerobic capacity and leg power and strength measures.

EFFECTS OF WHEY PROTEIN SUPPLEMENTATION WITH AND WITHOUT BETA-HYDROXY-BETA-METHYLBUTYRATE <HMB> ON FAT FREE MASS AND MUSCLE STRENGTH AFTER A 12-WEEK RESISTANCE TRAINING

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Introduction: Beta-hydroxy-beta-methylbutyrate (HMB) has been reported to have anti-catabolic effects, thus enhancing gains in both muscle strength and lean tissue mass during resistance training. It is less clear, however, whether HMB promotes additional benefits when combined with a sufficient protein and carbohydrate supplementation. The aim of the present study was therefore to investigate the independent effects of HMB and a protein-carbohydrate diet on fat free mass (FFM) and muscle strength after periodized 12-week whole-body resistance training.

Methods: With institutional ethics approval 16 healthy, young men (Age mean 22.1, SD = 1.6) with less than six months weight training experience were randomly assigned in a double blind fashion to either a control group or treatment group with no significant mean differences in FFM and 1-repetition maximums (1RM). In addition to 40 g of carbohydrates which were administered orally immediately following the termination of each exercise bout, both groups ingested 30 g of whey protein in the morning on nontraining days and one hour before and after each training, respectively. Additionally, the treatment group received 1 g of HMB, whereas the control group obtained a placebo three times daily. After a 2-week familiarization period subjects trained 4 times per week using an upper/lower body split routine employing exercises of 3 to 4 sets at an intensity that varied between 10RM and 6RM. Outcome measures included whole-body FFM determined by skinfold measurements, upper arm and thigh muscle cross-sectional area determined by magnetic resonance imaging and muscle strength determined by bench press and leg press.

Results and Discussion: Repeated multivariate analysis of variance (time × group) indicated a significant main effect for time ($P < 0.001$, eta2 = 0.951), but not for group ($P = 0.970$, effect size eta2=0.021). These results were confirmed by a lack of a significant interaction between time and group ($P = 0.502$, eta2=0.186). Univariate main effects for time showed that irrespectively of the group all, outcome measures significantly increased from pre to post ($P < 0.001$, eta2= 0.575 to 0.939). These findings suggest that in young healthy subjects HMB supplementation in combination with a sufficient protein-carbohydrate diet is not superior to a protein-carbohydrate diet alone.

THE EFFECTS OF A NUCLEOTIDE SUPPLEMENT (INMUNACTIVE) ON LYMPHOCITE PROLIFERATION AFTER INTENSIVE EXERCISE

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It has been described that intensive exercise is followed by a period of immune impairment (decreased lymphocyte proliferation and levels of salivary immunoglobulin A) during which there is an "open window" opportunity for pathogens (Petersen and Pedersen, 2002). It has been also demonstrated that dietary nucleotide supplementation is crucial to maintain immune function during stress situations (Gil, 2002). The aim of the present study was to test the impact of a specific nucleotide formulation (Inmunactive, Bioiberica, Spain) on the immune function of athletes after severe physical stress. A total of 20 athletes were recruited in a randomized double blind placebo controlled trial and distributed on 2 groups (N=10) supplemented with placebo (group C) or Inmunactive (group I) at 600mg/d during a period of 32 days. On day 0 and on day 32 each subject undertook an exhaustion exercise test using a cycloergometer at 70-80% %VO2max during at least 1h. Before and 24h after the exercise test, blood samples were taken to analyze lymphocyte proliferation of total, CD4+ and CD8+ subsets. 24h after the first exercise test, a decrease on lymphocyte proliferation was detected for both groups on total (-14.23±4.47 vs -11.52±4.93 % for groups C and I respectively; $P>0.05$), CD4+ (-6.60±5.68 vs -14.01±9.92; $P>0.05$) and CD8+ (-21.37±9.90 vs -24.60±14.08; $P>0.05$) cell subsets. At the end of the trial, after 32 days receiving the experimental product, lymphocyte proliferation 24h after the exercise test decreased on the placebo group but not in the supplemented group, in total (-3.64±4.50 vs 12.88±7.11 % for groups C and I respectively; $P=0.073$), CD4+ (-7.69±3.63 vs 15.26±5.74; $P<0.01$) and CD8+ (4.27±7.90 vs 23.58±12.49%; $P>0.05$). These results suggest that a specific nucleotide supplement given chronically may counteract the immune impairment associated to the severe physical stress.

References

Petersen WE and Pedersen BK (2002) Exercise and immune function – effect of nutrition. In: Calder PC, Fielf CJ and Gill HS (eds) Nutrition and Immune Function, CABI Publishing, New York, 347-355.

Gil A (2002) Modulation of the immune response mediated by dietary nucleotides. Eur J Clin Nutr. Suppl 3:S1-4.

ADMINISTRATION OF AN ANTIOXIDANT MULTI VITAMIN/MINERAL SUPPLEMENT REDUCED TRAINING INDUCED INCREASES IN VO2MAX IN WELL TRAINED SUBJECTS

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Introduction: Antioxidant supplements are widely used by athletes on both top and recreational level. However, the notion that oxidative stress during exercise may be an important stimulus for the adaptive response to endurance training [1, 2], has questioned the value of taking antioxidant supplements in this population. Consequently, the aim of this study was to investigate the effect of an antioxidant supplement on training induced changes in VO2max in well trained subjects.

Methods: In a double-blinded placebo controlled design a total of 40 amateur soccer players were randomised into a placebo group or an antioxidant supplemented group (SUP), and 28 of the participants completed the study. The SUP group (n=13) ingested 4+4 capsules per day of a combined antioxidant and vitamin/mineral supplement (LifePak) and the placebo group (n=15) took a similar amount of capsules containing lactose. The supplementation period lasted for six weeks, and before and after the participants were tested for skin caretonid score and VO2max. During the supplementation period all subjects continued their normal training.

Results: Six week supplementation with the antioxidant vitamin/mineral supplement increased skin caretenoid score by 20±7% while no changes in skin caretenoid score was observed in the placebo group. VO2max increased by 7.5±2.2% in the placebo group while no changes was observed in the SUP group. The relative increase in VO2max was significantly higher in the placebo group than in the SUP group.

Discussion: The antioxidant vitamin/mineral supplement used in this study reduced training efficiency by blocking the training induced increase in VO2max. Although possible mechanisms behind this finding was not investigated, this result supports the idea that administration of large amounts of antioxidants may reduce the signalling activity in pathways dependent on the formation of reactive oxygen or nitrogen species.

1. Gomez-Cabrera MC et al. J Physiol 2005; 567 (Pt 1):113-120

2. Gomez-Cabrera MC et al. Am.J Clin.Nutr. 2008; 87 (1):142-149

MAGNESIUM – DIETARY INTAKE, SUPPLEMENT USE AND SERUM CONCENTRATION IN ELITE YOUNG GERMAN ATHLETES

BRAUN, H., KOEHLER, K., ACHTZEHN, S., PREDEL, G., THEVIS, M., MESTER, J.

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Introduction: Magnesium (Mg) plays an important role in many cellular processes. This might explain why Mg supplement use is still widespread in the athlete community (Braun et al., 2009), even though dietary magnesium intake seems adequate for most athletes. Since data for young athletes is rare, the aim of this study was to compare dietary Mg intake, Mg supplement use and serum Mg concentrations in young athletes.

Methods: Between January 2007 and October 2008, 306 athletes visited the German research centre of elite sports for a medical examination. Two hundred fifty athletes reported their dietary situation using a validated 7 d food & activity record. On the morning following the recording period fasting blood samples were taken. A questionnaire regarding the frequency of supplement use was provided in advance by mail. Complete data was available for 195 (age 16.3 ± 2.8 y, male n = 99, female n = 96) athletes.

Results: Sixty-five (33 %) athletes took magnesium as dietary supplement in the past 4 weeks before the medical examination. Mean dietary magnesium intake (without supplements) was higher in supplement users (SU: 567 ± 196 mg/day) compared to non-users (NU: 485 ± 204 mg/day) ($p < 0.01$). However, dietary Mg density was similar (SU: 206 ± 47 mg/1000 kcal; NU: 199 ± 61 mg/1000 kcal). Mean serum levels were 0.86 ± 0.07 mmol/l (SU) and 0.87 ± 0.08 mmol/l (NU) respectively. Additionally those who consumed Mg supplements on a daily basis did not have elevated serum Mg levels (n = 8; 0.87 ± 0.06 mmol/l). While energy intake was significantly correlated with Mg intake ($r = 0.68$, $p < 0.001$), we found no association between Mg intake and serum Mg ($r = 0.02$).

Discussion: In the present study, we found decreased serum magnesium concentrations only in a few cases. However, it seems that an optimal serum Mg concentration for (young) athletes has not been defined (Fogelholm 1995). Mean Mg dietary intake were above the German RDA and increased with energy intake. In agreement with others (Fogelholm et al., 1991) we found that Mg serum does not reflect dietary intake. Consistent with an earlier study (Weller et al., 1998) there were no differences in serum Mg between SU and NU. Based on the described findings it should be questioned why young athletes use Mg supplements. The benefits of those supplements seem to be lacking, while the risk of contaminated supplements should not be underestimated.

References

Braun H., Koehler K., Geyer H., Kleinert J., Mester J., Schaenzer W (2009). Int J Sp Nutr Exerc Met, 19(1), 97-109

Weller E., Bachert P., Meineck HM., Friedmann B., Bartsch P., Mairbaurl H (1998). Med Sci Sp Exc, 30(11), 1584-1591

Fogelholm M., Laakso L., Lehto J., Ruokonen I (1991). Nutrition Research 11, 1111-1118

Fogelholm M (1995). Int J Sp Nutr 5(4), 267-284

10:15 - 11:45

Oral presentations

OP-SA01 Sport statistics & Analyses

A STUDY TO DETERMINE THE IMPORTANCE AND VALUE OF TAKING-A-CHARGE IN MEN'S DIVISION I COLLEGE BASKETBALL IN THE UNITED STATES

SWALGIN, K., KNJAZ, D.

PENN STATE UNIVERSITY AND THE UNIVERSITY OF ZAGREB

Introduction: The game of basketball can be defined by its structure, the rules that govern play and the value of the performance factors established for the sport. As the structure, rules, and quality of play have evolved, so have the primary statistical performance factor that quantify the quality of play that defines the game. Unfortunately, one of these defining performance categories has been left-out of the official 'box score' or record. That category is Taking-A-Charge (TC). The purpose of this study was determine the importance and value of TC's. A secondary purpose was to establish a foundation for Taking-Charges to be viewed as an important performance category that should be mandated in the official record of the game.

Method: The total population (n=342) of men's Division I college basketball coaches were surveyed to determine: 1) if they recorded TC's, 2) if they planned practice-time to teach TC's, 3) how much they emphasized TC's as part of their team defense, and 4) how strongly they felt to include TC's as a primary statistical category.

Results: Of the 342 coaches that were surveyed, 103 returned completed surveys representing 30% of the population. One or more coaches' returned surveys from each of the 29 conferences throughout the U.S. Question 1, do you record TC's as a statistic, .757 percent indicated they did. Question 2, do you plan practice-time to teach TC's, .772 percent indicated they did. Question 3, how much emphasis do you put on TC's, the results of a Likert scale indicated: 1=.009%, 2=.047%, 3=.104%, 4=.208%,and 5=.481%. Question 4, do you feel TC's should be kept as a primary statistical category, Likert scale results indicated; 1=.099%, 2=.079%, 3=.168%, 4=.208%, and 5=.446%.

Discussion: Division I coaches in the U.S. are professional coaches. The importance of TC's is illustrated from the results of Q1 and Q2 that indicate 75.7% keep TC's as a statistic, 77.2% planned practice-time to teach the skill or tactic. The results of Q3 indicate 84% of coaches' emphasized or strongly emphasized TC's as part of their team defense. When asked if TC's should be establish as a required primary statistic, 65.4% agreed or strongly agreed and 16.8% were undecided. Taking-A-Charges as indicated from the results of the survey of coaches is an important performance factor that has an established value for the game; it creates a change-in-possession leading to a scoring opportunity, and as well, takes a scoring opportunity away from the opponent. Taking-a-charge also adds to team foul totals leading to the Bonus-Free-Throw situation sooner, and results in a Personal Foul that may lead to a player's disqualification and/or reduced playing time to protect against disqualification. It is apparent form the results of the survey that coaches view Taking-A-Charges as a valued performance factor for the game and support its inclusion to the official statistical record of basketball

RATING ELITE AND NON-ELITE TENNIS PLAYERS

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Unlike golf and chess, tennis suffers from having no universal objective rating system that applies from beginners to champions. Even the rating systems used in open professional tennis are non scientific, somewhat ad hoc accumulative systems that often give no credit to outstanding performances. Some of the drawbacks of these systems will be discussed, and a simple adjustive rating system shown to be more effective than the ATP tennis rating system for predicting match results of elite players. The aim of this research is to extend this system to club players. Rating players is also important at a non elite level –to the individual wishing to measure improvement or achievement, to selection committees wishing to choose between players for competition teams, to competition organizers wishing to group teams into sections of similar standard, and to national organizers for talent identification. Methods of rating non-elite players, by analyzing results from a local veterans doubles tennis competition are investigated. Depending on the level of detail in the collected statistics, the effects of position played, partner, strength of team opposition and strength of individual opponent can be taken into account. A method of extending the above adjustive rating system to rate non-elite players on a continual basis is suggested, and some preliminary results discussed.

EVALUATION OF ERRORS IN ALPINE SKIING VIDEO ANALYSIS

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INTRODUCTION: Video records are widely used to analyze performance in alpine skiing at professional or amateur level. Parts of these analyses require the labeling of some movements (i.e. determining when specific events occur). If differences among coaches and differences for the same coach between different dates are expected, they have never been quantified. Moreover, knowing these differences is essential to determine which parameters reliable should be used. This study aimed to quantify the precision and the repeatability for alpine skiing coaches of various levels, as it is done in other fields (Koo et al, 2005).

METHODS: A software similar to commercialized products was designed to allow video analyses. 15 coaches divided into 3 groups (5 amateur coaches (G1), 5 professional instructors (G2) and 5 semi-professional coaches (G3)) were enrolled. They were asked to label 15 timing parameters (TP) according to the Swiss ski manual (Terribilini et al, 2001) for each curve. TP included phases (initiation, steering I-II), body and ski movements (e.g. rotation, weighting, extension, balance). Three video sequences sampled at 25 Hz were used and one curve per video was labeled. The first video was used to familiarize the analyzer to the software. The two other videos, corresponding to slalom and giant slalom, were considered for the analysis. G1 realized twice the analysis (A1 and A2) at different dates and TP were randomized between both analyses. Reference TP were considered as the median of G2 and G3 at A1. The precision was defined as the

RMS difference between individual TP and reference TP, whereas the repeatability was calculated as the RMS difference between individual TP at A1 and at A2.

RESULTS AND DISCUSSION: For G1, G2 and G3, a precision of +/-5.6 frames, +/-3.0 and +/-2.0 frames, was respectively obtained. These results showed that G2 was more precise than G1, and G3 more precise than G2, were in accordance with group levels. The repeatability for G1 was +/-3.1 frames. Furthermore, differences among TP precision were observed, considering G2 and G3, with largest differences of +/-5.9 frames for "body counter rotation movement in steering phase II", and of 0.8 frame for "ski unweighting in initiation phase".

CONCLUSION: This study quantified coach ability to label video in term of precision and repeatability. The best precision was obtained for G3 and was of +/-0.08s, which corresponds to +/-6.5% of the curve cycle. Regarding the repeatability, we obtained a result of +/-0.12s for G1, corresponding to +/-12% of the curve cycle. The repeatability of G2 and G3 are expected to be lower than the precision of G1 and the corresponding repeatability will be assessed soon. In conclusion, our results indicate that the labeling of video records is reliable for some TP, whereas caution is required for others.

REFERENCES

Koo S, Gold MD, Andriacchi TP. (2005). Osteoarthritis, 13, 782-789.

Terribilini M, et al. (2001). Swiss Ski manual, 29-46. IASS, Lucerne.

SPACE-TIME COORDINATION DYNAMICS IN BASKETBALL: INTRA- AND INTER-COUPLINGS AMONGST PLAYER DYADS

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Introduction: Interpersonal coordination in game sports is an emerging field of interest in sport science. Indeed, formal evidence is gathering for the viability of a complex system description for some individual sports but not yet for team sports. The objective of the present study therefore was to assess basketball game behaviour within the general context of a dynamical system description.

Methods: Six game sequences from a French professional basketball game were analysed from which the x-y coordinate data of each player was obtained using a tracking procedure. The longitudinal (forward-backward movements) and lateral (side-to-side movements) patterns of each possible dyad were then subjected to relative phase analysis using the Hilbert transform. The relative phases were reported as frequency histogram data. Single instances from select dyads and game sequences were then investigated for evidences of stabilities and instabilities as well as phase transitions within a data sequence.

Results: In general the attacker-defender dyads demonstrated a strong in-phase relation (attractor of 0 degree) for the longitudinal and lateral data. In the lateral direction, however, for both teams the two wing players being teammates yielded strong attractions to anti-phase (attractor of 180 degrees), and the guard and center players demonstrated a bi-modal distribution with phase attractors of -150 degrees and 90 degrees. Discriminating the two teams, one team exhibited more distinct intra-coupling phase relations than the other. Single instances from select dyads and game sequences furthermore demonstrated evidences of phase stabilities (on 0 degree and 180 degrees) that were temporarily perturbed before the phase relation was restored. Intermittent switching was also observed in the data either between in-phase and three quarter-phase, or between the anti-phase and quarter-phase relations.

Discussion: The results demonstrated that the forward-backward movements of basketball players are much constrained by the context of the game demands. This finding was not extended to the lateral direction, however, as evidenced in the varying phase relations reported for some dyads. Similar patterns across teams were identified suggesting the presence of a common coupling within the dyads based on position considerations, a possible consequence of well established game playing habits. That said, some observed differences between the teams indicated that one team was more patterned in its behaviours whereas the other was more changeable to the game context. In sum, the findings demonstrated that the space-time patterns of basketball player dyads conform to a uniform description according to dynamical principles of self-organizing systems.

ANALYSIS OF THE USE OF THE TRAVELLING RULE IN THE EUROPEAN CHAMPIONSHIP IN BASKETBALL 2005.

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: All ballgames have rules that define the way the game is supposed to be played. These so called primary or constitutive rules tells us how the players are allowed to act in order to try to score or bring the ball up the court, it also tells us how the players should act against each other. The most important rules concerning this are the travelling rule and the rules allowing or forbidding contact between the players. (Fosnæs 2009)

Methods: 4 games of the European championship in Basketball in Serbia 2005 are analyzed. We are looking at every action in offense when a player receives the ball, starts a dribble, stops or make a shot. The actions are analyzed frame by frame on a screen. The actions are compared with the international rules of the game (FIBA rules). The registration will also tell what kinds of moves are made, and when there is a violation we will register the kind of mistake.

Results: In average there are in general between 100 and 160 actions in every period. 1 or 2 of these actions are called as travelling violation according to the rule by the referee. In our analysis between 22 % and 40 % of the actions are violating the rules.

Discussion: The referees do not have the same chance as we have to see the situation frame by frame, and watch it many times to study what kind of movement the players are doing. And some of these rule violations are almost impossible to observe without DVD. There are several concerns to discuss here. If a player gets an advantage violating the rule it is easy for the defensive player to be beaten or to make a foul in the next situation.

The referees will always consider the situation, and call for the mistakes that are made. Sometimes it seems as if they have a common understanding of how they are to use the rule. As Fosnæs (2009) says the travelling rule and the contact rule are the most important rules describing how the game is to be played, a more loose way of calling the travelling rule might change the game. This again will influence on the teaching and learning of basketball both in schools and in the sport outside the schools. If the rule is difficult either to live up to or to call by the referees, may be the rule itself should be redefined?

References:

FIBA rules both 2005 and 2008 Referees manual

DVDs from games in European championship in Serbia 2005

Ola Fosnæs 2009, The structural integrity of ballgames

EVALUATION OF MOTOR LEARNING METHODS IN YOUTH BASKETBALL PROGRAM

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FACULTY OF KINESIOLOGY UNIVERSITY OF ZAGREB

Introduction: The aim of this study was to identify the efficacy of three motor learning/teaching methods existing in today's sport, namely, the analytical, synthetic and situational Methods: Method: The sample of subjects was comprised of 90 boys, 9 – 10 years of age, who were beginners in basketball. A six-month program was conducted that, as regards the groups analysed, varied only according to the teaching methods selected. The assessment of effects of certain methods was carried out through the analysis of the development of motor abilities, specific motor skills, that is, the acquisition of basic elements of basketball technique in the play. The effects of the program were analysed by the one-way and multiway analysis of variance. The variables were also analysed by means of the matrix of correlations and by means of comparison of differences between arithmetic means.
The kinesiological influence that the subjects were subjected to, and that included three basketball training sessions per week and the physical education classes, led to significant changes, regardless of the learning/teaching method, in most tests for the assessment of motor abilities (except for the tests for the assessment of muscular endurance and flexibility) and in all tests for the assessment of specific motor skills.
Discussion: The biggest effects achieved in most elements were initiated by the synthetic learning/teaching method; the analytical method proved to be the most successful in the most demanding elements, whereas the positive effects of the situational teaching method were the least expressed.
According to the results obtained and the analysis conducted it may be concluded that the best motor learning/teaching method in basketball training for the population of children of a younger age-group (9 – 10 years of age), beginners in basketball, is the synthetic method. The analytical method should be applied in the teaching/learning process of more structurally complex elements.

10:15 - 11:45

Oral presentations

OP-SO02 Sociology 2

HUMAN ACTION, TACIT KNOWLEDGE AND EMBODIED SKILLS

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Skillful performance in sports requires the ability to master uncertain situations by means of body techniques often under time constraints. It appears obvious that this kind of competence does not only owe to time-consuming planning processes and knowledge-based rationalizations governed by the conscious mind, but also involves the 'intelligence' of an experienced body. Yet, many hegemonic approaches to human action or movement provided in the field of sport sciences focus almost exclusively on those underlying mental processes. Especially in the last couple of years, however, these theories have come under criticism for their intellectualistic stance and reductionist understanding of human action and being. Against the background of this critique, several frameworks have been formulated, claiming that the faculty to react to uncertain situations in a quick and flexible manner constitutively depends on incorporated knowledge and subjective sensations, which are largely tacit and hence difficult to objectify.
In the course of a paradigm shift labeled 'practice turn' [1], in the field of social sciences as well, concepts of tacit knowledge and embodied skills have started to enjoy an increasing popularity with regard to the explanation of dexterous practice. Sociological practice theories maintain that versed action is not only to be attributed to cognitive processes, but draws on incorporated dispositions, too, which had been acquired in collective practices during socialization. Under certain conditions, these dispositions function as a 'practical sense' [2], an intuitive feeling and tacit knowledge for what is to be done, allowing for an immediate, i.e. pre-reflective understanding and flexible coping with a situation. According to the premises of practice theory, this sort of intelligence is not stored in an individual's mind as a subjective possession, but is rather to be regarded as a relational and situational phenomenon emerging in between different (human and non-human) 'actants' [3].
So far, attempts to establish interdisciplinary linkages between the different approaches from sport and social sciences have been rare. Thus, I intend to correlate them in order not only to identify parallels but also to uncover blind spots and shortcomings in the particular concepts and to correct them mutually. It is my prior concern to integrate insights from social practice theory into concepts of motor control and vice versa in order to achieve a more adequate understanding of human activity, which accounts for both sports and everyday situations.
[1] Schatzki, T., Knorr Cetina, K., v.Savigny, E. (eds.) (2001): The Practice Turn in Contemporary Theory. London, New York.
[2] Bourdieu, P. (1987): Sozialer Sinn. Kritik der theoretischen Vernunft. Frankfurt/M., p. 122.
[3] Latour, B. (1996): On Actor-Network-Theory. A few clarifications. In: Soziale Welt, 47, pp. 369-381.

ACTIVE CITIZENSHIP? A SOCIOLOGICAL ANALYSIS OF THE MOTIVATIONS BEHIND VOLUNTEERING IN SPORTS

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UNIVERSITY OF CHESTER

Introduction: The voluntary sector is widely accepted as being of fundamental importance to sport. Game Plan (2002: 9), the British government's strategy for sport, states that 'sport depends heavily on the commitment of thousands of volunteers'. Numerous academics have also highlighted the importance of the voluntary sector in sport (Cuskelly, Hoye and Auld, 2006). Furthermore, volunteering is one of several ways in which the British government is promoting 'active citizenship'. Very little has been written about sports volunteers from the point of view of the volunteers themselves. In this respect, we wanted to discover what motivates people to volunteer, what social factors impact upon the decision to become a volunteer and the pressures faced in volunteering. In addition, given how important volunteers are

deemed to be to professionals working in sport, we also wanted to analyse the relationships between sports development officers (SDOs) and the volunteers that they recruit. We do so from a figurational perspective.

Methods: The study was based upon 14 semi-structured interviews, made up of 11 sports volunteers and three SDOs who made direct use of the sports volunteers.

Results/Discussion: There are numerous motives for people volunteering in sport. This has policy implications for those seeking to recruit volunteers. It also meant that the SDOs that we interviewed did find it increasingly problematic knowing how to recruit and keep volunteers. The growing pressure on SDOs to put in place volunteer programmes, and the increasing requirement that volunteers in sport are subject to official legislation related to their role, has meant that there is a sense in which it is becoming more 'professionalized'. Furthermore, many considered that with competition for sports related jobs there was a necessary requirement to set themselves apart by volunteering. In this respect, some considered that they were, in fact, constrained to be involved. Some volunteers, however, did not identify themselves, necessarily, as a 'volunteer'. They saw it as part of their involvement in playing sport. Whilst this group of volunteers were highly motivated to remain involved, they are also perhaps more likely to stop volunteering the more that they consider official policy encroaching on what they are doing. Finally, the volunteers that we interviewed did not really consider that by volunteering they were deliberately taking an active role in their community. They were volunteering for intrinsic reasons. In this sense it was more about their own habitus than a desire to 'give something back' as an 'active citizen'.

References

Cuskelly, G., Hoye, R. And Auld, C. (2006). Working with Volunteers in Sport: Theory and Practice. London: Routledge.

DCMS/Strategy Unit (2002). Game plan: A strategy for delivering Government's sport and physical activity objectives. London: DCMS/Strategy Unit.

SPORTSPONSORING UND BRAND COMMUNITIES

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Recent marketing research gains increasing interest in brand communities.

Muniz and O´Guinn (2001, p. 412) define a brand community (bc) as „a specialized, non-geographically bound community, based on a structured set of social relationships among admirers of a brand". The customer-customer-brand triad model of Muniz et al. (2001) was expanded to a consumer centric model by McAlexander, Schouten and Koenig (2002).

Hellmann and Kenning (2007) describe the inner structure of bc using a concentric circle model. These circles constitute the different layers of a community. From an economic point of view these circles represent different target groups for marketing strategies, which should be adopted for each target group inside one community. The focus of recent research are people in the centre of the community (strong engagement, identification, etc.), but periphery has potential for marketing activities too.

Bc are similar to fan clubs in sports (Algesheimer, 2004). Bauer, Exler and Stockburger-Sauer (2007) transfer the construct bc to fan communities in soccer. Their results imply a positive image of the soccer club in the community, which leads to a strong commitment and attachment to the soccer club.

The research project addresses the question if sponsors benefit from bc. Compared to unorganized fans a greater identification with and stronger commitment to the sponsor is suggested for bc. The purpose of this research is to discover the influence of the structure and characteristics of bc in sports on commitment, identification and social representations of the sponsor. To describe the structure the models of Hellmann and Kenning (2007) and McAlexander et al. (2002) is used as a framework. The transformation of the construct bc into a sport context is going to be discussed and specifics of fan communities will be reflected. Relevant variables are going to be considered (interest in sports, global vs. regional communities, etc.). Different fan communities and unorganised fans are going to be surveyed to inspect the relationships in different bc and in the group of unorganised fans, using structural equation modeling.

INVESTIGATION OF CONSUMER-BASED BRAND ASSOCIATIONS OF TURKISH SOCCER TEAMS

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Introduction: Today, sport managers view their teams, leagues and properties as brands to be managed (Gladden and Milne, 1999). Managing sport teams and their brands are getting more important. To manage sport team brands, it is important to understand consumers because consumers control the creation of brand equity; so it is important to study brand equity from the consumers' perspective (Aaker, 1991; Keller, 1993). Therefore, the purpose of this study was to examine consumers' perception on brand associations and affects of some factors on brand equity of Turkish soccer teams.

Method: In order to measure the consumer-based brand associations of Turkish soccer teams, the Turkish version of Team Association Scale was distributed to 156 undergraduate university students at Middle East Technical University and Gazi University. Independent sample t-test was used to compare gender differences on brand association perceptions, and ANOVA was used to compare the different perceptions of grade levels, user types and soccer teams. Lastly, correlation coefficient was used to look at the relationships among brand associations and independent variables of the study.

Results: Male participants perceived their team more like a brand comparing to females and product, commitment, coach, nostalgia and affect were the factors perceived by males related to brand of their team. Moreover, differences were found among different soccer teams. While Besiktas fans valued star players, Fenerbahce fans viewed management related with brand of their team, and Galatasaray fans related coach and nostalgia and tradition factors to their team's brand image. Lastly, user type groups found to perceive brand associated factors differently. Heavy users perceived their team as a brand more than medium and light users did, and there were differences on the entire brand associations except peer group acceptance.

Discussion: In Turkey, soccer teams and their management have to realize the relevance of their brand in economic success. The key for professional teams is to differentiate their brand by developing and/or strengthening positive associations with team brands in the minds of their consumers (Gladden, Irwin and Sutton, 2001). As a result, management of Turkish soccer teams should market their team using brand associations in consumers' mind such as tradition, product, affect, coach and nostalgia.

References

Aaker, D. A. (1991). Managing brand equity. New York: The Free Press.

Gladden, J. M., & Milne, G. R. (1999). Examining the importance of brand equity in professional sport. Sport Marketing Quarterly, 8(1), 21-29.
Gladden, J. M., Irwin, R. L., & Sutton, W. A. (2001). Managing North American major professional sport teams in the new millennium; building, sharing, and maintaining equity. Journal of Sport Management ,15(4), 297-317.
Keller, K. L. (1993). Conceptualizing, measuring and managing customer based brand equity. Journal of Marketing, 57(1), 1-22.

"THE BEST SOLDIERS"; A QUALITATIVE STUDY OF "THE BEST SOLDIERS" IN THE NORWEGIAN HOME GUARDS RAPID REACTION FORCES IN THE LIGHT OF PIERRE BOURDIEU'S THEORETICAL PERSPECTIVES.

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In a political situation where it is stressed that defense planning cannot be carried out based on one specific idea as to what kind of threats might face the armed forces in the future, and it is emphasized that the armed forces must adapt to a complex, unpredictable and rapid threat image, it is still desired to select, recruit and educate "the best soldier". It is therefore relevant to question the types of criteria used as a basis for evaluating the soldier's performance, and how" the best soldier" is to be understood when the task to be performed is unknown.
This problem area will be investigated by exploring two questions and the relation between them:
1. Which criteria will form the basis for judging who "the best soldiers" are today?
2. Do the soldiers considered to be "the best" have any similarities in their background experience that may help to explain why they are "best"?
The study is based on a hermeneutic-phenomenological interpretation of qualitative material structured and interpreted with the inspiration of Pierre Bourdieu's habitus-, capital- and field theory.
I will conclude that "the best soldier" must be understood as a construction, constantly restructured in an interaction between historical and cultural structures and the agents' interests and practices. This study can contribute to an extended and critical understanding of the constructions that are made, and show that Bourdieu's perspectives represent a suitable tool for analyzing soldiers in a military field.

DEVELOPMENT OF MEDIA IMPERIALISM IN SPORTS AND EFFECT OF COLONIALIZATION ON OLYMPIC WRESTLING

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Introduction: Opposing the practice of the previous centuries, the present day financial and political groups of interests reach their aims not by means of military technique, but via media.
The economic, political and cultural capital piled up by the media empires is the result of a kind of modern colonialization. As a consequence of this kind of colonialization, certain nations and social groups lose their previous identity and become defenceless. Sport cannot be an exception from this either, and it is forced to continuously transform/change in favour of increasing Olympic profit.
The negative trends having formed during the past decade in the content values of wrestling is continuing.
Methods: The followings were applied during 1665 bouts (Olympics, World Championships: WCh'85, Atlanta '96, Athen '04, WCh. '05, WCh ' 07, Beijing '08)
Direct recorded information from the minutes of the bouts
• number of bouts
• duration of bouts
• number of falls
• number of technical points
Indirect observation Methods: • simple attack
• complex attack
• attempted attack and completed attacks are registered on a special survey sheet
Results: 1. As a result of the changing rules of the past years, wrestlers have minimised their actions initiated from standing, have decreased the number of their complex, but spectacular actions, have set themselves for holds worth one or two points. The number of falls and technical falls dramatically decreased in the past years, so - although suitable to TV broadcasting - wrestling has gradually lost its spectacle and spirit.
2. The number of technical points for a time unit decreased, which unambiguously means the devaluation of the contextual value of wrestling, although the length of the bouts shows a tendency to before changes 1985.
Discussion:
• Spectacular throws executed from standing and falls should be valued in a way, that it should mean end of the bout.
• The first action should have a double value and of decisive importance in case of a tie.
References
[1]. BARNA T. (1993): Nemzetközi szabadfogású élversenyzők teljesítményének többszempontú elemzése. TF. Budapest. 1993. Doktori értekezés, Könyvtár.
[2]. BARNA T. (2002): Cselekvéshatékonyság vizsgálata küzdősportban. TF. Budapest. 2002. Ph.D értekezés, Könyvtár.
[3]. FÖLDI L. (2002): Földi . Pécs, Minaret Kiadó 186old.
[4]. LENI RIEFENSTAHL (1938) OLIMPIA Turul Video Melbourne 2004

10:15 - 11:45

Oral presentations

OP-HF01 Health and Fitness 1

EFFECT OF AEROBIC DANCE ON BLOOD PRESSURE IN PREVIOUSLY INACTIVE PREGNANT WOMEN - A RANDOMIZED CONTROLLED TRIAL

EDVARDSEN, E., HAAKSTAD, L.A., HALVORSEN, S., BØ, K.

NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: In pregnant women, regular exercise has showed beneficial effects on numerous of health outcomes such as gestational diabetes and pregnant induced hypertension (1). Limited data are available on how regular training affects blood pressure (BP) in pregnant women in rest and during exercise. The aim of the present study was to evaluate the effect of a supervised exercise program on blood pressure at rest (BPrest) and during exercise (BPexercise) in previously inactive non-hypertensive pregnant women.

Methods: 105 healthy sedentary primiparous pregnant women, mean gestational week 17 (SD ± 4,19), mean age 31 yrs (SD ± 4,05), mean BMI 25 (SD ± 4,18), were included in the study. After measurement of BPrest, the subject walked on a treadmill for measuring of BPexercise, heart rate and blood lactate concentration at different sub maximal workloads for establishment of anaerobic threshold (AT). They were then randomized to either an intervention or a control group. The intervention consisted of two to three aerobic dance sessions per week and minimum 30 minutes of daily self-exposed activity the rest of the days. All participants performed a post exercise test at mean gestation week 37 (SD ± 1,03). Mean differences in BT between exercise and control group were analysed by Independent Sample Student's T-test in rest and during AT.

Results: During the training period, drop-out rates were 34,6 % in the exercise group and 47,2 % in the control group. In addition, those subjects who participated in < 80 % of the aerobic dance sessions, or who did not reach AT during the pre-post exercise testing were excluded.

BPrest before intervention was in the exercise (n= 52) and the control group (n=47) 115/66 mmHg (SD ± 11,73/7,30) and 115/67 mmHg (SD ± 10,07/9,06) [mean sys/dia (SD)], respectively (sys: p=0,997, dia: p=0,349). BPrest after the intervention did not change significantly between the exercise (n= 19) and the control group (n=26);3,7/7,6 mmHg (SD ± 9,55/7,52) and 1,3/8,3 mmHg (SD ± 11,54/7,22), respectively. BPexercise at AT before intervention was in the exercise (n=13) and the control group (n=16) 149/61 mmHg (SD ± 14,54/7,26) and 157/62 mmHg (SD ± 9,95/8,53), respectively, and did not change significantly after the intervention (sys: p=0,31, dia: p=0,68).

Discussion: Regular exercise training in previously inactive non-hypertensive pregnant women seems to have no effect on blood pressure at rest and during exercise. Further, rise in blood pressure from rest to AT seems normal in both intervention- and control group in second as well as in third trimester.

References

1. Dye TD, Knox KL, Artal R, Aubry RH, Wojtowycz MA. Physical activity, obesity, and diabetes in pregnancy. Am J Epidemiol 1997;146:961-5.

IS PELVIC FLOOR MUSLCE STRENGTH TRAINING EFFECTIVE WHEN TAUGHT IN A GENERAL FITNESS CLASS FOR PREGNANT WOMEN? A SINGLE BLIND RANDOMIZED CONTROLLED TRIAL

BØ, K., HAAKSTAD, L.A.H.

NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: A Cochrane review has shown that pelvic floor muscle training (PFMT) is effective in prevention and treatment of urinary and fecal incontinence in the peripartum period (1). The training programs used in the different randomized controlled trials followed vaginal palpation of ability to perform a correct contraction and were taught individually by trained physical therapists. The aim of the present study was to evaluate the effectiveness of PFMT given in a general fitness class for pregnant women instructed by lay instructors and with no vaginal palpation.

Methods: One hundred and five primiparous women, mean age 30.7 years (SD 4.1) were randomized to either participation in two weekly one hour fitness classes including 35 minutes of low impact aerobic dance, 20 minutes of strength training with emphasize of the abdominals- back and pelvic floor muscles (3 sets of 8-12 close contractions) and 5 minutes of stretching/ relaxation. Outcome measure was number of women reporting urinary, flatus or anal incontinence based on questions from the Severity index and the International Consultation of Incontinence Questionnaire Urinary Incontinence Short Form (ICIQ UI-SF). Comparison of prevalence was done before the intervention (mean gestational week 17.7), after the intervention (mean gestational week 6.6) and postpartum (mean week 7.7). Chi-Square and Fischer Exact tests were used for analyses and p-value < 0.05 was considered statistically significant.

Results: There was no difference in number of women with any type of incontinence before the intervention. Drop-out rates were 21.1 % and 24.5% in the training and control groups, respectively. 27.5% followed all training sessions, with a mean adherence of 17.2 (SD 12.5, range 1-55) out of 24 possible training cessions. Twenty-one women (40.4%) attended ≥ 80% of the training sessions. Number of women reporting urinary, flatus or anal incontinence immediately after the intervention were 17/42, 11/42, 1/42 and 16/42, 9/42, 1/42 in the training and control groups, respectively. Postpartum the corresponding numbers were: 12/43, 10/43, 1/43 and 13/47, 8/47, 3/47, respectively. No significant differences were found between the training and control groups at any evaluation point.

Discussion: There was no effect of a general fitness program including PFMT on reported urinary, flatus or fecal incontinence during pregnancy or after childbirth. The negative findings may be explained by an exceptional low adherence rate, instruction by lay instructors and no assessment of ability to conduct a correct PFM contraction. Future studies are recommended with larger sample size and use of more adherence strategies.

References:

1. Hay-Smith J et al. Pelvic floor muscle training for prevention and treatment of urinary and faecal incontinence in antenatal and postnatal women. Cochrane Database of Systematic Reviews 2008, Issue 4. Art. No.: CD007471. doi:10.1002/ 14651858. CD007471.

EXERCISE IN THE THIRD TRIMESTER OF PREGNANCY, DOPPLER EXAMINATIONS AND FETAL HEART RATE

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TECHNICAL UNIVERSITY MADRID

Introduction: From a biological viewpoint, pregnancy is a unique process in which the function of all the body's control systems is modified to maintain both maternal and fetal homeostasis. With physical exercise becoming an integral part of life for many women, the question whether exercise during pregnancy may have an adverse impact on the well being of the new born has reached increasing importance.

For healthy pregnant we examined the effect of protocol of moderate exercise (static bicycle) performed throughout the third trimester of pregnancy on circulation (umbilical and cerebral middle arteries) and behavior of fetal heart rate (FHR).

Methods: 20 pregnant healthy women in the third trimester were studied, age= 29.6 ± 4.3 and gestational age 239 ± 14.3 days. Relative to parity 10 of them were nulliparae and 10 multiparae. Exercise protocol consisted of 20 minutes of activity on a static bicycle (50-55% max cap). Pulsatility Index (PI) before and after exercise was obtained from doppler examinations in the umbilical and cerebral middle arteries. Other maternal data were recorded including smoking, occupational activity and physical activity habits.

Results: Our results shows no difference for measurements of IP, before and after exercise, for umbilical artery (p=0.06) and fetal cerebral middle artery (p= 0.10). We found an elevation of FHR between 11-36 beats/min (mean=24±7.6) and significant differences for changes of FHR between parity groups (p=0.04).

Discussion: Certain scientific evidence has demonstrated that physical exercise during pregnancy does not have adverse effects (Barakat et al, 2008; 2009). In that sense, our results shows no differences in IP of umbilical and fetal cerebral middle arteries in agreement with Ertan (2004). Changes in FHR caused by the exercise are a normal fetal reflex (Wolfe et al, 1994).

The results presented support the evidence that moderate exercise during the third trimester of pregnancy does not have a negative influence on neither uterine and fetal circulation nor FHR.

References

Barakat R, Ruiz JR, Stirling JR, Zakynthinaki MS, Lucia A (2009). Am J Obstet Gynecol, in press

Barakat R, Stirling JR, Lucia A (2008). Br J Sports Med, 42 (8), 674-678.

Ertan A, Schanz S, Tanriverdi H, Meyberg R, Schmidt W. (2004). J Perinat Med, 32, 260-265.

Wolfe, L. Brenner, I. and Mottola, M. (1994). Exerc Sport Sci Rev, 22, 145-194.

SELF REPORT VS. MOTION MONITOR IN MEASUREMENT OF PHYSICAL ACTIVITY DURING PREGNANCY

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Most pregnancy-studies have relied on retrospective, cross sectional surveys to measure physical activity level. Questionnaires are cost-effective, yet validity of the data may be questionable. Objective: The aim of the present study was to validate the Physical Activity and Pregnancy Questionnaire (PAPQ) with a portable activity monitor (ActiReg®, PreMed AS, Oslo, Norway). Design: Prospective comparison study. Setting: Norwegian School of Sport Sciences, Oslo, Norway. Population: Seventy-seven pregnant women wore the ActiReg sensors during waking hours for seven consecutive days and answered the PAPQ. Main outcome measures: Agreement between the two methods was analysed by Bland & Altman plot and Spearman correlation coefficient. Results: The results indicated only small differences between the PAPQ and the ActiReg in cross-tabulation of total physical activity level and proportion of participants meeting the current exercise guidelines. The correlation between the methods was good (r=0.59) for time spent in activities with high intensity (METS>6), moderate for time spent standing/moving (r= 0.36) and fair for sitting/lying (r=0.29). The Bland-Altman plot of the activity patterns, showed a mean difference near zero with no apparent trends and with wide scatter of individual observations. Conclusions: The PAPQ may be considered an acceptable method for assessing habitual physical activity and exercise among pregnant women at group level. However, as questionnaires and portable activity monitors have their strengths in measurement of different aspects of physical activity, there may be several advantages in combining these two types of instruments for registrations of physical activity level during pregnancy.

EXERCISE PRACTICE DURING PREGNANCY

SANTOS-ROCHA, R., CARNIDE, F., RAMOS, L., MAIA, F.

SPORT SCIENCES SCHOOL OF RIO MAIOR - POLYTECHNIC INSTITUTE OF SANTARÉM

According to ACSM and ACOG the benefits of physical activity during pregnancy are well documented and there are general guidelines for exercise prescription based on scientific research. Also, the literature supports the recommendation to initiate or continue exercise in most pregnancies1. The exercise prescription during pregnancy includes the forms of adaptation of the type of exercise, of the intensity, duration and frequency during the different phases of pregnancy: the 1st, 2nd and 3rd trimesters of gestation and the post-partum period (15 to 30 days); and the breast-feeding period. In each one of these phases morphological, physiological and psychological alterations occur which will respectively affect the adaptations of the exercise programs based on effectiveness and safety. However, there is a lack of information on the specific guidelines and real strategies of adaptation of several recreational activities that might be adapted to healthy pregnant women. We believe that in order to better develop safe and effective exercise programs it is necessary to understand, among other variables: the physical activity patterns of pregnant women; the motivations for exercise during pregnancy; and the characteristics of proper exercise. The general purpose of the present study was to characterize exercise practice during pregnancy by means of a questionnaire. Other purposes were to validate the questionnaire and to analyze the motivation for physical exercise during pregnancy. This retrospective study was conducted with a sample of 500 pregnancies. Prior to this analysis, the questionnaire was applied twice to a sample of 100 pregnancies involving 61 women (aged 20-45 years), in order to test the temporal stability (alpha of Crombach test). The average number of days between applications was 51.6 (20.3). The responses obtained in the two applications have shown a high significant correlation. In what is concerned to the characterization of the practice of physical exercise during pregnancy, physical exercise was encouraged by doctors, especially, walking. Most women choose professional oriented physical activity. During the 1st and 2nd trimesters the most popular activities were: strength training, water exercise, swimming and stretching. During the 3rd trimester was the preparation for childbirth. The main reasons behind the practice of physical activity during pregnancy were: the perceived healthy effects on pregnancy and labour; the promotion of mother and baby health and well-being. 76% reported the practice of physical activity before pregnancy, but 52% abandoned it during the 1st trimester. The perceived risk for baby's health was the main

reason for abandonment. 86% had to change or adapt the occupational activity. 73% had to stop work during the 3rd trimester. Physical exercise and diet played an important role during postpartum recovery for 73% of the subjects. The results of the present work will be useful to develop recommendations for pregnancy specific exercise programs.

THE EFFECT OF AEROBIC DANCE ON CARDIORESPIRATORY FITNESS IN PREVIOUSLY SEDENTARY PREGNANT WOMEN - A RANDOMIZED CONTROLLED TRIAL

HALVORSEN, S., HAAKSTAD L.A., EDVARDSEN, E., BØ, K.

NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: Healthy pregnant women are recommended to be physically active (1). A Cochrane review from 2006 concluded that regular aerobic exercise during pregnancy appears to improve physical fitness, but that the trials are small and of low methodological quality (2). The aim of the present study was to evaluate the effectiveness of a aerobic dance exercise program on cardiorespiratory fitness in previously sedentary pregnant women.

Methods: 105 sedentary primiparous women were randomized to either intervention or control. The intervention consisted of two one-hour aerobic dance sessions per week. The intervention group was also motivated to include 30 minutes of moderate self-imposed physical activity on the rest of the week-days. The control group was neither encouraged nor discouraged from exercising. All the subjects underwent exercise testing by walking on a treadmill for establishment of the relationship between oxygen uptake (VO2), heart rate and blood lactate ([La-]b) at 4-6 different submaximal workloads (lactate profile). Comparison of cardiorespiratory fitness was done before the intervention (mean gestational week 17.7) and after the intervention (mean gestational week 36.6). Analyses were done according to intention to treat (ITT). Independent sample t-test at differences between the groups at anaerobic threshold ([La-]b ∆1.5) (AT) was used for analyses, and a p-value < 0.05 was considered statistically significant.

Results: There were no differences in cardiorespiratory fitness between the groups before the intervention. Drop-outs rates were 34.6 % and 47.2 % in the training and control groups, respectively. On average, those allocated to exercise participated in 17 (SD 12.5) out of 24 possible exercise sessions. 21 women attended ≥ 80 % of the exercise sessions. VO2 at AT decreased with 5,1 % in both the intervention group (mean 25,3 ± 3,7 to 24,0 ± 3,8) and among the control group (mean 24,9 ± 3,7 to 23,7 ± 3,2). Further, there were no significant differences in lactate profile between the intervention and control groups.

Discussion: This study indicates a small negative effect on cardiorespiratory fitness during pregnancy. Our result does not confirm with previous reported findings (3). However, the difference in results may be explained by a much higher fitness level among the participants in the presents study and the unfortunate high drop-out rate and low adherence to the exercise program. Further studies on cardiorespiratory fitness in sedentary pregnant women are needed.

References

1. American College of Obstetriccians and Gynecologists (2002). Exercise during pregnancy and the postpartum period. Int J Gynaecol Obstet 2002: 77(1) s: 79-81.

2.Kramer M.S. & McDonald S.W. (2006). Aerobic exercise for women during pregnancy (review). Cochrane Database of Systematic Reviews 2006, Issue 3.

3. Santos I.A., Stein R., Fuch S.C et al (2005). Aerobic Exercise and submaximal Functional Capacity in Overweight Pregnant Women. A Randomized Trial. Obstetrics & Gynecology 2005:106(2) s:243-249.

10:15 - 11:45

Invited symposia

IS-SS01 Contemporary issues of motivation in sport

MOTIVATIONAL CLIMATE EFFECTS ON MOTIVATION REGULATION, PEER RELATIONSHIPS, EMPOWERMENT, AFFECT, AND BULLYING IN SPORT!

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NORWEGIAN UNIVERSITY OF SPORT SCIENCE

Current approaches to subjective well-being and ill-being in sport suggest that differences in the motivational sport environment, specifically the motivational climate the coach creates within the sport context, may influence psychological outcomes of participation. In the present study, we examined the association of the motivational climate to a range of potential beneficial and aversive psychosocial outcomes of soccer involvement for youths.

The sample consists of a cross-sectional study of 1294 youths aged between 12-16 years of age (Male n = 787, Female n = 507) experienced youth sport participants. Scales assessing the motivational climate and various indices of psychosocial health were administered. Multivariate canonical analyses revealed that a Mastery involving motivational climate was associated with psychologically healthy sport involvement outcomes (RC1 = .48). These outcome variables comprised of higher perceptions of autonomy, positive affect and perceived ability, more autonomous regulation of motivation in that positive associations with intrinsic and identified regulation of motivation were found, positive association with task involvement, and positive peer relationships. Negative relationships were found for external motivation and amotivation. In contrast, a primarily performance involving motivational climate was associated with negative psychological outcomes from soccer involvement (RC2 = .43

The findings suggest that coaches who emphasise winning as the criterion of success in youth sport put the subjective well-being of the participants in jeopardy. Two patterns of relationships were observed, one associated with a mastery climate and indices of subjective well-being, and one primarily associated with a performance climate and indices of subjective ill-being. A focus on mastery is more likely to create a positive experience for the youths that enhances positive outcomes of the sport experience. A focus on performance is more likely to create a negative experience for the youths and enhances negative outcomes.

MOTIVATION AND BURNOUT IN ELITE ATHLETES

LEMYRE, P.N., GUSTAFSSON, H.

NORWEGIAN SCHOOL OF SPORT SCIENCE

While competing in sports large doses of training and high quality motivation are necessary to perform at the elite level (Gould, Dieffenbach, & Moffet, 2002; Lemyre, Roberts, & Stray-Gundersen, 2007). Unfortunately, some of the personal qualities necessary to achieve the highest levels of performance in sports are also risk factors for experiencing debilitating levels of exhaustion often leading to athlete burnout (Lemyre, Hall, & Roberts, 2008). When athletes suffer from burnout, they typically experience chronic fatigue, poor sleep patterns, and bouts of helplessness. They may also complain about episodes of depression related to their sport participation, and not surprisingly their performance is considerably impaired. Previous research findings have established a relationship between athlete burnout and levels of self-determined motivation (Cresswell & Eklund, 2005; Lemyre, Treasure, & Roberts, 2006; Raedeke, 1997).

According to Self-Determined Theory (Deci & Ryan, 2000), on a continuum of self-determined motivation, intrinsic motivation is the most self-determined form of motivation and amotivation is the least self-determined form of motivation, while different levels of extrinsic motivation are found in between. These two forms of motivation are proposed to lie at the opposing ends of a self-determined continuum. Earlier burnout research has found that amotivation is positively and intrinsic motivation negatively associated with burnout (Cresswell & Eklund, 2005b; Raedeke & Smith, 2001). Furthermore, less self-determined motivation in the beginning of the season was associated with burnout at the end of the season in elite athletes (Lemyre et al., 2007). Lemyre and colleagues (Lemyre, Treasure, & Roberts, 2006) also found that motivation shifts along the self-determination continuum to less self-determined motivation during the season was associated with higher burnout susceptibility in swimmers.

Thus, the aim of the current study was to investigate in parallel shifts in self-determined motivation and changes in burnout scores during the season of competition. Participants were 73 national ski academy students (F=42, M=31) competing in xc-skiing (N=44) and ski orienteering (N=29). Each week, for thirteen weeks, athletes answered to a translated version of the Athlete Burnout Questionnaires (ABQ; Raedeke & Smith, 2001) and the Situational Motivation Scale (SIMS; Guay, Vallerand, & Blanchard, 2000). Findings demonstrated a significant negative relationship between shifts in quality of motivation and changes in burnout scores over a 13 weeks period. Decrease in quality of motivation throughout the season is directly linked to an athlete's susceptibility to experiencing feeling burned out. Furthermore, shifts in amotivation throughout the season were a very potent predictor of change in athlete propensity to burn out. Study findings suggest that monitoring quality of motivation of competitive athletes throughout the season may help steer athletes away from maladaptive sport participation outcomes such as exhaustion and burnout.

PASSION FOR SPORT

DONAHUE, E., VALLERAND, R.J.

UNIVERSITE DU QUEBEC A MONTREAL

The purpose of this presentation is to show the applicability of the passion conceptualization (Vallerand et al., 2003) to the realm of sport and exercise. Passion is defined as a strong inclination toward a self-defining activity that people like, that they find important, and in which they invest a lot of time and energy. Two types of passion are proposed: obsessive and harmonious. Obsessive passion refers to an uncontrollable internal urge to engage in the activity that the person likes that results from a controlled internalization of the activity in one's identity. On the other hand, harmonious passion results from an autonomous internalization that leads individuals to choose to engage in the activity that they like. Harmonious passion promotes healthy adaptation whereas obsessive passion leads to less adaptive outcomes. Results from a series of studies with athletes, in a sport setting will be presented, including some on persistence, injury, performance, and subjective well-being. These studies support the role of passion in sport (elite and recreational) and pave the way to new research.

MULTIDIMENSIONAL PERFECTIONISM AND PATTERNS OF ACHIEVEMENT STRIVING

HALL, H.K., HILL, A.P., APPLETON, P.R.

YORK ST. JOHN UNIVERSITY

While perfectionism is seen by some as a universally debilitating personality characteristic, associated with both psychological impairment and distress, (Flett & Hewitt, 2002), others have argued that some forms of the construct reflect an adaptive form of achievement striving (Haase and Prapevassis, 2004; Stoeber & Otto, 2006). This paper presents the findings from three empirical studies examining the relationship between different forms of perfectionism and various patterns of achievement striving. The first study examined the association between positive and negative perfectionism and patterns of achievement striving that included the endorsement of trichotomous achievement goals (Elliot & Church, 1997). A second study examined the association between perfectionism, conscientious achievement striving and maladjustment in junior elite cricket academy players. The third study examined the association between various forms of perfectionism (Hewitt & Flett, 1991) and approach and avoidance achievement goals (Conroy et al., 2003) in a sample of elite junior swimmers. Together, the findings from these three studies suggest that while all forms of perfectionism may lead to positive outcomes, most forms of perfectionism demonstrate a less than adaptive motivational profile.

10:15 - 11:45

Invited symposia

IS-SM06 Neuromuscular Adaptation in Disuse and Ageing (JSPFSM Exchange Symposium)

RESISTANCE EXERCISE TRAINING-INDUCED MUSCLE HYPERTROPHY WAS ASSOCIATED WITH REDUCTION OF INFLAMMATORY MARKERS IN VERY OLD WOMEN.

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TOKYO METROPOLITAN INSTITUTE OF GERONTOLOGY

Aging is associated with low-grade inflammation, which is implicated in a variety of diseases. We investigated the effects of low-intensity resistance training on changes in physical fitness, muscle hypertrophy, and circulating growth factors and markers of inflammation in very old women. Methods: Twenty-one very old women (mean age and SD, 85.0±4.5 years) participated in 12 weeks of low-intensity resistance exercise training, which were included four types of whole body strength training once a week. Physical performance test, muscle thickness, circulating levels of C-reactive protein (CRP), serum amyloid A (SAA), heat shock protein (HSP)70, tumor necrosis factor (TNF)-α, interleukin (IL)-1, IL-6, monocyte chemotactic protein (MCP-1), insulin, insulin like growth factor (IGF)-I, and vascular endothelial growth factor (VEGF) were measured before and after the exercise training. Results: The 12 weeks of low-intensity resistance training increased abdominal ($P<0.01$) and subscapular ($P<0.05$) muscle thickness, whereas it reduced systolic blood pressure ($P<0.05$), and the circulating levels of CRP, SAA (both $P<0.05$), HSP70, IGF-I, and insulin (all $P<0.01$). The plasma concentration of MCP-1, TNF-α, IL-6, or VEGF did not change significantly following the training. The training-induced reductions in TNF-α and CRP were associated with increased muscle thickness ($r= -0.53$, $P<0.05$, $r= -0.61$, $P<0.01$, respectively). Conclusion: Even low-intensity resistance training is beneficial for very old sedentary people as a valid strategy to improve blood pressure, insulin resistance, and muscle thickness and reduce some markers of low-grade inflammation. Resistance training may assist in maintaining or improving muscle volume with reducing low-grade inflammation.

[References]

1. Ogawa K, Suzuki K, Okutsu M, Yamazaki K, Shinkai S.: The association of elevated reactive oxygen species levels from neutrophils with low-grade inflammation in the elderly. Immun Ageing. 2008;5(1):13.
2. Greiwe JS, Cheng B, Rubin DC, Yarasheski KE, Semenkovich CF. Resistance exercise decreases skeletal muscle tumor necrosis factor alpha in frail elderly humans. FASEB J. 2001;15(2):475-482.
3. Rosendal L, Langberg H, Flyvbjerg A, Frystyk J, Ørskov H, Kjaer M. Physical capacity influences the response of insulin-like growth factor and its binding proteins to training. J Appl Physiol. 2002;93(5):1669-1675.

INFLUENCE OF AGEING ON MUSCLE FUNCTIONS OF HUMAN LEG MULTI-JOINT MOVEMENTS

YAMAUCHI, J.

THE UNIVERSITY OF TOKYO/FRIEDRICH-SCHILLER UNIVERSITY JENA

It is important to understand the ageing related differences in muscle function of lower limb multi-joint movements because they are profoundly related to the movements of daily living. Although the contractile properties of isolated muscle have been extensively studied, the influence of ageing on contractile properties of muscles that control the multi-joint movements has not been extensively studied. We have developed the dynamometer with a high time-resolution servo system to obtain the isotonic, force-velocity relation of knee-hip extension movements (Yamauchi et al. 2007). By using this method, muscle functions are precisely evaluated with relatively small physical stress; i.e., without generation of large force to accelerate the inertial mass (Yamauchi and Ishii 2007) and without a large increase in blood pressure (Yamauchi et al. 2008). Therefore, to understand ageing related differences on the maximum force, unloaded velocity and power of leg multi-joint movements, the dynamometer was used to investigate the isotonic force-velocity and force-power relations of muscles that control leg multi-joint movements. In experiment 1, twelve healthy young (age, 19-31yrs) and twelve healthy elderly (age, 60-82yrs) women performed bilateral and unilateral knee-hip extension movements. In experiment 2, two hundred eighty-five recreationally active men (n=142) and women (n=143) aged between 18 and 82 years volunteered for the cross sectional study. In both experiments, the maximum isometric force (Fmax), unloaded velocity (Vmax) and power (Pmax) were determined from the force-velocity relation. Experiment 1 showed that Fmax and Pmax of bilateral and unilateral knee-hip extension movements were 20-30% lower in elderly than in young women. On the other hand, there was no significant change in Vmax between young and elderly women and between bilateral and unilateral movements. Bilateral deficit was larger as the generation of force was larger in both young and elderly women. Also, bilateral deficit of Fmax and Pmax were not different between young and elderly women. Experiment 2 showed that with increasing age, Fmax/body mass significantly declined in both men ($r=-0.400$, $p<0.001$) and women ($r=-0.587$, $p<0.001$), while Vmax/leg length did not change with age in both men ($r=-0.033$, $p>0.05$) and women ($r=-0.040$, $p>0.05$). Pmax significantly declined with age in both men ($r=-0.370$, $p<0.001$) and women ($r=-0.446$, $p<0.001$). Both results showed the ageing related decline in maximum force and power output, but no differences in the intrinsic shortening velocity of leg multi-joint movements. This finding suggests that decreases in muscle force generating capacity and power may primarily lead to the loss of mobility and a reduced capability of accelerating and decelerating the body mass during the movements. Thus, it is important to prevent a loss of force generating capacity of leg multi-joint movements in elderly individuals.

SARCOPENIA AND AGE-RELATED INSULIN RESISTANCE OF MUSCLE PROTEIN METABOLISM

FUJITA, S., VOLPI, E.

UNIVERSITY OF TOKYO AND UNIVERSITY OF TEXAS MEDICAL BRANCH

Sarcopenia is an age-related progressive loss of muscle mass that leads to muscle weakness, limited mobility, and increased susceptibility to injury. Sarcopenia is a multifactorial disorder, and evidence is accumulating that a reduced response of skeletal muscle to anabolic stimuli is an important contributor.

Whereas the addition of carbohydrate to an amino acid meal enhances the amino acid stimulation of muscle protein synthesis in young subjects, such an combination does not have any additive effect on muscle protein synthesis in older subjects, thereby blunting the anabolic effect of the meal on muscle proteins. Since the ingestion of carbohydrate increases endogenous insulin secretion, we explored the hypothesis that aging is associated with a relative insulin resistance of muscle proteins.

Insulin is a potent anabolic stimulus for skeletal muscle. We have measured muscle protein and amino acid metabolism using stable-isotope methodologies in healthy young subjects at baseline and during local insulin infusion into a leg. We found physiological hyperinsulinemia increased skeletal muscle protein synthesis and anabolism in healthy young subjects (157±54%, $p<0.05$ vs. baseline), as long as blood flow and amino acid delivery to the muscle are stimulated by insulin (2). Thus, it appears that the insulin-induced modulation of muscle perfusion and nutrient availability is necessary for the anabolic response of muscle protein synthesis.

Healthy aging is also associated with a decreased insulin-induced vasodilation due to dysfunction of the endothelial-dependent vasodilation, which is normally initiated by insulin via activation of the endothelial NO synthase. We examined the effect of physiological local hyperinsulinemia (0.15 mU/min/100ml leg) on muscle protein metabolism in young and older glucose-tolerant healthy subjects and found that insulin mediated increase in blood flow, amino acid availability, and skeletal muscle protein synthesis was resistant to the action of insulin in older subjects ($p<0.05$ vs. young), which may be an important contributor to the development of sarcopenia (1).

More recently, we have demonstrated that a single bout of aerobic exercise (45-min treadmill walk at 70% HRmax) performed a day prior to insulin infusion improved the age-related insulin resistance of muscle protein synthesis by reducing endothelial dysfunction, improving muscle perfusion and amino acid delivery to the muscle tissue, and enhancing activation of the translation initiation (mTOR pathway) and muscle protein synthesis among healthy old subjects ($p<0.05$ vs. non-exercise control)(3).

Further clinical studies are necessary to investigate whether aerobic exercise may prevent the loss of muscle mass with aging by improving the muscle anabolic response during feeding.

References

1. Rasmussen, BB et al. (2006). FASEB J. 20(6): 768-9.

2. Fujita, S et al. (2006). Am J Physiol. 291(4): E745-54.

3. Fujita, S et al. (2007) Diabetes. 56(6): 1615-22.

10:15 - 11:45

Invited symposia

IS-PH02 High-Intensity training to achieve optimal adaptation?

AEROBIC HIGH-INTENSITY INTERVALS IMPROVE MAXIMAL OXYGEN UPTAKE MORE THAN MODERATE TRAINING

HELGERUD, J.

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, TRONDHEIM

It is important to know how different training intensities influence adaptations in physiological parameters when selecting the best training regimen for a specific sport or for improving fitness in the general community. Cardio-respiratory endurance has long been recognized as one of the fundamental components of physical fitness. Maximal oxygen uptake (VO2max) is probably the single most important factor determining success in aerobic endurance sports. At maximal exercise, the majority of evidence points to a VO2max that is limited by oxygen supply, and cardiac output seems to be the major factor in determining oxygen delivery (Wagner 2000).

Improvement in VO2max is directly related to the intensity, duration and frequency of training. However, there are few studies where training protocols of different intensities have been matched for work and frequency. The aim of my presentation is thus to compare training methods of different intensity matched for energy consumption. Up to the level of maximum aerobic velocity, the intensity of training seems to determinate the training response. Intensity and volume of training are, thus, not interchangeable (Helgerud et al 2007). The changes in VO2max correspond with changes in stroke volume of the heart, indicating a close link between the two.

While significant improvements in endurance performance and corresponding physiological markers are evident following submaximal endurance training in sedentary and recreationally active groups, an additional increase in submaximal training (i.e volume) in highly trained individuals does not appear to further enhance either endurance performance or associated physiological variables (Laursen et al 2005). Pilot studies containing massive high-intensity aerobic interval training in endurance athletes will be presented. Both case studies and group studies with elite endurance athletes will be discussed. It seems that, for athletes who are already trained, improvements in endurance performance can be achieved only through high- intensity interval training. Understanding and communicating these new developments in physiological research is probably the least of the problems in terms of changing existing training practices. The challenge is to ensure that this information is acted upon by coaches and athletes.

References

Helgerud J, Høydal K, Wang E et al. Aerobic high-intensity intervals improve VO2max more than moderate training (2007) Med Sci Sports Exerc; 39, 665-671

Laursen PB, Shing CM, Peake JM et al. Influence of high-intensity interval training on adaptations in well-trained cyclists (2005) J Strength Con Res; 19: 527-533

Wagner PD. New ideas on limitations to VO2max (2000) Exerc Sport Sci Rev; 28: 10-14

IS LONG SLOW DISTANCE <LSD> REQUIRED FOR THE ELITE ENDURANCE ATHLETE?

MARTIN, D., BARRAS, M.

AUSTRALIAN INSTITUTE OF SPORT

Australian Track Cyclist Brad McGee won the individual pursuit (4km) at the World Championships in 2002 after completing more than 30,000 km of cycling that year. After racing in Grand Tours (~1400km per week) Brad and his team mates set a World Record in the 2004

Olympic Team Pursuit event (~4min duration). Similarly, track cyclist Shayne Kelly, completed more than 25,000km per year, with a large proportion of LSD training leading up to his three World Championship wins in the kilometre, an event that last ~1min.

Traditionally exercise physiologists have focused on cardiovascular and skeletal muscle adaptations in response to different types of training intensity. However, the effects of endurance training on brain chemistry and function has also become a topic of interest (Dishman, Berthoud et al. 2006). Because movement patterns and corresponding skeletal muscle and cardiovascular load during LSD is not competition specific, and because improvements in VO2max are greatest following high-intensity interval training, some have questioned the efficacy of LSD training (Helgerud, Hoydal et al. 2007).

Perhaps the primary benefits of LSD are brain derived. Joe Henderson, an early adopter of LSD terminology and training practices, focused on the mental compared to physical aspects of LSD. Henderson wrote that "LSD was less a training system than a recovery system. We raced better by staying healthier and happier, not by training harder" (Henderson 1969). Sport specific, high intensity training can lead to desired improvements in aerobic fitness. However this high intensity training is often associated with elevations in stress hormones, body heat, and high impact forces. Some researchers have identified high volumes of high intensity training as the primary cause of "overtraining" (Lehmann, Foster et al. 1993). Animal studies demonstrate that endurance trained animals are more resistant to unavoidable stressors that lead to "learned helplessness" (Greenwood and Fleshner 2008). Exercise can have centrally mediated anti-depressive effects (Dishman, Berthoud et al. 2006) and the effects of endurance exercise on neural structure and function is in different regions of the brain are beginning to be better described (Cotman, Berchtold et al. 2007).

These observations raise the possibility that LSD training may prepare the brain to be more receptive and tolerant to competition specific, high intensity training which then directly leads to improvements in endurance performance in sports like track cycling, rowing and swimming.

References

Cotman et al. (2007). Trends Neurosci 30(9): 464-72.

Dishman et al. (2006). Obesity (Silver Spring) 14(3): 345-56.

Greenwood and Fleshner (2008). Neuromolecular Med 10(2): 81-98.

Helgerud et al. (2007). Med Sci Sports Exerc 39(4): 665-71.

Henderson, J. (1969). Long slow distance. Tafnews Press.

Lehmann et al. (1993). Med Sci Sports Exerc 25(7): 854-62.

HIGH INTENSITY AEROBIC INTERVAL TRAINING: NECESSARY BUT INSUFFICIENT FOR OPTIMAL ENDURANCE PERFORMANCE?

SEILER, S.

UNIVERSITY OF AGDER

Introduction: The athlete´s laboratory is daily training, month after month. The outcome variable is performance. This Darwinian arena sets the stage for a self-organizing process of training optimization based on thousands of athlete-year iterations of the same "experiment" connecting training input and performance outcome.

How do elite endurance athletes train?

Descriptive studies from divergent sports competed over 4-120 min show remarkable consistency in a key training characteristic; about 75 to over 90% of endurance sessions / km / HR zone minutes are typically performed at intensity under VT1, or ≤2mM blood lactate (LSD). Billat et al. (1) reported that elite marathoners (2:06-2:12), performed 75% of their training kms as LSD, 4% at their lactate threshold (race intensity), and 20% above LT. About 85% of the training distance of elite Kenyan 10k runners is actually LSD (2). Elite rowers, who compete over ~6 minutes at ~100% VO2 max intensity, perform 80% or more of endurance training time at ≤ 2mM blood lactate (5, 10). Data from other sports concur (7,8). All of these groups also perform HIT, and often temporarily increase HIT loading in peaking periods, but clearly emphasize large volumes of LSD throughout the training year.

Training studies on athletes

Esteve-Lanao et al (4) compared performance changes in sub-elite runners after 20 weeks of training with either 80-12-8 % or 67-25-8% distribution of training below VT1, between VT1 and VT2, and over VT2. The athletes performing more LSD training improved 10.4 km cross-country time more (157 ± 21 vs 121± 13 seconds, $p<0.05$) than the "threshold training" group. After a 25 day detraining period at <10% full training, 18 national class rowers trained for 12 weeks, either "100% LSD" training (64-74% VO2 peak, n=9, LOW)) or 70% below LT and 30% between 84 and 100% VO2 peak (MIX, n=9). Performance and VO2peak improvement were significant but similar in LOW and MIX. Power at LT and at 4mM [La-] increased more in LOW (6).

Stress Avoidance or Adaptive Signalling Advantage?

Potential driving mechanisms for the emphasis on LSD in top performers may be based on substituting duration for intensity in order to minimize stress responses and overtraining risk (3, 9). Alternatively, low intensity, longer duration training alone or in combination with energy status may elicit cell-signalling advantages that promote greater muscular adaptation. Perhaps it is both.

References

1. Billat et al. Med Sci Sports Exerc. 33:2089-97, 2001.
2. Billat et al Med Sci Sports Exerc. 35:297-304, 2003.
3. Bruin et al. J. Appl. Physiol. 76:1908-
4. Esteve.Lanao et al. J. Strength Cond. Res. 21:943-49, 2007.
5. Fiskerstrand & Seiler. Scand. J. Med. Sci. Sports 14:303-19, 2004.
6. Ingham et al. Med. Sci. Sports Exerc. 40:579-84, 2008.
7. Schumacher & Mueller. Med. Sci. Sports Exerc. 34:1029-36, 2002.
8. Seiler & Kjerland. Scand. J. Med. Sci. Sports 16:49-56, 2006.
9. Seiler et al. Med Sci Sports Exerc. 39:1366-73, 2007.
10. Steinacher et al. Med Sci Sports Exerc. 30:1158-63, 1998.

10:15 - 11:45

Oral presentations

OP-BC01 Biochemistry

AN NMR-BASED METABONOMIC EXPLORATION OF CHANGES INDUCED BY HIGH-INTENSITY EXERCISE IN HUMAN URINE

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Introduction: Metabonomics represents a holistic, hypothesis-free, approach to the study of metabolic responses to various stimuli through powerful data acquisition and advanced data processing techniques that determine tens or hundreds of analytes simultaneously. Metabonomic data related to exercise are scarce.
Methods: Fourteen young, moderately trained, males were equally and randomly assigned to either of two exercise sessions commonly used in sprint training. Both sessions involved three sets of two 80 m sprints. The two sprints in each set were separated by either 10 s (in one session) or 1 min (in the other) of rest, and sets were separated by 20 min of rest in both sessions. Urine was collected before and 35 min after exercise and was subjected to proton nuclear magnetic resonance (1Η-NMR) spectroscopy. Spectra were acquired on a 600 MHz spectrometer and were analysed using multivariate statistical methods including principal component analysis (PCA), partial least squares discriminant analysis (PLSDA), orthogonal partial least squares (OPLS), and principal component variable grouping (PCVG). In PCA, data are represented in K-dimensional space and projected onto few principal components that describe the maximal variation of the samples. Score plots show the relation between data and explain the maximal variation. Loading plots display the relation between variables (signals) and the variables' importance. PLSDA, a supervised linear regression method in which samples are assigned to different classes, includes an added vector characterizing the classes. OPLS filters out variation, provides S-plots and helps in detecting main contributors with the highest confidence. PCVG groups signals according to variation patterns, thus aiding in assigning signals to compounds. Using Student's t test, one can identify the variables with the highest influence on the models.
Results: In both PCA and PLSDA score plots, clear-cut grouping of the samples was afforded according to time (pre- vs. post-exercise) and rest interval (10 s vs. 1 min). Loading plots and further statistical treatment assigned the differences to lactate, compounds of the Krebs cycle (citrate, succinate), amino acids (alanine, glycine, histidine, phenylalanine, threonine), products of branched-chain amino acid catabolism (oxoisocaproate, isovalerate), short-chain carboxylic acids (butyrate, propionate, formate), 3-hydroxybutyrate (a ketone body), hippurate, and dimethylamine.
Discussion: The present study illustrates the utility of holistic analytical methods (rather than targeted analysis of a small number of analytes) in the study of exercise metabolism. Samples differing in as little as the rest interval between repeated sprints can be classified and predicted. In this way, important biomolecules involved in exercise biochemistry can be identified and further studied. The fact that such methodology can be applied to biological material obtained non-invasively (urine) is an added value.

ANALYSIS OF HUMAN PROTEIN AND ENERGY METABOLISM: APPLICATION OF A NEW METHOD IN SPORTS

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For many years the analysis of nitrogen stable isotope ratio analysis at natural abundances of animal tissue and urinary components has been used in ecology. Isotope ratio mass spectrometry (IRMS) was used for the interpretation of nutritional status and metabolic conditions of individuals and populations as well as for the exploration of food webs. For humans it has been shown that anabolic or catabolic conditions can be identified by segmental analysis of hair. Due to isotopic fractionation during nitrogen metabolism within the body dietary and body nitrogen exhibit significantly different natural isotope ratios. Therefore variations in natural stable nitrogen isotope ratios of tissue or urea allow for the estimation of the proportion of metabolized body nitrogen in comparison to dietary nitrogen. IRMS of natural variations in nitrogen isotopes expand the scope of analytical methods for studies of energy and protein metabolism in addition to conventional tracer experiments. In contrast to tracer experiments studies at natural isotope ratios do no require administration of labeled substances. Whereas nitrogen isotope ratio analysis of urea provides information about actual metabolic conditions the analysis of human hair enables a retrospective examination of an individual's energy and protein metabolism.
By IRMS of segmented hair we were able to identify catabolic and anabolic conditions of an athlete's metabolism that resulted from varying nutritional statuses and levels of physical activity. Nitrogen isotope ratios of hair segments were significantly associated with energy balance and protein intake. Identical patterns of correlation between natural stable nitrogen isotope ratios and energy balance and protein intake were detected by IRMS of urinary urea for athletes prior, during and after a 24-hour bicycle race. In contrast to the period before the race, during the race an increased excretion of body nitrogen could be detected by IRMS for the athletes with the most negative energy balance and the lowest protein intake. After the race an inverse situation was reached as athletes excreted high amounts of isotopically light nitrogen due to high amounts of protein intake.
Variations in natural nitrogen isotope ratios of urea yield additional information about the human energy and protein metabolism when compared to excreted urea concentrations. The analysis of natural stable nitrogen isotope ratios of human tissue and urinary components is capable to provide additional insights into human energy and protein metabolism besides existing analytical techniques.

CYTOKINE PRODUCTION BY MONOCYTES, BUT NOT NEUTROPHILS, IS HAMPERED BY LONG TERM INTENSIVE TRAINING IN ELITE SWIMMERS

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Introdution

The relationship between exercise and infection incidence may depend on the intensity and duration of the activity. The aim of the present study was to investigate the influence of long term intensive training over the functional features of innate immune cells from high competitive level swimmers, particularly concerning the production of inflammatory mediators.

Methods: We adopted a single group repeated measures design to study 18 swimmers. Blood samples were collected after 36hours of rest from exercise at four times during the training season: 1) in the beginning of the winter season, after an off training period of 5/6 weeks (t0) 2) after 7 weeks of training (t1) 3) at the 25th week (t2) and 4) at 29th week of training. We looked at the production of IL-1beta, IL-6, IL-12, TNF-alpha and MIP-1beta by neutrophils and monocytes with or without stimulation. The blood samples were incubated in the presence or the absence of LPS and IFN-γ and the frequency of cytokine producing cells and the amount of each cytokine produced by cell were evaluated by flow cytometry. Monocytes were identified by the expression of CD33, CD14, HLA-DR and by their FSC and SSC characteristics. Neutrophils were identified by their particular FSC and SSC characteristics and the absence of HLA-DR.

Results: The frequency and absolute numbers of neutrophils and monocytes did not significantly change during the season with the exception of a decrease in the absolute numbers of monocytes between t0 and t1.

Without stimulation, no significant frequencies of cytokine producing cells were observed during the season with the exception of MIP-1beta. The 6h stimulation with LPS and IFN-γ, did not induce cytokine expression by neutrophils.

The number of cytokine producing monocytes significantly decreased during the season. Additionally the amount of IL-1beta, TNF-αlpha and MIP-1beta produced by these cells in response to stimulation also decreased during the training season. The differences were most noticeable between the first (baseline values) and second blood collections, corresponding to the initial increment of training volume. The exceptions were IL-6 and IL-12 that decreased from t0 to t1 but with no statistical significance.

Conclusions

Our results support the idea that long term intensive training may affect the ability of monocytes to produce important cytokines involved in immune function responses reducing the cells capacity to respond to acute challenges, like an infectious agent, possibly contributing to an elevated risk of upper respiratory tract infections (URTI) episodes in athletes.

ACTN3 R577X AND ACE I/D GENE POLYMORPHISMS IN BULGARIAN ATHLETES

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Strength and speed human biomotor capacities are strongly genetically inherited, thus further influence with external stimuli (physical loading) when lack predisposition is almost impossible. The aim of this study was to analyse ACTN3 R577X and ACE I/D gene polymorphisms among 70 professional athletes, divided into three groups according to a power-time model, and 44 controls from Bulgarian population. Correlations have been made between genotypes and physiological and biochemical parameters at anaerobic conditions, using Wingate test. Genotyping was performed by RFLP analysis. We found that ACTN3 RR and RX genotypes significantly correlate with Peak Power Output (p=0,0004 and 0,004), Relative Power Output (p=0,0002 and 0,002) and Fatigue Index (p=0,04). Lactate Dehydrogenase enzyme activity was also statistically different in genotype before and after the Wingate test. In contrast, there were no significant differences when referred to XX genotype athletes and controls of those parameters. R-allele frequency was higher in Endurance group (0,70) than Anaerobic Capacity Group (0,50) (p=0,004), contrary to the prevailing data showing association of endurance with X-allele. ACE ID genotype athletes have significantly different PPO and RPO from ID controls, an observation which was not present in DD and II genotypes. We therefore conclude that XX genotype is unfavourable for speed/power performance. Higher R-allele frequency may lead to positive influence over the power component in endurance sports. Furthermore, the presence of D-allele in ACE heterozygous persons also indicates favourable conditions for speed and strength capacities development.

References

Alvarez R, Terrados N, et.al. Genetic variation in the renin-angiotensin system and athletic performance. Eur J Appl Physiol 2000 82(1-2)

Druzhevskaya AM, Ahmetov II, Astratenkova IV, Rogozkin VA. Association of the ACTN3 R577X polymorphism with power athlete status in Russians. Eur J Appl Physiol 2008 103(6)

MacArthur DG, North KN. Genes and human elite athletic performance. Hum Genet 2005 116(5)

Montgomery HE, et al. The renin-angiotensin system and physical performance. Biochem Soc Trans. 2003 31(6)

Nazarov IB, Woods DR, Montgomery HE, Shneider OV, Kazakov VI, Tomilin NV, Rogozkin VA The angiotensin converting enzyme I/D polymorphism in Russian athletes. Eur J Hum Genet 2001 9:797 801

Norman B. et al. Strength, Power, Fiber Types and mRNA expression in Trained Men and Women with different ACTN3 R577X Genotypes. J Appl Physiol. 2009 106(3)

Roth SM, Hurley BF et al. The ACTN3 R577X nonsense allele is under-represented in elite-level strength athletes. Eur J Hum Genet 2008 16(3)

Taylor RR, Mamotte CDS, Fallon K, van Bockxmeer FM. Elite athletes and the gene for angiotensin-converting enzyme. J Appl Physiol 1999 87(3)

Woods D, et al.. Elite swimmers and the D allele of the ACE I/D polymorphism. Hum Genet 2001 108:230 232

Yang N., et al. ACTN3 genotype is associated with human elite athletic performance. Am J Hum Genet 2003 73(3)

ADIPOSE TISSUE TRIACYLGLYCEROL LIPASE ACTIVITY IN LEAN AND OBESE MEN DURING AEROBIC EXERCISE

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Introduction: Triacylglycerol lipase catalyzes the committed step in the hydrolysis of triacylglycerols stored in adipose tissue. In our laboratory, we have studied triacylglycerol lipase activity (TGLA) in the adipose tissue of lean men during aerobic exercise by using a novel assay of the actual enzyme activity against endogenous triacylglycerols (Petridou and Mougios 2002). Through the same assay, we have recently found a delayed lipolytic response to resistance exercise of obese compared to lean men, which may be due to the unusual increase in the antilipolytic hormone, insulin, in the obese during exercise (Chatzinikolaou et al. 2008). The aim of the present study was to monitor and compare acute changes in adipose tissue TGLA during aerobic exercise between lean and obese men.

Methods

Sixteen young men, 7 lean (BMI < 25 kg/m2, body fat < 15%) and 9 obese (BMI > 30 kg/m2, body fat > 20%), participated in the study. After an overnight fast, the participants cycled for 30 min at a heart rate of 130-140 beats min-1. Needle biopsy from the gluteal adipose tissue was performed at baseline and at 5, 10, 20, as well as 30 min of exercise. VO2 and respiratory exchange ratio (RER) were monitored continuously throughout exercise via a portable gas exchange analyzer. TGLA was determined by measuring the decrease of endogenous triacylglycerol concentration during incubation of the homogenized tissue (Petridou and Mougios 2002). Differences were examined through two-way (group by time) ANOVA with repeated measures on time. The level of statistical significance was set at 0.05.

Results: There was a significant interaction of group and time and a significant main effect of time. Adipose tissue TGLA increased significantly at 10 min of cycling in the lean and returned to baseline at 20 and 30 min, whereas, in the obese, TGLA was significantly higher than baseline only at 20 and 30 min of exercise. As a result, TGLA was higher in the obese at 20 and 30 min of exercise.

Discussion: Our data suggest sustained adipose tissue lipolysis during aerobic exercise in obese men, as opposed to a decline in lipolytic rate after an initial rise in lean men. Hormonal analyses are currently under way to elucidate the mechanism of the different lipolytic response to exercise between lean and obese men.

References

Chatzinikolaou et al. (2008) Diabetes Care, 31, 1397-1399.

Petridou A, Mougios V (2002) J Lipid Res, 43, 1331-1344.

PASSIVE HEATING AT HIGH CORE TEMPERATURE DOES NOT INCREASE PLASMA HSP72

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Heat shock protein 72 (HSP72) of molecular weight 72 kDa is found both in the intracellular environment where it is strongly induced by heat and other stressors, and in the plasma where it is upregulated by exercise (Ruell et al., 2006). In the intracellular milieu HSP72 has a protective role, making the organism more resistant to a second stressful event. The role of HSP72 in the plasma, however, is less clear. It appears to act as a danger signal to the organism and high extracellular levels may lead to the release of cytokines. It has been shown that passive heating to a temperature of 38.5°C in humans does not elicit an increase in plasma HSP72 (Whitham et al., 2007). The aim of the present experiment was to determine whether raising rectal temperature to 39.5°C by passive heating would increase plasma HSP72.

Methods: Eleven male subjects were recruited to participate in the experiment. Subjects were seated in a bath and warmed by immersion to the waist in water heated to 42 – 43°C. Rectal temperature was monitored using a dataTaker DT500 system. Blood samples were taken before and immediately after the bath. Blood was centrifuged and the plasma frozen at -85°C until analysis for plasma HSP72 using a commercial kit (Stressgen, Canada). Samples were diluted 1/5 before analysis. Blood was also taken to determine monocyte HSP72 in 6 subjects. 14 ml EDTA blood was mixed with 6% dextran and allowed to stand at room temperature for 45 min. The leukocyte rich layer was then layered over Nycoprep 1.098 (Axis-Shield, Norway) and centrifuged at 600g for 15 minutes, and the monocyte layer removed and washed, then frozen. The pellet was later extracted and analysed for HSP72 by Western blotting using the Stressgen antibody SPA-810.

Results and Discussion: The mean age and weight of the subjects was 27.6 ± 1.2 years and 71.4 ± 2.3 kg. Subjects sat in the bath for 74.4 ± 3.6min, and the maximum Trec reached was 39.7± 0.1° C. Mean plasma HSP72 was 1.0 ng/ml before the bath and 1.3 ng/ml immediately post (not significant). Thus, increasing core temperature to a higher level does not significantly elevate plasma HSP72. In contrast, in a subset of subjects, monocyte HSP72 was significantly higher 19 hours after the passive heating compared with resting levels. It appears that heat alone is not the trigger for the increase in plasma HSP72 after exercise.

Ruell, P. A., Thompson, M. W., Hoffman, K. M., Brotherhood, J. R., and Richards, D. A. 2006. Plasma Hsp72 is higher in runners with more serious symptoms of exertional heat illness. Eur. J. Appl. Physiol. 97, 732-736.

Whitham, M., Laing, S. J., Jackson, A., Maassen, N., and Walsh, N. P. 2007. Effect of exercise with and without a thermal clamp on the plasma heat shock protein 72 response. J. Appl. Physiol. 103, 1251-1256.

10:15 - 11:45

Oral presentations

OP-PH13 Physiology 13

INTRALUMINAL ADENOSINE: MECHANISMS OF ACTION AND POTENTIAL ROLE DURING EXERCISE HYPERAEMIA IN HUMANS

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The present study examined the contribution of adenosine to exercise hyperaemia and the mechanisms by which intraluminal adenosine induces vasodilatation. We measured leg haemodynamics before and during intra-arterial adenosine infusion (0.30±1 µmol min-1 kg leg mass-1; n=13;) In addition, plasma adenosine concentrations were determined in plasma dialysate sampled with a novel type of intravascular microdialysis probes during rest and one-legged knee-extensor exercise (16±3 W and 31±6 W; 20 and 40 % of peak power; mean ± S.E.M.; n=8). Leg blood flow (LBF) was measured with the constant-infusion thermodilution method.

Adenosine was infused alone (CON) or during infusion of the nitric oxide (NO) synthase inhibitor (L-NMMA) and/or the cyclooxygenase inhibitor (indomethacin (INDO)). During adenosine infusion, LBF increased from a basal value of 0.33±0.03 l min-1 to 2.65±0.27 l min-1. When adenosine was co-infused with L-NMMA, INDO, or L-NMMA + INDO the adenosine-induced increase in LBF was reduced ($P<0.05$) by 35±8, 50±3 or 61±8 %, respectively. Exercise increased LBF from 0.21±0.04 to 2.35±0.20 and 4.00±0.53 l min-1. Arterial plasma [adenosine] was 52±11 nM at rest and 38±13 and 67±27 nM during the two exercise intensities, respectively. Similarly, venous plasma [adenosine] was 32±12, 20±7 and 16±4, respectively. Interestingly, when accounting for LBF, the arterial plasma delivery of adenosine

increased (P<0.05) from 11±4 nmol min-1 at rest to 337±167 nmol min-1 during exercise at ~30 W. Similarly, the venous plasma efflux of adenosine increased from 3±1 nmol min-1 at rest to 79±18 nmol min-1 during exercise.

These results show that a large part of the vasodilatory effect of intraluminal adenosine is mediated by formation of NO and prostaglandins. Furthermore, the fact that the reduction in adenosine-induced vasodilatation was greater with prostaglandin inhibition than with NO inhibition, and that the effects of prostaglandin and NO inhibition were not additive, indicates that NO formation in part may be mediated by prostaglandins. Finally, plasma adenosine concentrations during exercise, shows an increase in the arterial plasma adenosine delivery, but to what extent this contributes to skeletal muscle blood flow warrants further investigation.

Support: Lundbeck Foundation.

ERYTHROCYTE CONTROL OF SKELETAL MUSCLE CIRCULATION: INSIGHTS FROM STUDIES IN MITOCHONDRIAL MYOPATHY PATIENTS

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NEUROMUSCULAR RESEARCH UNIT 3342

Introduction: Oxygen (O2) extraction and utilization is impaired in exercising skeletal muscle of patients with mutations of mitochondrial DNA (mtDNA), a phenomenon hypothesized accompanied by hyperkinetic circulatory response. Implications of exaggerated muscle perfusion in concert with high levels of oxyhemoglobin, suggests that impaired mitochondrial function is associated with dysfunction in erythrocyte-derived vascular signalling or -response. In this study, erythrocyte- and vascular ATP control of skeletal muscle blood flow was investigated in patients with mutations of mtDNA.

Material and methods: Ten patients with mutations of mtDNA and ten matched healthy control subjects were recruited for the study. Leg blood flow (LBF) and femoral arterial and venous blood oxygenation and plasma ATP were examined at rest, during severe systemic hypoxia, hyperoxia, intrafemoral ATP infusion, and during passive and dynamic one-legged knee-extensor exercise.

Results: During hypoxia, hyperoxia, ATP infusion and passive exercise, erythrocyte oxygenation, plasma ATP, LBF and VO2 response were similar in patients with mtDNA mutations and healthy subjects. During dynamic submaximal and maximal knee-extensor exercise, however, LBF and vascular conductance were higher and leg O2 extraction and -VO2 lower in the patients vs. healthy subjects. The increased LBF and arterial and venous O2 content was accompanied by enhanced venous and arterial plasma ATP and norepinephrine concentrations.

Conclusions: The appropriate hemodynamic adjustments during severe hypoxia and ATP infusion in patients with mtDNA mutations, suggest that erythrocyte- and vascular endothelial blood flow regulating mechanisms are intact in these conditions. The increased ATP- and LBF levels in concert with unchanged oxyhemoglobin in the patients with mtDNA mutations, suggest that ATP, at least in part, is responsible for the hyperkinetic muscle perfusion in these conditions. Moreover, the findings demonstrate that, at least in patients with mitochondrial dysfunction, O2 offloading from hemoglobin is not obligatory for plasma ATP release.

EFFECTIVENESS OF INTERMITTENT TRAINING IN HYPOXIA COMBINED WITH LIVE HIGH/TRAIN LOW

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Introduction: Many elite athletes undertake some form of altitude training in an attempt to gain small improvements in fitness and performance that provide a competitive advantage. Overall, natural or simulated live high/train low (LHTL) can offer ~1-2% improvements in performance [1]. For athletes who cannot undertake several weeks of LHTL, an alternative approach of performing some but not all training sessions in hypoxia (train high, TH) can elicit hypoxia-induced adaptations and allow athletes to maintain high training loads [2]. No previous study has addressed a combined approach of LHTL plus TH (LH/TH) to enhance performance gains in a single altitude camp.

Methods: Seventeen well-trained male (VO2max: 68.6 ± 5.0 ml/kg/min, mean ± SD) and female (VO2max: 55.5 ± 3.1 ml/kg/min) runners trained in normobaric hypoxia for 3 weeks (2200 m, 4 times per week). During this period the LH/TH group (n=8) spent 14 h/d in a hypoxic chamber (3000 m) while the TH group (n=9) lived near sea-level (600 m). All other training was performed near sea-level (600 m). Laboratory (treadmill, VO2max) and field (3-km time trial) performance tests were completed before, and within 2-4 days of altitude training. A third 3-km time trial was completed 2 weeks later. Haemoglobin mass (Hbmass) was measured twice before, weekly and one week after altitude training. Data were log-transformed for the analyses to reduce bias arising from non-uniformity of error. Mean percent effects and their 90% confidence limits (CL) were estimated via the unequal-variances t statistic computed for change scores between pre- and post-tests [3].

Results: The LH/TH group substantially improved VO2max (4.8%; ±2.8%, mean; ±90% CL), Hbmass (3.6%; ±2.4%) and time trial performance (-1.1%; ±1.0%) immediately after altitude training. The TH group improved VO2max (2.2%; ±1.8%), with only trivial changes in Hbmass (-0.7%; ±2.0%) and time trial performance (-0.1%; ±1.0%). The magnitude of improvements in the LH/TH group was substantially greater than TH: improved VO2max (2.6%; ±3.2%), increased Hbmass (4.3%; ±3.2%), and faster time trial performance (-0.9%; ±1.4%). Neither group substantially improved 3-km time trial two weeks after altitude training compared with the pre-test (LH/TH: -0.4%; ±1.3%, TH: -0.6%; ±1.1%).

Conclusion

Three weeks of combined LH/TH can induce substantial increases in VO2max and Hbmass, and trivial to small improvements in time trial performance. Three weeks of TH alone was sufficient to improve VO2max, but Hbmass and time trial performance were essentially unchanged. LH/TH elicits greater enhancements in physiological capacities that underpin competitive performance compared with TH, however, transfer of these physiological adaptations to 3-km time trial performance was more variable.

References

1. Levine BD, Stray-Gundersen J, Gore CJ and Hopkins WG (2005). J Appl Physiol 99:2053-2057

2. Hoppeler H, Klossner S and Vogt M (2008). Scand J Med Sci Sports 18 Suppl 1:38-49

3. Hopkins WG (2006). Sportscience 10:46-50.

LACTATE RELEASE IN EXHALED BREATH CONDENSATE AT REST AND DIFFERENT LEVELS OF EXERCISE IN YOUNG AND HEALTHY SUBJECTS

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Background: Traditionally, lactate is measured from arterialized earlobe blood samples. Currently developed micro enzyme detectors permit a non-invasive measurement of lactate in exhaled breath condensate (EBC). This method might be interesting for the combined use with spirometric measurements of O2 consumption and CO2 release. In order to get inside into the correlation of lactate concentration or lactate release in EBC and in lactate blood concentrations, we investigated both parameters at rest and at different levels of exercise in a group of young and healthy subjects.

Methods: The study group 16 healthy subjects consists of 7 females and 9 males (23.3 ± 1.5 years, 175 ± 8,4 cm height, 68.9 ± 9.2 kg body weight). During resting conditions as well as at 60%, 75%, and 90% of maximal work capacity (each lasting for 5 minutes) on a cycle ergometer 100 L exhaled air along with capillary blood samples from the earlobe were collected under stationary load conditions. EBC was obtained by cooling the exhaled air volume to -20°C. The condensates were analysed using an ECo-Check amperometer (Viasys Health Care). Lactate measurements were performed using a bi-enzym-sensor after lactate oxidase induced oxidation of lactate to pyruvate and H2O2. The rates of expiratory release of lactate in nmol/min were calculated from the concentrations of lactate in the EBC, the EBC volume and the time of collection. A functional relation of lactate release and lactate concentration of arterial blood was computed.

Results: At rest lactate concentration in arterialized blood was 0.92 ± 0.31 mmol/L. At a resting ventilation of 12.0 ± 3.8 L/min, collection time (Ts) for 100 L exhaled air, was 8.9 ± 2.6 min, and 1.86 ± 0.66 ml EBC were obtained. In EBC lactate concentration was 24.5 ± 9.4 µmol/L, lactate release rate was 4.8 ± 1.8 nmol/min.

At 90% maximal work capacity (external load 200 ± 20 Watt), blood lactate concentration increased to 8.4 ± 1.6 mmol/L and ventilation increased to 83.8 ± 16.0 L/min. EBC collection time decreased to 4.7 ± 2.1 min ($p<0.01$) and 1.30 ± 0.46 ml EBC were obtained. Lactate concentration in EBC increased to 41.7 ± 11.7 µmol/L ($p<0.01$), and lactate release in EBC increased to 12.1 ± 4.7 nmol/min ($p<0,01$). The correlation of lactate release in exhaled air and lactate concentration in arterialized blood can be described by an exponential function (y = 9,93*e^0,144x, r = 0,64, a<0,01).

Conclusions: Release of lactate was found in exhaled breath condensate already under resting conditions. At increasing levels of external load, an increase in the lactate concentration was found in arterialized blood as well as in EBC. This method might be used in future for the analysis of lactate and metabolites during exercise.

CEREBRAL VASCULAR RESPONESE TO CO2 DURING VOLITIONAL EXHAUSTION

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CEREBRAL VASCULAR RESPONESE TO CO2 DURING VOLITIONAL EXHAUSTION

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Introduction: Cerebral vascular response to PaCO2 change was established with regional cerebral blood flow (rCBF) measurement in resting condition. During exercise the middle cerebral artery mean blood velocity (MCA Vmean) has been alternatively induced as index of rCBF because its capability for real time monitoring. The aim of this study was to evaluate CO2 reactivity during incremental exercise by spontaneous change in PaCO2 using MCA Vmean and to compare the results with the previous studies.

Methods: Eight healthy young male (mean ± S.D, ; age 21 ±1years) were participated in the present study. During incremental exercise tests using cycle ergometer, respiartory gas exchange was measured by an on-line analyzer (CPET, Cosmed , Italy) and MCAV mean was measured by transcranial Doppler (Companion III, Nicolet Vacular, USA). Exercise intensities at anaerobic threshold (AT), respiratory compensation threshold (RCT) and volitional exhaustion (Max) were determined and PaCO2 was estimated using the equation described by Jones and colleagues (ePaCO2).

Results: At baseline ePaCO2 was 38.4±3.3 mmHg and increased significantly to 43.6±4.9 mmHg at RCT ($P<0.001$). At Max, ePaCO2 decreased to 39.8±4.1 mmHg from RCT ($P<0.01$). MCA Vmean also increased from baseline by 39.4±21.1 % ($P<0.01$) at RCT and decreased at Max from RCT by 14.9±13.0 % ($P<0.05$). Since nearly stable hypercapnic condition was recognized between AT and RCT, cerebral vascular response to CO2 in hypercapnia was calculated using the change in ePaCO2 and MCA Vmean between baseline and the hypercapnic state, whereas the response to CO2 in hypocapnia was calculated between the hypaercapnia and Max. The cerebral vascular responses to CO2 were 5.0±1.8 % and 6.1±1.5 % in hypercapnia and hypocapnia, respectively.

Discussion: Cerebral vascular response to PaCO2 in hypercapnia in the present study was nearly identical to that of resting condition (Peebles et al 2007, Valdueza et al 1999) but the response in hypocapnia was higher than that of previous reports. This enhanced CO2 reactivity corresponded to the previous study (Rasmussen et al 2006). Although the present study has limitation that the steady state of hypo- and hypercapnia was not strictly induced, it speculated that rCBF would decreased during volitional exhaustion more than expected from change in PaCO2 for resting condition.

References

Jones N, Robertson D, Kane J (1979). J Appl Physiol, 47, 954-960 Peebles K, Celi L, McGrattan K, Murrell C, Thomas K, Ainslie P. (2007). J Physiol, 584, 347-357.

Rasmussen P, Stie H, Nielsen B, Nybo L. (2006). Eur J Appl Physiol 96, 299-304.

Valdueza J, Draganski B, Hoffmann H, Dirnagl U, Einhaupl K. (2000). Stroke, 30, 81-86.

DO SKELETAL MUSCLE MITOCHONDRIA PLAY A ROLE IN THE REDUCTION OF VO2MAX WITH MODERATE HYPOXIA IN ENDURANCE ATHLETES?

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HÔPITAL CIVIL AND UNIVERSITÉ DE STRASBOURG

Introduction: Hypoxic environments have repeatedly been observed to depress VO2max during whole-body exercise in humans (Fulco et al., 1998). The mechanisms behind the wide interindividual variability of the reduction of VO2max with hypoxia are largely unknown, especially in a homogenous group of athletes (Lawler et al., 1988; Robergs et al., 1998). The present study investigates the role of cardiac output (Q), arteriovenous oxygen difference (DavO2) and mitochondrial function in the limitation of VO2max with moderate hypoxia (FIO2=14.5 %) in a homogenous group of endurance athletes.

Methods: 15 endurance trained athletes (normoxic VO2max =58.6±1.7 ml/min/kg) performed maximal cycle incremental tests to assess VO2max, Qmax and DavO2max in normoxia and moderate hypoxia. Muscle biopsies of vastus lateralis were taken one week before the cycling tests to evaluate the maximal muscle oxidative capacity (Vmax) and the sensitivity of mitochondrial respiration to ADP (Km) with and without creatine (Cr) on permeabilized muscle fibers in situ.

Results: Athletes exhibiting the largest reduction of VO2max in moderate hypoxia (SL group: -18±2%) suffered from both significant reductions in Qmax (-4±1%) and DavO2max (-14±2%). Athletes who tolerated well hypoxia, as attested by a significantly smaller drop of VO2max with hypoxia (ML group: -7±1%), also displayed a blunted Qmax (-9±2%) but, conversely, were able to maintain DavO2max (+1±2%;). Even though Vmax was similar in the two experimental groups, the smallest reduction of VO2max with moderate hypoxia was observed in those athletes presenting the lowest apparent Km for ADP in presence of creatine (Km+Cr).

Conclusion

In already trained athletes with high muscular oxidative capacities, the qualitative rather than quantitative aspects of the mitochondrial function may constitute a limiting factor to aerobic ATP turnover when exercising in lower oxygen availability, presumably through the functional coupling between the mi-CK and ATP production. This study suggests a potential role for peripheral factors, including intrinsic mitochondrial properties, in determining the tolerance to hypoxia in maximally exercising endurance-trained athletes.

References

Fulco CS, Rock PB & Cymerman A. (1998). Maximal and submaximal exercise performance at altitude. Aviat Space Environ Med 69, 793-801.

Lawler J, Powers SK & Thompson D. (1988). Linear relationship between VO2max and VO2max decrement during exposure to acute hypoxia. J Appl Physiol 64, 1486-1492.

Robergs RA, Quintana R, Parker DL & Frankel CC. (1998). Multiple variables explain the variability in the decrement in VO2max during acute hypobaric hypoxia. Med Sci Sports Exerc 30, 869-879.

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- Ventura-Clapier R: U-769 INSERM, Faculté de Pharmacie, Châtenay-Malabry, France

10:15 - 11:45

Oral presentations

OP-BM01 Biomechanics 1

EFFECTS OF CONTRACTION ON PATELLAR TENDON MOMENT ARM AND FORCES DURING ISOMETRIC AND ISOKINETIC KNEE EXTENSION

BALTZOPOULOS, V., TSAOPOULOS, D., RICHARDS, P.J., MAGANARIS, C.

*MANCHESTER METROPOLITAN UNIVERSITY; *UNIVERSITY HOSPITAL OF NORTH STAFFORDHSIRE NHS TRUST*

Accurate values of moment arms are of vital importance for accurate calculation of internal muscle-tendon and joint forces. During knee joint extension, patellar tendon (PT) moment arm length (dPT) has been quantified from cadaveric data or in vivo imaging at rest. However, moment arms change with muscle contraction (Tsaopoulos et al., 2007) and it is well recognized that moment arms at the time the load is exerted are required for the realistic estimation of muscle and joint forces. The purpose of this study was to calculate the PT force using contraction-specific moment arm measurements during isometric, isokinetic concentric and eccentric knee extensions.

Eleven healthy males (age: 25.3 years, height: 178.4 cm, body mass: 72.3 kg) volunteered for this study after signing informed consent and radiation risk information forms. The maximum radiation exposure time was limited to 15 s for each person giving a maximum effective radiation dose <1.5 microSv. The experimental procedures were approved by the local ethical committee. Right knee extensions were performed on a Cybex Norm that was fitted with an extended input arm, to allow a gap (45 cm) between the chair and the main unit to accommodate the image intensifier of a GE FlexiView 8800 C-arm X-ray video system that was recording at 25 Hz. Before each trial, the most prominent point of the lateral femoral epicondyle was aligned with the dynamometer axis of rotation using a special laser pointing device. The alignment was performed at 90 deg of knee flexion under submaximal muscle contraction conditions. On the X-ray images recorded the dPT was measured as the perpendicular distance from the tibiofemoral contact point to the PT action line. PT force was calculated: 1) by dividing the actual maximum joint moment during isokinetic and isometric knee extensions with the contraction-specific dPT measurements and 2) by dividing the actual maximum joint moment during isokinetic and isometric knee extensions with the resting-state dPT data.

The differences between resting-state and contracting state moment arm length measurements yielded different estimates of PT force. The use of resting-state dPT values resulted in overestimated PT force by ~273 N (5.8%) and ~764 N (26%), during maximum isometric contractions at 90 and 20 deg of knee flexion angle respectively, compared with calculations using dPT values during MVC. The use of

dPT values from passive extension (resting state) lead to overestimated PT force by ~383 N (15%) and ~521 N (15%), during maximum concentric and eccentric knee extensions respectively.

The erroneous PT force values would overestimate stress of the PT and can lead to erroneous conclusions regarding the risk of tendon injury during daily living activities. These findings also indicate that significant errors may have been made by previous studies in estimations of PT force and stress using resting dPT measurements.

References

Tsaopoulos et al. (2007). J. Biomech. 40, 15, 3325-32.

CADAVERIC VERSUS ULTRASONOGRAPHIC ASSESSMENT OF THE LONG HEAD OF BICEPS FEMORIS AND SEMINTENDINOUS MUSCLE ARCHITECTURE

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ARISTOTLE UNIVERSITY OF THESSALONIKI

The purpose of this study was to document and compare the architectural parameters (fascicle length, angle of pennation, muscle thickness, tendon length) of the long head of biceps femoris (BFlh) and semitendinosus (ST) muscles measured from direct dissection as opposed to those measured using ultrasound (US). The BFlh and ST were examined bilaterally in 6 legs from 3 male cadavers (mean age 72±6, range 65±83 y). Data were obtained from direct measurement and ultrasonographic scans of cadaveric specimens. With the cadavers in the prone position, US scans were taken from proximal, mid-belly and distal positions of each muscle. From the recorded US images, the fascicle length, pennation angle and muscle thickness were measured. Following US imaging, the muscles were isolated and dissected from proximal to distal location in the direction of muscle fibers. Subsequently, the pennation angle and muscle thickness were measured. Bundles of fascicles were isolated and their length was measured. Two-way analysis of variance designs were used to compare fascicle length, angle of pennation and muscle thickness at matched locations in both groups. The results showed that the BF had a fascicle length of 7.50 ± 1.98 cm to 8.60 ± 2.31cm, a pennation angle ranging from 12.34 ± 2.76° to 15.03 ± 3.32° and a muscle thickness of 2.41 ± 0.41 cm to 3.58 ± 0.76 cm. The ANOVA results indicated that there were non-significant differences between US and direct measurement in all measured variables ($p > 0.05$). The results showed that the ST had a fascicle length of 17.23 ± 3.11cm to 21.58 ± 3.25 cm, a pennation angle ranging from 12.16 ± 2.98° to 14.96 ± 3.34° and a muscle thickness of 1.21 ± 0.40 cm to 2.66 ± 0.62 cm. The ANOVA results indicated that there were non-significant differences between US and direct measurement in all measured variables ($p > 0.05$). Compared with cadaveric measurements, the US variables displayed an error which is less than 5% for length measures and 3-5% for pennation angles. Pearson correlation coefficients showed a high agreement ($r > 0.90$) between the two techniques. The present results showed that determination of muscle architecture in BF and ST muscles using ultrasound is a valid technique, despite the complicated architecture of these muscles. The application of US for modeling human hamstring muscle at least under resting conditions is guaranteed.

FEMALES RUN DIFFERENT THAN MALES - IMPLICATION FOR RUNNING INJURIES?

GEHRING, D., MORNIEUX, G., FLEISCHMANN, J., GOLLHOFER, A.

UNIVERSITY OF FREIBURG

Introduction: Epidemiological studies suggest that specific running injuries occur with a higher frequency in females. Women have shown to be more prevalent to the most common running injury, the patella femoral pain syndrome (Taunton et al., 2002). As previous results suggest, that knee joint loading is deemed to be a risk factor for specific running injuries like the patella femoral pain syndrome (Stefanyshyn et al., 2006), the aim of the present study was to determine gender differences in knee joint biomechanics in experienced runners.

Methods: 3D-kinematics (Vicon) and kinetics of the knee joint were measured in 15 male and 15 female experienced runners at a running speed of 4m/s. Simultaneously, the activation of quadriceps and hamstrings muscles were determined by the use of telemetric electromyography.

Results: Females flexed their knees 5° less than males. While the males exhibited a clear knee joint adduction during the complete stance phase with peak values of 7° in average, the females showed a neutral or even abducted knee joint alignment with a peak abduction of 3° ($p < 0.001$). The maximal knee joint adduction moments were comparable between genders. However, the females had a significantly higher knee joint adduction loading ($p < 0.01$) during the braking phase, which was mainly caused by the multiple higher medial ground reaction forces than in males. Compared to males, the females' quadriceps activation was pre-shifted (about 15ms) and peaked in the braking phase.

Discussion: In accordance with previous studies females demonstrated a significant greater knee joint abduction (Ferber et al., 2003) which was combined with increased adduction moments in the initial braking phase. As frontal plane loading is associated with specific running injuries like the patella femoral pain syndrome (Stefanyshyn et al., 2006), the results of the present study may help to explain why females are more prone to this kind of injury. Furthermore, the pre-shifted quadriceps activation, related to the reduced knee flexion and therefore stiffer knee joint configuration in females, indicates that gender differences in knee joint control are even present in the sagittal plane.

References

Taunton JE, Ryan MB, Clement DB, McKenzie DC, Lloyd-Smith DR, Zumbo BD. (2002). Brit. J. Sports Med., 36, 95-101.

Stefanyshyn DJ, Stergiou P, Lun VMJ, Meeuwisse WH, Worobets JT. (2006). Am. J. Sports Med., 34, 1844-1851.

Ferber R, McClay Davis I, Williams DS. (2003). Clin. Biomech., 18, 350-357.

RELATIONSHIP OF REARFOOT ANGULAR VELOCITY TO VERTICAL AND LEG STIFFNESS IN RUNNING

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NORWEGIAN SCHOOL OF SPORT SCIENCES

The mass-spring model is used to describe the mechanical behavior of the lower extremity during running. At the middle of stance the spring is maximally compressed which is associated with maximal pronation, commonly described by rearfoot eversion. Few have looked at the relationship between foot motion and position to leg stiffness (Viale 1998), but not angular velocity. The current study which focuses on angular velocity was part of a larger project evaluating the influence of lower extremity joint kinematics on leg and vertical stiffness.

Methods: 15 female subjects were all tested in running along a 20 meter running path at a target speed 3.8m·s-1. Three dimensional kinematic data were obtained from reflective markers on the lower extremity using a pro-reflex motion capture system (Qualisys AB, Sweden). Three-dimensional kinetic data were obtained using three floor mounted force plates (AMTI, USA) in sequence placed midway on the runway. Three or more successful trials within a 5% range of 3.8m·s-1 were analyzed using MatLab and Visual 3D. Vertical and leg stiffness were calculated based on the method by McMahon and Cheng (1990). Rearfoot angle was calculated from tracking markers in Visual3D as the relative angle between the foot and shank segments with 0° taken as the positioning in a static standing trial. Rearfoot eversion (EvROM) was the angular change from heel strike to maximum value. EvROM was then divided by time to maximum value for rearfoot eversion angular velocity (EvAngVel). The relationship between EvAngVel and vertical and leg stiffness were evaluated using Pearsons product moment correlation (r).

Results: Mean EvAngVel was 137.9±42.78°·s-1. EvAngVel was not significantly correlated with vertical stiffness (31.8±4.7kN·m-1) ($r = -0.45$, $p > 0.05$) and leg stiffness (10.3±1.5kN·m-1) ($r = -0.46$, $p > 0.05$).

Discussion: The mass-spring model applies to the entire lower extremity as a system which collectively stores and returns elastic energy. This model does not identify which structures, joints or planes of motion that would be responsible for this. Foot kinematics is important in shock absorption during impact with the ground, and the angular velocity of foot motion could partially help explain the elastic properties of the leg-spring in running. EvAngVel was the only angular velocity analyzed, and was not found to be significantly correlated with neither leg nor vertical stiffness, however both were approaching significance (critical r=0,482). Motion in other planes, as well as other joints in the lower extremity, needs to be analyzed to better understand leg stiffness.

Conclusion: EvAngVel was not significantly correlated with neither leg nor vertical stiffness.

References

McMahon TA & Cheng GC (1990) The mechanics of running: how does stiffness couple with speed. J Biomech 23:65-78

Viale F et al. (1998). Leg stiffness and foot orientation in running. Foot & Ankle 19:761-765

COMPARISON OF LOWER LIMB JOINTS LOAD BETWEEN NORDIC WALKING AND NORMAL WALKING

TAKEDA, M., KOIZUMI, T., TSUJIUCHI, N., MURODATE, Y.

INSTITUTE OF EXERCISE PHYSIOLOGY

Nordic Walking is a form of exercise born in Finland in which a walker uses a pole in each hand much like cross country ski training. Recent years have seen a worldwide increase in people participating in Nordic Walking. It has been reported that Nordic Walking has a lot of physiological effects such as higher caloric expenditure, heart rate, oxygen consumption and muscular activity particularly in arms than in normal walking1,2) with facilitate mode of exercise. For elderly people, it is desirable to have high physiological advantages with reduced lower extremity load during healthy walking. In these preliminary studies, however, the conclusions in the reducing load effects on the lower limb joints in Nordic Walking than in normal walking has been contradictory (Wilson: -4.4%, Hansen: No effect) 3,4). The ambiguity in the studies seems to be caused by their experiments conditions. In the experiments that compared for Nordic Walking and Ordinary Walking, they have controlled for the only walking speed, not for the stride length. Stride length must have the possibility to affect the load of lower limb joints during both walking.

In this study, 8 healthy male subjects performed Nordic Walking and Ordinary Walking with three walking conditions i.e., i) comfortable walking speed and stride length, ii) controlled walking speed, iii) controlled walking speed and stride length, in order to investigate the effects of reducing load at joints of lower extremity during Nordic Walking. To evaluate the knee joint load on each walking, bone-to-bone force was calculated by means of the inverse dynamic approach combining the anthropometric, kinematics and ground reaction force with body motion data of subjects measured by a three dimensional motion analysis system. In this study, it was revealed that a significantly higher value in the bone-to-bone force on the knee in Nordic Walking in comfortable walking speed and stride length i), and no significant difference in the bone-to-bone force on a walking condition in ii) and iii). On the other hand, bone-to-bone force in Nordic Walking decreased significantly accompanying with decrease in stride length under the speed level of a comfortable stride length of each subject. It has been concluded that Nordic Walking had a load reduction effect at knee with short stride length.

1. Rodgers CD, Vanheest JL, and Schachter CL. Energy expenditure during submaximal walking with Exerstrider.，Med. Sci. Sports Exerc.，Vol.27，No.4，607-611 (1995).

2. Koizumi T, Tsujiuchi N, Takeda M, and Murodate Y. Physical Motion Analysis of Nordic Walking，The Engineering of Sport 7，Vol.1，379-385 (2008).

3. Willson J, Torry MR, Decker MJ, Kernozek T, and Steadman JR，Effects of walking poles on lower extremity gait mechanics，Medicine Science in Sports Exercise，Vol.33，No.1，142-147 (2001).

4. Hansen L，Henriksen M，Larsen P, and Alkjaer T: Nordic Walking dose not reduce the loading of the knee joint，Scand J Med Sci Sports，Vol.18, Issue 4，436-441 (2008).

PROFILING ROWING RACES AND CREWS USING VISUALISATION TECHNIQUES TO ASSESS MULTI-DIMENSIONAL BOAT MOTION

DRAPER, C., TING, K.M., LIU, T., RICE, A., BUCKLEY, R.

1. AUSTRALIAN INSTITUTE OF SPORT, 2. MONASH UNIVERSITY, AUSTRALIA

Introduction: Rower, blade, boat and water are in continual interaction during the rowing stroke and must be highly coordinated to achieve international medal winning performances. Rowing is a strength endurance sport. Its continuous, cyclic and closed skill movement must be repeated more than 220 times in a race at a high strength level. Technical proficiency is essential to achieve a high performance, as it is of little value to develop strength, endurance and physiological capabilities if these qualities cannot be transferred into boat speed. As the performance gap between boats narrows (races are often won ≤0.1% over 2000m), and the training loads reach the athletes' physical limits, there is a need for further research to find new and innovative ways to help coaches and athletes improve individual racing strategies to maximise boat velocity. Measuring multi-dimensional boat performance during racing was found valuable (Draper 2008), however the data presentation lacked on profiling boat-related variables in relation to crew performances and world's best times. Therefore, the aim was to analyse racing strategies linked to the rowers' capability using visualisation techniques.

Methods: In the last three years (at World Championships, Olympics) 45 Australian boats in 18 boat categories were equipped with the MinimaxX tracking device (Catapult Innovations) during racing, collecting boat velocity, 3D boat acceleration and 3D boat orientation. The data were analysed, the stroke by stroke (sbs) data detected using proprietary software. Multi-dimensional graphical sbs time scatter

and polar plots with a defined colour scheme were used to profile performance-related thresholds or different race phases for each boat variable to assess stroke consistency patterns in relation to boat velocity.

Results: 3D time scatter plots revealed a sbs consistency of boat-related intra-stroke patterns in regards to technique, performance and race progress. Lower intra-stroke pattern variations (propulsive boat acceleration) related highly to better boat performances. Polar plots appeared more meaningful for displacement-related variables (transverse boat acceleration, yaw).

Discussion/Conclusion

Colour-coded multi-dimensional graphical displays were found to be a powerful analysis tool to profile comprehensive sbs changes of several characteristic boat-related curve patterns in relation to the sbs average boat velocity and stroke rate throughout a rowing race. The results underscored that meaningful visualisation techniques are crucial tools to assist coaches/athletes in assessing and fine-tuning racing strategies. These displays are being utilised for training and testing in optimising crew and individual technique parameters and influencing boat motion.

Literature

Draper C, Rice T, et al (2008). Characteristic curve patterns of 3D boat motion in international rowing races in all boat categories. 13th Annual Congress of the European College of Sport Science, Estoril/ Portugal

12:00 - 13:15

Plenary sessions

PS-PL02 Physical Education - Bildung or Health promotion?

PHYSICAL EDUCATION'S ROLE IN PHYSICAL ACTIVITY AND HEALTH PROMOTION

MCKENZIE, T.L.

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Despite the documented benefits of physical activity, reports from around the world suggest that children and adolescents neither engage in sufficient activity for health purposes nor do they develop the appropriate skills for a lifetime of active living. The World Health Organization suggests that schools are one of the most cost effective investments a state or nation can make to improve education and health simultaneously. Additionally, physical education is the only setting where some children, particularly those from poor families, can accrue vigorous physical activity and learn important generalizable movement skills. Physical education is also one of only five interventions strongly recommended for increasing physical activity by the US Task Force on Community Preventive Service.

Physical education programs in schools have the potential to promote of healthy, active lifestyles by providing children with some of their recommended physical activity, increasing their physical fitness levels, and teaching them generalizable movement and behavioral skills. If "exercise is medicine" as suggested by the American College of Sports Medicine, physical education is indeed the pill not taken!

Numerous barriers, including limited curriculum time allocations, low subject status, and inadequate resources hinder physical education from playing a major role in providing and promoting physical activity. This paper profiles physical education as it relates to physical activity promotion, describes its current status from a contextual standpoint, and concludes with recommendations for improving it.

References

McKenzie TL (2007). The preparation of physical educators: A public health perspective. Quest, 59, 346-357.

McKenzie TL, Kahan D (2008). Physical activity, public health, and elementary schools. The Elementary School Journal, 101, 171-180.

McKenzie TL, Lounsbery M (2009). School physical education: The pill not taken. American Journal of Lifestyle Medicine. [Epub ahead of print]

Sallis J, McKenzieTL. (1991). Physical education's role in public health. Research Quarterly for Exercise and Sport, 62, 124-137.

THE EDUCATIONAL BENEFITS CLAIMED FOR PHYSICAL EDUCATION

O'SULLIVAN, M.

UNIVERSITY OF LIMERICK

In recent years there has been growing recognition of the importance of nutrition and physical activity as key contributors to health and healthy lifestyles. This public health agenda has focussed greater attention on the potential of physical education in schools to promote active living and healthy lifestyles. Public health professionals are looking to schools as supportive environments to stem the tide of what some perceive as growing numbers of sedentary children and young people (National Health and Nutrition Examination Surveys, 2004; McKenzie, 2004, 2007; Trost, 2004; WHO, 1998). In recent years, revisions of school curriculum are reflecting a view that schools "bear a great responsibility in ensuring that children not only understand the importance of good nutrition and exercise but can actually benefit from both" (Commission on the European Communities, 2007, p.11). As one example the revision of the Primary Education in the UK seeks to drop physical education as a subject and focus on physical development, health and wellbeing (Rose, 2009). The recent foregrounding and strong advocacy of a public health agenda for physical education has created tensions (O'Sullivan, 2004) and endangered some longstanding educational benefits of physical education. This presentation will present the educational value of physical education and the evidence we have for the education impact of our subject on young people. I will highlight the current tensions between the public health and educational agendas for physical education and implications for curricular content, pedagogy, and professional preparation of physical educators.

References

Commission on the European Communities (2007). White paper on A Strategy for Europe on Nutrition, Overweight and Obesity related health issues. Brussels: EU.

McKenize, T. (2007). The preparation of physical educators: A public health perspective. Quest, 59, 3345-237.

McKenzie, T (2004). Impact of the Surgeon General's Report: Through the Eyes of Physical Education Teacher Educators, Journal of Teaching in Physical Education, 23, 300-317

O'Sullivan, M. (2004). Possibilities and pitfalls of a public health agenda. Journal of Teaching in Physical Education, 23, 392-404.
Rose (2009). Rose Review of Primary Education. Available on April 30 at www.dcsf.gov.uk/primarycurriculumreview.
Trost, S. (2004). School physical education in the post-report era: An analysis from public health. Journal of Teaching in Physical Education, 23,318-337
World Health Organization (1998). Obesity: Preventing and managing the global epidemic. A report of a WHO consultation on obesity. Geneva: Author.

14:15 - 15:15

Poster presentations

PP-HF01 Health and Fitness 1

HOW IS PHYSICAL ACTIVITY CONNECTED WITH ACADEMIC ACHIEVEMENTS AND BMI OF PUPILS

BIZJAK, K., LESKOŠEK, B., KOVAČ, M., DEBEVC, H., STREL, J.
UNIVERSITY OF LJUBLJANA, FACULTY OF SPORT

The purpose of this study was to investigate the relationship between physical activity (self-reported engagement in PE lessons and sport activity in free time of pupils has been measured), final academic achievement, math grades and body mass index (BMI) of primary school pupils, aged 11-14. Data has been collected within the research of Strel et al. (2005). Participants were 1607 pupils (nmale=841, nfemale=766) who have attended 12 primary schools in different part of Slovenia in school year 2003/04. The number of pupils in each age group and in each physical activity group was around 200. The number of pupils with the worse final academic achievement (it is measured on five grade scale) was very low (7%), that is why the bottom two grades have been combined into one group.

Ordinal logistic regression with physical activity as dependent variable, and sport activity, age, gender, academic achievement and BMI as independent variables was used to establish the factors of physical activity. After controlling for other independent variables in the model gender was found to be the strongest predictor with boys having almost two times higher odds of being physically active than girls (adjusted odds ratio AOR=1.95, p<0.001). In the sample, 28% of male and 15% of female pupils were physically active more than 9 hours per week in and out off school, while 26% of male and 38% of female pupils were physically active 4 to 5 hours per week. Physical activity increased by age (AOR=1.09, p=0.05). Pupils with lower grades tend to be less physically active but grades variables were on the border of 5% significance level (for the difference between the highest and lowest grades AOR=0.5, p=0.01 for final academic achievement).

It was found that BMI category is not associated with physical activity, no matter if this association is studied separately (Somer's D=–0.06, p=0.054) or controlled for other variables in regression model (comparing to the obese reference category AOR=0.71, p=0.19 for overweight category and AOR=0.93, p=0.76, for non-overweight category). Even though, it was confirmed that there are no differences in levels of physical activity between children and adolescent with different BMI, we cannot claim that exercise does not produce fat los because we did not measure the intensity of the activity.

Strel, J., Kovač, M., Jurak, G., Starc, G., Bučar, M., Emberšič, D. et al. (2005). The Analysis of Development Trends of Motor Abilities and Morphological Characteristics, and the Relations of both with Biological, Psychological and Sociological Dimensions of Slovenian Children and Youth from 7 to 18 in the Period from 1970 - 1983 – 1993/1994 – 2003/2004. Research report. Ljubljana: Fakulteta za šport.

THE SUCCESS OF A GENERAL SCHOOL-BASED PHYSICAL ACTIVITY INTERVENTION ON BONE MINERAL CONTENT DEPENDS ON PUBERTAL STAGE BUT NOT ON GENDER

MEYER, U., ZAHNER, L., PUDER, J.J., RIZZOLI, R., KRIEMLER, S.
UNIVERSITY OF BASEL

Background: It is not clear whether sensitivity of bone to physical loading varies for different pubertal stages and among genders. We therefore performed a randomised controlled trial in children of both gender and different pubertal stages to determine whether a school-based physical activity (PA) program during a full school-year influences bone mineral content (BMC) and whether there are differences in response for boys and girls before and during puberty.

Methods: Twenty-eight 1st and 5th grade classes were cluster randomised to an intervention (INT, 16 classes, n=297) and control (CON; 12 classes, n=205) group. The intervention consisted of a multi-component PA intervention including daily physical education during a full school year. Each lesson was predetermined, included about ten minutes of jumping or strength training exercises of various intensity and was the same for all children. Measurements included anthropometry (height and weight), tanner stages (by self-assessment), and BMC for total body, femoral neck, total hip and lumbar spine using dual-energy X-ray absorptiometry (DXA). PA was assessed by accelerometers initially, at midtime and at the end of the intervention period. Bone parameters were normalized for gender and tanner stage (pre- vs. puberty). Analyses were performed by a regression model adjusted for gender, baseline height, change in weight, average PA, post-intervention tanner stage, baseline BMC, and cluster. Researchers were blinded to group allocation. Children in CON did not know about the intervention arm.

Results: 275 (72%) of 380 children who initially agreed to have DXA measurements had also post-intervention DXA and PA data. Mean age of prepubertal and pubertal children at baseline was 8.74±2.07 and 11.13±0.60 years, respectively. 64/144 girls and 86/131 boys were prepubertal at the end of the intervention. Compared to CON, children in INT showed statistically significant increases in BMC of total body (adjusted z-score differences: 0.110; 95%-CI 0.042 to 0.178), femoral neck (0.136; 95%-CI 0.014 to 0.257), and lumbar spine (0.110; 95%-CI 0.028 to 0.191). Importantly, there was no gender*group, but a tanner*group interaction consistently favoring prepubertal children.

Discussion/Conclusion: This study shows that a general, but stringent school-based PA intervention can improve femoral neck, lumbar spine and total body BMC in elementary school children. Pubertal stage, but not gender seems to determine bone sensitivity to physical loading.

This study was supported by the Swiss Federal Office of Sports and the Swiss National Foundation (PMPDB-114401)

HOW TO CARRY OUT A DIAGNOSTIC TO IMPLEMENT AN INTERVENTION PROGRAM TO PROMOTE PHYSICAL ACTIVITY AT SCHOOLS – A CASE STUDY

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TECHNICAL UNIVERSITY OF LISBON, FACULTY OF HUMAN KINETICS

Introduction: It is known from school intervention studies that increasing students' PE in-class activity time is an effective intervention approach to increase levels of PA among youth. What is not clear is whether different PE curricula influences long-term PA motivation and behaviour changes with the effects of personal and community influential variables taken into account.

Objectives: The purposes of this ecological study were a) to characterize both the school climate and PE curriculum (planed and in action); b) to characterize students considering: age, gender, lifestyle, attitudes toward school and PE, health and competency perceptions, achievement goals, daily routines, perceptions of his/her parents and peers PA; c) to characterize teachers', employees', and parents' lifestyle, their perceptions about both the value and aims of PE, perceptions about his/her health, past experience in PE, and about the amount of PA he/she performs.

Methods: Participants were 827 students (49.2% boys and 50.8% girls, aged 12-21 years); 72 teachers from all subjects; 38 employees; and 898 parents (419 fathers, 479 mothers). Questionnaires were used to collect data from all participants. The school principal was interviewed to determine the school politics regarding the promotion of active lifestyles. The School Educative Project (SEP) was also analysed. The quantity and quality of PA in PE classes was determined by using heart rate monitors and the SOFIT (40 students were monitored and observed during 3 lessons). The use of cluster analysis displayed different analysis.

Results: Students' overall PA was low, only 40% were considered active. The majority of the students said they commuted passively from home to school. Regarding adults, 20.9% of teachers, 13.2% of staff and 10.2% of parents were classified as active. Parents' academic background influences lifestyle. There was a closed relationship between parents' and children's lifestyle. The SEP made no mention of health or the importance of PA. Students have participated in MVPA during 58% of PE class time. There was a relationship between teachers' belief systems and their teaching practices.

Recommendations: PE accomplished its aims, and may make a more significant contribution to regular PA participation if lessons are planned and delivered with MVPA goals in mind. At school, besides PE, students can participate in scholar sports. The students' level of PA outside school was low. Because of that, an intervention program should focus mainly on educators (teachers and parents). The school must have a project to promote health-related fitness, to stimulate teachers and staff to be involved with PA, setting an example for students. This project must also reach parents, because literature shows a relationship between the PA of parents and children. Local authorities should create secure conditions for travel from home to school, and parents must motivate their children to use active transportation.

BODYWEIGHT AND MIGRATION-RELATED DIFFERENCES IN MOTOR ABILITIES IN PRESCHOOL CHILDREN "BALLABEINA"

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Introduction: Motor abilities in schoolchildren have been decreasing in the last two decades (Bös, 2003, Tomkinson et al., 2003). This may be related to the dramatic increase in overweight and adiposity during the same time period. Children of migrant background are especially affected (Lasserre et al., 2007). But little is known about the relationship between BMI and migration background and motor abilities in preschool children.

Methods/Design

We carried out a cross-sectional analysis with 665 children (age 5.1 ± 0.6 years; 49.8 % female) of 40 randomly selected kindergarten classes from German and French speaking regions in Switzerland with a high migrant background. We investigated BMI, cardiorespiratory fitness (20 m shuttle run), static (displacement of center of pressure (COP)) and dynamic (balancing forward on a beam) postural control and overall fitness (obstacle course).

Results: Of the children, 9.6 % were overweight, 10.5 % were obese (Swiss national percentiles) and 72.8 % were of migrant background (at least one parent born outside of Switzerland). Mean BMI from children of non-migrant background was 15.5 ± 1.1 kg/m2, while migrant children had a mean BMI of 15.8 ± 1.7 kg/m2 (p=0.08).

Normal-weight children performed better in cardiorespiratory fitness (3.1 ± 1.4 vs. 2.6 ± 1.1 stages, p<0.001), overall fitness (18.9 ± 4.4 vs. 20.8 ± 4.6 sec, p<0.001) and in dynamic balance (4.9 ± 3.5 vs. 3.8 ± 2.5 steps, p<0.001) compared to overweight and obese children, while the latter had less postural sway (COP: 956 ± 302 vs. 1021 ± 212 mm, p=0.008). There was a clear inverse dose-response relationship between weight status and dynamic motor abilities. There were no significant differences in most tested motor abilities between non-migrant and migrant. The latter performed less well in only one motor test (overall fitness: 20.2 ± 5.2 vs. 18.3 ± 3.5 sec, p<0.001). These findings persisted after adjustment for BMI.

Conclusion

In preschool children, differences in motor abilities are already present between normal weight and overweight/obese children. However, migrant children demonstrate similar motor abilities compared to non-migrant children for almost all tests, despite their slightly higher BMI.

References

Bös K. (2003). Erster Deutscher Kinder- und Jugendsportbericht, 1050-1073.

Lasserre AM, Chiolere A, Cachat F, Paccaud F, Bovet P. (2007). Obesity (Silver Spring), 15(12), 2912-2919.

Tomkinson GR, Leger LA, Olds TS, Cazorla G. (2007). Sports Med, 33(4), 285-300.

PHYSICAL ACTIVITY AND ITS RELATION TO AEROBIC FITNESS IN CHILDREN AND ADOLESCENTS

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A positive relationship between daily physical activity and aerobic fitness is established in adults, but not in children. This might be caused by methodological weaknesses when measuring physical activity and aerobic fitness in children. Methods: We examined 2,299 children aged 9- and 15-years. Physical activity was assessed using the Actigraph accelerometer (4 days). Mean accelerometer counts

and time spent in moderate-to-vigorous physical activity (MVPA) and vigorous physical activity (VPA) were calculated. Peak oxygen uptake was measured directly during a maximal cycle ergometer test. Expired gas was measured with a portable MetaMax III X oxygen analyzer. Univariate relationships between physical activity and fitness variables were assessed with Pearson correlation analysis. P-values ≤ 0.05 were considered statistically significant. Results: A weak, but significant positive correlation was found between VO2peak and mean accelerometer counts in both 9-year-olds (r=0.22 for girls and r=0.24 for boys, both p<0.001) and 15-year-olds (r=0.24 for girls, p<0.001 and r=0.17 for boys, p<0.001). In 9-year-old girls and boys and 15-year-old girls, all results remained similar when VO2peak was related to minutes per day spent in MVPA and VPA. In 15-year-old boys, the correlation was somewhat stronger when VO2peak was related to VPA (r=0.24, p<0.001) only. Conclusions: Our results imply that the amount of physical activity in childhood and adolescence is associated with aerobic fitness, although weakly. Thus, as physical activity level is a factor that can be modified, it is possible to improve children's physical activity to increase their maximal oxygen uptake.

EXERCISE ATTENUATES SMOKING CUE-ELICITED REGIONAL BRAIN ACTIVATION AND SELF-REPORT CRAVINGS

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Introduction: Smoking cues activate the limbic brain system, a system thought to mediate the rewarding effects of addictive behaviours, and trigger urges to smoke (ie. Wilson et al, 2004). Some pharmacological treatments target neurobiological pathways to reduce cravings. Exercise reduces cigarette cravings and cue-elicited urges (Taylor et al, 2007) but it is not clear how. The aims of this study were: 1) to pilot methods to confirm the effects of nicotine abstinence and smoking images on regional brain activation; 2) to assess the effect of exercise on smoking cue-elicited regional brain activation.

Method: In study 1, on separate occasions, 7 smokers abstained for 15 hours or smoked, reported their desire to smoke, then viewed a series of (N=120) smoking and neutral images while undergoing functional magnetic resonance imaging (fMRI)(1.5T Philips Gyroscan magnet). In study 2, following overnight abstinence, 18 participants, in a randomised cross-over design, begin with either 10 mins of moderate-intensity stationary cycling or passive seating (rest). Immediately after exercise or rest, participants entered the scanner and viewed smoking and neutral images in random blocks. Desire to smoke were assessed throughout both sessions.

Results: Study 1: 'Desire to smoke' was greater after abstinence compared with smoking, F (2.3, 14.0) = 16.12, p = .00 eta2 = .729. fMRI results showed when abstinent individuals were presented with smoking related images (compared with neutral cues), there were significant activation (p = .001 uncorrected, cluster threshold 15) clusters in the dorso-medial frontal cortex, an area that receives input from regions involved in drug use motivation (orbitofrontal cortex), and the hedonic effect of nicotine (i.e caudate).

Study 2: 'Desire to smoke' was significantly lower after exercise, t= 6.81. p<.00. After rest, fMRI showed significant activations (p = .001 uncorrected with a cluster threshold of 20) when viewing smoking (versus neutral images) in the insula, the parietal lobe and the dorsal striatium (putaman and caudate). No activations were seen in the post exercise treatment, for smoking or neutral images.

Nicotine abstinent individuals experience a heightened desire to smoke and exhibit brain activation in areas associated with reward, cravings and visual attention. This is in line with previous studies (e.g. Janse Van Rensburg et al, 2009). We have shown that a single session of exercise has the ability to modulate the effects on brain activation in response to smoking cues during temporary nicotine abstinence. Thus it may be the possible neurological mechanism by which exercise may exert its effects on subjective desire to smoke.

Janse Van Rensburg K et al, (2009). Psychopharmacology.

Taylor AH et al, (2007). Addiction, 102, 534-543.

Wilson et al (2004). Nature Neuroscience, 7, 211-214.

FACTORS ASSOCIATED WITH EXERCISE REFERRAL SCHEME COMPLETION AND HEALTH OUTCOMES

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Using a population-based cohort design, an Exercise Referral Scheme (ERS) based in a diverse London borough was investigated to examine participant sociodemographic characteristics and referral reason in relation to both completion and health outcomes. Participants (n=1315) were recruited within a two-year period. The scheme was completed by 57% of participants, a body mass reduction was achieved by 33.3%, and 49.2% of participants achieved a blood pressure (mean arterial pressure) reduction.

A three-stage binary logistic regression analysis identified the factors associated with completion (stage 1), body mass reduction (stage 2) and blood pressure reduction (stage 3). The independent variables in stage 1 were participants; age, gender, ethnicity, occupation and referral reason. Completion became an additional independent variable in stage 2 and both completion and body mass reduction were added in stage 3. The regression analysis revealed that increasing age was associated with the likelihood of patients completing the scheme (Exp (β)=1.019; 1.008- 1.030; p < 0.001). Ethnicity was associated with the likelihood of completion (p < 0.05) where, in comparison to the white category, patients in the mixed category were more likely to complete (Exp(β)=6.310; 1.388-28.695; p < 0.05). Participants referred for a pulmonary condition were less likely to complete (Exp(β) =0.546; 0.346-0.860; p < 0.01) compared to those referred for cardiovascular conditions. The findings from stage 2 revealed that in comparison to the white category, patients in the mixed category were significantly more likely to achieve a reduction in body mass (Exp(β)=3.991; 1.191-13.373; p < 0.05). Those who completed were also more likely to achieve a reduction in body mass (Exp(β)=3.541; 2.721-4.608; p < 0.001). The findings from stage 3 revealed that, when compared to the unemployed category, the skilled manual category had an increased likelihood of achieving a reduction in blood pressure (Exp (β)=1.875; 1.044-3.227; p < 0.05). Participants who completed also demonstrated an increased likelihood of a reduction in blood pressure (Exp(β)= 1.680; 1.250-2.003; p < 0.001). Furthermore, those participants who achieved a reduction in body mass had an increased likelihood of achieving a reduction in blood pressure (Exp(β)= 1.292; 1.008-1.641; p < 0.05).

In conclusion, an examination of the factors associated with the scheme outcomes has indicated that some of those referred may benefit from additional strategies to encourage success (for example, younger patients and those referred for pulmonary reasons). Completion of the scheme was associated with a reduction in both body mass and blood pressure. Therefore, placing an emphasis on improving completion must continue to be a key priority for exercise interventions.

ACUTE EFFECTS OF DIFFERENT TYPES OF TRAINING ON DORSAL AND LUMBAR SPINE IN EXPERT TENNIS PLAYERS

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UNIVERSITY OF ROME

Introduction: Scoliosis has been found in up to 80% of athletes with an asymmetric load on the trunk and shoulders, such as javelin throwers and tennis players (Swärd, 1992). Further research found asymmetry in volume between dominant and nondominant upper limbs larger in young tennis players than in control group (Rogowski et al., 2008). Anyway it is not clear the relationship between scoliosis and the practice of tennis. In order to investigate this topic, aim of the present study was to evaluate the dorsal-lumbar spine of expert tennis players before and after two different types of training session.

Methods: The sample consisted of 10 expert tennis players (male n=6, female n=4, age 22.6 ± 1.5 years). We assessed back surface by rasterstereography analysis with Formetric® 3D System (Diers, Germany) before and after two different training sessions both lasting 1 hour and half. The first one was a standard training session and the second was a specific over-shoulder shots training session. Lordotic angle, kiphotic angle, trunk imbalance, pelvic torsion and surface rotation parameters were measured and recorded both in static (S) and in average (A) (longer interval of time) modality.

Results: In the S modality, lordotic angle was affected by type of training ($P<0.01$) and by the interaction between training and time ($P=0.05$). In the A modality, trunk imbalance and pelvic torsion was affected by time ($P=0.05$), and surface rotation significantly differed for training ($P=0.05$).

Discussion: In the S modality we found a significant difference for lordotic angle, supporting the idea that over-shoulder load leads to high stress for the spine, as it links the shoulder and the lower extremity transferring much of the ground reactive forces into the upper extremity and it is also capable of generating additional forces to the throwing motion on its own (Young et al., 1996). For the A modality, our expectation to find more differences, as the recording interval is longer, was confirmed, and we found that 2 of the 3 significant parameters (trunk imbalance and pelvic torsion) were time sensitive and did not change depending on the type of training session; this, could be related just to the load stress that is certainly higher after each training session. Instead, surface rotation was affected by the factor training session, possibly because it indicates the orientation of the spinous process rotation, and the over-shoulder shots such as service are also related to vertebral trunk rotation (Elliot, 2006).

References

Elliot B, (2006). Br J Sports Med, 40, 392-396.

Rogowski I, Ducher G, Brosseau O, Hautier C. (2008). Pediatr Exerc Sci, 20, 263-272.

Swärd L. (1992). Sports Med, 13(5), 357-364.

Young JL , Herring SA, Press JM, Casazza BA. (1996) J Musculoskeletal Rehabil, 7, 5-17.

A NEW SURVEY ON ACCIDENT RISKS AND INJURIES IN COMMUTER CYCLISTS IN BELGIUM

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The health enhancing effects of regular bicycling (e.g. commuter cycling) are well known, however this health benefit has also a negative aspect especially when safety is neglected. Bicyclists have a higher risk of being injured than any other group of road users. They are "unprotected" in traffic, despite being capable of reaching high speeds. This increases the risk and severity of the injury. Bicycle related injury statistics from police, hospital and insurance statistics are well described in many countries, but only give us details about serious or fatal injuries. In Belgium, it is estimated that only 15 to 30% of the cycling accidents are officially reported.

To overcome this underreporting, the SHAPES project conducted an internet based online injury registration study, consisting of a Retrospective (RetroSur) and a Prospective survey (ProsSur). Since injury incidence needs to be calculated not only from the number of accidents and injuries, but also from the exposure time (= time spent cycling) a prospective study was included where participants had to fill out weekly diaries for 1 year, with information on travel frequency, distance and time spend on bicycling.

During the first 10 months of online injury registration, more than 1800 participants registered on the SHAPES website. Inclusion criteria are: age between 18 - 65 years (males & females), have a paid job outside their home, cycle to work more than 2 times per week. In- and exclusion criteria for the injury registration are: accident on the route to work; acute injury; accident with corporal damage. For the RetroSur, the accident had to occur in the past 12 months before the start of the study. We present the results after 10 months data collection, during which more than 17,000 week diaries were filled out and a total of 62 accidents were considered for data analysis (ProsSur). From the 773 participants who filled out the RetroSur, 64 had an accident. The risk of having an accident while cycling to work is 8,88% for men and 6,97% for women.

The most common risk is slipping, followed by 'direct contact with a car' and 'refuse to give priority. The built-up area is the most common place where accidents happen, while the traffic was perceived as being calm. The body part that is most often injured is the knee, the hand and fingers, the shoulder. Three percent lost consciousness and 4% of the participants had a concussion. In half of the accidents, more then 1 body part is injured, with graze or bruise occurring the most often. In less than 10% of the cases the police came to the place of the accident and in only 20% of the accidents, the insurance was involved. Medical assistance was needed in 80% of the accidents, although participants were take to the hospital in only 8% of the cases.

14:15 - 15:15

Poster presentations

PP-HF02 Health and Fitness 2

DEVELOPMENT AND RELIABILITY OF THE TELEPHONE-BASED QUESTIONNAIRE PRISCUS-PAQ TO MEASURE PHYSICAL ACTIVITY OF COMMUNITY-DWELLING ELDERLY GERMAN PEOPLE IN EPIDEMIOLOGICAL RESEARCH

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INTRODUCTION: There is a lack of a reliable instrument to measure physical activity (PA) of elderly people (>=70 years) for epidemiological research in Germany. The first aim of the study was therefore to develop a simple, non-invasive tool to evaluate daily habitual PA of elderly people: The telephone-based PRISCUS ("Prerequisites for a new health care model for elderly people with multimorbidity") physical activity questionnaire (PRISCUS-PAQ). The second aim was to test the reliability of the PRISCUS-PAQ.

METHODS: Validated PA questionnaires for older adults were translated and adapted to design a preliminary long version of the PRISCUS-PAQ (53 items). The questionnaire measures PA over a period of 7 days to provide a complete picture of the subject's habitual PA. It investigates different areas and periods of activity (basic everyday activity (e.g. walking), housework, gardening, sporting activities) and inactivity (sleeping, sitting) during daily life. The preliminary version was tested in 136 elderly people (aged 77±4 (71-89) years; 51% women) in a pilot study. Based on the results, the long version was adapted and shortened. To test the reliability of the PRISCUS-PAQ, the final short version (14 items) was applied to 72 community-dwelling elderly people (aged 76±4 (70-88) years; 50% women) and repeated after 4 weeks.

RESULTS: Test-retest reliability of the PRISCUS-PAQ ranged from r=.42 (walking) to r=.85 (sleeping times) as determined by the intraclass correlation coefficient (ICC). Data on habitual activity (e.g. cleaning: r=.50) were less reliable than sporting activity (e.g. cycling: r=.80).

CONCLUSIONS: The telephone-based PRISCUS-PAQ is a brief instrument for the assessment of physical activity in epidemiologic studies in older people, showing adequate repeatability in comparison to other PA questionnaires. It will now be used to collect data in a large cohort of elderly people (German epidemiological trial on ankle brachial index – getABI) within the PRISCUS research cooperation.

Acknowledgments: The study has been conducted within the research cooperation PRISCUS ("Prerequisites for a new health care model for elderly people with multimorbidity") which is funded by the German Federal Ministry of Education and Research (01ET0720).

MODERATE PHYSICAL EXERCISE IN THE ELDERLY IS LINKED TO APPROACH-RELATED EMOTIONS

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Introduction: Within the recent years numerous studies connected physical exercise to changes in brain cortical activity (Hollmann and Strüder, 2003; Schneider et al., 2009). In these studies a link of physical exercise and psychological parameters is often discussed, most recently referring to the model of frontal asymmetry (Coan and Allen, 2004; Davidson et al., 1979; Petruzzello et. al, 2006). However, so far most of this research dealt with inadequate exercise intensities for the elderly and applied comparatively intricate methods. In times of an aging society health aspects in physical exercise become more and more important. Therefore it is increasingly necessary to investigate the connection of physiological and psychological elements of exercise, in particular in the elderly. According to previous research this study tends to find changes within electroencephalographic (EEG) activity and mood after a moderate intensity walk in a group of elderly subjects.

Methods: EEG on two frontal positions (Fp1 and Fp2) as well as actual state of mood was recorded before and after walking. Walking was conducted at self-selected pace for 45 to 60 min within a moderate intensity. Frontal asymmetry as a marker of approach-related emotions (Coan and Allen, 2004) was calculated using the equation (Fp2-Fp1)/(Fp2+Fp1) provided by Schutter and his colleagues (2008).

Results: Results showed effects in both EEG and mood. Within the alpha-1 frequency range (7.5 – 10.0 Hz) a significant ($p < .05$) reduction of left-lateral frontal EEG activity was found. An increase in mood was reported after walking.

Discussion: Referring to the model of frontal asymmetry, the reduction in the alpha-1 frequency range can be associated with approach-related emotions. Recent studies provide similar enhancement of mood perception due to exercise (Ekkekakis et al., 2000; Ekkekakis and Petruzzello, 1999; Schneider et al., 2009). There is reason to speculate, that even moderate physical exercise programs, as they are common for the elderly, affect a general well-being. We were able to demonstrate this by a comparatively simple and economic method.

References

Coan, J.A., Allen, J.J. (2004). Biol Psychol, 67(1-2), 7-49.

Davidson, R.J., Schwartz, G.E., Saron, C., Bennett, J., Goleman, D.J. (1979). Psychophysiology, 16, 202-203.

Ekkekakis, P., Hall, E.E., VanLanduyt, L.M., Petruzzello, S.J. (2000). J Behav Med, 23(3), 245-275.

Ekkekakis, P., Petruzzello, S.J. (1999). Sports Med, 28(5), 337-374.

Hollmann, W., Strüder H.K. (2003). Nervenheilkunde, 9, 467-474.

Petruzzello, S.J., Ekkekakis, P., Hall, E.E. (2006). Human Kinetics, 111-128.

Schneider, S., Askew, C.D., Diehl, J., Mierau, A., Kleinert, J., Abel, T., Carnahan, H., Strüder H.K. (2009). Physiology & Behavior, doi:10.1016/j.physbeh.2009.01.007

Schutter, D.J., Weijer, A.D., Meuwese, J.D., Morgan, B., Honk, J.V. (2008). Hum Brain Mapp, 29(5), 574-580.

EFFECTS OF SENSORIMOTOR TRAINING ON PATIENTS WITH MALIGNANT LYMPHOMA

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Introduction: Cancer patients receiving chemotherapy suffer from severe balance problems corresponding with peripheral neuropathy, progressive loss of lean muscle mass and weakness associated with a strong impairment in their quality of life. Studies have shown that sensorimotor training leads to neural adaptations that effect reflex pathways, improve proprioception and intermuscular coordination as well as the sensitivity for joint angles. The aim of this study was to improve patients' balance control, enable them to reduce the side effects of chemotherapy and improve their quality of life.

Methods: Balance control was investigated in a total of 20 patients aged 19 to 68. The patients were assigned randomly to 2 groups: an intervention group (IG) (N=10) and a control group (CG) (N=10).The IG participated in a defined sports program, containing of aerobe endurance, strength and sensorimotor exercises, twice a week. Patients were evaluated 4 times over a time period of 36 weeks: Before start of chemotherapy (T0), 12W(T1), 24W(T2) and (T3) after chemotherapy. Status of peripheral deep sensibility was evaluated by tuning fork at each test interval. Balance control following mechanical perturbation was measured on the Posturomed®. Cumulative sway paths were evaluated as well as the number of failed attempts during a bipedal mediolateral as well as bi- and monopedal anteroposterior perturbation. Static- and dynamic balance control was registered via the central point of pressure on the force plate GKS 1000. A balance pad was adjusted on top of the platform for dynamic balance measurements. Quality of Life was assessed with the QLQ-C-30 questionnaire.

Results: Patients in the IG showed significant improvement of balance control, decrease in cumulative sway paths and a highly significant reduction of failed attempts in the monopedal task on the Posturomed®. Loss of peripheral deep sensibility during chemotherapy could be diminished and the sensitivity for joint position was improved. Furthermore, the IG experienced a highly significant improvement in quality of life. In the CG, however, no improvements were shown in any of the above mentioned tests. On the contrary, they progressively declined in their cumulative sway paths and with that in their balance control.

Conclusion: Sensorimotor training is a feasible and effective method in support for cancer patients during chemotherapy treatment. The training not only improves balance and postural control but also helps to reduce discomfort from chemotherapy induced peripheral neuropathy associated with an improvement in quality of life.

References

Granacher U., Gollhofer A., Strass D., (2006).Neuromuskuläre Leistungsfähigkeit im Alter, Geislingen: Maurer.

Gruber M., Gollhofer A., (2004), Impact of sensorimotor training on the rate of force development and neural activation, Eur. J. Appl. Physio.: 92: 98–105.

Quasthoff S., Hartung HP., (2002), Chemotherapy-induced peripheral neuropathy, J Neurol.:249:9-17.

METABOLIC SYNDROME IS ASSOCIATED WITH PHYSICAL ACTIVITY IN DAILY LIFE AS MEASURED USING A TRIAXIAL ACCELEROMER IN JAPANESE

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Introduction: The metabolic syndrome (MS) is a cluster of risk factors that predispose individuals to cardiovascular disease. Individuals with MS are at higher risk of developing type 2 diabetes and atherosclerotic cardiovascular disease, and have greater cardiovascular disease mortality rates than those without the syndrome. In Japan, MS is now a serious health problem for the middle-aged population.

Therapeutic lifestyle changes, including increased physical activity, are recommended for the prevention and treatment of MS. The effects of physical activity on MS have been examined in European and American populations, with results showing that physical activity improve the metabolic risk. However, the Japanese populations differs from European and American population in genetic background and social environment. Moreover, the required volume of physical activity remains unclear, because most investigators have either used questionnaires.

Purpose: The purpose of this study was to examine the relationship between physical activity in daily life and the prevalence of MS in middle-aged Japanese.

Methods: The subjects included 77 men and 58 women middle-aged Japanese (means±SD, 46.1±8.0 years). We measured metabolic syndrome risk factors and physical activity. The physical activity was measured for a period of 2 weeks using a triaxial accelerometer for movement registration (Omron Healthcare Co.). MS was classified using criteria modified from the National Cholesterol Education Program Adult Treatment Panel Ⅲ (NECEP-ATP Ⅲ). The relationship between physical activity and MS was assessed using logistic regression after adjustment for sex and age.

Results: A total of 31.9 % of participants has MS in this subject. The prevalence of MS was markedly lower in physically activity group compared with those who were physically inactivity group (physically activity group: 22.4 %, physically Inactivity group: 41.2 %, $p<0.05$). Total steps did not differ significantly between with and without MS. However, physical activity of ≧3 METs was significantly higher in Without MS group (without MS: 23.6±8.6 METs•h/week, with MS: 19.3±7.4 METs•h/week, $p<0.01$). Logistic regression showed that additional physical activity (10 METs•h/week, ≧3 METs) decreased the odds of MS by 0.55 (95 %CI: 0.331-0.911, $p<0.01$).

Conclusions: Physical activity was associated with lower odds and prevalence of MS, particularly in Japanese. This study suggests that to maintain level of physical activity (≧3 METs) have beneficial effects in prevention of metabolic syndrome.

THE EFFECT OF PILATES EXERCISE ON BODY COMPOSITION AND RESTING METABOLIC RATE IN DIFFERENT AGES

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THE EFFECT OF PILATES EXERCISE ON BODY COMPOSITION AND RESTING METABOLIC RATE IN DIFFERENT AGES

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Introduction: The Pilates Method is a body-mind exercise developed by Joseph Pilates, that increases muscle strength, flexibility and body awareness. Many studies have examined the effects of physical activity on resting metabolic rate(RMR) and body composition. The purpose of this study is to specify the effects of this widely popular exercise method on body composition and resting metabolic rate of women of different age groups.

Methods : The study group consisted of 64 females in total. The study group consisted of 16 females ages 40-50 and 16 females ages 18-25 . The control group consisted of 16 females ages 40-50 and 16 females ages 18-25. The study group attended a "pilates mat work" program for ten weeks, three times a week, one hour per class, while the control group did not participate in any exercise program. The subjects' resting metabolic rate was measure before and after the 10-week exercise program. The methods used were bodygem indirect method, body composition measured by bio electric impendence method, skin fat thickness measured by skinfold method, circumferences measured by measuring tape, and flexibility measured by sit and reach method. All obtained parameters were analyzed in SPSS for Windows. Results: The conclusion of the study shows that in the group of females, ages 40-50, waist to hip ratio, circumferences, and skin fat thicknesses decreased. Resting metabolic rate increased (p<0,05,) yet there were no significant change in body weight, body mass index, fat free mass, and % fat(p>0,05). In the group of females ages 18-25 there was no significant change in body composition and resting metabolic rate, but flexibility increased(p<0,05).

Discussion: Pilates improved the resting metabolic rate(RMR) in the ages 40-50 group. In the other ages 18 to 25 group there was no significant change in RMR. Former studies have shown that the amount of fat free mass effects resting metabolic rate(FFM). In this study there was no significant change on FFM, however RMR increased. Pilates exercise may have effected RMR by increasing the amount of hormone release and the amount of active cells in organs, but further research is needed. ACSM advises that cardiovascular exercise is needed 3-5 times a week for the best result on body composition. Only practicing pilates may not be enough for weight control. The results in this study confirm Segal et al's (2004) research that pilates can improve flexibility.

References

Segal NA, Hein J., Basford JR. (Archives of Physical Med. and Reh., Vol 85, Iss. 12, P.1977-1981.

Smith BA, Manore MM, Carroll SS.(1996). J of the American Dietetic Ass., Volume 96, Iss. 9, S 1, P. A73

Sekendiz, Özkan A, Korkusuz F, Akın S. (2007). j of Bodywork and Mov. Therapies, Vol.11, Iss. 4, P 318-326

ENERGY COST IN YOGA

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Introduction: Yoga has shown to be increasingly popular and is a common activity in many commercial training studios. Among different types of yoga, Ashtanga yoga consists of more powerful routines than the traditional yoga, and is by some instructors recommended as an effective exercise modality to loose weight and increase endurance. However, search on PubMed and Sports did not reveal any studies about the energy consumption in this type of yoga. The purpose of this study was therefore to examine the energy cost in an Ashtanga yoga class.

Methods: 10 healthy female sport students, mean age 27 yrs (SD ± 4,90), BMI 21,6 (SD ± 1,38) participated in a 60 minutes Ashtanga yoga class. Oxygen uptake (VO2) was measured about four times during the class in each subject while breathing in a mouthpiece for measurement of gas exchange and ventilatory variables. Heart rate (HR) was continuously measured and stored each 5th. second. The energy cost was calculated based on the average of the four measurements in each subject. Demographic variables and results are presented as mean values ± standard derivation (SD) or range.

Results: The mean VO2 for the whole yoga class was 14,6 ml•kg-1•min-1 (range 10,5 – 18,7) representing a METs of 4.2 (range 3,0 – 5,3). The caloric expenditure was 4,5 kcal•min-1 or 270 kcal•h-1 (range 168–348 kcal•h-1). The mean HR was 123 s•min-1 (range 88–163 s•min-1) corresponding to a oxygen pulse of 7,3 ml•s•-1 (range 5,9-10,9 ml•s•-1).

Discussion/Conclusions: Even in the subjects who achieved a high HR throughout the class, the energy cost in the Ashtanga yoga class was low, and did not fulfill the ACSM's recommendation for exercise training (300 – 400 kcal) (2). Ashtanga yoga is consideres one of the most powerful yoga-forms and our results indicate that it should not be recommended as an exercise mode for those wanting to loose weight or increasing maximal power.

References

1.Swendson D. Ashtanga Yoga. The practical manual. Korea. 2004

2.ACSM's Guidelines for Exercise Testing and Prescription, Philadelphia:Lippincott Williams & Wilkins, 2000.

RELATIONSHIPS AMONG PLASMA LEPTIN LEVEL, AEROBIC TRAINING AND RELATIVE MYOCARDIAL WALL THICKNESS IN OVERWEIGHT POSTMENOPAUSAL WOMEN

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Introduction: Physiological hormonal changes accompanying menopause determine both an increase of body fat (FM%), and its shifting from gynoid to android distribution, increasing cardiovascular risk. As the main source of leptin (PLL) is FM%, PLL rise parallelly to FM% leading to leptin resistance, both broking its physiological control on feeding, and increasing the cardiovascular risk through its effects on endothelial dysfunction, hypertension, and atherosclerosis. Literature is controversial about the role of PLL on myocardial hypertrophy. If Baroulch et al. (2003) showed 4-to-6 weeks leptin infusion to reduce weight and reverse left ventricular hypertrophy, Paolisso et al. (1999) showed PLL associated with increased myocardial wall thickness in hypertensive humans. PLL has been also shown associated with hypertrophy in neonatal rat ventricular myocytes. We hypothesize that both pathologies (e.g. diabetes, hypertension), and the use of different type of cells (e.g. rat ventricular myocytes, male heart) could mislead about the role of PLL on postmenopausal heart. Aim of the study was to investigate the relationships among relative myocardial wall thickness (RWT), PLL, blood pressure and aerobic fitness in healthy postmenopausal women before and after 4 months of walking training.

Methods : 22 overweight postmenopausal women were recruited by general physicians, attesting non-hypertensive and non-diabetic condition. Body composition was assessed by multi-frequency electrical bioimpedance (Ds Medica, Italy). VO2max was estimated (VO2maxest) by Rockport Fitness Walking Test, and PLL was measured by ELISA-test. Echocardiography was performed using an ultrasound system (GE Healthcare Fairfield, CT) with a 3.7 MHz transducer. Participants walked 4 d/wk, for 50 min, at 50-60% of her HRR. Paired Sample t-Test was performed to assess variations due to walking training. Simple regression models were performed both on basal and post-intervention values to quantify the effect of FM%, VO2maxest, PLL and diastolic blood pressure (DBP) on RWT.

Results: Participants were hyperleptinemic (34.98±16.70 ng/ml) and had a fair VO2maxest (25.75±3.71 ml/kg/min). Walking training determined a reduction of FM% (p=0.008), PLL (p<0.001) and RWT (p=0.03) and an increase of VO2maxest (p<0.001). Basal regression

model indicated the predictive role of PLL (coeff. est.=-0.002, t=-2.353, p=0.03) and DBP (coeff. est.=0.003; t=2.241, p=0.04) on RWT. After the training, regression model had no statistical significance.

Discussion: Light hyperleptinemia, without confounding variables, could be protective by myocardial hypertrophy in unfit postmenopausal overweight women. The positive contemporaneous modification of RWT, FM%, PLL and VO2maxest, elicited by the aerobic training, did not allow to indicate one or multiple protective factors at the end of the study.

References

Baroulch LA, et al. (2003). J Mol Cell Cardiol, 35, 637-644.

Paolisso G, et al. (1999). Hypertension, 34, 1047-1052.

STRENGTH, MUSCLE QUALITY AND FUNCTIONAL CAPACITY IN LIVER TRANSPLANTED FAMILIAL AMILOIDOTIC POLINEUROPATHY PATIENTS.

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Introduction: Liver transplantation is the unique treatment for several end stage diseases. Familial Amiloidotic Polineuropathy (FAP) is a neurodegenerative disease related with systemic deposition of amyloidal fibre mainly on peripheral nervous system, clinically translated by an autonomous sensitive-motor neuropathy with severe functional limitations in some cases. The unique treatment for FAP disease is a liver transplant with a very aggressive medication to muscle metabolism and force production. To our knowledge there are no quantitative characterizations of body composition, strength or functional capacity in this population. The purpose of this study was to compare levels of specific strength (isometric strength adjusted by lean mass or muscle quality) and functional capacity (meters in 6 minutes walk test) between FAP patients after a liver transplant (4.1±2 months after transplant surgery) (FAPT) and a healthy group (HG). Sixty-four subjects where assigned in 2 groups: 46 patients FAPT (27 males, 32±8 yrs; BMI 21.8±3.8 and 19 females, 37±5 yrs; BMI 22.4±4.0) and eighteen HG (9 male, 34±7 yrs; BMI 24.3±1.8 and 9 female, 36±8 yrs; BMI 23.2±2.6). Isometric strength of quadriceps was measured using an isokinetic dynamometer (Biodex). Body composition was determined by measuring lean mass of dominant lower extremity in a region of interest (thigh) by dual-energy x-ray absorptiometry. Muscle quality was ascertained by taking the ratio of strength to muscle mass. Results: HG showed significant higher values than FAPT patients for: peak torque (66.3N±25.2N vs 40.2N±17.6N respectively p=.000), muscle quality (11.8±2.6 vs 7.9±2.7 respectively, p=.000) and functional capacity (675.8m±109.1m vs 511.4m±139.1m respectively, p=.000). There are no differences between HG and FAPT for BMI (23.8±2.2kg/m2 vs 22.0±3.8 kg/m2 respectively, p=.07) and thigh muscle mass (5.5kg±1.2kg vs 5.05kg±1.1kg respectively p=.14). Negative correlations were observed for FAPT patients but not for HG between age and peak torque (p=.013; r=-.363) and age and thigh muscle mass (p=.011; r=-.373). When comparing functional capacity, peak torque, muscle quality and thigh muscle mass between males and females in each group significant higher values where observed (p≤.05) in males for HG but these differences disappeared in FAPT patients with exception for thigh muscle mass (p=.000; 5.6kg±1.02kg vs 4.3kg±0.7kg for males and females respectively). Conclusions: FAPT patients have lower functional capacity, strength and muscle quality than HG. The differences between groups for muscle quality and peak torque but not thigh muscle mass seems highlight the importance of the neural component of the disease and show also the importance of training the process of force production specially the sensoriomotor component in FAP patients and probably the importance of a strengthening exercise program. Further studies are needed to explore training effects on function after transplantation.

14:15 - 15:15

Poster presentations

PP-HF03 Health and Fitness 3

COMPARISON STUDY OF MATERNAL HEART RATE OF LAND/WATER ACTIVITIES IN LATE PREGNANCY

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INTRODUCTION: Many pregnant women wish to engage in aerobic exercise during pregnancy but are concerned about possible adverse effects on the outcome of pregnancy. In recent years there has been a great increase of scientific research regarding physical exercise during pregnancy and the pregnancy outcome (Barakat et al, 2008. Barakat et al, 2009). Nevertheless, many doubts persist relative to the response to exercise by the pregnant woman. Limited information is available about the comparison of the type of exercise (land-water) and the maternal response. Our aim was to assess and to compare maternal heart rate during land and water exercise of the same intensity level.

MATERIAL AND METHODS: 15 healthy pregnant women (nulliparous) at third trimester were evaluated (mean of gestational age=245 ± 14.3 days). Other maternal data were recorded including parity, smoking, occupational activity and physical activity habits. The physical activity protocol consisted of a session of aerobic exercise (25 min), the intensity of activity was evaluated by Borg Scale (level 12=light), maternal heart rate was registered by Polar F6 model. Aquatic session of similar intensity was developed and maternal heart rate was registered also. Comparison of data of maternal heart rate was made by Student t Test.

RESULTS: Our results shows that exercise developed on land produce larger elevations (mean: 110,86±6,1) in maternal heart rate than water activities (mean: 105,40±6,1) at same level of intensity, although no significant differences were found (p=0.09).

DISCUSSION: The aim of our study was to compare the effects of land and water exercises during pregnancy. O´Neill et al. (1992) studied the accuracy of Borg's ratings of perceived exertion in the prediction of heart rates during pregnancy but they didn't include aquatic exercises. In our opinion maintenance of the corporal weight caused by the pregnancy is possibly the cause of these differences, naturally during the aquatic activities this extra corporal weight caused by the pregnancy is attenuated (Granath et al, 2006).

Barakat R, Stirling JR, Lucia A. Does exercise training during pregnancy affect gestational age? A randomised controlled trial. Br J Sports Med. 2008; 42 (8), 674-678.

.

Barakat R, Ruiz JR, Lucia A. Exercise during pregnancy and risk of maternal anaemia: a randomised controlled trial. Br J Sports Med. 2009 Jan 21. [Epub ahead of print]

O'Neill M, Cooper K, Mills C, Boyce E, and Hunyor S. Accuracy of Borg's ratings of perceived exertion in the prediction of heart rates during pregnancy. Br J Sports Med. 1992 June; 26(2): 121–124.

Granath AB, Hellgren MS, Gunnarsson RK. Water aerobics reduces sick leave due to low back pain during pregnancy. J Obstet Gynecol Neonatal Nurs. 2006 Jul-Aug;35(4):465-71.

TYPE OF DELIVERY IS NOT AFFECTED BY LIGHT RESISTANCE AND TONING EXERCISE TRAINING DURING PREGNANCY: A RANDOMIZED CONTROLLED TRIAL

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Introduction: Obstetricians lack sufficient information for providing constructive guidance for patients who want to be physically active during their pregnancies. One frequently asked and important question regards the possibility that physical activity, especially during the second part of pregnancy, might affect gestational outcomes, such as type of delivery. We examined the effect of light exercise training performed throughout the second and third trimester of pregnancy on the type of delivery, as well as on the dilation, expulsion and childbirth time.

Methods: 160 sedentary women were randomly assigned to either a light intensity resistance and toning exercise training group (n=80) or a control group (n=80). Several maternal and newborn's characteristics, were recorded including the type of delivery (normal, instrumental, or cesarean) and dilation, expulsion and childbirth time.

Results: The percentage of women having normal, instrumental or cesarean delivery was similar for both the training (70.8%, 13.9% and 15.3% respectively) and control groups (71.4%, 12.9% and 15.7% respectively). The expulsion, mean dilation and childbirth time did not differ between groups.

Discussion: Certain scientific evidence has demonstrated that physical exercise during pregnancy does not have adverse effects (Barakat et al, 2008, 2009). In that sense, our results showing no differences in the type of delivery between both groups are in apparent disagreement with previous data from prospective (Bungun et al, 2000. Clapp, 2008) or training studies, which suggests that regular exercise performed over the course of pregnancy is associated with increased incidence of vaginal delivery (Hall & Kaufmann, 1987) . Comparisons between studies are difficult to make owing to differences in several variables that can affect type of delivery such as age, body mass index, gestational weight gain age, previous parity history, smoking habits, alcohol intake, number of hours standing or epidural anesthesia. In conclusion in we found that light intensity resistance and toning exercise training performed over the second and third trimester of pregnancy does not affect the type of delivery.

References

Barakat R, Ruiz JR, Stirling JR, Zakynthinaki MS, Lucia A (2009) AJOG, in press.

Barakat R, Stirling JR, Lucia A (2008). Br J Sports Med 42 (8), 674-678.

Bungum TJ, Peaslee DL, Jackson AW, Perez MA (2000). J Obstet Gynecol Neonatal Nurs 29, 258-64.

Clapp JF III (2008). Am J Obstet Gynecol 199:489.e1-489.e6.

Hall DC, Kaufmann DA (1987). Am J Obstet Gynecol 157, 1199-203.

DIFFERENCES IN SOMATOTYPE AND THE LEVEL OF SUBCUTANEOUS FAT TISSUE AMONG PHYSICALY ACTIVE AND INACTIVE WOMEN

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Introduction: Today there are a great many physical exercise programs designed for women, which lead to changes in body composition (Donnelly et al., 2003). The aim of this paper is to determine the differences in the level of one of the components of body composition between physically active and inactive women, primarily fat tissue and to determine whether a physical exercise program can lead to a change in somatotype.

Methods: Our study included 59 women aged 23 (±3 months), 29 of which were physically active (PA), and 30 physically inactive (NA). The PA women were included in a 12-week physical exercise program, and the NA women did not take part in any kind of physical activity. The level of fat tissue was determined by means of bioelectric impedance (Baumgartner, 1996) and with the help of a Body Composition Monitor TANITA UM-72. The Carter & Heath (1992) method was used to determine the type of somatotype. Statistical analyses were used to determine the differences in results from the initial and final measurings of each group.

Results: The groups of PA and NA women were characterized as having meso-endomorphic traits both at the initial and final measuring (PA initial 4.6-4.2-2.1; PA final 4.1-4.0-2.5 / NA initial 4.2-3.7-2.5; NA final 4.1-3.6-2.5). For the PA group, no statistically significant differences were found between the results of the initial and final measuring ($p > .05$), even though a decrease was noted in the endomorphic and mesomorphic components, while a statistically significant decrease in the values of fat tissue were noted ($p < .01$). No statistically significant differences were noted during the two measurings of the members of the NA group, either in terms of somatotype or in the values for subcutaneous fat tissue.

Discussion: The conclusion of this paper is that physical exercise program which lasts for 12 weeks can lead to changes in the subcutaneous fat tissue, but cannot lead to changes in the somatotype of physically active women.

References

1.Donnelly, Ј. et al. (2003). Effects of a 16-month randomized controlled exercise trial on body weight and composition in young, overweight men and women: the Midwest exercise trial. Arch Intern Med, 163 (11), 1343-50.

2.Carter, J.E.L., & Heath, B.A. (1992). Somatotyping – development and applications. Cambridge: Cambridge University Press.

3.Baumgartner, R., N. (1996). Electrical impedance and total body electrical conductivity. In: Roche AF, Heymsfield SB, Lohman TG, editors. Human body composition (79–109). Champaign (IL): Human Kinetics.

PEAK OXYGEN CONSUMPTION AND LEPTIN, ADIPONECTIN, HDL CHOLESTEROL, PAI-1 OR APO-A IN YOUNG FEMALE ATHLETES

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Introductions

Lifestyle related diseases as diabetes mellitus, hyperlipidemia or arteriosclerosis are closely related to their secretion level of the leptin, adiponectin and also related to concentration of HDL cholesterol, PAI-1 or APO-A. It is well known that persistent low level of exercise activity brings abnormality of serum concentration of adipocytokines, HDL cholesterol, PAI-1 in studies of middle or older ages, however little are known in young females. So in this study, we evaluated the exercise capacity, body composition with DEXA, and we studied serum level of adipocytokines, HDL cholesterol, PAI-1 and APO-A in female students in university.

Methods: We examined serum sampling in 67 normal young athletic women early in the morning. The measurement of peak oxygen consumption was performed by breath by breath using gas analyzer and monitored a heart rate with treadmill running. The body composition was also measured with DEXA.

Results: It showed an positive correlationship between peak oxygen consumption and adiponectin or APO-A or HDL-cholesterol and showed a negative correlationship between peak oxygen consumption and leptin or %fat or PAI-1.

Discussion: Adiponectin is one of the important molecules to inhibit the development of atherosclerosis and plasma high density lipoprotein-cholesterol levels are also inversely correlated to the risk of atherosclerotic cardiovascular diseases. ApoA-1-mediated cholesterol is increased by adiponectin secretion. APO-A or adiponectin same as HDL-cholesterol is of use to evaluate training effects in young females. Metabolic syndrome is associated with higher levels of leptin, PAI-1and with lower levels of adiponectin. It can be suggested that there was a possibility to evaluate the presence of having habitual exercise in young female to examine serum level of leptin or PAI-1

References

St-Pierre DH, Faraj M, Karelis AD, Conus F, Henry JF, St-Onge M, Tremblay-Lebeau A, Cianflone K, Rabasa-Lhoret R. (2006). Diabetes Metab, 32(2), 131-9

Bradley RL, Jeon JY, Liu FF, Maratos-Flier E. (2008). Am J Physiol Endocrinol Metab. 295(3), E586-94

THE MORPHOFUNCTIONAL CONDITION OF ADULT WOMEN IN RELATION TO PHYSICAL ACTVITY

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Introduction: The way of spending one's spare time and many daily habits are the elements of human behaviour which constitute a certain lifestyle. In case of adults the assessment of physical activity concerns not only the activity during spare time, but also during work. Physical activity which is undertaken for the proper amount of time and with regular frequency generally has a positive influence on the functioning of human organism, regardless of one's age. The aim of this work is to assess the somatic and functional parameters of adult women and to study if the values of these parameters are changed by active lifestyle.

Method : 132 women aged 25 – 65 were examined. They were divided in two groups: the younger one (25 – 49 years) and the older one (50 – 65 years). The following measurements were taken: body height and mass, body composition (fat mass, lean body mass, water), lungs' ventilation parameters (VC, FVC), and motor fitness (hand-grip strength, flexibility). BMI was calculated. The Seven-Day Physical Activity questionnaire was carried out (1997, 2003). The results regarding the time spent on physical activity, working with computers and watching television and a self-assessment of one's wellbeing were used in the study. Basic statistical characteristics and regression equations were calculated.

Results: The older women are characterised by a significant rise of body mass caused by an increase of the total amount of fat in the organism with no change of lean body mass. The systolic and diastolic blood pressure rises, however pulse remains at the same level as in younger women. In the older group a significant decrease of hand-grip strength, flexibility and lungs' ventilation parameters (VC, FVC) is observed. The older women spend less time on physical activity and more on watching television. The observed decline of biological condition reflects in health self-assessment.

After comparing the groups of women taking exercise and not taking exercise at all it has been stated that physical activity has contributed to the improvement of somatic and functional parameters of younger women. It is possible that older women did not spend enough time on physical exercise to see its positive effects.

References

Seven-Day Physical Activity Recall (1997). Medicine & Science in Sports & Exercise., 29, (Suppl.), 6, 89.

Washburn R.A. et al (2003), Medicine & Science in Sports & Exercise. 35(8):1374-1380.

INFLUENCE OF HEAT PRECONDITIONING ON ECCENTRIC CONTRACTION-INDUCED MUSCLE DAMAGE AND MUSCLE SORENESS IN WOMEN.

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Introduction: Strenuous eccentric exercise induces skeletal muscle damage and delayed-onset muscle soreness (DOMS). Recently, we have reported that heat treatment at one day before eccentric contractions could inhibit muscle damage in men. However, a previous study suggests that there may be gender-based differences in skeletal muscle responses to eccentric contraction-induced muscle damage. Therefore, the purpose of this study was to examine the influence of heat preconditioning on eccentric contraction-induced muscle damage and muscle soreness in women.

Methods: Nine untrained female subjects (23 ± 3 yrs) volunteered to participate in this study. They were randomly assigned to with (HEAT; n = 5) or without (CON; n = 6) heat preconditioning group and were asked to perform 30 repetitions of maximal isokinetic eccentric contractions (ECC; 10 reps × 3 sets) of non-dominant elbow flexors at angular velocity of 30°･s-1 by means of isokinetic dynamometer. The heat preconditioning was achieved by microwave hyperthermia units (150 W, 20 min). Maximal voluntary isometric strength, range of motion of elbow joint, upper arm circumference, serum creatine kinase (CK) activity and muscle soreness were assessed for 4 days after ECC. Maximal voluntary isometric strength was measured twice for 5 s at an elbow angle of 90°. Range of motion

was assessed as an angular displacement from relaxed through flexed positions. Upper arm circumference was assessed by the tape measurement of five points (3, 5, 7, 9, 11 cm above the elbow joint) on the upper arm in relaxed position. Approximately 10 ml of blood sample was drawn by venipuncture from the cubital fossa region of the arm for serum CK activity. Muscle soreness was measured using 100-mm visual analogue scale.

Results: The reductions in maximal voluntary isometric strength and range of motion of elbow joint were not changed by heat preconditioning (HEAT: 54 ± 14 % vs. CON: 51 ± 6 %, HEAT: -24.3 ± 15.5° vs. CON: -21.8 ± 13.8°). Also, Heat did not show any significant changes in the upper arm circumference (HEAT: 0.7 ± 0.4 cm vs. CON: 0.5 ± 0.3 cm), CK (HEAT: 349 ± 344 U/L vs. CON: 1878 ± 1092 U/L) and muscle soreness (HEAT: 45.5 ± 12.4 mm vs. CON: 67.6 ± 24.2 mm) after ECC, compared with CON.

Conclusion

These results suggest that a heat preconditioning at one day before eccentric contractions could not affect the eccentric contraction-induced muscle damage and muscle soreness in women.

AGE AND SEX DIFFERENCES IN PHYSICAL ACTIVITY OF STUDENTS LIVING IN THE LISBON METROPOLITAN AREA

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Introduction: Despite the knowledge of benefits of regular physical activity (PA), some studies with students have shown high prevalence on sedentary habits. Because of this it is important to investigate the determinants of their PA participation.

Objective: This study sought to examine sex and age differences in PA among students of 12, 15 and 18 years, living and studying in the Lisbon metropolitan area. It also characterizes adolescents' lifestyles and their psychological background.

Methods: A total of 877 students (436 boys, 441 girls) ages 12 (n=250), 15 (n=550) and 18 (n=77), from six public schools in Lisbon were sampled. Data was collected using a questionnaire about leisure time activities, PA participation, goal orientation, perceptions of health, competence and body image. A PA index was produced from questions about sports participation in several contexts (formal, informal, school sport, and intensity of PA during the week). An ANOVA and Scheffe post hoc comparisons to analyze the effects of age and sex on the PA index were used. Values were considered significant at $p < 0.05$.

Results: The mean of the PA index was 3.02±1.10 (3.27±1.05 for e 2.78±0.96 for girls), ranged between 1 and 6. A tendency to decrease the PA index by age in both sexes was observed. The general effect of age on PA index was significant with high intensity ($F(2,871) = 4.617$; $p = 0.01$; power = 0.78). Statistical differences were found between 12 and 18 years; 15 and 18 years, in both sexes. Even though 12 year old students were more active than 15 year olds, ANOVA revealed no significant differences.

Comparing sexes, boys had higher levels of PA participation than girls in all age groups, verifying that the lowest levels of boys, at age 18 (2.93±1.14), were superior to the highest levels of girls, at age 12 (2.82±0.92). It was very interesting to observe that girls ages 12 and 15 participated more than boys in school sport. Nevertheless, this tendency changed by the age of 18. Participation in PA decreased with age in both sexes. The general differences between boys and girls were significant ($F(1,871) = 28.074$; $p < 0.001$; power = 1).

Conclusions: The mean PA index was relatively low in general for all students but especially for girls. These results are in line with results that were obtained by other national and international studies. Something must be done in order to prevent this reality. The fundamental role that schools and PE can assume in the promotion of active lifestyle has been largely recognised. This claim must be assumed by school community. The older students and girls should be the focus of specific interventions. After leaving school they will no longer be obligated to participate in PE classes, which could mean that their PA levels will drastically decrease.

EFFECTS OF THE MENSTRUAL CYCLE ON EXERCISE PERFORMANCE IN ACTIVE WOMEN

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The present study examined the effects of menstrual cycle on exercise performance in university active women. Method: Fourteen active eumenorrheic women (age 21 ± 1.8 yr) after to fill up questionnaire was selected randomly. After determination the phases of menstrual cycle, subjects were performed a graded maximal exercise test for two phases of follicular (days 7-11) and luteal (days 19-23).The body fat(fat%),weight and height assessed before test .Blood lactate, VO2max, time to exhaustion, estrogen and progesterone hormones were measured in the FT and LT phases. Rating of perceived exertion assessed by Borg scale . Results :The results showed no significant differences between the follicular and luteal phases in VO2max (31.26 ± 3.01& 30.41± 3.43 ml.kg¹ֿ.min¹ֿ respectively), blood lactate ,maximal heart rate , time to exhaustion, and rating of perceived exertion (p>0/05).In addition ,there was no significant correlation between VO2max and progesterone hormone in the luteal phase (r =-./25, p>0/05).Conclusion:Data suggest that normal cyclic variations in estrogen & progesterone are without significant effect on any measure of maximal exercise performance. We conclude that in this study , menstrual phase (follicular vs luteal) with menstrual status (eumenorrheic) no alters or limits exercise performance in female active.

LEPTIN AND PHYSICAL FITNESS IN POSTMENOPAUSE

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Introduction: A big amount of postmenopausal women is overweight. Excessive body fat (FM%), especially when centrally distributed, is associated with an increased risk to develop diabetes, coronary heart disease, hypertension, ischemic stroke and several cancers. As adipose tissue is the main source of plasma leptin levels (PLL), FM% increases PLL up to leptin resistance, breaking its healthy physiological function (Considine et al., 1996). As PLL is related both to cardiovascular risk factors (e.g. endothelial dysfunction, hypertension, atherosclerosis) and risk of cancers, independently of FM%, it is highly suggested to reduce high PLL. The aim of this study was to investigate the effect of regular walking training on PLL in 22 overweight postmenopausal women.

Methods: Body composition was assessed by multi-frequency electrical bioimpedance (Human-Im PLUS, Ds Medica, Italy) and data were processed by software Human-Im PLUS 4.0. Dietary habits and caloric intake were estimated by a dietician with three-day dietary records, covering two weekdays and one weekend day, using WinFood-due software (Medimatica, Colonnella, Italy). VO2max was estimated (VO2maxest) by Rockport Fitness Walking Test and PLL was measured by commercially available ELISA-test. No dietary suggestions were given. Each woman walked 4 times a week, for 50 min, at 50-60% of her heart rate reserve.

Results : Walking training determined a decreasing FM% and PLL and an increasing VO2maxest. No variations in dietary habits were reported. Basal values of VO2maxest were poor. Multiple regression models were performed, both on basal and post-intervention values, in order to understand if walking training affected positively PLL taking under control FM% and energy intake. VO2maxest was taken as a proxy variable for walking training effect. Results indicated that, under basal condition, FM% was the only predictor of PLL (coeff. est.=1.093; p=0.010). Furthermore, after the training, FM% and VO2maxest had respectively positive and negative influence on PLL (coeff. est. FM%=0.779, p=0.007; coeff. est. VO2maxest=-1.092; p=0.003).

Discussion: Our results increase the assumption that, independently from FM%, aerobic fitness improvement affects positively PLL in postmenopause, as shown in young women (Hickey et al., 1997). This could lead to a reduction of both leptin resistance and negative cardiovascular effects of leptin even if body composition is not bettered.

References

Considine RV, et al. (1996). N Engl J Med, 334(5), 292-295.

Hickey, MS et al. (1997). Am J Physiol Endocrinol Metab, 272, E562-566.

14:15 - 15:15

Poster presentations

PP-HP01 History/Philosophy and Ethics

HENRIK IBSEN AND THE ORIGIN OF FRILUFTSLIV. AN OCCASION FOR CELEBRATION.

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Introduction: In 2009 it is 150 years since Henrik Ibsen wrote Paa vidderne, translated as On the Heights (alternative translations: Life on the Upland; On the Mountain Wilderness). In this long epic poem, he probably introduced in print for the very first time the word 'friluftsliv'. Did Ibsen create the word? It is hard to tell. But in the meantime friluftsliv has become an important word in the Norwegian language and culture as well as a theme at international scientific congresses. In addition Henrik Ibsen has become one of the very greatest names in world literature. Despite these facts few attempts have been made to investigate possible meanings and functions of friluftsliv" in Ibsen's poem.

Methods : Literary analysis and interpretations.

Results/Discussion: Most translators have treated 'friluftsliv' as a specific Nordic term. The consequence for English readers of On the Heights of course, is that the word 'friluftsliv' just isn't there. Either it is simply translated to 'outdoor life', or the passage is somehow rewritten. Here after Reed and Rothenberg (1993:12):

In the lonely seter-corner,
My abundant catch I take.
There's a hearth, and a table,
And friluftsliv for my thoughts.

The poem in total consists of 328 lines. We follow a young nameless man who leaves his home and the girl whom he loves, and heads for the mountains. First his plan is to return, with a splendid reindeer pelt for his mother, and some too for his sweetheart. But then he meets a stranger urging him to stay. The winter comes. At Christmas he observes the house in the valley burn to the ground with his mother inside, and by summertime his sweetheart is another's bride. The young man fills with sorrow, but at the same time it becomes obvious that there is nothing left for him down in the valley. He has expended his "lowland life" and the poem ends. This short summary and the quotation above actualises several underlying themes that can have relevance to our modern understanding of friluftsliv: to be alone in nature; a life simple in means, but maybe rich in ends; connections between friluftsliv and activities of more intellectual, recreational or spiritual character. It should be emphasized how the young man has to make deep sacrifices in order to achieve "the higher view". His "bosom becomes as stone". In the end he is "steel-set" and follows a command to live on the hills. Friluftsliv is introduced at an earlier stage in Ibsen's poem and does not belong to this extreme idealism. In "friluftsliv for my thoughts" the main character still has contact with the everyday ordinary life.

References

Reed, P. and Rothenberg, D.(ed.). 1993. Wisdom in the Open Air. The Norwegian Roots of Deep Ecology. University of Minnesota Press, Minneapolis.

THE EMBODIED SOLDIER: TOWARDS A NEW SOLDIER ETHOS FOR THE MODERNIZED NORWEGIAN ARMED FORCES?

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The military transformation of the armed forces is changing our understanding of what are good soldiering skills. The modernization process aims to develop military communities of practice that are ready, willing and able to serve and fight anyone, anywhere, anytime on regular bases. As a consequence many western countries, like Norway, are witnessing a radical shift from conscription towards professionalism – were being a soldier should be understood as an embodiment of the knowledge, skills and values of a professional military community of practice. In this article I will explore how the thinking underpinning the traditional invasion defense force and the flexible expeditionary force of the future supports two different views of the human body. In doing so I will show how a change from a traditionally dualistic view towards a more integrated holistic view can offer an opportunity to transition from competent, good enough practice to expert practice – and thereby a new soldiering ethos.

Keywords: transformation; soldiering skills; military community of practice; the emdodied soldier; soldier ethos

ANALYSIS OF RISKY BEHAVIOURS AMONG YOUNG BRAZILIAN ATHLETES

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The substances use and other ergogenics use by young and experienced athletes are common. Searching for an outstanding performance, the greed most of the times comes without essential ethical cares. This project has as objective the investigation of what's the athletes knowledge level when they are in the basis categories (12-14 years old), considering the ergogenics sources that are considered doping, or not. What is the motivation for them to the sportive practice and which are the factors or who are the people that influence their decision. Besides, it is intend to identify how act, in relation to this matter, the others agents so as: the coaches, the physical trainers, the medical team, the sportive psychologists and the team managers. The methodology insight the preparation of three investigation procedures: the behavior observation, made through athletes' films got during and as soon as the competition is finished; behavior analysis of athletes' and coaches', made through some application forms and trough a personality given test. The questionnaires (forms) will be given to all of the participant population on the Brazilian School Olympic Games in 2009, 2010 and 2011, including athletes, coaches and delegation managers. The personality test will be given as the sample calculus points out.The observations will be made in winners of the event, representatives of the five sport groups: strength and speed, resistance, collective games, combat sports and technique sports.The evaluations will be made during the Brazilian School Olympic Games (OEB) on the three years of 2009, 2010 and 2011 on the athletes' class (12-14), in all of the modalities.These athletes represent all Brazilian regions. The Brazilian Sport Ministry joined to the Brazilian Olympic Committee is promoting this event.This generation athletes should represent the country on future international events, and it's highly risky in the matter of the substances or methods potentially harmful to their health, which may be considered doping. At this age, the athletes begin to subdue to high train levels and they aren't controlled about the risk of prohibited substances or not. At this social group, it seems to be important the prevention to the use of social drugs and the use of drugs that increase performance. Coaches and multidisciplinary teams probably lead an important roll on the decision of these athletes and they may contribute to the correct ethical make up, or not. It is intend to analyse the kind of repercussion that the research can bring to these athletes and their own origin places, because this project treat of young athletes originated from the most different country localities and they, most of the times, return to the event on the next year. This investigation must create a national program of conscientiousness related to the use of social drugs and that increase performance. The study has the Sport Ministry and the Brazilian Doping Combat Agency guarantee to be realized.

ATTITUDES AND VALUES OF TALENTED YOUNG ATHLETES TOWARDS PERFORMANCE ENHANCING DRUGS: A QUALITATIVE STUDY

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USA-based review articles suggest a small but significant proportion (between 3 and 12 per cent) of adolescent males have used anabolic-androgenic steroids (AAS) at some point (Calfee and Fadale, 2006; Yesalis and Bahrke 2000). There are suggestions, however, that the terminology used in some questionnaires has lead to over estimates of prevalence (Kanayama et al., 2007). The general problem of doping in adolescents and young people has rarely been addressed in depth using qualitative methods. In this study a total of 40 talented young male and female athletes (mean average age 19.6 years) from 13 different sports attended 12 focus groups held over the UK in both 2008 and 2009.

Athlete knowledge of doping techniques was generally limited, as was their access to populations among whom doping or pharmaceutical body enhancement was practiced recreationally. Elite athletes often trained only with each other at elite facilities, and were in the main insulated from the wider trend toward body enhancement for aesthetic reasons noted within the health and fitness community more generally (Baker, Graham and Davies, 2006). Athletes in general did not report a significant national doping problem in their sport, but were sceptical regarding both doping practices and the stringency of testing procedures outside the UK. The traditional moral emotions of shame and guilt associated with doping were cited as significant deterrents (for a discussion of shame in relation to doping see McNamee, 2008). Athletes in general perceived no pressures to use performance enhancing drugs. In hypothetical discussion various factors were acknowledged as potential 'pressure' or 'tipping' points: most notably the economic pressures of elite sport. Finally, a significant minority of athletes entertained the possibility of taking a hypothetical, banned but undetectable performance enhancing drug that would guarantee success. When a caveat was added to the hypothetical question that this drug would reduce life span by ten years it resulted in an almost total rejection of the possibility of doping. The study thus offers an insight into the values and attitudes of young athletes, extending beyond mainly survey based research concerning doping prevalence.

References

Baker, J.S., Graham, M.R., and Davies, B. (2006) 'Steroid Prescription and medicine abuse in the health and fitness community: A regional study', European Journal of Internal Medicine, 17: 479-84.

Calfee, R. and Fadale, P. (2006) 'Popular Ergogenic Drugs and Supplements in Young Athletes' Pediatrics, 117(3): e577-e589.

Kanayama, G., Boynes, M., Hudson, J.I., Field, A.E., Pope Jr, H.G. (2007) 'Anabolic steroid abuse among teenage girls: An illusory problem?', Drug and Alcohol Dependence, 88: 156-62.

McNamee, M.J. (2008) Sports Virtues and Vices: Morality Plays, London and New York: Routledge.

Yesalis, C.E. and Bahrke, M.S. (2000) 'Doping among adolescent athletes', Baillière's Clinical Endocrinology and Metabolism, 14(1): 25-35.

SPORT AND CHRISTIANITY: SIMILES AND RECIPROCAL INFLUENCES OF TWO PILLARS OF WESTERN CULTURE

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Sport and Christianity are two phenomena which have remote origins: the first was born in Ancient Greece, the second has established itself within the Jewish culture as a point of rupture and progress compared to the previous tradition. Both have influenced each other reciprocally in many occasions through the contact between the original cultures. Both of them have evolved in time until they reached today a mass distribution on the entire planet, characterizing themselves as two of the pillars of western culture.

We can find an initial example of the reciprocal influences between Hellenic culture and Jewish-Christian culture in the ascesis, a practice shared but not invented by the Christians. Ascesis is a word coming from the world of Greek sport. The sportsman trains in order to

achieve outstanding performances. From the sports world, the word moved to the sphere of philosophy. Philosophers trained in order to achieve inner freedom. Furthermore, in San Paulo, sport is considered as metaphor of Christian life. This parallelism between Christian values and sports ethics is afterwards spoken about again by some Fathers of the Church and it has remained alive also during the Contemporary age, as it is possible to notice in the numerous « speeches » pronounced by the last Popes.

A line of circularity and fruitful reciprocality with Christian thinking appears by analyzing the foundations and the values which characterize sport. Values such as honesty, solidarity, loyalty, perseverance, altruism, peace, justice, fortitude, self-control, wisdom etc… are expressed through sport. Sport is joy of life, play, fun. All the factors that constitute the strong cultural, ethical and educational valence, which materializes itself in creating development and permanent growth opportunities of man in the totality and truth of its values and its needs. Sport is expression of the richness of the human being, much more valid and appreciable than having, and therefore much above the severe production and consumption laws and every other life consideration that is purely utilitarian and hedonistic. There is an ethical crucial need that conscience knows not to delete: that of turning sports practice into a reality which services the person, in the totality of his values and necessities. It is the evangelic and at the same time rational principle: «not man for sport, but sport for man».

Sport, as an educational vehicle with wide spread diffusion, is on the same wavelength of the Christian message for the same reason that the essence of real sport shares the majority of Christian values and its practical dimension allows to stage, in real terms, the «game field» in which those values can be reached.

References

Parry J, Robinson S, Watson NJ, Nesti M. (2007). Sport and Spirituality, Routledge, Oxon.

Scarpa S. (2008). Corpo, movimento, sport in discussione. Il punto di vista cristiano. Cleup, Padova.

Spencer AF. (2000). Journal of Interdisciplinary Studies, 12 (1/2), 143-158.

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Poster presentations

PP-SP01 Sport Management

SPORT FAN IDENTIFICATION, PERSONALITY TYPE AND SPORT CONSUMPTION

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Introduction & aim: Fans that are highly attached to their sports teams often purchase more licensed team merchandise (Wann &Branscombe, 1993; Fisher &Wakefield, 1998) and attend more games (Trail, Anderson &Fink, 2003) than fans with low involvement because of their desire to achieve a strong affiliation with the team. Basic personality traits such as extraversion, agreeability, and need for arousal positively affect the need for affiliation, and the need for affiliation positively influences the level of identification with the team (Donavan, Carlson &Zimmerman, 2005). Therefore, the aim of this study was to examine the effects of sport fan identification and fan personality types on purchasing licensed team merchandise.

Methodology: A total of 381 undergraduate students aged between 18 and 30, participated in the study. They were randomly selected, and those who were a football sport fan were included in the study. The Turkish version of Wann & Branscombe's (1993) Sport Spectator Identification Scale (Günay &Tiryaki, 2003) and the Turkish version of John, Donahue &Kentle's (1991) BFI (Evinç, 2004) were used to collect data. Product consumption of the fans was determined by asking them asking them the number of licensed products purchased from their teams' stores in the last one year. Independent sample t-test and regression analysis were used to analyze the data.

Results: revealed that there is a significant difference among gender groups on their team identification levels [t379= -5.895, p<.01]. Male fans' team identification (x=39.08) is higher than that of female fans (x=31.39). However, there is not a significant difference among gender groups with respect to their teams' licensed product consumption [t192= -1.289, p>.05]. The regression results showed that there is a significant relationship between the fans degree of team identification and their teams' licensed product consumption [R=.290, R2= .084, F(1-192)=17.591, p<.01]. Nevertheless, there is not a significant relationship between the personality traits of the fans and their teams' licensed product consumption [R=.163, R2= .027, F(5-188)=1.028, p>.05].

Conclusion: The results revealed that male fans are highly identified with their teams than female fans. The degree of fan identification affects fans' purchasing attitude that is, the higher the identification of fans with their teams, the higher the frequency of purchasing licensed team merchandise. This finding is consistent with the finding of Wann &Branscombe (1993), and Fisher &Wakefield (1998). Personality traits do not affect fans purchasing attitude. It could be said that personality trait is not a factor to predict the purchasing attitude of fans.

References:

Wann, D.L.,&Branscombe, N. R.(1993) Sports fans:measuring degree of identification with their team. Journal of Sport Psychology,24,1-17.

Trail, G.T., Fink, J.S.,&Anderson, D.F.(2003) Sport spectator consumption behavior. SMQ,12,8-17.

Donavan, D.T., Carlson, B.D.&Zimmerman, M.(2005) The influence of personality traits on sports fan identification.SMQ,14,31-42.

A SURVEY OF GOLF COURSE MANAGEMENT IN SCOTLAND

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Introduction: Golf is popular in many parts of the world as a sport of ladies and gentlemen. Golf has a large market from the viewpoint of sports business. We previously researched marketing and customer services performed by golf courses in Japan (Horie, et al., 2006) (Kita,et al., 2006). In the present study, we investigated marketing/management measures implemented or planned to attract new customers by golf courses in Scotland.

Methods: In this study, a survey was performed in 310 golf courses in Scotland. The survey was performed from September 1 to 31, 2006 by mailing questionnaires. Responses were obtained from 29 golf clubs with a recovery rate of 9.4%.

Results: "Revision of green fees" (55.2%),was the most common measure currently taken to increase profits at the golf courses surveyed. Subsequently, common measures included "renovation and construction of facilities"(27.6%),"cost reduction" (27.6%),"renovation and construction of course" (27.6%),"database of customers" (24.1%),"information services using information technologies" (24.1%),"enhancement of promotion" (20.7%),"customer development" (17.2%), "improvement of unprofitable operations" (17.2%),"securing of high-quality personnel" (13.8%) "enhancement of market surveys"(3.4%), and "enhancement of houses"(13.8%). Special customer service were provided at 6.9% of golf clubs, not provided at 65.5%, planned at 13.8%, and no specific comment was given by 13.8%. Detailed content of service were "easy payment plans" etc.

Discussion/Conclusion

In a similar survey with golf courses in Japan, the implementation rate of "cost reduction" was the highest, reaching about 80%, special customer service provided at 53.8%, which could have been considerably affected by the prolonged economic recession. In the future, we would like to obtain more detailed data based on factors such as the golf culture and economic conditions in each country.

References

Kita T et al.(2006). How to manage an attractive golg course –A case study with golf courses in the Kyusyu area , 15th Japan Society for Sports Industry abstracts pp.17-18(in Japanese)

Horie S et al.(2006). The contents of customer service at commercial sports facilities –A case study with golf courses, 57th Japan Society of Physical Education,Health and Sports Science abstracts p.184 (in Japanese)

THE OPINIONS OF AUDIENCES TO INCREASE THE APPEARENCE OF HANDBALL IN TURKISH PRINT MEDIA

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THE OPINIONS OF AUDIENCES TO INCREASE THE APPEARENCE OF HANDBALL IN TURKISH PRINT MEDIA

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INTRODUCTION: It can be said that although handball is one of the sports that has scored several successes, it is neglected by audiences and print media. In spite of this discrepancy in Türkiye, there are some leagues, which are shown increased interest, such as ASOBAL Liga in Spain, Handball Bundesliga in Germany, Handboll Elit Serien in Sweden, TDC Liagen in Denmark. Furthermore, handball is being shown interest by print media in Korea, Egypt and Tunisia.

All sports including handball and media have dynamic relations to market sports as commercial entertainment in the world. Audiences are affected by sport events, they take a strong interest in factitious events they read rather than real life they live in. As a result, they forget their daily problems, teams and athletes' problems or successes become more important.

In this research we tried to find the answer of the following question; What are the opinions of audiences to increase the appearance of handball in Turkish print media?

METHODS: In this research a questionnaire was used. There were 15 items in Likert scale, 8 questions for demographic characteristics and personal information. It was applied to 386 audiences.

FINDINGS : More than half of the audiences are under the age of 20 (% 52.1), % 47.9' are male, %52.1are female, most of them are single (%78.4), more than half of them have 500TL income (% 52.5), most of the are students (% 68.1), % 69 of them do/play sports and % 65 of them have knowledge about handball. According to arithmetic average and standart deviation of 15 items,'5 the most important, 1 not important, the item of 'success in sport' is at the top with (4.66) arithmetic average and (0,613) standart deviation, the item of 'athletes' daily life'is at the bottom with (2.97) arithmetic average and (1,348)) standart deviation

RESULTS AND DISCUSSION: It can be defined that more than half of handball audiences in Türkiye are students, single, young and they have low income,

According to their opinions, the items such as success in sports, advertisement, handball in media, educational and magazine tv programs about handball, precautions and changes to make handball more exciting, sponsorship contracts for handball, media as a sponsor for handball, transferring popular handball players to Türkiye are most important.

REFERENCES

-Çeliksoy, M. A. Hentbolde Teori ve Uygulama, Anadolu Üniversitesi Yayınları, No: 921, Beden Eğitimi ve Spor Yüksekokulu Yayınları, No: 1, Eskişehir:1996.

-Tükenmez, M. Medya ve Spor, Etikus Yayınları, İstanbul:2003.

-Özer. Ö. Medya Şiddet Toplum, İletişim Fakültesi Yayınları, No: 57, Eskişehir:2007.

SPORT SPONSORSHIP AS A FINANCIAL RESOURCE IN TURKEY

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Introduction: Economic dimension of sponsorship is continiously growing in the world. In this context, sport sponsorship has reached a global volume of 80 billion dollars in 2004 (1, 2). The aim of this study was to evaluate the effects of sport sponsorship contracts on individual athletes and sport clubs in Turkey, besides the general and specific motives of corporate organizations for the establishment of a sport sponsorship relation.

Methods: A semi structured face to face interview technique was applied to five specialists of sport sponsorship in order to identify relevant items for the questionnaire which was used for the quantitative evaluation. That questionnaire was applied to the following groups:

1. Individual athletes with sport sponsorships (29 athletes)

2. Sport clubs with sport sponsorships (27 clubs)

Results: Although group related differences of sport sponsorship exist for individual athletes and sport clubs, both groups struggle with similar procedures and difficulties. The athletes were supported financially for participating in the national and international events, and related revenues. The clubs were supported financially by the sponsors for participating in the national and international events, health related expenses, name rights and related revenues. But the financial support both for individual athletes and sport clubs, remained inappropriate. There were substantial divergences in the concept and application of sport sponsorship between the corporate organizations (the sponsors) and both individual athletes and sponsored sport clubs.

Discussion: The inadequate perception of sport in Turkey hinders the increase of sport sponsorship support. In order to develop and determine the status of sport sponsorship of individual athletes and sport clubs in Turkey, redaction of variance in sport sponsorship procedures and increase of the effectiveness of sport sponsorship legal and administrative steps covering all sport activities should be taken.

References

1. Crompton J.L., "Conceptualization and Alternate Operationalizations of the Measurement of Sponsorship Effectiveness in Sport", Leisure Studies, Vol.23, No.3, 267–281, July 2004.

2. Sporda Sponsorluk Firsatlari Almanagi 2007, GSGM Spor Kuruluslari Dairesi Baskanligi, Sponsorluk Subesi, İstanbul, p. 96, November 2006.

THE DETERMINATION OF DEMOGRPHIC CHARACTERISTICS OF HANDBALL PLAYERS IN FIRST DIVISION

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Introduction: The marketing of different sport branches need not only the success of the given sport, but also the number of spectators and the demographic characteristics of the participants. It can be said that the activities that are launched for finding sponsors are not enough in Turkey. The determination of demographic characteristics of Handball players in first division and to help bringing together the elite handball players with sponsors.

Method: A questionnaire has been prepared for gathering information on the demographic characteristics of the handball players (n=100, team n=7) in first division. The population of the current study is the total number of teams playing in the first division of Turkish Handball Federation during the session of 2007-2008.

Results: The analysis of the findings of the current study has shown that the players of Turkish Mans First handball division were 35,1 percent of them having the age range of 24-26, 81,6 percent of them were single, 77,3 percent of them were having undergraduate degrees, 65 percent of them had more than 2000 TL wages, 64,9 percent of them were living in a city centre, 85 percent of them were not having more than 2 sisters and/or brothers, their parents were having degrees higher than secondary schools and working as a governmental stuff and having middle class standards (38 percent of them having 1.500 TL or more income rates) in the Turkish standards. Besides, 44 percent of the players were team members of 1-3 years, 52,5 percent of them were chosen as handball players by their PE teachers. 25,8 percent of players choose reading books, 25.8 percent of them surfing in internet, 22,6 percent of them prefer listening music and 15,4 percent of them join activities like cinema/theater/concert etc. in their spare times.

Discussion: It can be concluded that the findings of the current study has shown that most of players of the Turkish Mans First handball division are young and single, having undergraduate degrees, reaching the level of middle class income rates in Turkey and coming from middle class families. It can be also said that most of them are city-dwellers and enjoy reading, listening music, dealing with computer and having high cultural level. The findings of the current study should be shared with Turkish Handball Federation for reaching to the potential sponsors.

References:

1.Argan, M.& Katırcı, H. Spor Pazarlaması, Nobel Yayınları, Ankara: 2002.

2.Dzudie, A. Menanga, A. Kinque, S. Ultrasonographic study of left ventricular function at rest in a group of highly trained black African handball players, E.J. Echocardiography V. 8, Cameroon: 2007.

3.Erkan, M. Spor İletişiminin Önemi ve Takım Performansına Etkisi Üzerine Bir Araştırma, Anadolu Üni. Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi, Eskişehir: 2002.

4.Keçeci, A. Eroğlu, E. Hentbol Sporcularında Dental Travma: Ön Çalışma, S.B.Ü. Tıp Fakültesi Dergisi, Sayı,12 (4), Isparta: 2005.

SOCIAL INTEGRATION AND NATURE SPORTS: A RESEARCH ON UNIVERSITY STUDENTS IN TURKEY

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Introduction:The purpose of this study was to explore the contribution of the nature sport activities on the social integration of the university students.

Methodology:The population of the research was composed of subjects who were university students and also members of the nature sports communities in the universities of Ankara. The sample of the research was consisted of 587 (male 341,female 246) university students. Social Integration in Sports Scale was used as the data collection instrument, which is composed of 7 sub-scales (personal development, 0.80; socialization, 0.82; physical benefit, 0.80; social integrity, 0.82; psychologic development, 0.71; moral development, 0.75; and emotional development, 0.55) and 32 items (Yılmaz, Karli, &Yetim, 2006). The data collection instrument was comprised of two main sections. In the first section, there were questions seeking demographic information (age, gender, residence place, involvement frequency to the nature sport activities) from the subjects, and the second section was composed of SISS items.

Statistical Analysis: To analyze the data, ANOVA was used to define social integration level differences of subjects according to their demographic characteristics such as; gender, residence place, meeting frequency with friends and involving frequency to the activities. To identify the difference causing group as the result of ANOVA, Tukey HSD Test was conducted. To display if any difference occurred in the social integration levels of subjects according to their gender t-test was conducted. In the statistical analysis of the data .05 significance level was taken into consideration.

Results: There was significant difference in subjects opinions about the effect of nature sports on individual development [F(3-583)=1,610;P>,05] and socialization [F(3-583)=2,844;P<,05] according to their participation level to the nature sports activities. Additionally, significant difference was identified in subjects' opinions about the effect of nature sports on individual development [F(2-584)=11,179;P<,05], socialization [F(2-584)=13,600;P<,05], psychological development [F(2-584)=3,892;P<,05] and moral development [F(2-584)=4,727;P<,05] according to their meeting frequency with their friends. There was significant difference in emotional development sub-scale of effect of nature sports on social integration according to the subjects residence place [F(2-584)=5,441;P<,05]. Also, significant difference was found in socialization [t(585)=-3,005;p<0,05] and physical development [t(585)=-2,977;p<0,05] aspect of nature sports according to the gender difference.

Conclusion: Finally, present research, which was conducted to analyze the effects of nature sports on the social integration of individuals, resulted that sports integrative role may show variations according to the participants personal characteristics.

Reference:
Yılmaz, B., Karlı, Ü.&Yetim, A.A. (2006).Sporda Sosyal Bütünleşme Ölçeği (SSBÖ) Geçerlilik Güvenirlik Çalışması.Gazi Beden Eğitimi ve Spor Bilimleri Dergisi, 11(4),3-10.

INTERCONNECTIONS AND INTERDEPENDENCY OF NORWEGIAN SPORTS FEDERATIONS AND SPONSORS, AND CONSEQUENCES CONSIDERING DOPING

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NORGES IDRETTSHØGSKOLE

Introduction: After the big doping case in the 2001 Ski World Championships in Lahti, where almost the entire finish ski team tested positive for doping, it was shortly after reported that the Finish Ski federation had lost a great deal of money through the loss of sponsors. In international cycling the same thing happened after the doping case in the Tour de France in 1998. Many sponsors and TV companies have withdrawn from the sport because of repeated doping cases. Based on experiences in the past, this thesis look at what could be the consequences of a similar episode in Norwegian sports. The main questions are: Is the doping question a part of the interconnection between Norwegian sport federations and sponsors? And: What could be the consequences for the interdependency of Norwegian sports federations and sponsors in the case of a positive doping case? This thesis drews on organizational theory (Mitchell, Agle & Wood, 1997) and sponsor theory (Cousens, Babiak & Bradish, 2006) to exam the questions.
Method: Ten in depth interviews with strategically selected people from two different Norwegian sports federation: The Norwegian ski federation and the Norwegian Snowboard association, their main sponsor DnB NOR, a sponsor of The Norwegian ski federation; Nemi Forsikring ASA, and a sponsor agent.
Results: Early findings indicate that the sponsors have the opportunity, based on the contracts with the sport, to withdraw if there are any positive doping cases. When it comes to the actually work relations, doping is almost not mentioned, and the sport and the sponsors do not talk so much about it. On the other hand, just because it's not talked so much about, doesn't mean it's not important to the sponsors. The sponsor will not be associated with doping, but can however evaluate the circumstances for the positive doping case before they decide to withdraw or not.
Discussion: Based on the nature of the interconnection and interdependency between sports and sponsors, this thesis try to explain why the consequences of a positive doping case is not a matter of just what the contract says about doping, but is an evaluation of different factors done by the sponsors before they decide whether to withdraw from the sport.
References:
Cousens, L., Babiak, K. & Bradish, C. (2006). Beyond Sponsorship: Re-Framing Corporate Sport Relationships. Sport Management Review, 9, 1-23.
Mitchell, R. K., Agle, B. R. & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. Academy of Management. The Academy of Management Review, 22, 853-886.

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Poster presentations

PP-BM01 Biomechanics 1

THE USE OF COMPUTER-AIDED-DESIGN (CAD) FOR THE CONSTRUCTION OF AN INERTIA RIGID MODEL OF THE SKI JUMPER

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Introduction: Different types of isometry inertia models of the human body have been developed for the mathematical modelling of aerial movements (e.g., Yeadon, 1990). Recent advancements in rigid modelling include the use of anthropometric data adjusted for 3-dimensional (3D) simulation (Dumas et al., 2007) and of CAD in support of computational fluid dynamics projects (e.g., Meile et al., 2006). CAD may be used to model variations in flight posture and to obtain inertial parameters for the assessment of flight stability in ski jumping. Thus, this study aimed to evaluate the use of CAD for the construction of an inertia rigid model for applications in ski jumping.
Methods: A 14-segment 3D rigid model of the ski jumper was designed using Delcam PowerSHAPE-e 8080 CAD software, adjusted anthropometric data (Dumas et al., 2007) and postural ski-jumping data (e.g., Meile et al., 2006). Variations in flight posture included ski opening angle (SOA) at 20°, 25° and 30° and forward leaning angle (FLA) sampled from 0° to 40°, at 10° intervals. The position of the centre of gravity (CG) and the principal longitudinal moment of inertia (Iy) were computed for each posture (Parallel-axes theorem; Yeadon, 1990). Inertial properties of the helmet, boots and skis were included using equations for symmetric objects of uniform composition (Griffiths, 2006).
Results: The mean ± SD position of the CG for all flight postures was 54.9 ± 0.2% of athlete's height. The mean ± SD Iy was 14.7 ± 0.3 kg • m2, where Iy decreased slightly with SOA but increased prominently with FLA.
Discussion/Conclusion
Iy increased noticeably with FLA; thus, FLA may be considered an important damping derivative in ski jumping that helps prevent departures from trimmed attitude. However, large FLA lowers the static stability. Drawing upon past research (Yeadon, 1990; Meile et al., 2006), CAD permitted modelling variations in flight posture and the computation of inertial parameters for the assessment of flight stability in ski jumping.
References
Dumas, R., Cheze, L. and Verriest, J.P. (2007). Adjustments to McConville et al. and Young et al. body segment inertial parameters. Journal of Biomechanics. 40: 543-553.
Griffiths, I.W. (2006) Principles of Biomechanics and Motion Analysis. Lippincott, Williams & Wilkins. London.

Meile, W., Reisenberger, E., Mayer, M., Schmölzer, B., Müller, W. and Brenn, G. (2006). Aerodynamics of ski jumping: Experiments and CFD simulations. Experiments in Fluids. 41: 949-964.

Yeadon, M.R. (1990). The simulation of aerial movement – II: A mathematical inertia model of the human body. Journal of Biomechanics. 23 (1): 67-74.

MECHANICAL EFFICIENCY AND SKIING SPEED DURING ROLLER SKIING WITH DIAGONAL STRIDE TECHNIQUES

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The purpose of this study was to clarify how mechanical efficiency during submaximal level roller skiing with diagonal techniques (ME) changes with speed. ME was calculated with the total work rate which contained the work for body segment motions and for external loads, and also the energy expenditure rate measured under experimental conditions. Eight male intercollegiate cross-country skiers were roller skied with a diagonal stride at given speeds on an all-weather level track to videotape motions and measure oxygen uptake. The work rate which was supposed all mechanical energies could be transferred within and between all body segments and was summed increase in the whole body energy levels, and the work rate for overcoming frictional loads on roller skis were calculated. Then, both work rates normalized for body mass were summed. This total work rate was divided by the energy expenditure rate which was subtracted energy cost in a resting state, and thus ME was calculated. The results could be summarized as follows. ME increased remarkably with speed up to 3.6 m/s at which ME indicated the maximal value of 0.357, and subsequently shifted to a moderate decrease. This variation of ME could be attributed to reutilization of elastic energy stored in actively stretched muscle-tendon complexes and variation of recruitment patterns of muscle fibers with roller skiing speed. At low speed, less elastic energy could be restored and reused due to small force application and long coupling time in activated muscles, and therefore ME was lower. ME could have a significant increase at middle speed since slow-twitch (ST) fibers, which are efficient in low-intensity exercises, were recruited adequately, and stored elastic energies were reutilized efficiently during stretch-shortening cycles and hence energy expenditure was reduced. At more than middle speed, ST fibers, which deteriorated efficiency in high-intensity exercises, were recruited sequentially, and in addition recruitment of fast-twitch fibers, which were originally more inefficient than ST fibers, was started. These might cause augmentation of energy expenditure and modest degradation of ME consequently. Furthermore, it was suggested that ME during races could be almost as high as its maximal value.

BIOMECHANICAL FACTORS OF BIATHLON SHOOTING IN YOUTH, JUNIOR AND ELITE ATHLETES

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In Biathlon many factors can have influence on the shooting results. Nitzsche (1998) consid-ered shooting position, targeting, breathing technique and triggering as main performance variables. Regarding stance stability and triggering Sattlecker (2007) stated that these two variables do not require a maximum or minimum, an individual optimum seems to be neces-sary. According to Nitzsche (1998) a pre shot triggering of at least 70 to 80 percent should be achieved. Comparisons between youth and elite athletes showed significant differences be-tween these two groups concerning shooting results, stance stability and triggering (Sattlecker 2009).

The aim of this study was on the one hand to compare 3 different age groups (youth, junior and elite biathletes). On the other hand it was important to measure the influence of stance stability-variables and triggering on the shooting results. Therefore 8 youth (15  1 yr), 5 jun-ior (18  1 yr) and 7 World Cup athletes (28  5 yr) were tested in May 2008. Each biathlete had to shoot 8 series of 5 shots in the standing and 4 series in the prone position. All shots were made without physical load. The measure station consisted of 1) Force plate (FiTRO Sway Check, SVK) for stance stability, 2) Oil force transducer at the trigger (Spezialmess-technik Ilmenau, GER), 3) Computer controlled display for the shooting results ("SA 921" - Sius Ascor, GER). The data were processed by iSportmanager-Biathlon (Ike-Software, AUT). As variables the mean pre-shot trigger force (TF) over one second before firing [in % of the maximum force], the deviation of the standing position [mm] in x-(cross shooting) direction (Xdev) and y-direction (in shooting course) (Ydev), the path length [mm2] (PL) on the force plate and the shooting results (1-10) (Score) were measured. For the prone shooting only TF and the scores were quantified.

For the standing shooting the results showed significant differences between youth and elite and between youth and junior athletes for the stance stability parameters (PL, Xdev, Ydev) but not for the triggering (TF). In prone shooting TF was significantly different between youth biathletes and the two other groups. Regarding the calculated relationships the results demon-strated high significant correlations between all stance stability parameters (PL, Xdev, Ydev) and the shooting scores, although the coefficients were low (-0,275; -0,170; -0,196; $p < 0,001$). For TF no significant correlation with the shooting results could be found. The results also showed that in most cases the correlations for the younger athletes are higher than for the World Cup biathletes.

The significant differences between the groups showed that stance stability and triggering seem to be relevant. Especially for beginners and young athletes the analysed variables look like being important for good shooting scores. It can be assumed that the correlations are low because biathlon shooting is a complex task with many other influencing parameters.

THE GROWTH AND DEVELOPMENT OF LOWER LIMB MUSCLE SIZE AND ANAEROBIC POWER GENERATION CAPACITY IN MALE SPRINT AND LONG-DISTANCE SPEED SKATERS.

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Introduction: It was not cleared that the differences of the muscle structure and function due to growth and development in sprint and long-distance speed skaters. Therefore, in this study, the effects of growth and development on muscle size and maximal anaerobic power generation capacity in sprint (SG) and long-distance speed skaters (LG) aged 13-26 years were investigate.

Methods : The subjects were divided into 5 groups according to chronological age every 2 years in both SG and LG, respectively. The skater at aged 20 or over assumed it adult group (AG). All subjects had belonged to speed skating clubs and they performed training of the each type of speed skating all through the year. Body compositional parameters for body height, body mass, fat mass and fat-free mass (FFM) of the whole body were measured using the body impedance analysis method. The anterior (MTA) and posterior (MTP) thicknesses of the thigh muscles were measured using the B-mode ultrasonic method. Maximal anaerobic power (MAP) was determined using a bicycle ergometer.

Results: FFM, MTA, MTP and MAP increased with chronological age in both SG and LG. The FFM were significant higher in SG than LG in 13-16yr groups. In addition, the MAP was significant higher in SG than LG in 13-18yr groups. However, differences in FFM and MAP were not found among the AG. The MTA in SG were larger than those of in all groups of LG. The MTP in SG and LG were almost the same values in all groups. The ratio of MTA to MTP in SG showed significant higher than that of LG in AD.

Discussion: From these results, it was indicated that the fat free mass and maximal anaerobic power generation capacity in sprinters developed than long-distance speed skaters during pubescent period. In case of sprinters, it was considered that the knee extensor muscles developed than knee flexor muscles.

References

de Koning et al. (1991), J Biomechanics 24 (2): 137-146

Nemoto I. et al. (1990), J Sports Med Phys Fitness, 30 (1): 83-88.

COMPARATIVE TECHNIQUE DIAGNOSIS OF THE CONTACT PHASE AND PUSH OFF PERFORMANCE IN CROSSCOUNTRY ROLLER <XCR> SKIING

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INTRODUCTION: Analysis of XC skating techniques deals with kinematic and kinetic aspects of upper and lower body motions and with resulting forces (Schwirtz, A., 1994). Studies concerning ground reaction forces showed different components of the total impulse (Lindinger S., 2006) but didn't analyze them individually. In this study we are interested in how the total impulse gets generated and if there are different solutions regarding the economy of a contact and push off phase.

METOHDS: 4 trained XC skiers performed 3 trails on roller skis in the V1, V2, V2 alternate and V skating technique. Plantar pressure was measured over an interval of 30s with F-Scan® Mobile insole sensors and analyzed with the Fast Scan Mobil Research 6.31 software package. The sampling rate was 30Hz. The pressure data was normalized and converted to force by means of body weight. For each trail one average contact phase was calculated and the average of that 3 contact phases constitute one representative contact phase. For distinguished analysis both feet were divided into 4 areas: 1st total, 2nd front-interior (FI), 3rd front-exterior (FE), 4th back (BA). Point of view was impulse of each area per body weight and the shift of load from back to forefoot.

RESULTS: The range of the total impulse of V2 was within 9,6-6,8N/kg for the right and 9,6-7,2N/kg for the left foot. Individually there were no conspicuous differences in the intensity between the left and the right foot. The percentage composition of the total impulse of the left foot was: skier1 36% FI, 15% FE, 49% BA. Skier2: 30% FI, 17% FE, 53% BA. Skier3: 44% FI, 8% FE, 47% BA. Skier4: 42% FI, 19% FE and 39% BA. Data of the right foot showed no striking differences. Regarding the shift of load from back to front skier1 and 2 shifted at about 50% of the contact phase whereas the other skiers already shifted at about 25%.

DISCUSSION: Generating the total impulses the athletes showed variable distributions of the 3 sub impulses FI, FE and BA. Skier 3 and 4 generated almost the same resulting impulse as skier1 but already shifted load from back to forefoot at 25% of time while skier1 finally shifted at 48%. Skier3 shifted the load onto his forefoot at 42% of time but 52% of the resulting impulse was generated from the back of his foot. In comparison to skier1, skier 3 and 4 had longer stance on the forefoot, skier3 longer stance on the back foot. They had longer contraction times of the involved muscles and a less explosive rate in the final push off. This could imply less O2 supply and worse economy. Those aspects could play a role in a differentiated diagnosis of the contact phase in XC skiing. In this running study the other skating techniques will be analyzed as well.

REFERENCES

Lindinger S. (2006) Biomechanische Analyse von Skatingtechniken im Skilanglauf. Spektrum Bewegungswissenschaft, Band 4. Meyer&Meyer, Aachen.

Schwirtz, A. (1994). Bewegungstechnik und muskuläre Koordination beim Skilanglauf. Sport und Buch Strauß. Edition Sport Köln. Köln.

EFFECTS OF FATIGUE ON KINETIC PARAMETERS DURING A SIMULATED CROSS-COUNTRY SKI RACE. PRELIMINARY RESULTS

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Introduction: Fatigue is defined as a decrease in performance or in work capacity or as the inability to maintain a level of strength. Very few studies have analyzed the effect of fatigue on the technique in cross-country skiing in an ecological setting (on-field). The purpose of the study was to examine the changes induced by fatigue on kinematic parameters and force expression during a race simulation using diagonal stride technique.

Methods: Eight cross-country skiers were asked to complete a 12-km simulated race, consisting of 8 laps of 1.5 km each using classical style technique. The subjects were timed over each lap and passage along a straight and constant uphill tract (length: 130m, slope: 12%) that was covered using diagonal stride. The athletes were filmed over a field of 8m at the end of the uphill tract by means of 3D SIMI motion system. Length and duration of the cycle (CL; CT), of the gliding phase (GL; GT) and the duration of the propulsive phase (PT) were calculated. The plantar and the pole forces were recorded over the whole simulation using a Novel Pedar System and load cells inserted under the handgrips. Mean force, peak force and duration of the propulsive phase were considered for both skis and poles during uphill tract. Blood lactate concentration was measured at each lap. Mean parameter of the first lap (L1) and last lap (LL) were compared.

Results: Preliminary analysis on the first two skiers (S1 and S2) indicated a reduction of the speed (S1:2.89m/s for L1, 2.68m/s for LL; S2: 2.98m/s for L1, 2.59m/s for LL) on the uphill tract. The mean value for lactate concentration was 7.5mmol/l and no values below 6mmol/l were found. Temporal variables showed a slight decrement of the GT (S1:0.29s for L1, 0.26s for LL; S2:0.25s for L1, 0.21s for LL) associated to a reduction of the CL (S1:3.35m for L1, 3.32m for LL; S2:3.05m for L1, 2.66m for LL) and GL (S1:0.49m for L1, 0.46m for LL; S2:0.43m for L1, 0.31m for LL). The plantar peak force decreased in both athletes (S1:1118N for L1, 1043N for LL; S2:1190N for L1, 1136N for LL) while the mean force decreased only in one athlete (S1:416N for L1, 363N for LL; S2: 521N for L1, 525N for LL). The PT increased according to both kinematic and plantar force data (S1:0.35s for L1, 0.37s for LL; S2: 0.31s for L1, 0.34s for LL). The poling data did not show substantial differences between first and last lap.

Discussion: The high lactate concentration confirmed that the exercise was performed at high intensity, and the decrease of speed between the first and last lap indicated the occurrence of fatigue. The most evident effect on the spatio-temporal parameters is the de-

crease of both the duration and the distance travelled during the gliding phase. Moreover, the reduction of the peak force and the increment of the propulsion time across laps seems to indicate that fatigue mainly reduce the dynamical characteristic of the legs propulsion.

References

Zory et al., Human Movement Science 28(2009)85–98

SKI-SNOW INTERACTION MECHANICS DURING THE TRANSITION FROM SKIDDING TO CARVING IN COMPETITIVE ALPINE SKIING

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Skiers manipulate the orientation, edging and pressure of their skis on the snow surface to control their path of motion. Understanding the nature of the ski-snow interaction can thus be important for coaches and skiers for technique and performance optimization. Using a model based on metal cutting theory, Lieu & Mote [1] predicted that the carving process is initiated at the aft-most portions of the ski during the transition from skidding to carving, and that carving is limited to the ski after-body. These are concepts which, if true, have important implications for skiing technique and equipment development yet are poorly understood amongst practitioners. The purpose of this study was to examine how well the Lieu-Mote model predictions correspond to empirical data from a kinematic study of skier technique.

METHODS: Six male Norwegian national team members completed a slalom race simulation on 2 rhythmical courses set with 10 and 13 m gate separations. Ski 3D position data were reconstructed using 4 panning video cameras for 2 complete turns per athlete per course. The ski position data were then fit with a 15 segment ski model of 14 m sidecut radius. The whole ski attack angle was calculated as the angle between the ski longitudinal axis and the ski center point velocity vector in the plane of the local snow surface [1]. Similarly, the local attack angle at each ski segment was calculated to describe the extent of carving at each point along the ski's length. Local ski attack angle data were averaged according to whole ski attack angle across all trials and subjects for the turn phase of the turn cycle.

RESULTS AND DISCUSSION: Some variability in local ski segment attack angle patterns was apparent, likely due to variation in the mechanical and geometrical properties of the skis used by the athletes. In general however, local attack angles were high along the entire ski when whole ski attack angles were greater than about 12°, indicating that skidding processes dominated. Below this level, local attack angles in the aft-most ski segments diminished while those of the fore-body segments remained elevated. Local attack angles of the aft-most segments reached 2-5° as whole ski attack angles approached 8°, indicating the initiation of the transition to carving in good accordance with Lieu and Mote's [1] predictions. Further decreases in the whole ski attack angle were associated with increasing numbers of tail segments carving along with the reduction of fore-body segment attack angles. The ski reached an advanced carving stage at whole ski attack angles of approximately 2.5°, although fore-body segment attack angles remained slightly elevated indicating that this part of the ski was still machining new snow.

CONCLUSION

The ski motion characteristics observed in this study are in good accordance with Lieu and Mote ski and snow interaction model.

[1] Lieu, D.K. & Mote, C.D. (1983). Skiing Trauma and Safety: Fifth International Symposium, 117-140.

FORE/AFT MOVEMENT IS ADAPTED TO GATE SEPERATION BY ELITE ALPINE RACERS IN SLALOM

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Fore/aft position and movement have been shown to be related to performance in slalom [1,2]. These studies were carried out on a relatively tight slalom course using gates set with 10 m separation. This follow-up study from the same day tested similar relationships for slalom turns through a more open course with 13 m distances between gates.

Methods. The performances of 6 members of the Norwegian men's Europa Cup team were analyzed through 2 complete turns during a 13 m slalom race simulation. Skier 3-D positions were determined from 4 panning cameras and calibration control points distributed near the course [3]. Utilizing the method of Schiefermüller [4], a local coordinate system (LCS) originating at the outside ankle joint center was defined at each point in time.

Motion of the body center of mass in the LCS fore/aft direction was divided into fore and aft phases of positioning relative to the outside ankle joint and time normalized to the turn cycle. Fore and aft position data were separately integrated over time in the positive and negative portions of the turn cycle and were then divided by the percent of turn cycle which they represented. Finally, the forward values were divided by the aft values to create a fore/aft ratio where a value of 1 would indicate a symmetrical distribution of fore/aft positioning about the ankle joint center. Ratios greater than or less than 1 thus indicated positioning which was biased either forward or backward, respectively. These ratios were then correlated with performance time controlling for each skier's entrance velocity.

Results. The mean fore/aft ratio for the 13 m course was 1.27 ± 0.54. The partial correlation coefficient between the fore/aft ratio and performance time was 0.735 ($p = 0.03$). This follow-up study found that when the turns changed from 10 to 13 m, the fore/aft ratio decreased from 2.44 ± 1.41 to 1.27 ± 0.54, indicating that skiers, on average, were further back and more fore/aft symmetric on the 13 m course. A two tailed t-test, assuming unequal variances, between the previous 10 m fore/aft ratios [1] and the current 13 m fore/aft ratios yielded a $p = .10$.

Discussion. Fore/aft positioning of a slalom skier has been shown to be significantly related to performance. The correlation between fore/aft ratio and performance time was significant and positive for both 10 and 13 m courses ($r = 0.980$ and 0.735 respectively). Fore/aft positioning graphs were observed to be differently shaped for the two courses with more constant, closer to centered positioning for the 13 m course. This may in part be due to the increased time available between turns (about 12%) allowing different strategies.

References

[1] Kipp et al. (2008) Med Sci Sport & Exer, 40(5), S1246.

[2] Tjørhom et al. (2007). 4th Int Congress on Science and Skiing, 158.

[3] Nachbauer et al. (1996). J Appl Biomech, 12, 104-115.

[4] Schiefermüller et al. (2005). Science & Skiing III, Meyer & Meyer Sport, 172-185.

CADENCE ADAPTATIONS OF DOUBLE POLING TECHNIQUE IN ELITE CROSS-COUNTRY SKIERS

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During the last decade, double poling (DP) became a main classical technique in cross-country (XC) ski racing. A recent study analyzed speed influence on biomechanics of DP and found increases in poling frequency, cycle length, peak pole force, flexion and extension ranges of motion and angular velocities in arm and leg joints and decreases in poling time and time to peak pole force (Lindinger et al, 2009). Cadence and its influence on exercise is well investigated in different cyclical activities like running, race walking, swimming, etc. (Marais et al. 2003) but rarely anaylzed in XC skiing (Millet et al. 1998). The purpose of a bigger project was to answer the question "Does an optimal cadence exist and which factors determine the choice of cadence?". The aim of the current biomechanical study was to analyze the influence of different cadences on three submaximal velocities during DP.

10 elite XC skiers roller skied using DP at three given cadences (40, 60 and 80 pole thrusts per min [t •min-1]) performed at three submaximal treadmill velocities (12, 18, 24 km•h-1). Joint angles (Noraxon, Germany), EMG activity of triceps brachii and axial pole forces (strain gauge system) were measured by Noraxon-System (Germany). Repeated ANOVA were calculated to analyze changes in all variables across cadences at all speeds (statistical level $P<0.05$).

Poling time decreased with higher cadence ($P<0.05$) and reached critically short values of ~0.2 s at 80 t •min-1 at 24 km•h-1 compared to ~0.3 s at 40 t •min-1. Relative poling and recovery time (% cycle time) increased and decreased with higher cadences (all $P<0.05$) showing minima and maxima of ~20 and ~80% cycle time at the lowest cadence of 40 t •min-1. Peak pole force and impulse of pole force decreased with increasing cadence leading to smaller power outputs per cycle at high DP cadences (all $P<0.05$). Heel lift, elbow, hip and knee joint flexion and extension ranges of motion and angular velocities decreased with higher cadences at all speeds (all $P<0.05$). Triceps pre-activation and MPF increased with higher cadences whereas average EMG during flexion and extension phase decreased (all $P<0.05$).

Today's top skiers adapt to higher cadence by decreasing absolute and increasing relative poling times, decreasing forces and impulses of forces, upper and lower body joint motions and changing EMG activity. In contrast cycling the change of joint kinematics is unique and might affect work economy during DP at different cadences. Anthopometry, technique and muscle quality might play a crucial role concerning the question "Which is the optimal cadence during DP in XC skiing?". Further investigations will be necessary to answer these important questions.

Lindinger SJ, Stöggl T, Müller E, Holmberg HC. (2009). Control of speed during the double poling technique performed by elite cross-country skiers. Med Sci Sports Exerc. 41(1):210-20.

Marais G, Pelayo P. (2003). Cadence and exercise: physiological and biomechanical determinants of optimal cadences-practical applications. Sports Biomech. 2(1):103-32. Review.

THE EFFECTS OF SPRINT, RESISTANCE AND PLYOMETRICS TRAINING ON SPRINT ACCELERATION KINEMATICS AND MUSCULAR FUNCTION

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A range of interventions are used to enhance sprint acceleration. However, the means by which these training modalities improve sprinting remains unknown. The study aim was to assess 4 common protocols (free sprint [FST], weights [WT], plyometrics [PT], resisted sprint [RST]) for changes in acceleration kinematics and maximum muscular power and strength.

35 men (18-39 yrs) were divided into 4 groups (FST=9, WT=8, PT=9, RST=9) matched for 10m sprint performance. Kinematic analysis included velocity, step length and frequency, and contact and flight time during a 10m maximal sprint. Vertical (countermovement jump: CMJ), horizontal (5-bound test: 5BT), and reactive (drop jump: RSI) power and strength (3-repetition maximum squat: 3RM) were also assessed. Training involved 2 1-hr sessions a week for 6 weeks. The sprint programs commenced with a volume of 195m rising weekly by 20-30m. The WT program progressed from 75% to 90% 1RM by Week 6. The PT program began with 100 ground contacts, and increased by 12-20 contacts per week. Significant ($p<.05$) within-group changes were verified by paired samples t-tests.

Following training, each group increased 0-5 and 0-10m velocity by ~9-10%. The WT and PT groups increased 5-10m velocity by ~10%. Each group increased step length in all intervals. The FST group decreased step frequency in all intervals and 0-5m flight time, and increased 0-5 and 0-10m contact time. The FST group improved 5BT. The FST, PT and RST groups increased RSI. All groups increased the 3RM squat; the WT group had the highest percentage gain.

The enhanced step length experienced by all groups signified specific horizontal power gains, but only the FST group increased 5BT. This change for the FST group contributed to the increased contact time, which allowed for greater horizontal force expression leading to lengthened steps. Reduced flight time balanced the contact time change. All protocols that increased RSI involved ballistic actions indicative of reactive power. For the PT and RST groups, this adaptation permitted contact time maintenance following training. The WT group's improved strength increased the ability to use concentric force to generate speed, primarily through step length increases. This was vital as this group did not have significant increases in power, which may limit adaptations for extended sprints (>10m). This improved strength may also have permitted contact time maintenance following training.

This study has revealed critical information about the outcomes of specific protocols on sprint acceleration. With correct administration, all protocols from the current study can improve acceleration, primarily through step length development. The underlying power and strength adaptations contributing to speed improvement are protocol-specific. Step length may be the major limiting factor for sprint performance in field sport athletes. It is recommended that specific horizontal power be developed to enhance field sport acceleration.

EFFECT OF AGEING ON EQUILIBRIUM: INCREASE IN PERCENTAGE OF TORQUE EXERTED AT THE ANKLE JOINT

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Background: Whatever the age, ankle joint muscles play an important role to maintain upright standing (Amiridis et al., 2003). More specifically, differences of stability have previously been observed with aging, notably by assessment of centre of pressure (CoP) displacement. Moreover, aging induced a decline in maximal voluntary contraction (MVC) at the ankle joint in both plantar- (PF) and dorsiflexion (DF) (Simoneau et al., 2009). The aim of this study is to quantify the necessary torque at the ankle joint to maintain different postural tasks, and to observe this torque from the MVC capacity in young and older adults.

Methods: Eight young adults (Y) (22.8 ± 2.4 years; 1.77 ± 0.04 m; 67.1 ± 8.4 kg) were compared with seven older individuals (O) (80.0 ± 4.2 years; 1.66 ± 0.06 m; 75.0 ± 9.6 kg) during three postural tasks (Normal Quiet Stance (NQS), Romberg (ROM) and One Leg Balance (OLB). CoP displacement was measured via a force plateform during 10s for each condition. MVC was measured in isometric DF and PF via a forceplate. The electromyographic (EMG) activity of triceps surae and tibialis anterior muscles was recorded simultaneously. To estimate torque during postural tasks we reported EMG during upright standing into the relationship between EMG activity and torque obtain from sub-maximal contractions (5, 10, 20 and 30 % of the MVC in the DF and PF).

Results: Aging induces an increase of the CoP displacement in the two most complex postural tasks (i.e. ROM ~ + 38 %, $p < 0.05$ and OLB ~ + 86 %, $p < 0.001$). A significant decrease in the DF (~ - 36 %) and PF (~ - 32 %) agonist torques was also observed with aging ($p < 0.01$). During every postural task, the torque exerted in DF and PF was not significantly different between Y and O ($p > 0.05$). However, we observed that the torque in % MVC is greater for older than young adults in ROM (26.6 ± 4.6 % vs. 15.0 ± 5.1 % respectively, $p < 0.01$) and OLB (41.9 ± 7.8 % vs. 23.7 ± 6.1 % respectively, $p < 0.001$), but not in NQS (10.7 ± 4.4 % vs. 5.6 ± 1.2 % respectively, $p > 0.05$).

Discussion: Our study report that despite the increment of the CoP displacement with aging, we observed that torque needed to maintain a postural task is not significantly different between Y and O. Nevertheless, older adults used a greater percentage of MVC during the most complex postural task. Finally, this finding suggests that fatigue could be induce when older adults are in a difficult posture and thus provoke a significant increase in fall risks.

References

Amiridis IG, Hatzitaki V, Arabatzi F (2003) Age-induced modifications of static postural control in humans. Neurosci Lett 350: 137-140

Simoneau EM, Billot M, Martin A, Van Hoecke J (2009) Antagonist mechanical contribution to resultant maximal torque at the ankle joint in young and older men. J Electromyogr Kinesiol 19: e123-e131

NEUROMUSCULAR STRATEGIES IN THE CASE OF RAPID AND HIGH IMPACT LOADS: IMPACT VERSUS TASK DEPENDENCY?

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Introduction: In landing, the neural strategy is adjusted as a function of the required muscle-tendon stiffness at impact (Santello, 2005). This has been thought to result from regulation of leg extensor muscle preactivation. For the post-impact phase, evidence was obtained that both the reflex and central regulations are involved. Our recent study (Galindo et al. 2009) investigated the influence of different pre-set force levels on the post-impact muscle activation. The main finding was the similarity across all conditions of the post-impact electromyographic (EMG) activity, including the short latency reflex (SLR) response. This was mostly attributed to the similar EMG levels reached at impact despite the instruction to maintain a given force level. This might suggest a pre- to post-impact continuum of neural adjustments to prevent overloading of the tendomuscular system. The present study investigates further the impact vs. task dependency of the observed protective neural strategy.

Methods: The testing protocol was performed on a sledge apparatus with a single lower limb and in a seated position. To evaluate the impact influence, landings were performed either from a maximal (H100) or from a supra-maximal (H200) dropping height, with the instruction to resist the impact. To examine the task influence, subjects were released from the H100 dropping height, with the instruction to either land or rebound. A lower limb guiding device fixed to the front of the sledge seat allowed the subjects to sustain a given pre-set force level up to impact. The force level was set at 20, 35 and 50% of maximal isometric plantarflexion force. EMG activity was recorded from 8 major lower limb muscles.

Results: As expected H200 led to higher impact peak force (826 ± 41 kN) than H100 (684 ± 49 kN) ($P<0.05$), but the EMG patterns did not differ among the pre-set force conditions. The early (0-100ms) post-impact EMG pattern of the triceps surae was particularly stable, including its SLR response. The landing vs. rebound comparison emphasized the stability of the early post-impact EMG pattern, but revealed a decrease prior to impact and increase during the late post-impact phase.

Discussion: The overall EMG stability during the early post-impact phase demonstrates the intervention of a protective neural strategy during this specific time period. As indicated by the compensatory neural adjustments observed in the rebound task during the pre-impact and late post-impact phases, this neural strategy is not task dependent. The absence of neural adjustment to the impact peak force is in contrast with the literature (Santello, 2005). The EMG stability is attributed to the extremely rapid timing of the impact force peak: 5 ms (present study) vs. 25 ms (Kamibayashi & Muro 2006).

References

Galindo A, Barthelemy J, et al. (2009) J Appl Physiol. 106: 539-547.

Kamibayashi K, and Muro M. (2006) J Electromyogr Kinesiol 16: 432-439.

Santello M. (2005) Gait & posture 21: 85-94.

14:15 - 15:15

Poster presentations

PP-BM02 Biomechanics 2

THE ASSESSMENT OF GOLF SHOE-SOLE INTERFACE TRACTION ON NATURAL GRASS

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Introduction: Damage to golf course turf by traditional metal spiked golf shoes has resulted in the development of new shoe sole designs based upon the inclusion of plastic alternative spikes. Evaluation of such shoes has been reported in terms of mechanical force generation at the sole-artificial grass (astroturf) interface but not at the natural grass interface (Williams and Sih, 1998). The aim of the present study was to compare the traction (torques and forces) generated between different shoe-sole interface designs on natural grass surface using a mechanical traction-testing rig and during dynamic golf shots.

Method: Three golf shoe designs were assessed (A,B,C) All shoe types were identical except the number and type of sole spikes on each shoe-sole interface. During the dynamic testing eighteen golfers (HC <15) completed ten shots using a driver in each shoe condition while standing with each foot on a grass turf covered force platform. Mechanical testing was conducted on the same shoes used in the dynamic tests. Shoes were placed with the sole interface flat on the ground (whole-foot) and with only the forefoot of the shoe on the ground representing the shoe positions during different stages of a golf swing. For both testing modalities, the natural turf was attached to the top of Kistler force platforms (1000Hz) (Janaway and Dyson, 2000). The peak, range and coefficient of friction was assessed within linear (Fz, Fy) and rotational (Tz) variables for both the dynamic and mechanical tests. One-way analysis of variance with repeated measures was used to assess any differences in the forces generated between the shoe conditions in each of the testing protocols. The between shoe differences were then compared between the two traction tests.

Results: Mechanical traction testing results identified shoe A to produce significantly less ($P<.05$) traction within all linear and rotational variables when compared to all other shoe conditions. Shoe B produced significantly greater ($P<.05$) traction within all linear and rotational variables when compared to shoes A and C. Dynamic analysis during the golf swing identified no significant ($P<.05$) differences between the shoe-sole interface designs within all linear and rotational variables with all shoe conditions performing comparably to each other.

Discussion: The contradictory results suggest it is not appropriate to test shoe-sole interfaces using mechanical testing devices and relate them to a dynamic sporting movement. Only through testing actual dynamic sports specific movements can an accurate understanding of the performance characteristics and interactions of sports shoes and the ground be gained.

References

Janaway, L. and Dyson, R. (2000). Turf laying system. British patent no: EP1212934. Williams, K.R. and Sih, B.L. (1998). Ground reaction forces in regular-spike and alternative spike golf shoes. Science and Golf III (edited by Farrally, M.R. and Cochran, A.J.) pp568-575. Human Kinetics.

GROWTH AND DEVELOPMENT OF LOWER LIMB MUSCLE AND BALL KICKING PERFORMANCE IN MALE SOCCER PLAYERS

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Introduction: The purpose of this study was to investigate the effect of lower limb muscle size on ball kicking performance in Japanese male soccer players.

Methods: One hundred thirty-eight Japanese male soccer players aged from 12 to 22 years old were participated as subject. The subjects were classified three groups (JG: Junior high school group, n=43. HG: High school group, n=18. UG: University group, n=77). Muscle thickness of TA (thigh anterior including rectus femoris : RF and vastus intermedius : VI) and TP (thigh posterior) were measured by Ultrasonography method (SSD-900, Aloka). Three cross-sectional planes were imaged at 30%, 50% and 70% of femur length from trochanter major to lateral condyle of femur, starting at the trochanter major. In all subjects, the maximal kicked ball velocity (BV) was measured by Rader gun (Mizuno, Japan.) in distance of 5m with the three trials. The ratio of RF and VI (RF/VI ratio) was calculated in all the subjects.

Results: Muscle thickness of TA was showed significantly wider in 30% than 50% and 70% in each group. There were significant differences between 30%, 50% and 70% in muscle thickness values of VI and RF in each group. RF/VI ratio was obtained significantly lower value in 70% than 30% and 50% in each group. Muscle thickness of TA was showed significantly higher in UG than JG and HG in measured all site. Muscle thickness of RF at 50% was significantly differed in each age group. Whereas, there were not significant differences between JG and HG in 70% RF muscle thickness and HG and UG in 30% RF muscle thickness. RF/VI ratio was not significant difference in 70%, however significantly higher ratios in JG were observed in 30 and 50%. BV was showed higher value in UG than the other groups. In JG, TA muscle thickness was significantly correlated to the BV in measured all site. And also, muscle thickness of RF was closely related to the BV in JG.

Discussion: Muscle thickness of TA at 30% was showed higher value than the other sites in all groups. RF muscle thickness at 30% was increased from JG to HG, In case of 70% site RF muscle thickness was increased from HG to UG. It means that the growth of muscle in RF may be differed by site in lower limb. AT muscle thickness was closely related to the ball kicking performance in JG. And also, Muscle thickness of RF correlated to the kicked ball velocity in JG, whereas muscle thickness of VI was not related to the kicked ball velocity in all the age groups. From these results, it was suggested that level of muscle growth might be affected on ball kicking performances in adolescent soccer players.

Reference

Masuda K, Kikuhara N, Takahashi H, Yamanaka K. (2003) J Sports Sci, 21 851-858.

Masuda K, Kikuhara N, Demura S, Katsuta S, Yamanaka K. (2005) J Sports Med Phys Fitness, 45(1) 44-52.

CHARACTERISTICS OF MUSCLE ACTIVITY IN THE UPPER LIMB DURING BASEBALL BATTING

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Introduction: Recordings of surface electromyography (EMG) with kinematic data are useful to evaluate muscle activities during baseball batting. We examined differences in the reproducibility of muscle activity parameters and swing time in the impact phase between baseball players and non-baseball players.

Method: Subjects comprised 21 male students (14 baseball players, 7 non-baseball players) performing a practice swing and 10 baseball batting trials using a baseball bat (length, 83 cm; weight, 900 g) so as to cross two photoelectronic sensors set 15 cm apart on the home plate. EMG in upper limb muscles and elbow joint angles was simultaneously recorded during bat swing trials. Electromyographic signals from the left (leading) and right (trailing) triceps brachii (TB), biceps brachii (BB), pectoralis major (PM), trapezius (TRA), and latissimus dorsi (LD) muscles were recorded with the left elbow joint angle. Myoelectric signals were recorded from each muscle using surface electrodes. Before each experiment, isometric force at MVC of each muscle was measured, and the highest of three maximal efforts was used as MVC force. Time differences between signals from photoelectronic sensors were determined as bat swing time. EMG activities during the bat swing phase were analyzed to evaluate the reproducibility of muscle activity patterns.

Result: The times for practice swing (S) and batting (B) were 6.8 ms and 6.1 ms in baseball players, and 8.8 ms and 7.1 ms in non-baseball players, respectively. Swing speeds for S and B were 21.5 m/s and 23.4 m/s in baseball players and 17.2 m/s and 20.3 m/s in non-baseball players, respectively. Coefficients of variation were also 6.0 and 4.7 in baseball players and 5.6 and 4.7 in non-baseball players, respectively. EMG activities in the PM, TB, BB, TRA were higher than in RA or LD in baseball players. We observed variable patterns of muscle activities at the impact phase in both batting and practice swing. Higher coefficients of variation for mean EMG (mEMG) in the TB showed in the leading arm compared to the trailing arm in baseball players, but showed opposite in non-baseball players.

Discussion: Higher coefficient of variation for EMG activity in TB in baseball batting suggests that TB muscles play a role in modulation of settling the arm or bat position in the sequence of coordinated muscle activity, beginning with the lower limb and terminating with the arms.

Reference

Eric W. Kitzman (1964): Baseball: Electromyographic Study of Batting Swing, Res Q., 35, 166-178.

Moynes DR, Perry J, Antonelli DJ, Jobe FW. (1986): Electromyography and motion analysis of the upper extremity in sports, Phys Ther., 66, 1905-1911.

Klaver-Król EG, Henriquez NR, Oosterloo SJ, Klaver P, Bos JM, Zwarts MJ. (2007): Distribution of motor unit potential velocities in short static and prolonged dynamic contractions at low forces: use of the within-subject's skewness and standard deviation variables, Eur J Appl Physiol., 101,647-658.

3-D KINEMATICS DURING INSTEP AND OUTSTEP SOCCER KICKS IN PUBERTAL PLAYERS

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INTRODUCTION: The biomechanical characteristics of the instep soccer kick have been extensively studied (1,2). However, there are several types of kicks which are commonly used during a soccer game and have not received the appropriate attention.

PURPOSE

To examine the kinematic differences between instep soccer kick and kick with the outside portion of the foot (outstep kick).

METHODS: Ten pubertal soccer players (age: 13.6 ± 0.7 yrs, mass: 47.5 ± 13.1 kg, height: 153.5 ± 8.8 cm) performed 10 consecutive kicking trials in a random order after a two step angled approach with the instep and the outside portion of the dominant foot. The kick with the highest ball velocity was further analyzed. Bilateral three-dimensional kinematics in sagittal, coronal and transverse axis (six camera Vicon motion analysis system, 200Hz) were collected. The maximum ball speed, ball speed / foot speed ratio, segmental angular velocities and joint displacements were also estimated. A dependent Student t-test was used for comparisons between the two types of kick.

RESULTS: Significant ($P < 0.05$) differences in ball speed were observed between the instep (19.62 ± 1.89 m•sec-1) and the outstep soccer kick (18.55 ± 1.60 m•sec-1). Similarly, the ball/foot speed ratio was significantly ($P < 0.05$) lower for the outstep kick (1.52 ± 0.32) compared with the instep kick (1.63 ± 0.41). Non-significant differences in angular and linear sagittal kinematic parameters between the two types of kick were observed ($P > 0.05$) except the foot angular velocity which displayed significantly higher values during the instep kick ($P < 0.05$). In contrast, the outstep kick displayed higher hip abduction and internal rotation, internal knee rotation and ankle inversion ($P < 0.05$).

DISCUSSION: The present study indicated significant differences in the main biomechanical indicators of kicking success between the instep and the outstep kick. Similar results were reported for other types of kick (3) ranking the instep kick as the most powerful kick. During the outstep kick, the player needs to change the motion in the trunk-thigh, thigh-tibia and tibia-foot plane orientation in order to take the appropriate position for the kick. These changes seems to alter the proximal-to-distal transfer of energy between segments (4), thus leading to lower foot angular velocities and therefore lower ball speed values.

REFERENCES

1) Kellis E. & Katis A. (2007). J Sports Sci Med. 6:154-165.

2) Lees A. & Nolan L. (1998). J Sports Sci. 16:211-234.

3) Nunome H. et al. (2002). Med Sci Sports Exerc. 34:2028-2036.

4) Putnam C. et al. (1991). Med Sci Sports Exerc. 23:130-141.

COMPARATIVE ANALYSIS OF ELITE FOOTBALL PLAYERS' THROW-IN

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Introduction: Lees and Nolan (1998) state that a throw-in is on the one hand a means of initiation of a game (a ball got out of playing field across a side line) and on the other hand it is a player's tactic skill. On professional level, but very often on amateur level, every team has its own specialist in throw-in on long distances, into opponents' penalty area. This way of throw-in in attack zone is more accuracy than long high pass of the ball.

Methods: The research group was n=13 (age = 20.28±0.91 years, height = 179.45±4.62 cm and weight = 76.15±3.72 kg). To evaluate the distance of the throw-in, 2D analysis was used; it was provided by one camera covering calibrated scope of 30m. 3 cameras were used for 3D spatial analysis of player's movement. The speed of the thrown ball was measured by means of a radar device STALKER ATS at the same time.

Results: The observed parameters of throw-in in the players show a longer distance (the length of throw-in) when throwing after a run up that in throwing from a standing position. In throw-in from a standing position an average value of the longest measured trials was xds = 20.19 ± 1.52 m. In throw-in after the run up, the distance of the throw was longer about 13.5 % when compared to throw-in from the standing position (xdr = 23.34 ± 2.75 m). In case of maximal velocity of the ball after the throw-in, the lower average speed was registered in throw-in from the standing position vs = 50.1 km/h than in the throw-in after run up vr = 53.9 km/h. The highest registered speed after throw-in from the standing position was vsmax = 56.2 km/h and the minimal speed was vsmin = 42.2 km/h. Variation coefficient of the speed of all trials is 6.6 %. When throwing-in after run up the maximal measured velocity was vrmax = 62.3 km/h and the minimal velocity was vrmin = 46.9 km/h. The performance of throw-in after run up is realized in two ways. In a symmetric way, both arms perform symmetric movement above a head in a final phase. In an asymmetric way, a trunk is more twisted. A non-dominant arm is shifted forward and a swipe is performed by a dominant arm. From totally 13 players, 7 players performed the throw-in asymmetrically and 6 players symmetrically.

Conclusion

Measured data show wider scope of values among several players. It proves different level of technical mastery of particular skill. Linthorne and Everett (2004) indicate variable velocity in various angle of the throw-in from the standing position in range 43.2 – 68.4 km/h in an experienced player. In training practice it is necessary to focus on improvement of performance of this skill and the choice of suitable way of the throw-in.

References

Lees A, Nolan L. (1998). The biomachanics of soccer: A review. Journal of Sports Science, 16, 211–234.

Linthorne NP, Everett DJ. (2004). Release Angle for Attaining Maximum Distance in the Soccer Throw-in. Sport Biomechanice, 5,243-260.

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BIOMECHANICAL ANALYSIS OF HANDBALL THROWS IN TWO DIFFERENT PLAYERS

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INTRODUCTION Many sports and physical activities require different levels of abilities and skills. Accuracy and throwing velocity are basic parameters of sport performance in handball. Diagnostic process – monitoring of overarm throws by kinetic parameters with the help of 3 D biomechanical analysis is possible to achieve much more accuracy and different points of view.METHODS Two handball players in age 24 and 20 were observed in three throwing attempts by using two synchronized high speed cameras and Simi motion software. This 3D biomechanical analysis allows to find exact values of kinetic parameters.RESULTS All attempts of each player were similar, more differences appeared among tested players. Better results are tied with higher sport performance. Throwing technique is stabilized and throws of one player have very common characteristics. The interesting differences appeared among tested handball players but we could find some basic phases which have to be done in same or similar way. We obtained following average results for velocities in ball release time: dominant wrist=8,397 (7,719) m/s, dominant elbow=5,954 (5,548) m/s, dominant shoulder=3,047 (3,151) m/s. All this values of playing hand confirm the theory about increasing velocity and acceleration during the throw. The other hand is also useful for keeping optimal and well balanced body position, velocities are lower: undominant wrist=1,952 (2,322) m/s, undominant elbow=3,016 (2,399) m/s and undominant shoulder=2,485 (2,188) m/s. Excellent kinetic chain has to be connected with well balanced body position. The lower part of body must be also quiet enough. All throwing phases have to be very accelerated but smooth and players are able to do some movements corrections in time just before ball release phase (shoulder and elbow velocity decrease). Very interesting are high acceleration peaks in time about 0,04s before releasing ball but quite big differences exist in decceleration after this moment. The reason for doing this is accuracy of overarm throw.CONCLUSION The kinetic chain is a coordinated activation of the body segments which starts with legs, trunk, then follows to shoulders, elbows and ends with the acceleration of the wrist. Created three dimensional space is real and sufficient for understanding of each handball throw. Based on this biomechanical analysis it is possible to improve individual throwing technique which requires special individual training.

REFERENCES: Psalman, V.:The kinetic chain of tennis strokes. In: 13th Annual Congress of the European College of Sport Science, Lisboa, Portugal, 2008, p.643.

COMPARISON OF DYNAMIC AND STATIC BALANCE IN ADOLESCENTS HANDBALL AND FOOTBALL PLAYERS

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Introduction: Handballers and soccer players require maintain balance as they run at high speed, change direction and powerfully throw and kick the ball to pass or shoot. Sport training programs may cause different balance abilities and these differences could be objectively measured using Center of Pressure Measurements (COP). The aim of this study was to compare static and dynamic balance between adolescent handball and soccer players.

Materials and Methods: Thirty two student national athletes: soccer (17), Handball (15) between 15-18 years of age and at least 3 training years were included to the study.

Assessment of static balance and dynamic balance was measured with Prokin 5.0 Technobody. The following tests were utilized: 1) Static tests were done as Opened Eyes (EO) and Closed Eyes (EC) with 30 second duration. Dynamic Tests 1) Slalom test was used as monoaxial dynamic-time test Forward-Backward (F-B) to one axis a time and to assess the subject's skill to complete the exercise. In this test, the subject tries to see some balls-objectives that come against. The subject's scope is to hit objectives and follow ideal line within 60 sn duration (a) hold with two hand and (b) without hold. Subject load was selected 5 hard degree (according to soft (0) to hard (10) degree system). 2) Unilateral dynamic-stance tests were done with the controlled load monoaxial test (F-B) for right and left foot. This test consists in a test where the subjects try to catch up two objectives with 10 repetitions on an axis controlling load (5 hard).

Results: Balance test evaluations between two groups compare with Mann Whitney-U test. There were no significant differences in EO Indexes Average C.O.P. X, EO Indexes Average C.O.P. Y, EO Indexes F-B Std. Dev., EO Indexes Medium-Lateral (M-L) Std. Dev., EO Indexes Average F-B Velocity, Indexes Average M-L Velocity and all dimensions for closed eyes (EC) between the two groups on static tests. Be-

sides, There were no significant differences between two groups on Romberg Test EC/EO Perimeter Ratio and Perimeter Area Ratio (p>0,05). No significant differences were found between two groups in dynamic tests; 1) slalom tests both holding with hands and without holding hands (p>0,05) 2) unilateral dynamic-stance tests for left and right foot between two groups (p>0,05). Within each group all parameters were compared between left and right foot perimeter error scores for unilateral F-B dynamic balance condition by Wilcoxon Test. For football players, significant differences were found between left and right foot (p<0,05). But, there is no significant differences for handball players (p>0,05).

Discussion: The main reason to that is dynamic balance is necessary and effective in the fundamental technical movements of the both sports (examples dribbling, throwing, kicking and faking). F-B dynamic balance was greater for left foot than for right foot for football players. The reason is that all of the footballers are dominantly using their right leg so left leg is the supporting leg.

EFFECT OF GROWTH AND DEVELOPMENT ON UPPER AND LOWER LIMBS MOVEMENT DURING THROWING IN BASE-BALL PLAYERS.

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Purpose: The aimed of this study was to clarify the characteristic of upper and lower limbs movement velocities during throwing in base-ball players due to growth and development.

Methods: Seventy-nine male baseball players aged from 12 to 21 years old were requested in this study. These subjects were classified by chronological age. And also, they were divided 3 groups. (During adolescence: DA, 12-15 years, n=46, Post adolescence: PA, 16-19 years, n=21, Adult: AD: 20-21 years, n=12). The body height (BH) and body weight (BW) as body size parameters were measured in all the subjects. The maximal ball velocity of overarm pitched in a distances of 10.0m (BV) as a throwing performance was obtained by Radar-gun (Mizuno) in all the subjects. The throwing movement was recorded by two high-speed cameras and analyzed by computer with 3-D analysis software. The phase of throwing movement analyzed from the point of knee up position to ball release. Peak velocity of wrist joint (PVW), elbow joint (PVE), shoulder joint (PVS), hip joint (PVH), knee joint (PVK) and stride length (SL) on throwing movement were measured. Significant group differences between age group in each item were performed using ANOVA. Moreover, partial correlation coefficient and multiple regression analysis between peak velocity of each joint and pitched ball velocity were analyzed for all the subjects.

Results and conclusion: BV was increased due to age groups. Significantly higher value was showed in AD（33.8±1.9m/s）compared to other groups (DA:28.1±2.5m/s, PA:32.2±21.7m/s). SL was progressive increased from DA (1.05±0.09m) to AD (1.20±0.05m). SL per BH was relatively constant in all age groups (DA:66.6±5.0%, PA:66.9±3.4％, AD:69.3±3.2%). Significant partial correlation coefficient was obtained between BV and SL (rxy.z= 0.635, p<0.05) in DA. PVW, PVE and PVS were increased from DA to PA. However, PVH was increased from PA to AD. Significant partial correlation coefficient was obtained between BV and peak velocity of each joint in upper limbs in DA (PVW: rxy.z= 0.756, PVE: rxy.z= 0.628, and PVS: rxy.z= 0.371, p<0.05). And also, PVW were effect to BV in PA (rxy.z= 0.512 p<0.05) and AD (rxy.z= 0.695, p<0.05). Significant partial correlation coefficient was obtained BV and PVE in PA (rxy.z= 0.519, p<0.05). In lower limbs, PVH were effect to BV in DA (rxy.z= 0.494, p<0.05) and PA (rxy.z= 0.558, p<0.05). PVK weren't effect to BV in all groups.

From these results, it was considered that the effects of throwing movement velocities of upper and lower limbs on pitched ball velocity were differed by growth stage in young baseball players.

References

Fleisig G S, Barrentine S W, Zheng N Escamilla R F, Andrews J R (1999). J Biomechanics 32:1371-1375

Takahashi, K., et al. (2000). J.J.B.S.E 4(2):116-124

MUSCLE ACTIVITIES OF THIGH DURING 100M SPRINT IN TRACK AND FIELD ATHLETES EXPERIENCED HAMSTRINGS MUSCLE STRAIN INJURY.

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It is not clear that the profiles of muscular activities during 100 m sprint running in relation to the occurrence of muscle strain injury. The present study aimed to investigate the profiles of muscle activities of thigh during 100 m sprint running in track and field athletes experienced hamstrings strain injury, with specific emphasis on the difference between injured and uninjured legs. The subjects were 18 track and field athletes. Of the subjects ten had experienced hamstrings muscle strain injury (MS, 5 males and 5 females) and the remainder was classified as a non-muscle strain injury group (NMS, 4 males and 4 females). The electromyograms (EMGs) of thigh muscles (the biceps femoris, semitendinosus, rectus femoris, vastus lateralis and vastus medialis) and knee joint angles were recorded during the 100 m sprint. The EMG activities and knee joint angles were analyzed in the three phases of 100m sprint; acceleration (30~50m), maximum speed (50~70m) and deceleration (80~100m) phases. The average integrated EMG (iEMG) value of each phase was expressed as relative to that of the maximum voluntary contraction (%mEMGMVC). In the ground contact phase and the swing phase during running cycle, the maximum value of the knee joint flextion angle was determined. The NMS group did not show significant difference between left and right legs in the muscular activities for all muscle groups and maximum knee joint angles in each phase. In injured leg of MS group, the %mEMGMVC values of the biceps femoris and semitendinosus in the acceleration and maximum speed phases were significantly higher than those of uninjured leg. Also, the maximum knee joint angles for the injured leg were significantly lower as compared to the uninjured leg. The observed differences in the muscular activities between injured and uninjured legs may be assumed to be due to the corresponding difference in the strength capability of hamstring muscles. Also, the results of the knee joint angle were suggested that effected on the muscle activity level and muscle fatigue. The present study indicated that track and field athletes experienced muscle strain injury show different muscular activities between injured and uninjured legs in 100 m sprint running. It is difficult to conclude whether running form and muscle activity is related to the main cause of muscle strain injury. However, the finding obtained here will be a reason for high recurrence rate of muscle strain injury.

Reference

1)Agre.JC Hamstring Injuries Proposed Aetiological Factors, Prevention, and Treatment Sports Med, 1985; 2: 21-33

2)Liemohn.W Factors related to hamstring strains. J Sports Med 1978; 18: 71-76

3)Mero.A et.al. Biomechanics of sprint running .A review Sports Med 1992; 13: 6, 376-392

ISOMETRIC SURFACE EMG FATIGUE EVALUATION IN FEMALE ROWERS

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Introduction: Methods for assessing the electrical manifestations of muscle fatigue during isometric, constant-force contractions are reported in many studies. Relatively few studies were carried out to quantify muscle fatigue resulting from isometric contractions in elite female athletes.

Purpose: We aim to evaluate isometric conditioning and fatigue profile with 30 second duration isometric exercise using surface electromyography (SEMG) in female elite rowers.

Method: The subjects are composed of a total of twelve healthy female athletes between 16-21 years of age. The Vastus Lateralis (VL) muscle of the dominant leg was chosen for the recordings. Although, in all subjects the dominant extremity was the right leg, for only one subject, the experiment was carried out with the left leg because she had a meniscus injury in her right leg. Experimental set up was designed in accordance to the rowing sport. While the hip joints for all the subjects were brought to a 100 degree flexion, the knee joints were brought to a 90 degree flexion. The range of the knee joint angle (15) during the movement was set from 90 to 105 degree for each subject.

The Maximum Voluntary Contraction (MVC) force was determined using the instrumentation set up within a few trials. The maximal value of MVC was used as the reference value to determine a load of 80 % of MVC for each subject. For isometric contraction the subjects managed to close the spring. SEMG data were recorded from the VL muscle with Ag-AgCl surface disk electrodes according to the recommendation by SENIAM. SEMG signal was increased 1000 times using a differential amplifier and filtered through an analog band pass filter between 5-500 Hz at 2000Hz sample rate. The median frequency (MDF) and the mean frequency (MNF) of the power spectrum and Root Mean Square (RMS) were computed for the SEMG signal.

Results: Initial and final values of MDF, MNF and RMS of elite female rowers were compared by wilcoxen test. Significant decrease was found between initial MDF (mean: 105.60) and final MDF (mean: 95.61) of subjects ($p<0.01$), in the same way, significant decrease ($p<0.01$) was found between initial MNF (mean: 124.18) and final MNF (mean: 112.99) of subjects. In this experiment, significant decrease ($p<0.01$) was found between initial RMS (mean: 141.03) and final RMS values (mean: 96.59).

Discussions: Shift in MNF and MDF is well known in the literature during fatiguing contractions. The reasons are the conduction velocity decrease and synchronization between different motor units in the muscle. In contradiction to the RMS increase reported in the literature for sustained isometric contractions, decrease is found in all the subjects who could reflect some underlying strategy for muscle load sharing in these female athletes. As a result, there should be further research for the SEMG fatigue evaluations for different muscle groups and contraction types on female athletes.

EFFICIENCY PARAMETERS OF ENDURANCE ATHLETES WHILE JUMPING

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Introduction: There is controversy about the rate of force development (RFD) when examining explosive force in dynamic conditions. Its relevance in complex dynamic exercises could be masked by some different factors as its influence in isometric conditions has been extensively demonstrated (Aagaard et al., 2002). Thus, our purpouse was to evaluate kinetics while jumping (CMJ) in a cohort of well trained endurance athletes as they have some homogeneous anthropometric and neuromuscular characteristics that could facilitate the study of selected parameters.

Methods : 14 male endurance athletes (8 middle-distance runners and 6 triathletes) performed in a force plate (500 Hz) two attempts of CMJ after a warm-up. The depth of countermovement was freely choosen by participants.The best jump was selected for further analysis. The kinetic parameters selected were: peak power (PP), mean power (MP), peak RFD (pRFD), and vertical stiffness (Kvert).

Results: Significant correlations were found between: pRFD and PP (r = 0,544; p=0,044); pRFD and Kvert (0,693; p=0,006); Kvert and MP (r = 0,808; p=0,000); and Kvert with PP (r = 0,756; p=0,002).

Discussion: Correlations between Kvert and power measurements suggest an elastic energy transfer between eccentric and concentric actions (Bosco et al., 1982). The novel correlations between RFD and PP suggest an indirect influence of RFD in CMJ performance as PP is highly related to CMJ height. The relationship exhibited between Kvert and RFD, as both are very close in time during force recording, could suggest a reflex origin of this RFD based on previous assumptions (McBride et al., 2008).

References

Aagaard P, Simonsen EB, Andersen JL, Magnusson P, Dyhre-Poulsen P (2002). J Appl Physiol 93: 1318-26.

Bosco C, Tihanyi J, Komi PV, Fekete G, Apor P (1982). Acta Physiol Scand 116(4): 343-9.

McBride JM, McCaulley GO, Cormie P (2008). J Strength Cond Res 22(3): 750-7.

COMPLEX SYSTEMS EVALUATION OF FATIGUE BASED ON ECG INTERCONNECTED PARAMETERS

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Introduction: Dynamic processes are evident trough the complex fluctuations of physiologic output signals such as those appearing in the ECG. Interconnections of different ECG parameters based on matrix theory (Vainoras et al., 2008) have been determined during a modified Rufje exercise test. The aim of this investigation was to evaluate the dynamics of different fractal levels of inter-parameter interactions in the ECG and to establish new features to assess fatigue.

Methods: 14 elite Lithuanian Greco Roman wrestlers participated in the study performing a modified Rufje exercise test in 4 stages of the investigation protocol: 1st day before trainings and after 1st and 2nd training, and 2nd day before trainings. The „Kaunas-load" ECG analysis system has been used for the evaluation (Vainoras, 1997). The interconnection of different ECG parameters representing different fractal levels (heart, organism) have been studied in the different stages.

Results: The interactions of ECG parameters and its dynamics at different fractal level varied respectively to the stage of investigation. The dynamic of interconnections during the beginning of 1st and 2nd day was similar – the change of interconnection was increasing during load at heart level. In both days the results after the 1st and 2nd training, respectively, show how interconnections at the organism level

differ significantly (P>0,95), showing an increase in the fluctuations with fatigue. This significant change also depends on the sportsmen level and experience.

Discussion: New features of fatigue have been revealed as the tendency to present altered values of inter-parameter relationships in post-training monitoring. These results are in agreement with the finding that the process of fatigue is related to the interaction between functional systems (Nybo, 2008). Summing-up the evaluation of the interconnection between ECG parameters representing different fractal levels allows the detection of fatigue features.

References

Nybo L. (2008). Hyperthermia and fatigue. Journal of Applied Physiology, 104, 871-878.

Vainoras A., Gargasas L., Ruseckas R. et al..Computerized exercise electrocardiogram analysis system "Kaunas-Load". (1997) In "Electrocardiology'97" Bratislava, Slovak R., 253-256.

Vainoras A., Navickas Z., Poderys J., Berskiene K., Bikulciene L. (2008). ECG signal for assessment of interpersonal or inter parameter influences. // the 2nd International Scientific Conference "Current issues and new ideas in sport science". [Electronic resource], Kaunas.

14:15 - 15:15

Poster presentations

PP-AP01 Adapted Physical Activity 1

VIBRATION EXERCISE: AN EFFECTIVE COUNTERMEASURE FOR VASCULAR ADAPTATIONS TO BED REST

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Introduction: Physical deconditioning is an important independent risk factor for atherosclerosis and cardiovascular disease. While bed rest results in marked vascular changes, exercise has shown to be an effective countermeasure for these adaptations (Bleeker et al, 2005). However, little is known about the most optimal exercise type to prevent the vascular changes to bed rest. Therefore, the purpose of this study was to examine the effect of two different types of exercise, i.e. resistive exercise and resistive vibration exercise, to counteract the vascular adaptations to bed rest.

Methods: Eighteen healthy men (31±8 years) were randomly assigned to bed rest (control; C), bed rest with resistive exercise (RE), or bed rest with resistive vibration exercise (RVE). Exercise was applied three times a week for 5-7 min per session. Before and after 60 days of bed rest, resting diameter and blood flow, flow-mediated dilation (FMD; a measure of endothelial function), and maximal diameter of the superficial femoral artery (SFA) were measured using echo Doppler ultrasound.

Results: After 60 days of bed rest, resting diameter of the SFA was significantly decreased in C and RE (Wilcoxon: P=0.02 and 0.04, respectively), but not after RVE. No changes in resting and hyperaemic blood flow were found after bed rest in all groups. While FMD increased in C and RE (P=0.02 and 0.04, respectively) after bed rest, FMD did not change in the RVE-group. C and RE showed a decrease in maximal SFA diameter (P=0.02 and 0.04, respectively), while maximal SFA diameter was preserved in the RVE-group. Using ANCOVAs, we identified significant group effects for resting diameter and FMD (P=0.02 and 0.003, respectively), but not for maximal diameter.

Discussion: 60 Days of bed rest deconditioning is accompanied by a decrease in resting and maximal diameter of the SFA, and an increase in FMD. The stimulus provided by resistive exercise was insufficient to counteract the vascular adaptations to bed rest. However, adding a vibration component to the resistive exercise, significantly attenuated or even preserved the changes in superficial femoral artery diameter and endothelial function to bed rest. In conclusion, only three, ~6-min resistive vibration exercise bouts per week during bed rest is suitable to counteract the detrimental vascular adaptations to bed rest.

References

Bleeker M, De Groot P, Rongen G, Rittweger J, Felsenberg D, Smits P, Hopman M. (2005). J Appl Physiol 99(4), 1293-300.

THE EFFECTS OF REGULAR EXERCISE ON THE CARDIAC AUTONOMIC NERVOUS ACTIVITY IN RECOVERY PHASE AFTER ANAEROBIC INTERVAL EXERCISE

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Introduction: It has been suggested that the collapse of the autonomic nervous system is related to sudden death. It has become clear that high activity of the parasympathetic nervous system causes a decline in the death rate. The purpose of this study was to determine the effects of regular exercise on cardiac autonomic nervous activity in the recovery phase after anaerobic interval exercise.

Method: Twenty four healthy young people (11 males: age: 20.3±0.67years; Mean ± S.D., height: 169.67±3.59cm, body weight: 59.89±3.53kg, % body fat: 16.46±1.92% and 13 females: 20.7±5.37years, 159.9±40.46cm, 52.63±14.36kg and 25.97±7.92%: T-group) and 26 young people (12 males: 21.6±1.06years, 173.0±4.67cm, 62.1±6.22kg and 18.1±3.18% and 14 females: 21.6±0.87 years, 157.0±4.21cm, 48.0±4.69kg and 27.0±3.69%: S-group) participated in this study, voluntary. The subjects ran up 23 steps with theirs best, and they had interval for 20 seconds. They repeated up to 80% HR reserve. After exercise, they had recovered for 30 minutes by supine position. The measurements were Augmentation index (AI) and central systolic blood pressure (c-SBP) on rest, heart rate (HR) and cardiac autonomic nervous activity (low frequency: LF and high frequency: HF) on rest and after exercise (immediately, 5, 10, 15 and 30min.), respectively. The temperature and humidity were 25.3±0.98ºC and 47.3±4.11% during measuring, and they were 19.3±0.25ºC and 45.6±1.69% during exercise.

Results: The T-group's AI on rest was 64.9±14.0, and the S-group's was 55.7±9.10. The T-group's c-SBP on rest was 112.17±9.99mmHg, and the S-group's was 104.7±10.26mmHg. The T-group's HR on rest was 57.1±6.85bpm, and S-group's was 68.7±11.31bpm. The T-group's log HF on rest was 3.33±0.49, and S-group's was 3.05±0.36. The results revealed that the T-group's HR on rest led to a significant reduction and AI, c-SBP and log HF led to a significant high value compared with on S-group's (P<0.05), respectively. The T-group's HR at the 30 minutes on recovery phase was 70.9±9.59bpm and the S-group's was 81.9±4.67bpm. The T-group's HR got back early

significantly to S-group at the 30 minutes on recovery phase (P<0.05). The changes of the parasympathetic nervous activity with recover were not significant between T-group and S-group. The T-group's log HF on every measuring timings showed higher than S-group (P<0.05). Both the T- and S-group's log LF/HF showed high value till 5 minutes on recovery phase (P<0.01).

Discussion/Conclusion

It was suggested that cardiac parasympathetic nervous activity play a role in trained people's reduction of HR on rest and early recovery of HR after anaerobic exercise. It was suggested that a regularly exercise had rise cardiac parasympathetic nervous activity after anaerobic exercise.

THE EFFECT OF ENDURANCE EXERCISE AND SIRT ACTIVATION ON BRAIN FUNCTION IN RATS ARTIFICIALLY SELECTED TO HIGH OR LOW RUNNING CAPACITY

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Sirtuins are NAD+ dependent protein deacetylases and suggested regulators of aging, fat and sugar metabolisms, DNA repair, mitochondrial biogenesis and brain function. Resveratrol, a potent activator of SIRT1 has been shown to reduce plaque pathology in transgenic model of Alzheimer diseases. In addition, it is well documented that regular exercise enhances performance at number of tests including Morris maze and passive avoidance tests. In the present study we trained selectively bred 24 generations for intrinsic aerobic high running capacity (HCR) or low running capacity (LCR) rats and some groups were supplemented by SIRT activator for 4 month. We measured balance using Rotarod test and found the benefical effects of exercise training. The behavior of the animals was assessed by open field tests, in which exercise trained HCR rats with SIRT activator supplementation showed higher level of interest to explore the new environment. Interestingly enough, on the other hand, when we checked the new object recognition, LCR rats had better performance. We also observed, that exercise training resulted in better performance at passive avoidance test. The biochemical analysis of hippocampus suggest that some of the beneficial changes in the brain could be mediated through brain derived neurotrophic factors which was induced by running exercise.

Our data show, that the brain performance of LCR and HCR rats not significantly different, when it is assessed by passive avoidance, new object recognition tests. On the other, hand exercise training beneficial for both groups.

PHYSICAL ACTIVITY INTENSITY, HEART RATE, BLOOD LACTATE CONCENTRATION AND RPE DURING 5-KM MEN'S AND 3-KM WOMEN'S INDOOR RACE WALK

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INTRODUCTION: Physical training is the systematic repetition of physical exercises and it can be described in terms of its outcome (anatomical, physiological, biochemical, and functional adaptations) or its process; that is, the Training Load (TL) (the product of volume and intensity of training). Nowadays, there have been several attempts to quantify TL, such Heart Rate (HR), Blood Lactate Concentration ([La]) and Rate of Perceived Exertion (RPE)[1, 2]. Race Walking (RW) is the technical and athletic expression of fast walking and it can be considered an endurance performance. Despite its centuries-old history few studies have investigated the physiological profile of the race walkers and, moreover, no study has analyzed both the physical activity intensity and the physiological stresses during a race. Thus, this study classified the intensity of the 5-km men's (5M) and 3-km women's (3F) Indoor RW (IRW) and examined both HR, [La] and RPE responses in the two races and the possible relationship between the above mentioned variables in order to verify the Internal Load (IL) of the athletes.

METHODS: 11 race walkers, 5 male (mean age: 30,2±3,4 yrs; height: 174,6±3,5 cm; weight: 63,2±5,9 kg) and 6 female (mean age: 22,3±3,6 yrs; height: 167,2±3,3 cm; weight: 53,2±2,2 kg) were enrolled in this study. During the Italian Athletic Indoor Championship held in Turin in February 2009, HR was recorded to establish the HRmean; after the performances [La] and RPE (Borg 6-20 scale) were registered. HRmean was set as a percentage of the mean predicted maximal heart rate to quantify, with the RPE, the possible physical effort of the disciplines. Therefore, both for 5M and 3F, HRmean, [La] and RPE were standardized with each data point transformed to a z score [z=(raw score–mean)/SD] using the variable specific grand mean and SD. Means for standardized values were then compared using repeated-measures ANOVA. Results were considered significant at p=0.05.

DISCUSSION/CONCLUSION

HRmean and the RPE show that both the 5M and 3F present a very hard intensity profile[2], suggesting that the physiological model of the two disciplines might be aerobic-power-oriented. No statistical differences (p>0.05) were found between the HRmean, [La] and RPE in the two groups; that means in the IRW there might not be a more appropriate tool to evaluate the IL of the athletes; thus the three means seem to be able to measure, indirectly, the IL during an IRW race and the choice might be attributed to the specific knowledge and/or techniques available to the coach. However, considering the low number of the athletes involved, further studies should be conducted to outline the most suitable tool to assess the IL in the IRW.

REFERENCES

[1] Achten & Jeukendrup. Sports Med 2003; 33(7): 517-538

[2] ACSM. Med Sci Sports Exerc 1998; 30(6): 975-991

ACHIEVEMENT GOAL ORIENTATIONS OF YOUNG MARTIAL ARTISTS

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INTRODUCTION: To date, contrasting images seem to appear regarding the effect of martial arts involvement. While some studies reported an increase of antisocial behaviour among young martial artists, others described positive social-psychological effects.

To make general statements with regard to the socio-psychological outcomes of sports participation, Shields and Bredemeier (1995) indicated several influential factors have to be taken into account. The present study focuses on the influence of the differences of participants' characteristics.

One of the differences could refer to the specific behaviour of the participants (e.g., how self-confident, aggressive, … is someone). Another difference of participants' characteristics reported in the literature relates to the achievement goal orientations of the martial artists.

Two studies examined whether the achievement goal orientations vary as a function of the type of martial art. Gernigon and Le Bars (2000) stressed the compatibility of a competitive context and task orientation, whereas King and Willams (1997) stressed the compatibility of traditional martial arts and task orientation. Building on these findings a hypothesis, which will be investigated in the present study, is formulated: "Children participating in a harder martial art (e.g., kick-thaiboxing), where a modern approach is used, will be more ego oriented, while children practising a softer martial art (e.g., aikido), where a traditional approach is used, will be more task oriented.'

The purpose of the present study is to make a behavioral screening of the young martial artists and to examine the achievement goal orientations of the children.

METHODS: 120 children between the age of 10 and 16 years who practised aikido, judo or kick-/thaiboxing in a sporting club located in Flanders and the Netherlands were interviewed. The young martial artists were asked to respond to a Dutch version of the Perception of Success Questionnaire to measure the achievement goal orientations and their parents were asked to respond to a Dutch version of the Strength and Difficulties Questionnaire to make a behavioral screening of the children.

DISCUSSION: Findings revealed, among other things, that the type of martial art that is practiced has an influence on the achievement goal orientations of the participants, which on his turn has an influence on the youngsters' experiences. However, other aspects should be taken into account when examining the experiences of young martial artists, such as the type of guidance or approach used by their martial arts teachers.

REFERENCES

Gernigon, C., & Le Bars, H. (2000). Achievement goals in aikido and judo: a comparative study among beginner and experienced practitioners. Journal of Applied Sport Psychology, 12(2), 168-179.

King, L.A., & Wiliams, T.A. (1997). Goal orientation and performance in martial arts. Journal of Sport Behaviour, 20(4), 397-412.

Shields, D.L.L., & Bredemeier, B.J.L. (1995). Character development and physical activity. Champaign, IL: Human Kinetics.

DESIRED SUPPORT TOWARDS PHYSICALLY MORE ACTIVE LIFESTYLE IN FINNISH MIDDLE-AGED MEN

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LIKES

DESIRED SUPPORT TOWARDS PHYSICALLY MORE ACTIVE LIFESTYLE IN FINNISH MIDDLE-AGED MEN

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Introduction: To encourage people to be physically more active is a major challenge in modern societies. In order to be successful, the promotion of physical activity requires understanding of the desired support of different groups. The middle-aged men represent one of the least physically active groups in Finland. The aim of this study was to gather detailed information on factors that may support physical activity promotion efforts in this group of population.

Method: The data was collected from a group of men (n=607) who participated in a physical activity promotion tour (Adventures of Joe Finn -campaign) during spring 2008. The men, who were aged 25-64, answered questions about their physical activity levels and attitudes towards physical activity. According to their socio-economic status, the men were divided into blue-collar workers (51%) and others (49%). The age deviation of the group matched well the general population, but the group was slightly less active than Finnish men on average, when measured in frequency of leisure time physical activity.

The men were asked about supporting factors towards physically more active lifestyle (a total of 9 answers, multiple answers possible). According to the men's physical activity levels, three subgroups were created; low activity (at least 30 min exercise, ≤ 1 time a week, n=196), intermediate activity (at least 30 min exercise, 2-3 times a week, n=223), and high activity (at least 30 min exercise, ≥ 4 a week, n=119).

Results: Regardless of their physical activity level, the men mentioned the same supporting factors. The most mentioned supporting factors in the low activity group were support from spouse/family/friends (78%), prospect of more leisure time (71%), and social type of exercise (70%). In the high activity group, support from spouse/family/friends and prospect of more leisure time (both 81%) were mentioned the most frequently. Only 21% of the low activity group and 48% of the high activity group desired for competitive activity. 35% of the low activity group and 50% of the high activity group would appreciate materials as supporting factors. In addition to activity levels, the socio-economic status did not affect the desired support significantly.

Discussion: According to this study, physical activity level or socio-economic status do not have sufficient influence on desired support towards physically more active lifestyle. The findings of the study suggest that in order to increase physical activity and behavioural change, the social micro-environment of a person is essential. More information about a target group and its desired support can be used as evidence based platform for planning future policies and efforts to increase physical activity.

PHYSICAL ACTIVITY OF GIRLS - SOCIALIZATION PROCESSES IN ELITE ARTISTIC GYMNASTICS

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INTRODUCTION: The aim of research was studied the consequences of participation in elite women's artistic gymnastics. The attention was put at the children, who were in the top of Olympic Games competitions in period from 1972 to 1988. The treated period was marked with the youngest competitors in women's artistic gymnastics in entire history of the gymnastics Olympic competitions.

METHODOLOGY: The research was carried out with anthropological methodology approach. The data was collected in media articles, interviews, shows, documentaries and autobiographies in all countries, from where Olympic champions came. Qualitative analyses were made with statements of journalist, public, parents and gymnast themselves.

RESULTS: The results pointed out, that there exist sport abuse behaviours in elite women's artistic gymnastics in the Olympic period from 1972 till 1988. There are evidences about emotional and physical abuses during the training and competitions (the most often caused from trainers), falsification of personal data of gymnast (from nation federations) and presence of eating disorders and anxiety during or after sport carrier. Injuries on one side and winning at the Olympic Games at the other side were the most popular reasons for leaving the elite gymnastics carrier.

CONCLUSIONS

Women's gymnastics in seventies and eighties was sport for children. The central meaning was put to achieve the biggest international trophies for any price. With intention to avoid such abuses of children in elite sport in the future is urgently to raising the age limitation for the senior artistic women's gymnastics competitions to the majority, like is usual praxis in other Olympic competitive sports.

A WEARABLE SYSTEM TO TIME GATE CROSSING DURING ALPINE SKIING SLALOM

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INTRODUCTION: In alpine skiing, chronometry analysis is currently the most common tool to assess performance. It is widely used to rank competitors during races, as well as to manage athletes training and to evaluate material. Usually, this measurement is accurately realized using timing cells. Nevertheless, these devices are too complex and expensive to allow chronometry of every gates crossing. On the other side, differential GPS can be used for measuring gate crossing time (Waegli et al). However, this is complex (e.g. recording gate position with GPS) and mainly used in research applications. The aim of the study was to propose a wearable system to time gates crossing during alpine skiing slalom (SL), which is suitable for routine uses.

METHODS: The proposed system was composed of a 3D accelerometer (ADXL320®, Analog Device, USA) placed at the sacrum of the athlete, a matrix of force sensors (Flexiforce®, Tekscan, USA) fixed on the right shin guard and a data logger (Physilog®, BioAGM, Switzerland). The sensors were sampled at 500 Hz. The crossing time were calculated in two phases. First, the accelerometer was used to detect the curves by considering the maximum of the mediolateral peak acceleration. Then, the force sensors were used to detect the impacts with the gates by considering maximum force variation. In case of non impact, the detection was realized based on the acceleration and features measured at the other gates. In order to assess the efficiency of the system, two different SL were monitored twice for two world cup level skiers, a male SL expert and a female downhill expert.

RESULTS AND DISCUSSION: The combination of the accelerometer and force sensors allowed to clearly identify the gate crossing times. When comparing the runs of the SL expert and the downhill expert, we noticed that the SL expert was faster. For example for the first SL, the overall difference between the best run of each athlete was of 5.47s. At each gate, the SL expert increased the time difference slower at the beginning (0.27s/gate) than at the end (0.34s/gate). Furthermore, when comparing the runs of the SL expert, a maximum time difference of 20ms at each gate was noticed. This showed high repeatability skills of the SL expert. In opposite, the downhill expert with a maximum difference time of 1s at each gate was clearly less repeatable. Both skiers were not disturbed by the system.

CONCLUSION: This study proposed a new wearable system to automatically time gates crossing during alpine skiing slalom combining force and accelerometer sensors. The system was evaluated with two professional world cup skiers and showed a high potential. This system could be extended to time other parameters.

REFERENCES

Waegli A, Skaloud J (2007). Inside GNSS, Spring, 24-34.

INFLUENCE OF WORKLOAD AND POSTURE ON HANDCYCLING EFFICIENCY

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Introduction: Handbike (HB) is an arm propelled device of locomotion for subjects with lower limbs disabilities. Handcycling has become a Paralympics discipline, increasing the need to study how lesion level may influence posture on HB and energy cost during exercise. The aim was also to test how postures different from the free chosen one might influence functional parameters during exercise.

Methods: We studied 20 handbikers: 14 DivB (lesions T1-T10), 6 DivC (lesions T11-L5). The HB was placed on a computerized roller to measure speed (km/h), frequency of revolutions (rpm) and power (Watt). The arm-crank unit was equipped with a load cell to measure horizontal (Fh)/vertical (Fv) forces and an infrared encoder to transduce angular position (15° resolution). VO2 and VCO2 were measured by a portable metabolic system Cosmed K4 b2 and heart rate (HR) by Polar monitor. The main muscles involved in cranking (Biceps Brachii, Triceps Brachii, Deltoid Anterior, Trapezius, Latissimus Dorsi) were studied by a portable EMG system.

1) The subject sat on the HB and chose his favourite posture (seat-crank distance and adjustable backrest inclination). The elbow angle (α) was measured when crank was in 90° position (maximal arm extension during cranking).

2) The athlete was asked to cycle at 65 rpm with 3 different chain gears: L1, L2, L3, corresponding to 32x28, 32x21 and 32x16 gear ratios, respectively.

3) The gear ratio determining 60-70% of HRmax, named threshold gear (Lt), was used to test two other positions with elbow angles of α+10° and α-10°.

Each bout lasted 4 min. Averaged Force and EMG envelope profiles were derived for a complete revolution.

Results: The increase of external workout from L1 to L3 determined an increase of both Fh and Fv. In particular, an increase of about 100% and 60% of Fh in DivB and DivC, respectively, took place. EMG activity in DivC increased less than in DivB subjects to obtain the same increase of external workload from L1 to L3. Considering exercise at Lt, no variations in EMG envelopes were founded passing from α-10° to α+10°. An increase in Fh was observed only in DivB group from α (41.2±21.6 N) to α+10° (56.9±27.5 N). VO2 was influenced by posture changes only in DivC: higher values for α-10° and α+10° than α position (α-10°: 23±7.5; α+10°: 22±6.9; α: 20±6.7 ml/kg•min).

Discussion: The different increase of both Fh and EMG with incrementing workload suggests different biomechanics and muscle recruitment in the two groups. Indeed, DivC subjects can recruit abdominal muscles leading to a higher exercise efficiency.

The increase of energy cost in DivC for α-10° and α+10° cranking positions, without concomitant changes in force and EMG, indicates lesser efficient postures compared to the free chosen one. For DivB, the more stable α+10° position determines even a more advantageous biomechanical condition, that is probably not spontaneously adopted by the subject for the uncomfortable sustained flexion of the head required to look forward.

14:15 - 15:15

Poster presentations

PP-CO01 Coaching 1

THE WATERBASKET PLAYED BY MEN YOUTH PLAYERS: A HEART RATE, LACTATE, AND STRENGTH PROFILE.

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UNIVERSITY OF ROME - FORO ITALICO

Intruduction

Waterbasket is a new team sport (Italian Waterbasket Federation, FISBA) during which two teams of 5 players compete four 10-min quarters on a 16x8m pitch with two baskets located at 1.5 m above the water surface. Every basket scored during the game is assigned 2 points, while 1 point is given when a free throw is scored (FISBA, 2005). To provide meaningful information for trainers interested in the development of waterbasket competitions, this study aimed to assess the intensity of efforts playing waterbaskeet matches.

Methods: Heart rate (HR) responses of 10 male waterbasket players (17±1yrs; height: 1.79±0.09m; weight: 74±15kg; BMI: 23±3 kg/m2; VO2max 57±6 ml.kg-1.min-1) were recorded with a sampling frequency of 5 s during a friendly match. Determinations of blood lactate (La; Accusport, Roche, Basel, Switzerland) were performed before the match, after the 2nd quarter, and at 3, 6, and 9 min of the recovery phase. Grip strength was measured (Lode, Groningen, The Netherlands) before and after the match. Intensity of effort was according to four categories: 1) maximal effort (>90% HRmax); 2) high-intensity (81-90%, HRmax); 3) moderate-intensity (71-80%, HRmax); 4) low-intensity (≤70% HRmax). ANOVA for repeated measures was used to test differences ($p<0.05$).

Results: Differences for HR emerged only for intensity effort ($p<0.0001$). In particular, during the waterbasket match, 7%, 24%, 55%, and 14% of the total duration were performed at ≤70%, 71-80%, 81-90%, and >90% of the individual's HRmax, respectively. Differences ($p=0.0008$) emerged for La, with highest values registered at the end of the 2nd (4.2±1.6 mmol•l-1, p=0021) and 4th quarter (4.6±2.2 mmol•l-1, p=0004). The comparison of the handgrip strength showed no difference between values recorded before (right hand: 460±78N; left hand 426±64N) and after (right hand: 465±102N; left hand: 430±61N) the match.

Conclusions: The present findings show that waterbasket matches impose a high load on the players, comparable to that reported in young elite basketball (Apostodolis et al., 2003) and elite water polo (Smith, 1998) players. Despite the HR response was greater than 80% of HRmax for 70% of game and peak La values were higher than the lactate threshold, players maintained their strength throughout the match.

References

Fisba (2005). Regolamento di gioco del Basket Acquatico. www.fisba.it/regolamento.asp

Apostolidis et al. (2003). J. Sports Med. Physic. Fitness, 43, 157-163.

Smith (1998). Sports Medicine, 26, 317-334.

ACUTE EFFECT OF STRENGTH EXERCISES WITH AND WITHOUT WEIGHT BELTS IN YOUNG RHYTHMIC GYMNASTS

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Introduction For many years, young athletes were not expected to incorporate weight training into their overall training programs, and coaches did not put an emphasis on this type of preparation. Retrospective reviews found that weight training can be a safe and effective method of conditioning (Faigenbaum et al., 1996). The aim of this study was to assess if a single session of strength conditioning using weight belts could have a positive influence on leaping ability in young rhythmic gymnasts. Methods Twenty pre-puberal rhythmic gymnasts (age 12±1.6 years) were recruited for this study. The sample was divided into 13 cadets (age 11±0.9 years), and 7 juniors (age 13.7±0.8 years) competing at regional and national level. The gymnasts underwent two testing sessions in which three vertical jumps (Squat Jump, Counter Movement Jump, and Hopping Test) and three technical leaps (Split Leap with Leg Stretched - SL, Split Leap with Ring - R, Split Leap with Back Bend of the Trunk - BBT) were assessed in two conditions: after 15-minute of rhythmic specific strength exercises with and without weight belts at 6% of body mass (Faigenbaum et al., 2006). Leap performances in each of the two types of conditioning exercises were simultaneously evaluated through the Optojump System (focusing on flight time and ground contact time parameters) and by three rhythmic gymnastics judges (score). Results The main effects of categories (cadet and junior) and strength conditioning session (with and without weight belts) on dependent variables (vertical jump and technical leap ground contact time and flight time) were examined by a MANOVA with repeated measures on the second factor (p≤0.05). Two factors ANOVA assessed the effect of conditioning and categories on leaping performance evaluated by judge scores (p≤0.05). The analyses revealed no significant main effect on jumping performance of strength conditioning session. Significant differences between categories were found for flight time in R after strength exercises with weight belts (cadet 425±40.4ms; junior 464±17.2ms; $p<0.05$); in BBT after exercises with and without weight belts (cadet 429±26.7ms; junior 459±11ms; $p<0.01$; 427±32.8ms; junior 457±16.8ms; $p<0.05$, respectively). No differences were found in vertical jump performance. The judge evaluation was not affected by the protocols of the single session strength conditioning. Discussion A single session of conditioning with weight belts did not modify the jumping and leaping performance in young rhythmic gymnasts, likelihood because the eventual positive effect was counterbalanced by the negative effect of fatigue due to the exposure to unusual dynamic preloads exercises (Duthie et al. 2002).

References

1.Faigenbaum AD, Kraemer W, Cahill B. (1996). Strength Cond, 18, 62-75.

2. Faigenbaum AD, McFarland JE, Schwerdtman JA, Ratamess NA, Kang J, Hoffman JR (2006). J Athl Train, 41, 357-363.

3.Duthie GM, Young WB, Aitken DA. (2002). J Strength Cond Res, 16, 530-538.

PLASMA GHRELIN RESPONSES TO PROLONGED SCULLING IN MALE COMPETITIVE ROWERS

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The aim of the present investigation was to investigate plasma ghrelin responses to a single endurance rowing training session in male comüpetitive single scull rowers. Nine national standard male rowers (20.1±1.5 years, 183.9±4.3 cm, 81.0±5.0 kg, body fat%: 10.8±3.3%) volunteered for this study. The participants completed two 2.5 h trials (exercise or control) on separate days. The exercise trial involved a prolonged rowing training session lasting about 2 h (7373±129 s, distance covered 20.7±1.4 km, heart rate 133±4 bpm, intensity 80.2±1.6% of anaerobic threshold) followed by 30 min rest. The control trial consisted of 2.5 h of rest. Venous blood samples were obtained at 0, 2.0 and 2.5 h. No differences were found between baseline values for measured plasma ghrelin and leptin concentrations at exercise and control trials. Plasma ghrelin concentration was increased (+12.2%; $P<0.05$) and leptin concentration decreased (-20.0%; $P<0.05$) after the first 30 min of recovery at exercise trial. No differences in plasma ghrelin or leptin concentrations over time were observed during control trial. There were no relationships between basal ghrelin concentration and the measured body composition, energy balance, physical performance, or blood biochemical data. Plasma ghrelin ($r=0.75$) concentration measured immediately after the training session were related ($P<0.05$) to the distance covered, but no such relation was observed for post-exercise leptin concentration ($r=-0.16$; $P>0.05$). In conclusion, these results suggest that acute negative energy balance induced by a single prolonged endurance rowing training session elicits a metabolic response with opposite changes in ghrelin concentrations in competitive male rowers.

THE EFFECTS OF RESISTED TRAINING USING PARACHUTE ON SPRINT PERFORMANCE

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Introduction: Running velocity is an important element of successful performance in many sports. Two important factors that affect running velocity are stride length and stride frequency (Mero et al, 1992). Research has shown that running velocity is improved using repetitive sprint training and strength training (Delecluse et al., 1995). The means utilized in sprint training with pull against resistance are sled and parachute sprinting. The purpose of this study was to examine the effects of resisted (using parachute) and un-resisted sprint training programs on acceleration and maximum speed performance.

Methods: 16 sprint athletes (12 male, 4 female), age 25±4 years, completed a resisted (n=8) and an un-resisted (n=8) sprint training program. The resisted group followed the program towing a large size chute and the un-resisted group followed a similar sprint training program without resistance. The training program consisted of 4x30m and 4x50m maximal runs and was applied 3 times/week for 4 weeks. All subjects performed a 50m run and the running velocity of 0-10m, 10-20m, 20-40m and 40-50m was measured. In addition, stride length, stride rate, contact time and flight time were evaluated between the 1-7m during the acceleration phase and between 40-47m during the maximum speed phase. A series of ANOVA was used separately for acceleration and maximum speed phases.

Results- Discussion: The resisted sprint training group improved running velocity in all sections of acceleration phase 0-10m, 10-20m and 0-20m, while un-resisted sprint training group in the run section 0-20m. Comparison between groups indicated that running velocity was significantly higher during run section 0-20m in the resisted group compared to the un-resisted group ($F1, 12=5.307$, $p=0.04$). For the maximum speed phase the resisted sprint training program improved running velocity in the 40-50m run section and the maximum running velocity between 40-47m, while un-resisted sprint training had no effect in any run section in the maximum speed phase. Stride length increased after resisted and un-resisted sprint training in acceleration phase, whereas stride rate increased only after resisted sprint training in maximum speed phase.

Resisted sprint training with a large size chute for 4 weeks significantly improves running velocity during acceleration phase by increasing stride length and during maximum speed phase by increasing stride rate in sprint athletes.

References

Delecluse C, Van Coopenolle H, Willems E, Van Leemputte M, Diels R, Coris M (1995). Influence of high-resistance and high velocity training on sprint performance. Medicine and Science in Sports and Exercise, 27(8), 1203-1209.

Mero A, Komi PV, Gregor RJ (1992). Biomechanics of sprinting: A review. Sports Medicine, 13, 376-392.

THE EFFECT OF ENDURANCE RESPIRATORY MUSCLE TRAINING ON NORMOXIC AND HYPOXIC PERFORMANCE

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Introduction: The evidence regarding the effect of endurance respiratory muscle training (RMT) on exercise performance remains equivocal (Wylegala et al., 2007; Sonetti et al., 2001), which may be attributed to the fact that very few studies in the past have used appropriate control or placebo groups (Sheel 2002). The present study investigated the effect of endurance RMT on normoxic and hypoxic endurance performance.

Methods: Eighteen healthy males were stratified for age and aerobic capacity; and randomly assigned to either the RMT (n=9) or control training group (CON, n=9). Both groups trained for 1-h on a cycle-ergometer 5•d•wk-1 for 4 wks at intensity corresponding to 50% of normoxic peak power output (PPO). Additionally, the RMT group performed a 30-min specific endurance training of respiratory muscles (Spirotiger®, Bologna, Italy - isocapnic hyperpnea) before cycling. Pre, mid, post and 10-d after the end of training period, subjects performed blood tests, pulmonary function tests (PFTs), VO2max test in normoxia (VO2maxNOR) and in hypoxia (VO2maxHYPO; FIO2: 0.12); and constant power test at 80% of pre-training VO2maxNOR in normoxia (CPTNOR) and in hypoxia (CPTHYPO; FIO2: 0.12).

Results: Both groups enhanced VO2maxNOR, but only the RMT group improved ($p<0.05$) VO2maxHYPO post training. Furthermore, only the CON group increased PPO, whereas the RMT group had higher values of minute ventilation at the same relative intensity. Both groups increased CPTNOR, but only RMT maintained the adaptation 10-d after training. CPTHYPO remained unchanged in both groups.

Discussion: Endurance respiratory muscle training appears to enhance hypoxic aerobic capacity without a concomitant enhancement of hypoxic exercise endurance performance. In summary, RMT does not benefice performance under normoxic conditions.

References

Sheel AW (2002). Sports Med, 32, 567-581.

Sonetti DA, Wetter TJ, Pegelow DF, Dempsey JA (2001). Respir Physiol 127, 185-199.

Wylegala JA, Pendergast DR, Gosselin LE, Warkander DE, Lundgren CEG (2007). Eur. J. Appl. Physiol. 99, 393-404.

14:15 - 15:15

Poster presentations

PP-NU01 Nutrition 1

NUTRITIONAL ERGOGENIC AIDS USAGE AND NUTRITIONAL KNOWLEDGE IN ELITE FEMALE VOLEYBALL PLAYERS

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Introduction: Recently, an increasing use of nutritional ergogenic aids has been observed in various sports, particularly among elite athletes (Ronsen, et al., 1999). Without much scientific backing, a host of dietary supplements have lately been introduced to fill the proposed "micronutrient gap" between the daily requirements and the actual dietary intake, targeting both the general population and specific athletic groups (Rosenbloom et al.,2002). Therefore, the aim of this study was to examine nutritional ergogenic aids usage and nutritional knowledge among elite female volleyball players.

Methods: Sixty seven volunteer elite female volleyball players, age 15-33 (mean 23.1 ±3.96 years) were included in this study. The instrument was a questionnaire designed to assess nutritional knowledge of athletes. We developed the instrument using selected questions from questionnaires created by Zawila et al (2003). Thus, the entire questionnaire contained 78 questions and was scored in a true/false manner. The questionnaire content consisted of the following: hydration status, macronutrients, vitamins and minerals food variety and groups, relation to food and health, nutrition training, body composition. Athletes were given another questionnaire including question about use of nutritional ergogenic aids. For 2-group comparisons, independent t test were used to identify evidence of a significant difference.

Results: Use of supplements was widespread with 56.7 % of volleyball players declaring supplement use. None of the volleyball players gave correct responses to the whole total nutrition knowledge (38-60 point, min-max) and subgroups questions except for hydration questions. The mean total nutrition knowledge score of athletes who usage supplement and who don't usage supplement were 51.5 ±5.47 and 50.5±4.84 points, respectively (mean ± SD). No significant difference was observed between the mean total nutrition knowledge score and their subgroups score of both groups.

Discussion: Although the results of this study reflect the knowledge of elite female volleyball players and cannot be generalized to all athletes, they indicate that nutritional knowledge may not have an effect on athletes supplement usage. Athletes are exposed to nutrition information from multiple sources, and dietetics professionals are in a position to provide accurate and timely information on a variety of topics of interest to athletes (Ronsen, et al., 1999). Results from this survey suggest that athletes could benefit from learning how supplements affect performance and should be cautioned that supplements cannot make up for a poor-quality diet.

References

Ronsen, O., Sundgot-Borgen, J., Maehlum, S. (1999). Scand J med Sci sports.9;28-35.

Rosenbloom, CA., Johnlagadda, S., Skınner, R. (2002). JADA. 102(3);418-20.

Zawila, LG., Steib, CSM., Hoogenboom, B. (2003) J Athletic Training. 38(1);67-74.

THE EFFECT OF NUTRITION EDUCATION INTERVENTION ON DIETARY INTAKE AND NUTRITIONAL KNOWLEDGE IN ADOLESCENT ATHLETES

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Introduction: Previous studies showed that athletes have limited knowledge of nutrition and did not use their knowledge in making proper food choices (Kunkel et al., 2001). Therefore, the purpose of this study was to evaluate the efficacy of a nutrition education intervention to improve nutrition knowledge, to build self-efficacy with respect to making healthful dietary choices, and improve dietary intake in adolescent male athletes.

Methods: Adolescent male basketball players (n=10, age 10-12 yr) constituted the subjects of this study. All athletes completed the nutrition knowledge (NK) and nutrition attitude (NA) questionnaires as pre-education in order to evaluate their nutrition status. The true/false NK test included 17 items related to total calories, macro and micro nutrient, and intake of these components. A total NK scores was based on the sum of all of the correct answers, worth 1 point each. The purpose of these questionnaires was to gather the baseline data necessary for the development of an intervention. A 3-day dietary record was also administered with the pre-and post education to determine any changes in selection of pre-competitions meals, types of fluids consumed prior to and during games, and general dietary habits. The 3-day diet record was averaged and then analyzed using the computer program. Nutrition education seminars were conducted by dietitians for 2 months, 1-hour educational session conducted on a monthly basis. At post-education, athletes completed the same questionnaires. The Wilcoxon Signed Ranks Test was used to analyze the results between pre-and post nutrition education.

Results: The total possible score for the NK assessment was 17; therefore, the pre-education score was slightly below an average score (12.9). The total possible score for NA was 56. The mean pre-education score on NA making healthful choices were 46.9. After nutrition education experienced a significant increase in NK and NA (respectively, 14.3 and 52; $p<0.05$). Pre-and post education comparisons of the athletes indicate that except for monounsaturated fatty acids, sodium and bread ($p<0.05$), there was no significant improvement in dietary intake and food choices due to the limited duration of the education ($p>0.05$). After nutrition education, the amount of fluid intake was increased by 13.6% ($p>0.05$).

Discussion: Adolescent athletes in the present study demonstrated a higher level of knowledge and attitude after nutrition education. However, the knowledge and attitude did not lend itself to improvement of dietary intake. According to these results, it is believed that providing adequate and balanced nutrition training starting from childhood with regular intervals decreases the health and performance problems associated with inadequate and imbalanced nutrition (Barr, 1987; Chapman, et al. 1997).

References

Barr SJ (1987).JADA 87:1660-64.

Chapman P, Toma RB, Tuveson RV, Jacob M. (1997). Adolescence 32;437-46.

Kunkel ME, Bell LB, Luccia BHD. (2001). J Nutr Education 33:114-5.

WEEKLY VIGOROUS PHYSICAL ACTIVITY AND DIETARY HABITS IN SEDENTARY UNIVERSITY STUDENTS. GENDER-RELATED DIFFERENCES

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Introduction: The finding that women seem to compensate the increased exercise-related energy expenditure, through high lipid-dense foods (Stubbs et al., 2002), suggested us to verify if this is due to the intensity of daily body movement and energy expenditure or to exercise program participation through 2 different protocols. The aim of this study was to investigate the interaction between the amount of weekly vigorous physical activity and gender on dietary habits of sedentary university students.

Methods : We recruited 30 sedentary university students among courses with mandatory attendance. 15 were women (22.07±2.46 yrs; %fat mass 29.63±7.79) and 15 men (23±3.5 yrs; %fat mass 22.30±5.47). Nobody had gone on a diet during the last 2 years and did not take part in exercise programs during the last year. Physical activity was investigated by International Physical Activity Questionnaire (IPAQ). Qualitative and quantitative characteristics of daily meals were assessed by a dietician with 3-day dietary records, by WinFood-due software (Medimatica, I). Body composition was estimated by single-frequency electrical bioimpedance (Akern, I). We created 2 sub-samples according to the 50th percentile of weekly min of vigorous physical activity: LOW (<30 min) and HIGH (>30 min). M-ANOVA was performed taking gender and groups of vigorous physical activity as independent variable, while parameters of dietary habits were taken as dependent variables.

Results: Groups differed only in vigorous physical activity. Men had worse values than women of both daily intake of percentage of lipids ($F(1, 27)=5.669$; $p=0.027$) and carbohydrates ($F(1, 27)=4.031$; $p=0.05$) and that of satured fat ($F(1, 27)=4.549$; $p=0.04$). The interaction between gender and weekly min of vigorous physical activity showed that men and women differed in lipid ($F(1, 27)=3.771$; $p=0.05$) and satured fat intake ($F(1, 27)=6.903$; $p=0.016$) trend. Men showed a worse tendency than women.

Discussion: Our results show that, if sedentary women have a correct distribution of daily energy intake among macronutrients, independently from weekly min of vigorous physical activity, both lipid and satured fat intake of sedentary men are linked with weekly min of vigorous physical activity. In fact, more active men had high lipidic diet. Weekly amount of vigorous physical activity seems to be negatively linked with a healthy diet in men but not in women.

References

Stubbs RJ, Sepp A, Hughes DA, et al. (2002). Int J Obes Relat Metab Disord, 26, 866-869.
Stubbs RJ, Sepp A, Hughes DA, et al. (2002). Eur J Clin Nutr, 56, 129-140.

CARBOHYDRATE INGESTION IMPACTS ON MALE TRAP SHOOTING PERFORMANCE

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Researchers have demonstrated that consumption of a carbohydrate solution during prolonged exercise enhances performance, but the effect of these supplements on shooting sports is unclear. The aim of this study was to determine the effect of a carbohydrate solution on performance in the sport of Olympic Trap shooting. In a double-blind, balanced, crossover design, eight fasted Olympic Trap shooters (mean ± SD: age 33.0 ± 15.9, weight 91.9 ± 21.7 kg) were required to ingest a liquid form of glucose or similarly flavoured placebo throughout a simulated shooting performance, following an overnight fast. Glucose content was 7.6% in a total volume of 1300 millilitres, with 100 millilitres being consumed every 10 minutes. Blood glucose levels were tested every 15 minutes. Each shooter completed three rounds of 25 targets, 20 minutes apart in one testing session. Changes between conditions for the same time interval, and for performance and blood glucose levels across time intervals were analysed. No significant blood glucose changes ($p>.05$) were seen in the placebo group. Blood glucose results were elevated from fasting levels and were significant in the final round ($p<.05$). No significant changes in performance were seen between the two drink groups (glucose score (mean ± SD) 56 ± 5; placebo score 54 ± 7). Prior to commencing the study all shooters completed a baseline shooting score under non-fasted conditions. The performance scores for shooters whilst consuming both drinks were only ever reduced from baseline (baseline score 61 ± 7), hence average scores across the time intervals never exceeded their average baseline performance. Despite no statistical change in performance it is shown that limiting your glucose intake negatively affects scoring consistency represented by first barrel, second barrel and lost targets. Whether this is indicative of cognitive performance would require further research.

NUTRITION KNOWLEDGE AND DIETARY HABITS OF ATHLETES

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Introduction: The nutrition of athletes has been of interest to scientists for decades and since the origins of sports competitions the questions about what to eat and what to drink in order to improve performance have been raised. Today there are scientific proofs that an adequate dietary habits influences in a large extent to an athlete's health, body composition, and energetic pathways during the activity as well as during the competition or recovery. Athletes should be well informed about the food groups, caloric intake, and daily meal schedule.

The aim of this study was to evaluate nutrition knowledge and dietary habits of athletes and to estimate inter-relationship between them such as the differences between male and female. The source of nutrition information and food supplements related behaviours were also taken into consideration.

Methods: Respondents of this study were active and succesful athletes (n=100) both genders. Methods used in this study were for this occasion specially designed questionnaire for nutrition knowledge determination, and dietary assessment method through qualitative food frequency questionnaire (FFQ).

Reasults and Discussion: Results showed middle knowledge level of nutrition which statistically wasn't significantly affected by the frequency of asking for nutrition information and qualification level of the nutrition information source. Respectively high number of respondents were estimated for irregular meal consumption, especially snack meals and they in average don't satisfy the recommendations for optimal hydration. The knowledge level of nutriton doesn't significantly influence on the quality of dietary habits among respondent ath-

letes. Estimated knowledge level of nutrition and dieatary habits don't differ between genders. Still, statistically significant positive correlation between knowledge level of nutrition and quality of dietary habits is estimated among male althletes and all questioned athletes but not between female athletes. The recommendations are to improve conscionsness about the importance of well balanced diet for athletes, and to educate them as well as their coaches.

References: American Dietetic Association. (2000) Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and athletic performance. Journal od the American Dietetic Association. 100, 1543-1556.

Benardot, D., Thompson, W.R. (1999) Energy from food for physical sctivity. Enough and on time. ACSM Health and Fitness Journal. 3, 14-18.

Manore, M.M., Thompson, J.L. (2000) Sport Nutrition for health and performance. Champaign, Ill: Human Kinetics.

Stevenson, E.J., Williams, C., Mash, L.E., Phillips, B., Nute, M.L.(2006) Influence of high-carbohydrate mixed meals with different glycemic indexes on substrate utilization during subsequent exercise in women. Am J Clinical Nutrition. 84, 354-360.

NUTRITIONAL INTERVENTION IN TRACK AND FIELD ATHLETES

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Introduction: Optimal nutrition contributes to achieve maximum athletic performance. Track and field events include the development of different motor skills: race walking, running, jumping, and throwing. The aim of this work is to compare nutritional patterns in athletes competing in different events, and verify possible changes in dietary practices after intervention.

Methods: Diet composition was analysed in 44 Spanish elite athletes [26 female (F) and 18 male (M)] competing in three different events: fast events (FE) include jumpers, throwers, and multi-event (n = 12; Age =22.5 ± 4.8; BMI = 22.4 ± 3.9), middle distance (MD) runners (n = 17; Age =24.7 ± 4.0; BMI = 20.0 ± 1.5) and long distance (LD) runners (n = 15; Age =24.9 ± 4.9; BMI = 19.4 ± 1.1), to describe and compare their usual nutritional patterns. After a preliminary diet evaluation, an individual nutritional report was given and a personal advice program was performed to all of them focusing on improving their diet quality. To verify possible changes after this intervention, a new diet composition evaluation was done (160 ± 88 days after) in 27 of them (8 FE, 11 MD and 9 LD).

Diet composition was estimated by retrospective method for a 3 day period (rest, moderate, and intense training days); additionally, they completed a 24h activity questionnaire to estimate energy requirements (EER) (IOM, 2002) during the same 3 day period.

Results: Comparing data between the three groups (FE, MD and LD): energy intake (EI) and energy distribution (%P, %CH, %L) were similar despite a tendency to a higher %CH and a lower %L in the LD group (FE = EI: 2653± 950, %P: 19, %CH: 46, %L: 35%; MD = EI: 2668 ± 676, P: 17%, ,CH: 45%, L: 35%; LD = EI: 2737 ± 518, P: 16%, ,CH: 51%, L: 32%). EER were similar to IE in the three groups. Attending to gender, absolute values for EI (Kcal/day), P, L and CH (g/day) were significantly lower in females, but these same values, expressed in terms of body weight, were similar in both genders.

After intervention, the EER was lower (2516 ± 480 vs 2816 ± 461 kcal/d), and so was the EI ($p<0.005$) expressed in absolute values (2466 ± 546 vs 2781 ± 763 kcal/d) and relative to body weight (45 ± 12 vs 40 ± 10 Kcal/Kg/d). Elite athletes were able to get an energy balance in both trials. After intervention, CH expressed as % of the total EI was significantly higher (51 ± 8 vs 47 ± 6) (p≤0.01), conversely a decreased L intake, expressed as % of the total EI (31 ± 6 vs 36 ± 5), and a significant (p≤0.0001) decreased L (saturated and monounsaturated) intake (g/d) were found.

Discussion/Conclusion

CH intake was still lower than recommended for athletes (Burke, 2007). Other nutritional intervention, such as a personal and close relationship with athletes and their coaches, is needed in order to improve further their diet energy distribution.

References

IOM. National Academy Press. Washington DC, 2002.

Burke L, Maughan R and Shirreff S. J. Sport Sciences, 25 (S1), 2007.

THE RELATION BETWEEN SECRETORY IGA CONCENTRATION IN SALIVA AND FOOD INTAKE IN JAPANESE YOUNG MEN

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Introduction: Recently, it is reported secretory immunoglobulin A in saliva (s-IgA) can be a useful stress maker because s-IgA plays an important role in the defense mechanism of mucosal membranes for resistance to infectious disease. And it is thought that saliva production is greatly influenced by state in mouth and diversified eating habits. Therefore to search for the possibility of making use of s-IgA concentration for health indicator, we investigated the relation between s-IgA concentration and food intake in Japanese young men who belong to baseball team.

Methods: The subjects were 39 Japanese young men (aged 18-21) who belong to baseball team. Saliva samples were collected chewing for one minute after the meal in one hour or more. The s-IgA was examined by ELISA (Enzyme-linked immuno-sorbent Assay) using anti-human IgA and protein in saliva was determined by BCA method. We investigated food intake by food frequencies questionnaire and lifestyles.

Results: The numbers of regular people were 13 in the team and the rest were the substitute. In the physical characteristics of subjects, Height was 173±4.3cm, Weight was 70±6.4kg, Body Mass Index(BMI) was 23.4±1.7kg/m2. There was no difference between regular persons and substitute persons in the body mass characteristics. The average s-IgA concentration was 43.1±36.5 μg/mL. The average s-IgA concentration of the regular persons was lower than that of the substitute. The average of food energy was 2842±931 kcal. The average of food energy was also lower than that of the substitute.

Discussion: These subjects were baseball players therefore they have to make more meal than the person who doesn't exercise. But most of them didn't cover estimated energy requirement: EER. According to Bruins GJ, they reported that physical exertion, such as practicing sports, might have an influence on the secretion and composition of saliva. After a single physical exertion, the alterations are reversible and the values return to baseline within a few hours. In the case of long lasting intensive physical exertions, for instance lasting several months, particularly the decrease in s-IgA concentration seems to have a more permanent character. And Sakamoto reported that the s-IgA level was significantly increased in the pre-germinated brown rice diet group. They have shown that pre-germinated brown rice may have beneficial effects on psychosomatic health. In this research, the s-IgA concentration of the subjects who had felt the

mental stress tended to be low. Therefore for these baseball players, s-IgA concentration is thought to be useful to judge both physical and psychological conditions.

References

Bruins GJ, Vissink A, Veerman EC, van Nieuw Amerongen A.(2008). Ned Tijdschr Tandheelkd,
115(9),467-73.
Sakamoto S, Hayashi T, Hayashi K, Murai F, Hori M, Kimoto K, Murakami K.(2007). Eur J Nutr.,46(7), 391-6.

ANTHROPOMETRIC AND DIET PROFILE OF BRAZILIAN MALE HANDBALL PLAYERS

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VITA CARE

ANTHROPOMETRIC AND DIET PROFILE OF BRAZILIAN MALE HANDBALL PLAYERS

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In handball a victory can be determined in details such as a powerful and agile team (1). For this an adequate diet plan is essential, it can assure the energy required to the last counter-attack. Define individual characteristics is crucial to recognize what can be improved. Purpose: the aim of the present study was to analyze body and diet composition of handball players and compare these variables to the international recommendations for macro and micronutrients. Methods: The sample was constituted by 20 handball male athletes (14 to 17 years old). Body composition was determined by body mass index - BMI (kg/m2), skinfolds (mm) and body fat percentage was calculated according to Slaughter (2). Food consumption (macronutrients and micronutrients) was obtained by 24-hour recall and calculated by nutritional Dietwin® software. Results: Athletes presented average age of 14,9 ± 1 years old. Mean body composition: 18,5 ± 4,3% of body fat; 173,9 ± 7,1 cm of stature; 65,5 ± 9,3 kg of body mass and 21,60 ± 2,00 kg/m2 of BMI. According to the 24-hour recall, athletes nutrient intake was: 2.293,5 ± 644,4 kcal; 1.238,3 ±439,5 kcal of carbohydrates (53,4 ± 6,3 %); 437,6 ± 143,2 kcal of protein (19,2 ± 4,2 %); 617,5 ± 177,8 kcal of fat (27,4 ± 5,0 %); 753,3 ± 336,8 mg of calcium; 2918,4 ± 1253,6 mg of sodium; 17,2 ± 7,0 mg of iron and 13,4 ± 7,4 g of dietary fiber. Discussion and Conclusion: According to Dietary Reference Intake (DRI) (3) the athletes showed an appropriate macronutrient intake. However handball athletes need a high glycogen content which means that they must have a hyperglicidic diet. Micronutrient analysis showed that sodium and calcium ingestion were the major problem. Sodium reached toxic levels and calcium intake was almost half of the recommendation. Those data showed us that a nutritional intervention is vital in order to improve performance and prevent any future health problem.

References: 1 Gorostiaga EM et al. Strenght, endurance and throwing in handball players. Int J Sports Med, 2005. 26: 225-232.

2 Slaughter MN, Lohman TG, Boileau RA, et al. Skinfold equations for the estimation of body fatness in children and youth. Hum Biol 1988; 60:709–23.

3 Dietary Reference Intakes, 2002.

THE STUDY OF PREVALENCE ERGOGENIC DRUGS USE,THEIR ATTITUDES BY BODYBUILDERS IN SARI CLUPS

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ISLAMIC AZAD UNIVERSITY

The study of prevalence ergogenic drugs use,their attitudes by bodybuilders in sari clups

Abstract

Introduction: Dietary supplements and ergogenic agents, including anabolic steroids, are common components of present-day bodybuilder and weightlifter training regimens. Prior reports of anabolic steroid use suggest polypharmacy and high doses of injectable agents(Perry et al.,2005). The purpose of this study was to determine the prevalence of ergogenic drugs,their attitude to ward these substance and their side effect of bodybuilders in sari clubs .

METHODS: The quesnnairs were distributed among 100 bodybuilders(age 25/6+6years,weighe87/17+16kg ,high 175/88+7 cm).The data collected were analyzed usingpoint-biserial correlation coefficients,phi correlation and contingency correlation.

RESULTS: The results showed that the majority of bodybuilder believed that ergogenic drugs caused better physical appearance,take champion rank and health body(31/42%,16/73%,15/92%). Then 64 (%64) from 100 samples of this study have taken these ergogenic substance at least once. Also, the average of prevalence's total score of these substances was 9.5 (MAX=45), the average score of awareness of their side effects 60 (MAX=100), and the average score of knowledge ergogenic substance 25.11(MAX=50).

The analyzing of information indicated that the prevalence of ergogenici substance has a completely significant relation with job, the record of body building, the record of championship, the championship field, the championship level, the amount of awareness about side effects of this ergogenic substance and knowing them($p<0.05$). But it hasn't any significant relation with education level, and the clubs & provinces distribution ($p>0.05$).

Discussion: The number of athletes self-administering ergogenic pharmacological agents to increase their competitive edge continues to be a problem. Most athletes using anabolic steroids (AS) have acquired a crude pharmacological database regarding these drugs(Kutscher et al.,2002). The principal reason bodybuilders used steroids was related to their perception that these drugs were an important factor in winning competitions. Another important motivating factor for use was consistent with reports that significant gains in strength could be achieved by including anabolic steroids as part of the training regimen in spite of the reported adverse side-effects(Tricker et al.,1989, standard., 2004).This conclusions suggests that bodybuilders and coach need more information.

References

Kutscher EC, Lund BC, Perry PJ. Sports Med. 2002;32(5):285-96

Perry PJ, Lund BC, Deninger MJ, Kutscher EC, Schneider J2005. Clin J Sport Med. Sep;15(5):326-30.

Tricker R, O'Neill MR, Cook D. : J Drug Educ. 1989;19(4):313-25.

standard. Montreal: (www. Wada- amo. Org).Abstract

CONCLUSIONS OF HUNGARIAN ELITE ATHLETES' DOPING CONTROLS IN THE YEAR OF THE OLYMPIC GAMES IN BEIJING.

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Introduction: The sportsmen have been used different medicines and dietary supplements during the trainings and competitions. Theirs quantity and quality are disputable by point of view of health protection many times. According to our opinion it is necessary systematic health education and scientific nutrition advices to fend off pressure of consuming supplements induced by the commercial advertisements and by psychological reasons. Sport background of these acting we should like help on with special data bases. In former researches we fixed information during long time (7 years) one kind of sport (athletic). In the present case, our aim gain data about medicine and supplement consumption habit and specification of Hungarian elite athletes of different discipline of sport during one Olympic year.

Methods: The analyzed information based on the admissions of Doping Control Collection Form of different Hungarian elite athletes in Hungary in time from January 01 2008 to December 31 2008. The Forms are recording the names of medicines and nutrition supplements consumed by the competitors ten days prior the control. We have created a database out of these data.

Results: The members of examination were representatives of 32 Olympic-, 12 Paralympics- and 5 non Olympic -disciplines.

The total sum of Doping controls was 1518 (n= 851m, n=667w) out during in the given period of time.

The competitors of Olympic disciplines have been participated 1396 in case n=766m (503 urine samples, 263 blood samples), n=630w (422 urine s, 208 blood s).

Non Olympic sportsmen were checking 61 in case, n=43m (41 urine s, 2 blood s), n=18w (17 urine s, 1 blood s).

Paralympics had controls 61 in case, n=42m, n=19w all in urine.

In the period of survey only in case 70 (4.6%) hasn't use any medicines and dietary supplements.

Use of the prohibited medications with license were detected 97 (6.38%) in case. (n=50m, n=47w)

Numbers of articles named by Hungarian elite athletes were investigated grouped to medicines and nutrition supplements by the athlete gender and disciplines of sports.

Conclusions: It has been discovered from Doping Collecting Forms too many sports men use different non steroid medicines and pain relieves with together.

After detailed analyzing of consumption of vitamins, the results showed too many competitors used by more types of vitamin complex.

In our opinion there is a high rate of consumption if somebody used five or more dietary supplements in the checking period. We was detected 66 in case (n=49m and n=17w) when the number of taken supplements are over then 10.

Conclusions of our examination that significant numbers of sportsmen do not used the supplements according to needs.

For optimization of nutrition advices should be a theoretically accept for sports, like the standards RDA, ODI, PDI.

References:

D H Catlin, K D Fitch, A Ljungqvist. (2008) Journal of Internal Medicine, 264; 99-114.
Ránky M. (2007) Annual Congress of the ECSS abstracts book, 502.

14:15 - 15:15

Poster presentations

PP-MB01 Molecular Biology 1

PHYSICAL ACTIVITY AND EXERCISE-INDUCED LYMPHOCYTE APOPTOSIS

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Introduction: A decrease in lymphocyte counts and changes in its composition has been described after prolonged and sustained vigorous exercise. To evaluate the contribution of apoptosis to lymphopenia during early recovery from acute physical exercise in humans, a systematic review has been carried out.

Methods: From January 1998 to August 2008, 11 studies investigating the incidence of apoptosis in human blood lymphocytes during early recovery from an acute exercise bout have been published. They comprise of 17 effects from a total sample of 90 volunteers. Exercise mode differed greatly among studies and included; short duration (<60') moderate intensity (60%VO2max) exercise; short duration high (>70%VO2max) intensity exercise; prolonged (>120') exercise; eccentric exercise and progressive maximal exercise. In all cases, venous blood samples were collected before and early after the exercise bout. In some studies, a third sample time-point was allocated at some time between 1 hour to 24h of recovery.

Lymphocyte apoptosis was analyzed by cytometric procedures or by optic microscopy determination of apoptotic morphological changes.

Results and Discussion: Results show that an intensity threshold can exist as exertion below 60%VO2max did not induce significant changes in apoptosis parameters such as annexin-V or CD95 expression, or caspasses activities in lymphocytes. On the other hand, increases in percentages of lymphocytes expressing annexin-V or CD95, or in caspasse 8 and 9 activity (Mooren, 2002; Tuan, 2008; Wang, 2005) have been reported immediately after intense exercise. Sixty minutes after exertion values had returned to resting levels, except for the percentage of NK cells expressing CD95 that were still elevated (Simpson, 2007), and for caspasse 3 activity that increased at 24 hours of recovery (Wang, 2005).

A duration threshold can also exist seeing that percentages of annexin-V or CD95 lymphocytes were superior after long duration running; and persisted elevated for a longer time; than after short duration running at a similar speed (Mooren, 2004; Steensberg, 2002).

Navalta (2005) notes an increase in percentage of lymphocytes with morphological signs of apoptosis immediately after a progressive and maximal exercise test that returned to resting levels in the first hour of recovery.

Physical fitness can also regulate apoptosis, as 180' after a marathon run, the percentage of lymphocytes expressing annexin-V was significantly elevated from pre-exercise values in bad-trained athletes while in well-trained athletes there was no increase (Mooren, 2004). The percentage of lymphocytes expressing CD95 increased but did not differ among groups.

References

Mooren FC 2002 J Appl Physiol 93(1), 147-53
Mooren FC 2004 Med Sci Sports Exerc 36(9), 1476-83
Navalta JW 2007 Int J Sports Med 28(6), 539-42
Simpson RJ 2007 Res Sports Med 15(3), 157-74
Steensberg A 2002 Eur J Appl Physiol 87(1), 38-42
Tuan R 2008 BJSM 42(1), 11-16
Wang JS 2005 Eur J Appl Physiol 95(4), 290-7

PGC1A GENE VARIATION AND PHYSICAL PERFORMANCE IN LITHUANIAN ATHLETES

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INTRODUKTION Peroxisome proliferator-activated receptor gamma coactivator-1a (PGC1A) is a transcriptional coactivator with crucial impact on multiple aspects of cellular energy metabolism including mitochondrial biogenesis and cellular respiration, the regulation of adaptive thermogenesis, adipocyte cell development and also lipid and glucose metabolism. The most common coding single nucleotide polymorphism - G1444A (rs8192678) is located in exon eight and cause amino acid substitution Gly482Ser. PGC1A [A] allele is associated with traits of the metabolic syndrome.

METHOD We tested the hypothesis that the frequency of the minor [A] allele at the PGC1A locus is lower in Lithuanian professional athletes (cases) [N=551; mean age: 17.7±5.3 yr], than in controls [N=97; mean age: 31.3±13.5 yr]. Athletes represented 4 functional groups: endurance (N=64); mixed sports (N=33); strength and speed (N=47), and team sports (N=407). Their physical characteristics were (mean ± SD): height 176±10.4 cm, weight 68.8±15.6 kg, body mass index 21.9±3.4 kg/m2, body muscle mass 36.7±9.5 kg and body fat mass 8±3.2 kg, muscle/fat mass index 5±1.6. All subjects gave informed consent before participating and went through a medical examination. Genomic DNA was extracted from peripheral blood leukocytes. Genotyping for PGC1A [G/A] polymorphism was performed by PCR and restriction enzyme digestion. All the statistical analyses were carried out by use of the SPSS program version 13. Allele frequencies were compared between athletes and controls.

RESULT Genotypes of athletes were identified as [G/G] 52.1%, [G/A] 42.1% and [A/A] 5.8% (χ2=2.83, p=0.09) and the genotypes in the population samples were [G/G] 42.2%, [G/A] 37.8% and [A/A] 20.0% (χ2=3.79, p=0.055). The frequency of the minor [A] allele was significantly lower in athletes than in controls (26.9% vs. 38.9%; P = 0.01). In the mixed sports group the frequency of the [A] allele was less common than in other sports groups: in the endurance group and the strength and speed group the frequency of the [A] allele was 26.6%, and in the team sports group the frequency of this allele was 27.4%.

DISCUSSION PGC1A [A/A] genotype is less frequent in all Lithuanian athlete groups in comparison to the general population (5.8% vs. 20.0%; P=0.005). The results of the present study imply that the PGC1A [G] allele of the [G/G] genotype is more common in the professional athlete group than in the general population of Lithuania. In conclusion, the present findings suggest that there is an association between PGC1A G1444A polymorphim and physical performance in Lithuanian athletes.

HIGH MOLECULAR MASS PROTEOMICAL EVALUATION OF CARDIAC MUSCLE OF RATS SUBMITTED TO AEROBIC EXERCISE.

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Several reports describe regular exercise as an important factor for health improvement. This practice could be directly related to con tractile force development in cardiac cells. In order to evaluate the relations between exercise intensity protein and mRNA expression, 30 isogenics adult male rats Wistar (Rattus norvergicus) were randomly divided into four groups and further submitted to swimming training during twelve weeks with 2.5% (TG1); 5.0% (TG2) and 7.5% (TG3) overload and one control group (CG) by using sedentary rats. Firstly, our findings demonstrated clear morphologic alterations, suggesting that the intrinsic contractile characteristics of myofibrils could be modified in order to contribute for an increase of left ventricle activity. Furthermore, reliable differences at high molecular mass 80 to 240(kDa) protein maps were observed, by using one and two dimensional electrophoresis .Major proteins were further indentified by MALDI ToF-ToF. Among these proteins, all treatments demonstrated an increased expression of protein and mRNA of myosin heavy chain in comparison to CG. Moreover the improvement of other proteins were also observed as troponin, sarcomeric proteins, proteins associated to oxidative metabolism as oxidoredutases, translocases of mitochondrial membrane and proteins analogous to super oxide desmutases. These modifications in protein expression patterns suggest a clear correlation to standard intensity obtained in each training group. One of these effects demonstrated in high intensity when compared to low and moderate, showed to be more efficient in the MHC enhancing expression in cardiac contractile cells. These alterations seem to demonstrate that exercises of moderate and high intensity can induce significant molecular and structural alterations in the cardiac contractile cells

EFFECTS OF DIFFERENT INTENSITY AND DURATION OF ENDURANCE TRAINING ON SATELLITE CELL CONTENT IN RAT SKELETAL MUSCLE

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Introduction: Skeletal muscle satellite cells play an important role for muscle fiber regeneration and hypertrophy. It is well known that resistance training can increase the number of satellite cells with muscle hypertrophy. Recently, it has been reported that relatively high intensity endurance training causes proliferation of satellite cells in human skeletal muscle with hypertrophy. Also, we clarified that relative low intensity and long duration endurance training by using voluntary wheel running induced the number of satellite cells in rat plantaris muscle without hypertrophy. Therefore, not only exercise intensity but also duration might affect for an increase in satellite cell

content. However, it is not clear which factor is important to increase satellite cell content. Therefore, this study investigated the effects of difference in intensity and duration of endurance training on satellite cell content in rat plantaris muscle.

Methods: Forty-one 17-week-old female Sprague Dawely rats were assigned to one of four groups: control (CON: n=8), high intensity and high duration (H90: n=7), high intensity and low duration (H30: n=8), low intensity and high duration (L90: n=9) and low intensity and low duration (L30: n=9) group. Exercise intensities were controlled by running speed and grade (High: 25-30m / min · 0-18%, Low: 25-30m / min · 0-3%). Exercise durations were 90 and 30min for high and low duration, respectively. Training groups exercised 5 days / week on a motor driven treadmill for 10 weeks. After the training period, the plantaris muscle was removed under anesthesia, weighted and frozen with liquid nitrogen. Serial transverse sections (7μm thick) were made using a microtome at -20°C. Satellite cells were immunohistochemically stained, visualized and identified by using anti-Pax7 and anti-laminin antibody and DAPI. The number of muscle fibers, mean fiber area, myonuclei and satellite cells were measured. To determine mean fiber area for each fiber types, mATPase staining was performed.

Results: Endurance training increased percentage of satellite cells (CON: 1.42 ± 0.35%, L30: 1.56 ± 0.30%, L90: 1.73 ± 0.34%, H30: 2.21 ± 0.31%, H90: 2.49 ± 0.29%), however, there were no significant differences in muscle weight, mean muscle fiber area and myonuclei per muscle fiber between groups. The percentage of satellite cells was no significant difference between H30 and H90, but there was significantly higher in both H30 and H90 groups compared with L30, L90 and CON group ($P < 0.05$).

Conclusion

It was concluded that intensity of the endurance training affect an increase in number of satellite cells in the rat plantaris muscle.

EXERCISE TRAINING IMPROVES AGING-INDUCED DECREASE OF PPAR-ALPHA AND PGC-1ALPHA PROTEIN LEVELS IN CARDIAC AND SKELETAL MUSCLES

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Background and Purpose: Exercise training improves aging-induced decrease of oxidative metabolic capacity in mitochondria of cardiac and skeletal muscle1. However, the mechanisms underlying improving oxidative metabolic capacity in the cardiac and skeletal muscles by exercise training are unclear. Peroxisome proliferator-activated receptor (PPAR)-alpha regulates 3-hydroxyacyl CoA dehydrogenase (HSD) gene expression via PPRE transcriptional activation. Peroxisome proliferator-activated receptor gamma coactivator-1alpha (PGC-1alpha) regulates cytochrome oxidase (COX) gene expression via transcriptional activation of nuclear respiratory factor-1 (NRF-1). We investigated whether aging-induced alteration in PPAR-alpha and PGC-1alpha protein levels and these signals in cardiac and skeletal muscle is improved by exercise training.

Methods: We used cardiac and epitrochlearis muscles of sedentary young rat (4-month old), sedentary aged rat (23-month old), and swim-trained aged rat (23-month old, swimming training for 8-week, 5days/wk, 90min/day). PPAR-alpha and PGC-1alpha protein expressions were detected by immunoblot analysis. For determination of HSD, NRF-1 and COX mRNA, reverse transcription-polymerase chain reaction (RT-PCR) was used. Furthermore, enzyme activities of HSD and COX were measured.

Result: The activity of HSD and COX, which are key enzymes of energy metabolic capacity, in cardiac and epitrochlearis muscles were significantly lower in the sedentary aged rats compared with the sedentary young rats, and were higher in the trained-aged rats than the sedentary-aged rats. PPAR-alpha and PGC-1alpha protein levels in cardiac and epitrochlearis muscles were significantly lower in the sedentary aged rats than the sedentary young rats, and were higher in the trained-aged rats than the sedentary-aged rats. Additionally, in the heart, activity of PPRE DNA binding to the transcriptional regulating region and mRNA expression of HSD altered in association with changes of the PPAR-alpha protein levels. Moreover, the mRNA expression of NRF-1, activity of NRF DNA binding to the transcriptional regulating region and mRNA expression of COX altered in association with changes of the PGC-1alpha protein levels.

Conclusion: These findings suggest that exercise training may improve aging-induced impairment of metabolic enzyme activity associated with PPAR-alpha and PGC-1alpha proteins in cardiac and skeletal muscles.

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Reference:

1. Iemitsu M, et al. Exercise training improves aging-induced downregulation of VEGF angiogenic signaling cascade in hearts. Am J Physiol Heart Circ Physiol 2006;291:H1290-H1298.

SIRTUIN ACTIVATOR INCREASES ENDURANCE FOR RATS ARTIFICIALLY SELECTED TO HIGH RUNNING CAPACITY

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SEMMELWEIS UNIVERSITY

Sirtuins are NAD+ dependent protein deacetylases and suggested regulators of aging, fat and sugar metabolisms, DNA repair, mitochondrial biogenesis and fiber type differentiation of skeletal muscle. SIRT activators like caloric restriction or supplementation of resveratrol have been shown to increase mean life span via alteration of central cellular processes. In the present study we trained selectively bred 24 generations for intrinsic aerobic high running capacity (HCR) or low running capacity (LCR) rats and some groups were supplemented by SIRT activator for 4 month. Twelve weeks exercise training significantly increased the VO2max in both groups, and the increase was almost twice as large in the LCR (26%) rats than at HCR (15%). The supplementation of SIRT stimulator (SRT501) significantly enhanced the VO2max and the running distant at HCR rats, while no significant effects were observed at LCR rats. SIRT stimulator also improved the performance at gripping. The biochemical analysis of gastrocnemius muscle revealed that both exercise training and SIRT stimulator effected the activity of SIRT1 at the nuclear extracts, moreover it appears that the NAD biosythetic activity also altered by exercise training. Our data suggest that SIRT stimulator selectively effected HCR rats and resulted in significant improvement of aerobic endurance capacity.

LYMPHOCYTE NUCLEAR DNA DAMAGE IN HUMANS: AGE AND AEROBIC CAPACITY RELATION

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UNIVERSIDADE DE TRÁS-OS-MONTES E ALTO DOURO

LYMPHOCYTE NUCLEAR DNA DAMAGE IN HUMANS: AGE AND AEROBIC CAPACITY RELATION

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Introduction: The aging is characterized by a progressive decrease of the organic functions. However an important role has been recognized for regular exercise in improving the overall functionality of the body promoting the general health of individuals. The present aims to: 1) study the association between VO2max and age; 2) evaluate the existing association between DNA damage and oxidative damage in lymphocytes and age; 3) evaluate the association between DNA damage and oxidative damage in lymphocytes and VO2max.
Methods: To achieve this, it was gathered a sample of 37 healthy individuals, non-smokers, male, with an average age of 50.5±16.6 years old, average height of 169.68±8.44cm, average weight of 74.01±9.24kg and a average VO2max of 41.95 ± 10.72 mL/kg/min. The cardiorespiratory fitness was evaluated through the completion of the protocol of Bruce with direct measurement of oxygen consumption. For evaluation of DNA damage and oxidative DNA damage in lymphocytes, it was used the method of comet assay (comet assay - single cell gel electrophoresis) (Collins, 2004).
Results / Discussion: Results showed an inverse correlation between age and VO2max (r = -.734; p = .000), positive with DNA damage in lymphocytes and positive with oxidative DNA damage in lymphocytes, as well (r = .694; p = .000; r = .646; p = .000, respectively). Regarding VO2max, this variable is also correlated with the DNA damage in lymphocytes and oxidative DNA damage in lymphocytes (r = -.590; p = .000; r = -.453; p = .000, respectively). In short, the results of this study show that older individuals have higher DNA damage in lymphocytes compared to younger individuals, and that these higher levels are associated with lower levels of VO2máx.
References
Collins, A. R. (2004). The comet assay for DNA damage and repair: principles, applications, and limitations. Mol Biotechnol, 26(3), 249-261.

EFFECT OF ADVENTURE RACE IN LEUKOCYTES DEATH

LEVADA-PIRES, A.C., FONSECA, C.E.R., BREDARIOL, F., HATANAKA, E., LOUREIRO, T.A., CURI, R., PITHON-CURI, T.C.
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PURPOSE: The effect of an adventure race (Ecomotion Pró), which lasted for 4-5 days, on neutrophils and lymphocytes death from elite athletes was investigated. METHODS: Blood was collected from ten athletes under rest and after an adventure race. The follows parameters of cell death were investigated in neutrophils and lymphocytes: cell membrane integrity, DNA fragmentation, mitochondrial transmembrane depolarization and ROS production. RESULTS: The adventure race decreased membrane integrity by 3 and 15% in lymphocytes and neutrophils, respectively, as compared to the rest and after the competition. The DNA fragmentation and mitochondrial transmembrane depolarization were increased in lymphocytes by 2.9- and 1.5-fold, respectively; however, these parameters do not alter in neutrophils. The ROS production was unchanged in lymphocytes from athletes as compared to the rest and after the competition, whereas in neutrophlis there was increased by 2.2-fold. CONCLUSION: Adventure race induced neutrophil death by necrosis as indicated by loss membrane integrity and induced lymphocyte death by apoptosis as indicated by increased DNA fragmentation and mitochondrial transmembrane depolarization. ROS production by cells might be involved in cell type death. FINANCIAL SUPPORT: Fapesp, CNPq and CAPES.

14:15 - 15:15

Poster presentations

PP-BM07 Biomechanics 7

THE EFFECTS OF MORTON'S FOOT ON STATIC-DYNAMIC BALANCE AND VERTICAL JUMP PERFORMANCE OF MODERN DANCERS

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Introduction: In modern dance technical movements with dynamic and static characteristics are used. Dancers must master those stylized movements in a consistent manner with minimal variability, while using different balance, postural and support conditions (1). Therefore modern dancers must have exceptional postural control to maintain balance and to display strength. For the dancers, it is important to have a strong stable support from the floor during technical movements. Performing barefoot in modern dance puts more emphasis on the foot type of the dancer. Foots are classified according to their shape and relative length of toe. Morton's Foot (MF) is a foot type where the second-toe is longer than the others (2). Having a longer second and shorter first metatarsal makes the foot less stable, especially in relevé position. Although, reports exist in literature which indicate that MF can cause calluses, injuries and pain in ballet dancers, and that it is a factor in the etiology of foot disorders (3), we couldn't find any study about the effects of MF on the performance of dancers. The aim of this study is to investigate the effects of MF on dynamic and static balance, and vertical jump performances of modern dancers.
Methods: 14 modern dancers (10 female, 4 male; average age 24,14±2.56 years; involvement in dancing 7.82± 5.52 years) participated in this study. The participants were divided into two groups (each 5 female, 2 male) according to the presence or absence of MF. In order to determine the foot type of the dancers, feet were photographed while joints were in neutral position. A second toe longer than the hallux by 2 mm or more was considered as MF. To determine the explosive power of the leg, two vertical jump tests were performed: the dancers performed squat jumps in parallel and in first position on an Ergojump platform. Static balance (SB) performance was determined using the Single-Leg-Stance test which was modified for the dancers (in turn-out passé, in relevé position). Dynamic balance (DB) was determined using a stabilometer platform (Model 16020, Lafayette).
Results: The squat jump height and the time to stay in SB with right foot and in DB were found to be higher for the non-MF group compared to MF group, but these differences were not statistically significant ($p>0.05$). However the non-MF group dancers were able to stay longer in balance on their left foot than the MF group (32.92±16.02 s versus 9.35±6.27 s) and this was statistically significant ($p<0.05$).

Discussion: Modern dancers with MF stayed shorter in balance on their left foot. It is concluded that MF could be a negative factor influencing the performance of static balance of modern dancers.

References

1. Bronner S, Ojofeitimi S (2006). J Motor Behavior, 38 (1),71-79.
2. Kennedy JG, Hodgkins CW, Colombier JA, Guyette S, Hamilton WG (2007). Int Sport Med J, 8 (3), 141-165.
3. Oztekin HH, Boya H, Nalcakan M, Ozcan O (2007). J the American Podiatric Med. Ass., 97:5,385-388

EFFECT OF GENDER ON ANAEROBIC POWER GENERATION CAPACITY DURING CYCLING EXERCISE.

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Introduction: The maximal anaerobic power generation capacity is an important factor in many athletic activities. It is not clear that the effect of gender on characteristics of the load and the pedaling rate to the anaerobic power generation capacity during cycling exercise. Therefore, the purpose of this study was to investigate the gender difference of the anaerobic power generation capacity in cycling exercise with different loads.

Methods: The subjects were three hundred twenty one (201 male and 120 female) collegiate students of physical education. These subjects were six grouped according to body weight (male: M-LG, M-MG, M-HG., female: F-LG, F-MG, F-HG). The anaerobic power generation capacity was determined by using bicycle ergometer (Power max V2, Combi co. Japan) with custom-made analyzed system. Subjects performed ten seconds with the maximal efforts intermitted of three trials with first, second and third load stages, and requested to have warm-up and including two minutes rest. The anaerobic power generation capacity, workload and pedaling rate of cycling exercise on each trial measured in all the subjects. In addition, ratios of second stage and third stage to first stage trials were calculated for each parameter.

Results: The maximal anaerobic power generation capacity was obtained in groups of M-LG and M-MG, the anaerobic power generation capacities of second trial showed highest values compared with other trials. However, significant difference between second and third trial was not observed in M-HG. Moreover, the anaerobic power generation capacity between second and third trials was not differed in all the groups on female. The pedaling rate decreased with the increase of workload in both male and female for each stage. In workload ratio, M-LG and F-LG admitted by third stage trial. In case of M-MG and F-MG, the ratios of workload differed between male and female in both stages of second and third trials. The ratio of pedaling rate between M-HG and F-HG was significant difference on third stage trial.

Discussion: From these results, it considered that the maximal anaerobic power generated in the same stage of second trial in both male and female subjects. However, the effects of workload and pedaling rate on the anaerobic power generation capacity during cycling exercise may differed by gender.

References

J. L. Mayhew. Et al. (1990). Eur. J. Appl Physiol. 60, 133-138.

M. E. Liljedahl. Et al. (1996). Eur. J. Appl Physiol. 74, 375-383.

C. Weber. et al. (2006). Med. Sci. Sports Exerc. 38, 1, 129-137.

BALANCE TRAINING ALTERS POSTURAL DYNAMICS UNIQUELY FOR STANCE ON COMPLIANT VS. NON-COMPLIANT SURFACES

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Balance training is a common clinical modality used for improving postural control and preventing injury. However, a number of empirical studies have failed to support the efficacy of balance training. One factor that may have limited the previous empirical studies is a lack of sensitivity with regard to the traditional descriptive statistics used to characterize postural control. Recent developments in non-linear dynamic analyses have led researchers to revaluate the way in which postural control is measured and understood. The advantage of nonlinear analyses for assessing postural behavior is their sensitivity to changes in the time-dependent structures of continuous postural sway. The purpose of this study was to evaluate the effects of balance training on postural control in a healthy population using both a traditional (position variability; as measured by standard deviation) and non-linear (Lyapunov Exponent; LyE) measure of postural sway variability. To accomplish this, eighteen participants completed a six-week balance training program (three sessions per week; eighteen total sessions). Pretest and posttest measurements of postural sway were obtained in the anterior-posterior (A/P) and medial-lateral (M/L) planes via Center of Pressure (COP) from a forceplate during upright bipedal stance performed on a hard and foam surface. Results showed that participants exhibited increased chaotic variability in the temporal structure of their postural sway in the M/L plane following balance training (as assessed via LyE) in stance performed on the noncompliant surface ($p = .053$), but decreased chaotic variability in the M/L planes in stance performed on the compliant surface ($p = .021$). In addition, results from traditional measures showed that participants exhibited an increase in A/P variability (as assessed via SD of COP position) following balance training, but only for the hard surface ($p = .019$). Together, these results imply that balance training results in changes to postural behavior which are specifically tailored to task demands and environmental constraints. While these findings seem to resonate with previous literature on dynamics systems theory, which respects the interdependence of human-environment interactions, and which has implied that increased chaotic variability may actually be an indicator of health/expertise in some circumstances, this interpretation is qualitative different from traditional theories of postural control and needs further development.

EFFECTS OF PLYOMETRIC TRAINING ON THE MECHANICAL AND GEOMETRICAL PROPERTIES OF THE PLANTAR FLEXOR MUSCLE-TENDON COMPLEX

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Introduction: Plyometric training (PT) has already been shown to increase vertical jump performances which could be attributed to changes in the mechanical properties of muscle-tendon complex (MTC) rather than muscle activation strategies (Kubo et al., 2007). Cornu et al. (1997) hypothesized a specific adaptation of the MTC structures as it was shown concerning the passive stiffness of plantar flexors

(Foure et al., 2008). The aim of this study was to determine the effects of PT on the stiffness of the structures involved in the ankle joint plantar flexion using an original method previously used in animal models (Ettema and Huijing, 1994) in order to assess possible specific local adaptations of their elastic properties.

Methods

Nineteen subjects divided in a trained (TG) and a control group (CG) were tested before and after the 14 weeks of a PT period. The jump performances were assessed. The ankle joint stiffness was determined during a stretch imposed on isometric PF randomly performed twice at 7 levels of torque (from 30% to 90% of maximal voluntary contraction (MVC)). Active joint stiffness was computed from the increase in torque relative to the change in ankle flexion angle for the first 60 ms of the stretch (approximately 7 degrees). The joint stiffness was determined for 40% (S40%), 60% (S60%) and 80% (S80%) of the minimal MVC between the two tests. Both the active and passive parts of series elastic component (SEC) stiffness were assessed using the alpha method. Cross-sectional area (CSA) of Achilles tendon was determined using ultrasonography.

Results: For the TG, a significant increase in jump performances was found (changes between +7.3% and +26.5% according to the jump form). An increase in the Achilles tendon CSA was found (+2.9%). The joint stiffness increased (S60%: +1.8% and S80%: + 2.7%) with an increase in the passive part of SEC stiffness (+ 7.8%) and a decrease in the active part of the SEC stiffness index (- 5.0%). Analyses on the CG data are still in process.

Discussion: The present study was based on the use of an original method to assess both the active and passive parts of the SEC stiffness. The major results showed an increase in the ankle joint stiffness with a different change between passive and active part of the SEC stiffness. Then, these opposite adaptations could be responsible for a better efficiency of the energy storage-recoil process by the MTC leading to an increase in jump performances. The adaptation seems to be attributed to changes in the geometrical properties of the involved structures rather than intrinsic mechanical properties of the structures.

References

Cornu C, Almeida-Silveira M.I, Goubel F. (1997). Eur J Appl Physiol Occup Physiol, 76(3), 282-288.

Ettema G.J, Huijing P.A. (1994). J Biomech, 27(11), 1361-1368.

Foure A, Nordez A, Cornu C. (2008). Scand J Med Sci Sports, in press.

Kubo K, Morimoto M, Komuro T, Yata H, Tsunoda N, Kanehisa H, Fukunaga T. (2007). Med Sci Sports Exerc, 39(10), 1801-1810.

EXTENSIBILITY OF THE HUMAN ACHILLES TENDON DURING ISOMETRIC CONTRACTION: AN IN VIVO MRI STUDY

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[Introduction] Extensibility of the human Achilles tendon has been studied in vivo, based on the partial deformation of a selected area [1, 2]. However, it has been shown that the Achilles tendon deforms inhomogeneously, with different strains between the external tendon and aponeurosis, both longitudinally and transversely [3]. The present study further examined the extension of the entire Achilles tendon during isometric contractions by using MRI. [Methods] Subjects were 12 healthy men (n = 6) and women (n = 6). The subject lay supine with the knee fully extended and the foot secured to a torque meter at neutral position. While a series of longitudinal and transverse MR images (thickness: 3 mm, spacing: 0 mm) of the Achilles tendon were taken, the subjects sustained 0 (rest), 30, 60 and 80% of the maximum voluntary contraction (MVC) of isometric ankle joint plantar-flexion. The length and width of the Achilles tendon were determined from each MR image, from which longitudinal and transverse strains were calculated. Additionally, the Achilles tendon was divided into proximal and distal portions at the distal end of the soleus muscle, and the length and width of each portion were measured. [Results] There was no longitudinal strain in the proximal portion of Achilles tendon from rest to 30%MVC, and there were significant positive strains at 60 and 80%MVC (1.4 and 1.8% respectively). Transverse positive strains of the proximal portion of the tendon were observed both at 30%MVC (12.3%) and 60%MVC (18.8%). As for the distal portion, the longitudinal and transverse strains of the tendon were significant at all intensities (30%MVC: longitudinal: 2.2%, transverse: -4.3%, 60%MVC: longitudinal: 3.0%, transverse: -4.9%, 80%MVC: longitudinal: 4.3%). [Discussion] The Achilles tendon extended inhomogeneously. The proximal portion of the tendon, which extended both directions, is mainly composed of the aponeurosis of the soleus muscle. It has been reported for animals and also for humans that the aponeurosis extends transversely upon isometric contractions [4, 5]. Because the directions of fascicles of the soleus muscle are not parallel to each other, or not to the longitudinal direction of Achilles tendon [6], soleus muscle fascicles might possibly pull the aponeurosis in multiple directions. In contrast, since the distal portion of Achilles tendon has no connection to muscle fibers, there would be no source of force in the transverse direction. We conclude that the extensibility of the Achilles tendon to force applied to it varies depending on locations, both longitudinally and transversely. [Reference] 1; Muramatsu et al., J Appl Physiol, 90:1671-1678, 2001. 2; Kubo et al., Scand J Med Sci Sports, 12:3-8, 2002. 3; Iwanuma et al., 13th annual congress of the ECSS, 2008. 4; van Donkelaar et al., J Biomech 32:755-62, 1999. 5; Maganaris et al., J Anat 199:449-56, 2001. 6; Agur et al., Clin Anat 16:285-93, 2003.

A 6-WEEK STRETCHING PROGRAM ALTERS MECHANICAL AND ARCHITECTURAL PROPERTIES OF THE GASTROCNEMIUS MUSCLE-TENDON UNIT

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Introduction: Stretching is known to increase the joint range of motion (ROM) both acutely and chronically, the reason for which is thought to be related to some changes in musculotendinous structures. While the acute effect of stretching on mechanical properties of a muscle-tendon unit (MTU) in humans has been documented, few studies have examined the long-term effect of periodical stretching sessions on MTU. The purpose of this study was to investigate changes in the mechanical and architectural properties of the human gastrocnemius MTU by a 6-week stretching program.

Methods

Sixteen healthy men participated in this study (stretching group, n=8, control group, n=8). The stretching program consisted of static stretching (1 min passive dorsiflexion performed 5 times) everyday for 6 weeks. Before and 1, 2, 4, and 6 weeks after the onset of the stretching program, the passive dorsiflexion ROM was measured by goniometry as well as muscle and tendon elongation by ultrasonography. To measure muscle and tendon elongation, an ultrasound probe mounted with a water bag was attached over the distal end of the medial gastrocnemius at the muscle-tendon junction (MTJ), so that longitudinal scanning was made along the length of the muscle. Muscle belly elongation was determined as the displacement to the distal of the MTJ. The change in total MTU length was estimated from

the change in ankle angle. The Achilles tendon elongation was calculated as the difference between elongations of the MTU and muscle belly. Negligible muscle activity during the stretching was confirmed through surface electromyograms taken from the medial and lateral gastrocnemii, soleus, and tibialis anterior muscles during stretching. The fascicle length (FL) was also measured in the mid-belly of the medial gastrocnemius using ultrasonography.
Results and Discussion: The passive dorsiflexion ROM increased significantly at the 4th week and later from the onset of the stretching program, which was accompanied by a significant increase in Achilles tendon elongation, especially in the dorsiflexed position. There was no further increase in muscle belly elongation in the dorsiflexed position. The plantar flexion torque passively attained at rest (0 deg of ankle joint) decreased significantly, while the FL increased significantly at the 4th week and later. This result indicates that the Achilles tendon elongation became smaller after the stretching program due to elongated fascicles and the muscle belly at rest at 0 deg of ankle joint. However, an increase in tendon elongation in the dorsiflexed position after the stretching program suggests a decrease in tendon stiffness, especially under higher passive tension. In conclusion, these results imply that the 6-week stretching program affects both mechanical and architectural properties of the gastrocnemius MTU, with different changes of muscular and tendinous components that are joint angle dependent.

DOES CYCLING INFLUENCE NEUROMUSCULAR CONTROL DURING SUBSEQUENT RUNNING IN LESSER-TRAINED TRIATHLTES?

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Triathlon success depends primarily on a triathlete's ability to run after cycling. As the neuromuscular system effectively translates cardiorespiratory capacity into efficient movement and therefore into optimal performance, triathletes' performance relates closely to their ability to maintain neuromuscular control (muscle recruitment and movement patterns) that is specific to running and not adversely influenced by the preceding bike-leg1. However, a previous study has shown that running muscle recruitment is influenced by cycling in 36% of highly-trained triathletes2, despite their years of training. This altered muscle recruitment is due to a direct influence of cycling on neuromuscular control during running, is independent of fatigue, and is associated with a decrease in running economy and a 2.5 times greater likelihood of exercise related leg pain3. However, it is not known if cycling has the same direct influence on neuromuscular control during running in lesser-trained triathletes. PURPOSE To investigate the direct influence of cycling on running muscle activity and movement patterns in lesser-trained triathletes. METHODS 15 lesser-trained triathletes participated. 3-D kinematics of the pelvis and lower limbs and recruitment of 11 leg and thigh muscles were compared between a control run (no prior exercise) and a 30 min run that was preceded by a 15 min cycle (transition run). RESULTS Neuromuscular control was not different between control and transition runs, or differences were only transient, in most triathletes. Changes in joint position (mean difference of 3°) were evident in 5 triathletes, but these changes persisted beyond 5 min of running in only 1 triathlete. One triathlete displayed altered recruitment of the biceps femoris muscle (7.4% decrease in average amplitude over the running stride), which was not associated with a change in kinematics, and persisted for 20 min of the transition run. DISCUSSION Short periods of cycling have no direct influence on running muscle activity in most lesser-trained triathletes. Muscle recruitment during running was influenced by cycling in only 1 of 15 lesser-trained triathletes (< 7%), compared to 36% of highly-trained triathletes2, and the magnitude of this change was less than previously reported in highly-trained triathletes (7.4% vs. 10-20%). Cycling did cause some transient changes to running kinematics in 30% of lesser-trained triathletes. Our findings suggest that optimal neuromuscular control for running is preserved after cycling in lesser-trained triathletes. The differing influence of cycling on neuromuscular control during subsequent running in lesser-trained and highly-trained triathletes is likely related to training history.

1Bonacci et al. Sports Medicine. in press

2Chapman et al. (2008) J Sci Med Sport, 11, 371-380

3Chapman et al. (2008) Med Sci Sports Exerc. 40: p. s87

RIGHT OR LEFT – IS THERE AN OPTIMAL INITIAL PRACTICE SIDE IN MOTOR LEARNING?

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Introduction: Findings from neurosciences indicate, that the two hemispheres in the human brain are specialized for the processing of distinct movement features (i.e. Serrien, Swinnen & Ivry, 2006). How this knowledge can be useful in motor learning remains unclear. In the present study two experiments on the acquisition of complex sports motor skills are carried out to prove the relation between the initial practice side and inherent task de-mands.
Methods
Within a transfer design two groups practiced a novel motor task with same amount of practice on each hand, but in opposite hand-order. Performance changes are measured on both sides separately after a practice period and after a period without practice. In experiment I subjects were asked to learn a throwing task with high demand on maxi-mum force production. Subjects initially practiced with their preferred hand and changed to the non-preferred (P-NP) benefited more from practice. In experiment II subjects were asked to learn a dribbling task with high demand on movement coordina-tion and speed. Subjects initially practiced this task with their non-preferred hand before changing to preferred hand (NP-P) benefited more from practice than subjects practiced in opposite order.
Results & Discussion: The results indicate, that tasks with high demand on spatial accuracy and movement coordination are learned better through initial practice with the non-preferred hand, whereas initial practice with the preferred hand seems to be more efficent for tasks with high demand on maximum force production. These findings suggest a strong relation between the initial practice side and the hemispherical specialization for different task demands. The present findings can be used to optimize early motor learning processes.
References
Serrien, D. A., Ivry, R. B. & Swinnen, S. P. (2006). Dynamics of interhemispheric spe-cialization and integration in the context of motor control. Nature Review Neuroscience, 7, 160-167.

14:15 - 15:15

Poster presentations

PP-BC02 Biochemistry 2

NO DIFFERENCE ON THE LEVEL OF PGC1A MRNA EXPRESSION AFTER TWO RADICALLY DIFFERENT HIGH INTENSITY TRAINING SESSIONS IN HIGHLY TRAINED CYCLISTS

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In recent years a number of studies on high intensity interval training have shown that a very limited number of wingate type intervals performed over only a few weeks can improve endurance performance dramatically. Since PGC1a is a major regulator of mitochondrial biogenesis, we hypothesized that there would be no difference in PGC1a mRNA expression between wingate type intervals and longer lower intensity intervals.

The aim of this study was to compare the impact on the level of PGC1a mRNA expression of two radically different high intensity interval training sessions in highly trained cyclists. Ten male cyclists, (mean±SD) age 24.7± 4.4 years, height 179.1±4.8 cm, weight 70.1±6.2 kg, VO2peak 4753±470 ml min-1, Wmax 403±40 W volunteered for the study. After a standardized 15 min warm up, the subjects performed the following radically different high intensity interval training sessions, on a Cyclus 2 ergometer, 7-9 days apart in a counterbalanced fashion. The short interval high intensity training session consisted of 7 maximal 30 seconds isocadence sprints at 110 rpm separated by 4 minutes of active recovery at 50W. The long interval high intensity training session consisted of 3 time trials of 20 minute duration separated by 4 minutes of active recovery at 50W. Subjects were instructed to try and achieve to highest possible average power during all three intervals. The effective work duration for the short and long intervals was 3.5 minutes and 60 minutes respectively. Needle biopsies were obtained from M.Vastus Lateralis muscle at 15 minutes prior to the training session and 3 hours after completion of the training session.

Average power output, capillary blood lactate levels and PGC1a mRNA expression of the short and long high intensity training session was 643±71 W, 14.9±2.4 mmol L-1, 6.03±1.8 fold change and 304±38W, 4.4±1.3 mmol L-1, 6.59±2.45 fold change respectively, with significant differences between the two sessions for power output and blood lactate levels but not for PGC1a mRNA expression.

Despite the radical difference of the high intensity training sessions in terms of power output and blood lactate levels there is no difference in PGC1a mRNa expression. Meaning that both types of high intensity training sessions may provide similar stimuli for mitochondrial biogenesis.

THE SATELLITE CELL RESPONSE TO AN ACUTE BOUT OF OCCLUSION EXERCISE.

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Introduction: Low load exercise with vascular occlusion has attained increased interest the last years due to the observed effects on muscle hypertrophy (Wernbom et al 2008). Although the potential to induce muscle growth over a training period has been well documented, the effects of occlusion exercise on the cellular level remains to be investigated. Because satellite cells (SC) are important for skeletal muscle hypertrophy and the satellite cell expresses myogenic regulation factors (MRFs) upon activation, the aim of this study was to investigate the effect of one bout of occlusion exercise on the number of SC and the number of SC expressing either MyoD or myogenin.

Methods: Nine subjects completed one bout of unilateral knee extension with five sets till failure with a load representing 30 % of 1 RM. One leg completed the bout with partial vascular occlusion provided by an inflatable pressure cuff. The other leg preformed a repetition-matched bout, and thus served as a non occluded control. Maximal isometric voluntary contraction force (MVC) was measured before exercise and repeatedly for one week after the bout. Biopsies were obtained pre-exercise, control leg only, 1 h-, 24 h- and 48 h post exercise from both legs. Cross sections from the biopsies were stained with antibody against NCAM, which recognises SC, and counter-stained with antibodies against MyoD or myogenin, on neighbour sections. SC was counted as NCAM positive ring like staining in close relation to the muscle fibre. MyoD- og myogenin positive SC were identified as MRF positive staining inside the SC.

Results: Immediately after exercise there was a lager reduction in MVC force in the occluded leg than in the non occluded leg. Four hrs after exercise this difference was reduced, but the occluded leg generated less force throughout the recorded period compared to the control leg. Our data indicates a tendency towards an increased number of SC expressing one of the two MRF's. There were no differences in the increase of SC between the two legs. However, when combining the two legs an increased number of SC per fibre was observed one hour after exercise, and the number remained increased throughout the 48 h period.

Discussion: An increased number of SC expressing MRF indicates a SC response to the exercise. The immediate increase in number of SC per fibre is an interesting observation, and to our knowledge this has not been described earlier. However, it's rather unlikely that this is due to a real increase in the number of SC per whole muscle fibre; it's more likely that it's a methodical issue. One explanation could be an increased SC volume in activated SC, leading to in an increased number of counted SC per cross section. In further analysis we will elucidate the possible mechanisms for the early increase in the number of SC and further describe the time course of activated satellite cells after low load occlusion exercise.

Wernbom et al. Scand J Med Sci Sports 18: 401-416. 2008.

AGE ASSOCIATED INCREASE IN SIRT1 AND SIRT6 CONTENT ATTENUATED BY EXERCISE IN RAT SKELETAL MUSCLE

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Sirtuins suggested to be one of the key regulators of aging process, and the dependence of these proteins on NAD+, makes them a potential marker of cellular metabolism. Regular physical exercise results in a metabolic and redox challenge to skeletal muscle which at

certain degree can attenuate the age-associated loss in muscle function. Young control (YC), exercised (YE) and old, control (OC) and exercise (OE) rats were used, with six weeks of treadmill running program at the 60% of VO2max. Aging resulted in increased level of SIRT1 in cytoplasm and nuclear extracts, while exercise training significantly increased the relative activity of SIRT1 in both age groups. The levels of nicotinamide phosphoribosyltransferase (NAMPT) and NAD+ significantly degreased with aging, which were prevented by exercise training. Both, aging and exercise training modified the level of acetylation in number of proteins. The oxidative challenge was evaluated by accumulation of carbonyl groups, which increased at OC, and 8-oxydeoxyguanosine level of nuclear extracts, which did not change. On the other hand, the content of SIRT6, which suggest to influence base excision repair increased with aging in parallel with the content of 8-oxoguanine DNA glycosylase (OGG1). Aging resulted in massive increase in the content of hypoxia inducible factor alpha (HIF-1alpha) and vascular endothelial factor (VEGF), which was prevented by exercise training.

Aging of the skeletal muscle is associated with inadequate production of NAD+ because of impaired synthesis via NAMPT, although the activity of SIRT1 does not change with aging.

Hence, NAMPT emerged as possible therapeutic target to attenuate aging process in skeletal muscle, suggesting metabolic and partly reversible consequences of aging, as regular exercise, decreased the gap in all between young and old groups.

ESTROGEN REGULATES SATELLITE CELL ACTIVATION FOLLOWING A NOTEXIN-INDUCED SKELETAL MUSCLE INJURY

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Skeletal muscle repair processes are mediated by the coordinated response of inflammatory immune cells and satellite cells. It has been reported that estrogen activates satellite cells in skeletal muscle damaged by high intensity downhill running exercise and that this process is ER-mediated (Tiidus, Holden et al. 2001; Tiidus, Deller et al. 2005; Enns, Iqbal et al. 2008; Enns and Tiidus 2008). To prove that estrogen may also activate satellite cell activity in a skeletal muscle injury model relevant to pathological processes involved in inflammatory dystrophic skeletal muscle diseases or sarcopenia, we analyzed the effects of estrogen in a myotoxin (Notexin) based skeletal muscle injury model. This model is known to cause an early inflammatory reaction followed by a satellite cell driven repair period. Female Wistar rats were divided into three experimental groups: intact (SHAM), ovariectomized (OVX) and ovariectomized E2 substituted animals (E2). We investigated the effects of subcutaneous (E2) replacement for 7 days on immune and satellite cell activation. Results show that protein expression levels detected by western blot analysis of the proliferating cell nuclear antigen (PCNA) are highest in the toxin-damaged m.Gastrocnemius (m.GAS) of OVX rats compared to control (Sham) and E2-substitued groups, 24-h following the injury. A different PCNA expression pattern was detected 3-d after Notexin injections into the right m.GAS. Here, PCNA expression was highest in the right m.GAS of Sham and E2 animals compared to OVX animals. This differential expression pattern of PCNA could be due to the proliferation and infiltration of inflammatory immune cells into the injured m.GAS after 24-h. The increased expression of PCNA in the right m.GAS of Sham and E2 animals after 3-days may be the result of increased satellite cell proliferation. Gene expression data confirms that the expression of the satellite cell marker Pax-7 is highest in the right m.GAS of Sham and E2 treated groups compared to OVX. Protein expression levels of the inflammatory cytokine tumor necrosis factor alpha (TNFα) are elevated 24-h post-injury in the right m.GAS of all treatment groups and are below detection levels after 3 days. In summary, our results show that estrogen replacement increases satellite cell numbers following a toxin-induced skeletal muscle injury. Based on this information we speculate that normal E2 serum levels may provide protection against inflammatory dystrophic diseases and sarcopenia, whereas reduced E2 serum levels may promote the development of these diseases. Further studies are in progress to investigate whether these mechanisms are estrogen receptor alpha or beta mediated.

COMBINED TREATMENT WITH INSULIN AND EXERCISE TRAINING AMELIORATES EXPRESSION OF CALCIUM SIGNALLING PROTEINS IN STREPTOZOTOCIN-INDUCED DIABETIC RAT HEARTS.

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Background – Insulin therapy and regular exercise activity have positive impact on the diabetic cardiomyopathy, where impaired contractile responsiveness to β-adrenergic stimulation results in part from alterations in the Ca2+ regulatory systems. If the cellular and molecular mechanisms involved in insulin or exercise training myocardial adaptations have been partially explained, the concomitant effects of these 2 approaches remains incompletely characterized. So, the present study was undertaken to assess the combined effects of insulin treatment and exercise training on Ca2+ signalling proteins expression on heart of diabetic rats.

Methods – Type 1 diabetes was induced by a single intraperitoneal injection of streptozotocin (STZ, 45 mg/kg, in citrate buffer) in adult male Wistar rats. One week after STZ injection, diabetic rats were randomly divided into 3 groups: non-treated diabetic, insulin-treated diabetic, and trained insulin-treated diabetic animals. Exercise training consisted of progressive running at speeds to 25 m/min, 60 minutes/day, 5 days/week for 8 weeks on a rodent treadmill set at 10°. A group of normal sedentary rats served as control. Abundance of Ca2+ signalling proteins was assessed using Western blots. Langendorff left ventricular performance was also determined.

Results – After nine weeks of diabetes, SERCA2, RyR2 and NCX1 protein expression were significantly reduced by 32, 44, 23%, respectively, whereas PLB expression was significantly elevated (46%) and FKBP 12 unchanged. Intrinsic contractile parameters were also significantly reduced. Insulin treatment initiated after 1 week of diabetes normalized the expression of SERCA2, RyR2, and NCX1, and attenuated the loss in cardiac relaxation and contraction as assessed by ±dP/dt. Moreover, training accentuated positive insulin-treatment effects because trained insulin-treated diabetic animals exhibited significantly higher SERCA2, RyR2, and NCX1 protein expression and RyR2/FKBP12 ratio than insulin-treated diabetic animals. Although the difference were not significant, positive and negative dP/dt were increased (19 and 8%, respectively), by the association exercise training-insulin compared with insulin alone.

Conclusion – Taken collectively, these data suggest that the beneficial effect of insulin treatment in the expression of the main Ca2+ signalling proteins could be potentiated by exercise training. Moreover, these adaptations might lead to normalise cardiac contractile efficiency. So this study provides additional funding as to the beneficial role of exercise in the management of diabetes.

THE ENZYMES OF INTRAMUSCULAR TRIGLYCERIDE SYNTHESIS EXHIBIT FIBRE TYPE SPECIFICITY.

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Introduction: Excessive fatty acid (FA) uptake in skeletal muscle is known to lead to insulin resistance in sedentary obese individuals. The underlying mechanism involves the accumulation in muscle of long-chain FAcylCoA and diacylglycerol. These FA metabolites activate protein kinase Cβ and this leads to serine phosphorylation and inactivation of insulin receptor substrate-1. Intramuscular triglycerides (IMTG) accumulate in skeletal muscle as discrete lipid droplets that fill the space between mitochondria. The key enzymes in IMTG synthesis are glycerol-3-phosphate acyltransferase (GPAT) (which exists in a mitochondrial (mt) and a microsomal (mic) isoform) and diacylglycerol acyltransferase (DGAT). These enzymes catalyse acylations that consume the FA metabolites that lead to insulin resistance. An increase in the content of mtGPAT and DGAT has recently been observed in the muscle of non-obese women the day after a single bout of endurance exercise and was shown to prevent lipid induced insulin resistance. The aim of the present study was to develop methods that for the first time allow us to investigate the spatial and fibre type distribution of mtGPAT, micGPAT and DGAT in human skeletal muscle.

Methods: Percutaneous biopsies were obtained from the vastus lateralis muscle of 6 lean, insulin sensitive males. 5 µm cryosections were stained using either rabbit anti-DGAT IgG, rabbit anti-mtGPAT IgG or rabbit anti-micGPAT IgG antibodies, each in combination with mouse anti-myosin heavy chain (MHC) type 1 IgM. IMTG were stained using the neutral lipid dye oil red O (ORO) and images were viewed using widefield fluorescence microscopy.

Results: Cryosections stained for mtGPAT in combination with MHC and ORO revealed a two-fold higher lipid content in type 1 fibres ($P < 0.020$). This corresponded to those fibres with the strongest mtGPAT signal ($P < 0.001$). Anti-DGAT staining showed a diffuse pattern of staining in all fibres with a significantly stronger signal in type 1 fibres ($P < 0.001$). The greater DGAT signal corresponded to those fibres with a two-fold higher lipid content ($P < 0.014$). Anti-micGPAT staining showed a diffuse signal throughout both type 1 and type 2 fibres.

Discussion: These results demonstrate that type 1 fibres have a higher content of the enzymes of IMTG synthesis than type 2 fibres which is in line with the observation that type 1 fibres contain more IMTG whilst being more insulin sensitive. The low content of mtGPAT in type 2 fibres despite the presence of IMTG suggests that micGPAT is responsible for IMTG synthesis in these fibres. In future studies we will investigate the distribution of these enzymes in biopsies of obese individuals and patients with type 2 diabetes and the effect of various modes of exercise with the aim to better understand the relationship between muscle IMTG synthesis and fibre type specific differences in insulin sensitivity between these populations.

EFFECT OF CONTRACTION AND INSULIN ON GLUCOSE UPTAKE AND GLYCOGEN SYNTHASE IN MUSCLES WITH DIFFERENT GLYCOGEN CONTENTS.

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Background: Insulin and contraction stimulate glucose uptake and glycogen synthase through different mechanisms in skeletal muscle. Furthermore, glycogen content is a potent modulator of glucose uptake and glycogen synthase activity when muscle was exposed to insulin or contraction stimulation. An additive effect of insulin and contraction is often reported in muscle with normal glycogen content; however, it has not been well studied in muscles with low and high glycogen contents.

Aim: Our aim was to systemically investigate the effect of glycogen content on glucose uptake and glycogen synthase activity in muscles stimulated by insulin and contraction alone or in combination.

Method: Glycogen content in rat muscles was manipulated by fasting and fasting followed by refeeding. After manipulation, epitrochlearis muscles with low (LG), normal (NG), and high (HG) glycogen contents were dissected and mounted on contraction apparatus for in vitro studies. Muscles were either kept rested in the absence or presence of insulin for 30 min or contracted in the absence or presence of insulin for 30 min. Glucose uptake was measured during the incubation and glycogen synthase fractional activity and phosphorylation were measured after 30 min of contraction.

Results: Insulin and contraction additively stimulated glucose uptake in NG and HG but not in LG. Nevertheless, glucose uptake was higher in LG than in NG and HG during insulin and contraction stimulation alone or in combination. Contraction-stimulated AMPK activity and insulin-stimulated PKB phosphorylation was higher in LG than in NG and HG. However, AS160 (probably included TBC1D1) phosphorylation was not correspondingly elevated in LG. Contraction and insulin also additively increased glycogen synthase fractional activity in NG and HG but not in LG. Glycogen synthase phosphorylation at Ser641 was decreased by insulin and contraction. Furthermore, glycogen synthase Ser641 phosphorylation was inversely correlated with glycogen synthase fractional activity ($R = -0.92$, $p < 0.001$) when modulated by contraction, insulin and glycogen content alone or in combination. Glycogen synthase Ser7 phosphorylation was increased by contraction and was not regulated by insulin.

Conclusion: Contraction and insulin additively increase glucose uptake and glycogen synthase activity in muscles with normal and high glycogen content, but not in muscles with low glycogen content. Moreover, glycogen synthase Ser641 phosphorylation describes the physiological activity of glycogen synthase in muscle. Contraction-mediated glycogen synthase Ser7 phosphorylation does not prevent glycogen synthase activation.

BODY WEIGHT-BEARING RESISTANCE TRAINING PREVENTS SARCOPENIA IN OLDER WOMEN OF THE XX GENOTYPE OF ACTN3 POLYMORPHISM: THE FOUR-YEAR INTERVENTION STUDY

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Introduction: It is important that maintenance of muscle mass for older adults. However, muscle mass decreases with aging, i.e., sarcopenia. The previous studies showed resistance training is beneficial program in the prevention of sarcopenia, and even low-intensity resistance training (e.g., body weight-bearing resistance training) could increase muscle mass in older adults.

Alpha-actinin-3 (ACTN3) is structural proteins of the Z-line and is expressed in only type II fibers of muscle. We have demonstrated that XX genotype of ACTN3 gene R577X polymorphism has less thigh muscle cross-sectional area (CSA) compared with other genotypes of ACTN3 in Japanese older women (13th Annual ECSS congress, Portugal, 2008). Furthermore, other study group reported XX genotype has less muscle mass in Caucasian women (Walsh et al., J Appl Physiol 2008). Thus, ACTN3 R577X polymorphism influence muscle mass.

However, it is unclear whether low-intensity resistance training prevents the loss of muscle mass in older adults with XX genotype of ACTN3.

Purpose: The present study was designed to investigate whether body weight-bearing resistance training prevents the loss of muscle mass in postmenopausal women with XX genotype of ACTN3.

Methods: The subjects consisted of twenty healthy Japanese postmenopausal women (means ± SD, 63.7 ± 4.3 years). The study conformed to the principles outlined in the Declaration of Helsinki. Subjects underwent the eight body weight-bearing resistance training (knee extension, sit-up, push-up, back extension, leg curl, high knee, squat and hip extension), and walking or bicycle Ergo meter exercise for 4 year, 5 times per week at a fitness center of University of Tukuba and their home. Thigh muscle CSA was measured using magnetic resonance image (MRI) before and four-year after exercise training. ACTN3 R577X genotype was determined using real-time PCR with DNA extracted from blood.

Results: The distribution of RR, RX and XX genotypes in the study was 4, 9 and 7, respectively. XX genotype has less thigh muscle CSA compared with RR & RX genotype at pre training (XX: 69.9 ± 14.1 cm^2, RR&RX: 84.1 ± 10.3 cm^2, P = 0.018). XX genotype maintained their thigh muscle CSA, but not decrease at four year after training (Pre ＝ 69.9 ± 14.1 cm^2，Post = 75.3 ± 9.3 cm^2； P = 0.133).

Conclusions: This study suggests that body weight-bearing resistance training benefit for XX genotype who genetically less muscle mass. We consider that the results become important data for tailor-made training program regard with gene information in a future.

14:15 - 15:15

Poster presentations

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INFLUENCE OF VIBRATION TYPE, FREQUENCY, BODY POSITION, AND ADDITIONAL LOAD ON THE NEUROMUSCULAR ACTIVITY DURING WHOLE BODY VIBRATION

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Introduction: Despite the substantial amount of articles concerning whole body vibration (WBV), there are few that address fundamental questions such as optimal frequency, amplitude or body position on the training device (Abercromby et al., 2007).

Since vibration training is a form of training where the muscle is externally driven, the "motor" (i.e. the vibration device) and its adjustment (i.e. the choice of frequency and amplitude) has a big influence on the muscles' response to the training.

Methods: The electromyographic activity of the soleus (Sol), gastrocnemius medialis (GM), tibialis anterior (TA), rectus femoris (RF), vastus medialis (VM) and biceps femoris (BF) muscles were measured in ten healthy subjects during WBV. The independent variables were vibration type (rotational (RV) and vertical vibration (VV)), vibration frequency (5, 10, 12.5, 15, 20, 25 and 30Hz), body position (knee angles of 5, 30 and 60°; two different foot positions: forefoot vs. normal stance, i.e. heel and forefoot in contact with the vibration platform) and load (no load vs. an additional load equal to 1/3 of the body weight). The statistical analysis consisted of an ANOVA and paired t-tests.

Results: Vibration type: significantly ($p<0.01$) enhanced EMG activity during RV compared to VV in all recorded muscles.

Vibration frequency: the higher the frequency, the higher the EMG activity of all recorded muscles ($p<0.01$).

Body position: changing the knee angle from 5° to 30° to 60° resulted in successively increasing EMG activity in RF (+47% p=0.04; +28% p=0.001) and VL (+55% p=0.02; +52% p=0.04), whereas the muscular activity of Sol, GM and BF were reduced. Forefoot stance resulted in significantly increased neuromuscular activity only for the dorsal extensors compared to normal stance (Sol +51% and GM +72% $p<0.001$), whereas TA (+60% $p<0.001$), RF (+68% p=0.01), VM (+54% p=0.04) and BF (+25% p=0.03) showed enhanced activation during normal stance.

Additional load during WBV resulted in significantly enhanced neuromuscular activation in Sol (+21% $p<0.001$), GM (+31%p=0.01), RF (+18% $p<0.001$), VM (+29% p=0.02) and BF (+52% p=0.02).

Discussion: RV resulted in higher EMG activation than VV despite allegedly identical parameters, which is most likely due to the specific WBV device, described by the subjects as "massage-like". The clear influence of the frequency was to be expected, considering the function of WBV as an external drive to the muscles. The increased activity of VM and RF with increasing knee angle is understandable given their anatomical properties. Likewise, the damping effect of the ankle joint explains the activity pattern when the foot position varies.

References

Abercromby AF, Amonette WE, Layne CS, McFarlin BK, Hinman MR and Paloski WH. (2007). Med Sci Sports Exerc, 39, 1642-1650.

THE RELATIONSHIP BETWEEN ANTHROPOMETRY, PHYSICAL FITNESS AND UPHILL LOAD CARRIAGE

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UNIVERSITY OF VIENNA

Introduction: Uphill load carriage is a key element in dismounted military operations in alpine terrain and demands a high level of physical fitness. However, testing staff directly on the criterion task is not usually practicable (e.g. safety, logistic etc.). Therefore the objective of this study was to determine the relationship between anthropometric parameters, physical fitness tests and uphill loaded marching performance in the field with loads of different weight.

Methods: Fourty-six male soldiers (age: 22.2 ± 2.5 yrs, body height: 179.7 ± 6.0 cm, body weight: 77.8 ± 7.4 kg, body fat: 15.9 ± 4.4%, VO2max: 51.3 ± 2.0 ml/kg/min) completed a test battery consisting of anthropometric, strength/power and aerobic fitness tests. Furthermore two 5.68 km loaded marches (1.43 km flat and 4.25 km with a vertical gain of 390 m) with a 20 kg (LM20) respectively 30 kg (LM30) backpack were conducted on two non-consecutive days. Participants started individually and were encouraged to complete as fast as possible by walking only.

Results: Time to complete LM20 was 65.76 ± 6.32 min (average speed: 5.18 ± 0.50 km/h) respectively 77.46 ± 11.36 min (average speed: 4.40 ± 0.65 km/h) for LM30. Significant correlations ($p < .05$) were found between LM20 time and strength/power (bench press power: $r = -.39$, bench row power: $r = -.32$) and aerobic fitness measurements (Queen's College Step Test: $r = .36$, 1.5 mile run: $r = .30$). Besides significant correlations existed between LM30 and anthropometric (fat-free mass: $r = -.60$, body height: $r = -.42$, leg length: $r = -.38$, body fat: $r = .38$, body weight: $r = -.36$), strength/power (bench press power: $r = -.51$, bench row power: $r = -.47$, sit-ups: $r = -.34$, back extensions: $r = -.32$) and aerobic fitness variables (1.5 mile run: $r = .57$). Stepwise multiple regression analysis was performed to generate prediction equations for both loads. The best model for LM20 (adjusted R-square = .22, $F = 7.222$, $p = .002$, SEE = 5.64, Beta(bench press power) = -.351, Beta(Queen's College Step Test) = .317) was LM20 (min) = 49.913 - [0.043 * bench press power (Watt)] + [0.185 * Queen's College Step Test (bpm)]. For LM30 the most accurate estimation (adjusted R-square = .53, $F = 25.472$, $p < .001$, SEE = 7.89, Beta(fat-free mass) = -.491, Beta(1.5 mile run) = .447) revealed the following equation: LM30 (min) = 45.731 - [0.962 * fat-free mass (kg)] + [9.498 * 1.5 mile run (min)].

Conclusion: Results of this study indicate that variables of physical fitness relate to uphill load carriage performance. The influence of these parameters increased when the carried load was augmented. Moreover, anthropometric parameters became relevant. Models for each load included an index of aerobic fitness and certain parameters linked to muscle mass. Anyhow the regression equation for the heavier load caused a higher explained variance. Loaded marching performance seems too complex and inconsistent to be assessed by unspecific surrogate tests.

INFLUENCE OF GENDER ON PACING ADOPTED BY ELITE TRIATHLETES DURING A COMPETITION

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Purpose

The aim of the present research was to improve the description of the pacing strategies adopted by female and male elite triathletes during a World Cup triathlon and to discuss possible factors influencing the self-selection of such strategies.

Methods : Twelve elite triathletes (6 females, 6 males) performed three maximal tests: an all-out 400-m front-crawl to determine their swimming maximal heart rate (swimming HRmax), an incremental cycling test during which power output (PO), heart rate (HR), at ventilatory thresholds (VT1, VT2), maximal aerobic power (MAP) were assessed, and an incremental running test to evaluate their maximal running HRmax. Throughout a World Cup short distance competition, speed and HR were measured. The amount of time spent below 10% of PO (zone 1), between 10% MAP and PO at V1 (zone 2), between PO at VT1 and VT2 (zone 3), between PO at VT2 and MAP (zone 4) and above MAP (zone 5) was analyzed during the cycling leg.

Results : Swimming and running speeds decreased similarly for both genders ($P < 0.05$) and HR values were similar through the whole race (92±2% and 92±3% HRmax for women and men, respectively). The distribution of time spent in the 5 intensity zones during the cycling leg was the same for both genders (17 ± 5% and 17 ± 3% for zone 1, 36 ± 5% and 31 ± 5% for zone 2, 13 ± 2% and 19 ± 7% for zone 3, 13 ± 6 and 14 ± 3% for zone 4, 22 ± 2% and 19 ± 2% for zone 5 for women and men, respectively). Men's speed and PO decreased after the first bike lap ($P < 0.05$) and women spent more relative time above MAP in the hilly sections (45±4% vs. 32±4%). Men's running speed decreased significantly over all the circuit, whereas women slowed only over uphill and downhill sections ($P < 0.05$).

Conclusion : The main finding of this study was that both female and male elite triathletes adopted similar positive pacing strategy during swimming and running legs. On the contrary, men pushed the pace toughly during the swim-to-cycle transition in contrary to women and female triathletes were more affected by changes in slope during both cycling and running phases. These effects of gender on pacing may have strong implications for the differentiation of training for female and male elite triathletes.

References

Hausswirth, C., Brisswalter, J. Strategies for improving performance in long duration events: Olympic distance triathlon. Sports Med. 2008;38:881-91.

Vleck VE, Bürgi A, Bentley DJ. The consequences of swim, cycle, and run performance on overall result in elite olympic distance triathlon. Int J Sports Med. 2006;27:43-8.

Vleck VE, Bentley DJ, Millet GP, Bürgi A. Pacing during an elite Olympic distance triathlon: Comparison between male and female competitors. J Sci Med Sport. 2007;11:424-32.

NON-FUNCTIONAL OVERREACHING IN YOUNG SWIMMERS OVER AN 8-MONTH COMPETITIVE SEASON

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Little is known about the relationship between training load and non-functional overreaching (NFOR) in child swimmers. Due to the multifactorial nature of NFOR, previous work has recommended a multidisciplinary framework to address this topic (Matos and Winsley, 2007). The purpose of our study was to follow a group of young swimmers over an 8-month competitive season and assess the relationship between training load and the occurrence of NFOR, and its association with physiological and psychological measures. Seven national-level swimmers (3 males and 4 females) with a mean age of 15.4±1.0 yr volunteered to participate. Training load was monitored over the 8 month period using the stress index scale (Mujika et al., 1995). Data collection was performed monthly and involved determination of Immunoglobulin A (IgA) and cortisol (C) levels from a salivary sample, and the completion of the Training Distress Scale (TDS; Raglin and Morgan, 1994). Incidence of upper respiratory tract infections (URTI) was also recorded. A submaximal 7x200m step test was performed 2 times during the 8-month period with blood lactates, heart rates and rates of perceived exertion collected. Athletes were classified as NFOR if their competitive performance (main swimming event calculated by the 2004 FINA International Points Score) had stagnated or decreased over a period of weeks to months (Meuusen et al., 2006). Of the 7 athletes, 2 females (F3 and F4) were classified as NFOR. Competitive performance had stagnated/ decreased for more than 6 months (F3's performance stayed the same and F4 had a 6% decrement, even though they continued to train); all other athletes improved performance (8±9.8 % improvement) during the season. The NFOR swimmers monthly swim mean volumes (6-month NFOR period) were 31% (F3; 11.4km) and 22% (F4; 31.7km) greater compared to the non NFOR swimmers (8-month period). There was no evidence of higher mean cortisol in the NFOR swimmers (NFOR period) compared with the non-NFOR swimmers (8-month period). Absolute IgA and the incidence of URTIs did not show conclusive results on the F3 and F4 swimmers. TDS scores relative to the 6-month NFOR period were 54% (F3; 2.8) and 32% (F4; 1.9) greater than those of the non-NFOR swimmer (8-month period). The submaximal performance test data displayed no clear association with NFOR. These data indicate that young swimmers may become NFOR and that high training volumes may be implicated. Furthermore, high TDS scores may be useful

in identifying young swimmers at risk of NFOR, but measures of cortisol, IgA or URTI incidence rates have limited confirmatory use. Non-functional overreaching in children is a complex phenomenon and requires more research into the underlying causes for the development of applied diagnostic tools.

Matos & Winsley, 2007. J Sp Sci Med, 6:353-367.
Meuusen et al., 2006. Eur J Sp Med, 6:1-14.
Mujika et al., 1995. Can J Sp Sci, 20 (4),395-406.
Raglin & Morgan, 1994. Int J Sp Med, 15: 84-8.

EFFECTS OF TAE-BO EXERCISE PROGRAM ON BLOOD MARKERS OF OXIDATIVE STRESS IN YOUNG WOMEN

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Introduction: Strenuous physical exercise characterized by a remarkable increase in oxygen consumption with concomitant production of ROS presents a challenge to the antioxidant systems (Radovanovic et al., 2004). The risk of oxidative stress with exercise depends on exercise intensity and the participant's state of training (Alessio et al., 2000). This study examined the effects of 10 weeks tae-bo training on selected markers of oxidative stress in young women.

Methods: Blood samples were collected from seven women (mean+/-SD: age 26.8+/-4.3 years, body height 1.65+/-6.7 m, body weight 58.4+/-9.8 kg, body fat 15.1+/-6.4%) who performed tae-bo training as high-intensity aerobic exercise. The experimental program was consisted from three training sessions every week. This made total of 30 training sessions. Each training session lasted one hour. After the warm-up the main part of the training was consisted from the combination of tae-bo exercises. The choreographies were made from next tae-bo basic moves: jab, hook, cross, upper-cut, kick (front, side and back). Cross train with other forms of exercise such as walking, jogging, knee up, leg curls, step touch, etc. Intensity in the main part of training is adjusting to held heart rate frequency (HRF) in range between 60-85% of maximal HRF. Samples were analyzed for lipid peroxidation byproduct malondialdehyde-MDA, enzyme catalase-CAT, reactive carbonyl derivates, total sulfhydryl groups-TSHG and total antioxidant status–TAS (Sachdev and Davies, 2008). Blood markers of oxidative stress were determined by standardized spectrophotometry techniques.

Results: An important finding in present investigation is that TAS increased significantly after 10 weeks tae-bo training (median 78.2% pre vs. 82.4% post, $p<0.05$). There were no significant changes in CAT (median 25.14 IU.L-1 pre vs. 23.82 IU.L-1 post, $p>0.05$), erythrocyte MDA (median 13.6 µmol.L-1 pre vs. 13.63 µmol.L-1 post, $p>0.05$), TSHG (median 229.7 mM.L-1 pre vs. 219.18 mM.L-1 post, $p>0.05$), reactive carbonyl derivates (median 1.31 µM.g-1 of proteins pre vs. 0.91 µM.g-1 of proteins post, $p>0.05$).

Discussion: This data suggest that 10 weeks tae-bo exercise training increase serum total antioxidant status. Also, it can be concluded that tae-bo training program did not have other effects on oxidative stress levels in young women.

References

Alessio HM, Hagerman AE, Fulkerson BK, et al. (2000). Med Sci Sports Exerc, 32(9), 1576-1581.
Radovanovic D, Rankovic G. (2004). Acta Med Medianae, 43(4), 45-48.
Sachdev S, Davies KJ. (2008). Free Radic Biol Med, 44(2), 215-223.

SEASONAL VARIATION IN PHYSICAL FITNESS AND FUNCTIONAL PARAMETERS OF PROFESSIONAL ELITE SOCCER PLAYERS

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Introduction: Soccer player must be able to perform more than 50 matches over competitive seasons of around 11 months. This high number of competitions in addition to systematic training may impose considerable physiological strain and fatigue to soccer players possibly affecting physical performance over the season. However, the variation of a large group of physical fitness and functional parameters of professional soccer players throughout the entire season has never been assessed, being the purpose of this study.

Methods: Twenty-two Portuguese elite professional soccer players were evaluated in four occasions throughout the season [prior pre-season (PPS), end pre-season (EPS), mid-season (MID) and end-of-season (EOS)] for counter-movement jump (CMJ), sprint (5 and 30m) agility (T-test), maximal concentric isokinetic knee extensor (KE) and flexor (KF) strength (90°s-1), and intermittent endurance performance (YYIET2; no YYIET2 data were collected in MID due to the Club match commitments).

Results: Improvements in 30m sprint test were observed in MID vs. EPS ($p<0.01$), whereas no change occurred in 5m. CMJ results were higher in EPS vs. PPS, MID and EOS ($p<0.05$). The performance in T-test improved ($p<0.01$) in MID and EOS vs. PPS and EPS. No significant changes were found in KE, KF and bilateral leg strength differences (BD) along the season. However, the dominant leg hamstring/quadriceps ratio (H/Q-DL) increased ($p<0.05$) from MID to PPS. The YYIETL2 performance was higher in EPS ($p<0.01$) and EOS ($p<0.05$) than in PPS and decreased from EPS to EOS ($p<0.05$).

Discussion: Our results suggest that sprint performance is considerable stable throughout the season. Variations in CMJ performance are in accordance with Clark et al. (2008) but not with Malliou et al. (2003). With the exception of H/Q-DL ratio, players maintain the same levels of KE, KF and BD throughout the season. The increased agility in MID and EOS might be due to possible improvements in soccer-specific coordination levels, allowing an improved ability to stop, start and turn rapidly. The increments in YYIET2 observed in competitive period may be related to improvements in players' endurance-related physiological features as aerobic power (Mohr et al., 2002) and anaerobic threshold (Clark et al., 2008), as well as to the increased ability to repeatedly perform eccentric muscular actions. The decrements in YYIET2 performance from EOS to EPS may be linked with the specificity of competition schedule (eg. high number of games in the second half of season), that is, with the reduction in the time devoted to fitness training and also to the development of chronic fatigue.

References

Clark N, Edwards AM, Morton R, Butterly, J. (2008). J Sports Sci Med, 7, 157-165.
Mohr M, Krustrup P, Bangsbo J. (2002). Med Sci Sports Exerc, 36 (5), 24.
Malliou P, Ispirlidis I, Beneka A, Taxildaris K, Godolias G. (2003). Isok Exerc Sci, 11, 165-169.

INDUCED INCREASE OF SYSTEM IMMANENT VARIABILITY THROUGH AN ELASTIC CORD TECHNIQUE TRAINING DEVICE AND A PRACTICAL APPLICATION

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In motor learning a leading aspect has been on the contentious issue whether movement variability is dominantly attributable to measurement error (Van Emmerik & Van Wegen 2002) or whether it is a system inherent necessity to flexibly adapt to changing environment. Ever since Kelso's coordination dynamics theory (1995) and Schöllhorn's practical application of various forms of variable practice (2000) movement variability is seen as an inevitable and intrinsic feature for motor learning. According to Bernstein (1967) movement outcome is the result of an equivocal relationship between forces generated by muscle contraction and so called reactive phenomena (gravitation, inertia, forces stored in muscle-tendon unit). Hence, if variability of non-muscular genesis is a determinant in movement outcome changes in reactive phenomena should be increased to develop an interpolation ability to adequately adapt to new situations, i.e. stability at one point that relies on the freedom of others to vary. This demand could be put into practice with elastic cords fastened between joints acting as constraints to increase the degrees of freedom and consequently skill related movement variability within the optimal range.

In two experiments we investigated the effect of elastic cords in a complex closed skill under laboratory conditions and in an open sport skill under training conditions. In the latter one variability was further increased by purely altering cord applications.

In the first experiment variability in muscle activity during treadmill running increased with the elastic cords between 39 and 119 % (2 (running condition) X 7 (block) ANOVA: eta2=.55-.70; p<.09), whereas stride duration, a more macroscopic parameter, increased with 21 % (eta2=.65; p<.03). In the second experiment, two groups practiced the smash in volleyball for 18 sessions, one group with, the other without various elastic cord applications. Results unveiled a significant advantage for the cord group in variable situations (2 (group) X 2 (time) ANOVA: eta2=.36; p=.03) whereas constant situations did not reveal similar results (eta2=.03; p=.58).

Data demonstrated an increase of muscle and movement variability through constraints in form of elastic cords. Furthermore, different cord applications led to a superior learning effect, especially in variable situations, what in fact coincide with the real sport situation. In constant task conditions the combination of the subject's inherent variability and task variability probably exceeded the optimal amount of movement variability. Therefore it remains an open research issue to find the optimal level of variability in relation to the subject's individual properties to enhance motor learning.

Bernstein NA (1967). The coordination and regulation of movement.

Kelso JA (1995). Dynamic patterns: the self-organization of brain and behavior.

Schöllhorn et al (2000) Acta Academiae Olympiquae estoniae, 8, 67-85.

van Emmerik R & van Wegen E (2002) Ex Sport Sci Reviews, 30, 4, 177-183.

RESPONSE ACCURACY AND VISUAL SCAN PATTERNS IN OFFSIDE DECISION MAKING

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Introduction: The aim of this study was to examine the visual scan patterns of association football assistant referees in offside decision making. Oudejans et al. (2000) first explained errors in offside decision making by the optical error hypothesis, i.e. bad positioning of the assistant referees in relation to the offside line results in an incorrect viewing angle and, hence, incorrect decisions. Baldo et al. (2002) and Helsen et al. (2006), however, discussed the flash-lag hypothesis as a relevant explanation of errors in offside judgements. A third explanation came from Belda Maruenda (2004) and Sanabria et al. (1998). They hypothesized that errors in judging offside were due to the time taken to shift gaze from the player passing the ball to the player receiving the ball, implying a time delay. In this study, international and national assistant referees were compared for response accuracy and visual scan patterns when judging offside situations in computer animations and video simulations.

Methods: Five international and five national assistant referees judged computer animations and video simulations of potential offside situations. The visual scan pattern was recorded with a Tobii T120 Eye Tracker. Mann-Whitney U-Tests were used to study the differences in response accuracy and eye movement data with respect to the expertise levels.

Results: The international assistant referees (78.3% computer animations; 83.5% video simulations) judged the potential offside situations significantly better than their national counterparts (61.3% computer animations; 74.6% video simulations) ($p < 0.05$). The national assistant referees showed also a bias towards flag errors. No significant differences were found in the scan patterns (number of fixations and mean fixation duration) of both groups. All assistant referees fixated the offside line before, during and after the precise moment the pass was given.

Discussion: The results of this study provide a better understanding on the potential causes of incorrect offside decisions. International assistant referees were more accurate when judging offside situations. In line with the flash-lag hypothesis as proposed by Baldo et al. (2002) and Helsen et al. (2006), the national assistant referees showed a bias towards flag errors. However, international and national assistant referees employed the same visual scan patterns and showed no shift of gaze. Probably the international assistant referees found a better way to deal with the flash-lag effect.

References

Baldo M, Ranvaud R, Morya E (2002). Perception 31, 1205-1210.

Belda Maruenda F (2004). British Medical Journal, 329, 1470-1472.

Helsen W, Gilis B, Weston M (2006). Journal of Sports Sciences, 24, 521-528.

Oudejans R, Verheijen R, Bakker F, Gerrits J, Steinbrückner M, Beek P (2000). Nature, 404, 33.

Sanabria J, Cenjor C, Marquez F, Gutierrez R, Martinez D, Prados Garcia J (1998). The Lancet, 351, 268.

A NEW METHOD FOR TMS MAPPING

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Introduction: The ability to assess cortical plasticity is important in sport science and neurorehabilitation studies. Transcranial Magnetic Stimulation (TMS) may be used to map the representation of muscles in the motor cortex and, therefore, to assess training-induced

changes in cortical representation. The traditional TMS mapping technique is far too time-consuming to be used in most training studies. However, the advent of real-time frameless stereotaxy, which improves the accuracy and repeatability of coil placement/orientation, can be used to make this possible. Here, we describe a modification of the traditional TMS mapping technique that takes advantage of real-time frameless stereotaxy to reduce the number of stimuli required to produce a reliable cortical excitability map.

Methods: Subjects were seated with the right arm supported and the wrist pronated. Surface electromyography was used to record motor evoked potentials (MEPs) in first dorsal interosseous (FDI) while the subjects held a small (~5% maximum) voluntary contraction. TMS was delivered at 0.8 Hz with a MagStim Rapid stimulator and a batwing design coil. The coil was positioned within an 8×8cm grid approximately centered over the hand area of the motor cortex. Stimulation intensity was set to 120% of the active FDI motor threshold when positioned at the location with the greatest MEP (hotspot). Coil position and orientation were monitored in real-time with frameless stereotaxy. For each stimulus, spatial coordinates and the MEP were recorded for offline analysis. In a conventional protocol, 3 MEPs were elicited at each of 64 points within the grid (192 stimuli). In the second protocol, 192 stimuli were elicited at random locations within the grid. The maps were compared with a correlation analysis using $p<0.05$.

Results: The two protocols produced similar maps (mean correlation coefficient $r = 0.8\pm0.1$). To determine the minimum number of stimuli needed to produce a reliable map with the random protocol, correlation coefficients were calculated between the conventional and random maps using successively fewer stimuli from the random protocol. Correlation coefficients began to exceed the 95% confidence interval of the traditional map when the random data set was reduced to the first 35±25 stimuli.

Conclusion

We have demonstrated that reliable maps can be produced with as few as 35 stimuli. At twice the standard deviation observed here (i.e. 85 stimuli), a reliable map can be recorded in as short as 106 seconds with 0.8 Hz stimulation. This method significantly minimises assessment time and will provide better temporal resolution of excitability changes. Our new method may be used to reliably assess motor learning tasks in sport science and neurorehabilitation studies where short acquisition time is essential.

INTER-LIMB COORDINATION, STRENGTH AND POWER IN SOCCER PLAYERS ACROSS THE LIFESPAN

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Introduction: High level of strength and power of young, adult and older soccer players have been widely reported. However, there is a lack of information on coordination, which is crucial for a successful performance. Thus, this study aimed to verify whether a chronic participation in soccer training has a beneficial effect for the improvement and the maintenance of inter-limb coordination performance across the lifespan and whether coordination is moderated by strength and power performances.

Methods: Twenty young (12 ± 1 years), 21 adult (26 ± 5 years), and 16 old (59 ± 11 years) male soccer players were paired to co-aged sedentary individuals and administered strength (handgrip), power (countermovement jump, CMJ), and in-phase (IP) and anti-phase (AP) coordination (i.e., hand and foot synchronized flexions and extensions at 80, 120, and 180 bpm) tests. A 3 (age) x 2 (activity) ANOVA was applied ($p<0.05$). A hierarchical model was used for inter-limb coordination, CMJ and handgrip parameters.

Results: Regardless of age, soccer players always showed better ($p<0.0001$) performances (handgrip: 383 ± 140 N; CMJ: 28.3 ± 8.7 cm; IP: 55.2 ± 12.9 s; AP: 31.8 ± 25.0 s) than sedentary individuals (handgrip: 313 ± 124 N; CMJ: 21.0 ± 9.4 cm; IP: 46.7 ± 20.2 s; AP: 21.1 ± 23.9 s). A hierarchical model ($p<0.0001$) emerged for CMJ, explaining 30% and 26% of the variance for IP and AP, respectively. In contrast, handgrip did not provide increments in the explained variance.

Discussion/Conclusions

Results indicate that chronic soccer training is beneficial to develop strength, CMJ and inter-limb synchronization capabilities in children, to reach higher levels of proficiency in adults, and to maintain performance in old individuals. The predicted role of CMJ on inter-limb coordination indicates that timing in neuromuscular activation is central for both jump (Bobbert and Van Soest, 2001) and inter-limb coordinative performances (Salesse et al., 2005). Thus, soccer coaches are strongly recommended to modulate complex motor behaviours with increasing velocity of execution to induce higher executive function and attentional control during technical and tactical drills under time pressure.

References

Bobbert M.F. and Van Soest A.J., 2001. Exercise and Sport Science Review, 29: 95-102.

Salesse R. et al., 2005. Human Movement Science, 24(1): 66-80.

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THE EFFECT OF HEAVY STRENGTH TRAINING ON MUSCLE ADAPTATIONS AND PERFORMANCE IN ELITE CROSS-COUNTRY SKIERS

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Introduction: Cross-country skiing is a typical endurance sport with high reliance on maximal aerobic power. However, the introduction of sprint skiing and mass start has increased the importance of other physiological factors affecting top speed on skies, such as muscular strength and the ability to generate high power. A good correlation has been reported between maximal power output measured in a 4RM rollerboard test and sprint skiing tests in cross-country skiing (Stöggl et al 2007). In addition to have a potential role on maximal power generation and top speed on skies, heavy strength training may also reduce the energy cost of skiing and thereby also affect endurance performance (Hoff et al 1999, Østerås et al 2002).

Method: Eleven males (18-26 yr, VO2max; 68.3 ± 4.8 ml•kg-1•min-1) and eight females (18-27 yr, VO2max; 59.3 ± 2.9 ml•kg-1•min-1) were assigned to a strength training group (STR) (n=9) and a control group (CON) (n=10). In addition to their regular training, STR performed heavy strength training twice a week, for 12 weeks (3-4 x 4-10RM sets in three exercises for upper-body muscles and one exercise for legs).

Results: One repetition maximum (1RM) improved in STR both in sitting pull-down (19 %) and half squat 12 % ($p<0.01$), while no changes was observed in CON. Jump height was 6.2% reduced in CON ($p<0.05$), while no change was observed in STR. A small increase in cross sectional area (CSA) were found in m. triceps brachii for both STR and CON ($p<0.05$), with no change in m. quadriceps CSA. VO2max in ski-skating increased 7% in STR ($p<0.01$), but was unchanged in running. Work economy, evaluated from VO2 during submaximal rollerskiing was unchanged and rollerski skating time-trial performance (~5 min) improved similarly in both groups. A 100 meter sprint skiing test showed no significant changes in performance between groups. Correlation analyses from baseline (n=25) showed a strong correlation between 1RM sitting pull-down and time-trial performance and 1RM half squat and 100 meter rollerski skating performance ($p<0.01$). However, we were not able to observe any significant correlation between changes in 1RM and changes in any of the performance tests.

Discussion: A 12-week period of heavy strength training improved maximal strength in leg and upper body muscles, but had little effect on muscle cross sectional area in thigh muscles. In addition, heavy strength training added to regular endurance training improved VO2max during skating. However, we were not able to observe any statistically significant beneficial effects in time-trial performance on rollerskies.

References

Hoff, J., Helgerud, J., Wisløff, U. (1999). Med Sci Sports Exerc. Jun;31(6):870-7.

Stöggl, T, Lindinger, S., Muller, E. (2007). Medicine & Science in Sports & Exercise. 39(7):1160-1169, July.

Østerås, H., Helgerud, J., Hoff, J. (2002). Eur J Appl Physiol 88:255-263

THE EFFECT OF HEAVY STRENGTH TRAINING ON PERFORMANCE AND MUSCLE ADAPTATIONS IN ELITE NORDIC COMBINED ATHLETES

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Introduction: Performance in Nordic combined is dependent on both endurance performance in cross country skiing and the ability to generate maximum power during take-off in ski jumping. Heavy strength training on leg muscles has the ability to improve power in leg extensors, but it is uncertain how a large volume of endurance training may influence this adaptation. Furthermore, strength training of upper body muscles may also improve performance in cross country skiing (Hoff et al., 2002). However, the effect of heavy strength training has not been investigated in Nordic combined athletes. Thus, the aim of this study was to investigate the effect of adding heavy strength training to normal training in elite Nordic combined athletes.

Methods: 17 male Nordic combined athletes (16-26 yrs, VO2max: 66.2±1.2 ml∙kg-1∙min-1) were assigned to a strength training group (STR, n=8) and a control group (CON, n=9). STR performed strength training twice a week, for 12 weeks with 3-5 x 10-3 repetition maximum (RM) training loads in two exercises for upper-body (seated pull-down and standing double poling) and one exercise for the lower-body (deep squat) as a supplement to their regular training. CON maintained regular training without heavy strength training. Measurements of muscle thickness, 1RM, roller ski performance (7.5 km time trial), work economy and VO2max during treadmill roller skiing and vertical jump-height were performed before and after the training intervention.

Results: STR increased muscle thickness of m. vastus lateralis (7.1±3.0%) while no change was observed in CON (-2.2±2.5%). STR improved 1RM in both seated pull-down and deep squat (23±6% and 12±4% respectively), while no change was observed in CON. Vertical jump-height improved in STR (8.8±4.9%), while no change was observed in CON. The change in relative strength in deep squat was correlated with changes in vertical jump–height (r=0.59). Maximal aerobic power in ski skating, time-trial roller ski performance, skiing economy, and body weight remained unchanged from before to after intervention in both groups.

Discussion: As expected, the 12-week period of heavy strength training improved 1RM deep squat and increased vertical jumping height (McBride et al., 2002). On the other hand, we did not observe any improvements in maximal aerobic power or working economy during ski skating. The increase in muscle thickness did not lead to a subsequent increase in body weight. Altogether; strength training may improve total performance in Nordic combined by improving the athletes' ability to mobilize maximal power during ski jumping without negatively affecting cross country skiing performance.

References

Hoff, J., Gran, A., & Helgerud, J. (2002). Scand.J.Med.Sci.Sports. 12, 288-295.

McBride, J. M., Triplett-McBride, T., Davie, A., & Newton, R. U. (2002). J.Strength.Cond.Res., 16, 75-82.

TECHNICAL AND TACTICAL ANALYSIS OF YOUTH TAEKWONDO PERFORMANCE

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Technical and tactical analysis of youth Taekwondo performance

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Introduction: Several studies focused on the psychological and physiological aspects of elite Taekwondo athletes, while little information is present regarding the technical and tactical aspects of the match (Kazemi et al., 2005, 2006). Considering that athletes start training and competing around 10 years of age, an area that needs attention is the study of youth performance. Therefore, this study aimed to

analyze the technical aspects of young athletes competing in the Italian Youth (i.e., Cadetti A) Taekwondo Championships in relation to gender, age, and match outcome.

Methods: Sixty youth taekwondo athletes (age range: 10-12 yr) participated in the study according to their weight category (ranging from -24 kg to +59 kg). Thirty-seven matches (three 1-min rounds, with 1 minute rest in between) were recorded for further match analysis. Sixteen kicking techniques, equally divided in offensive and defensive actions, were considered. A 3 (round: first vs second vs third) x 2 (match outcome: victory vs defeat) x 2 (gender: female vs male) ANOVA for repeated measures was applied to verify differences ($p<0.05$) in the frequency of occurrence of the kicks with relative PLSD post-hoc.

Results: Regardless of gender, the offensive techniques occurred more frequently (91.5%, 14±8) than defensive ones (8.5%, 1±2) ($F(1, 70) = 210.1$; $p<0.0001$). Regarding gender, the number of techniques approached the significance ($F(1, 70) = 3.93$; $p = 0.0531$), with a higher occurrence for female (3±4) than male (2±3) athletes. Moreover, females attack more and defend less than males ($p=0.0054$).

In relation to match outcome ($F(1, 70) = 18.43$; $p<0.0001$), the number of technique was higher for winners (3±4) than losers (2±2). Regarding the rounds ($F(2, 140) = 10.07$; $p=0.0004$), differences between offensive techniques emerged only between the first (6±4) and third (4±3) while differences between the second (5±3) and third round approached significance ($p=0.064$). No difference was found for the defensive techniques among the three rounds.

Discussion/Conclusion

The lower frequency of defensive techniques with respect to the offensive ones indicates that young taekwondo athletes did not completely develop this capability. Thus, coaches are urged to stress defensive drills during their trainings.

References

Kazemi M. et al. (2006). Journal of Sports Science and Medicine CSSI, 114 – 121

REGIONAL AND NATIONAL COMPETITION OF YOUNG PROMOTIONAL GYMNASTIC: A LONGITUDINAL STUDY

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Introduction: Amateur gymnastics includes competitions with easy technical programmes and provide a massive participation of both young and master athletes. Anxiety and self-efficacy are the psychological factors most commonly linked to motor performance during elite gymnastics. Best performance is correlated with a low level of anxiety and a high level of self-efficacy (Cartoni et al, 2005). Amateur gymnastic however has never been investigated therefore the aim of the present study was to investigate the correlation between anxiety, self-efficacy and performance during Regional (RC) and National (NC) competitions in young gymnasts.

Methods: Fourteen young female gymnasts, (mean starting age 13 ± 2) were administered State-Trait Anxiety Inventory form Y (STAY-Y) (Spielberger, 1983) with a scale ranging from 20 to 80 points and the Self-efficacy for Physical Abilities (SEM-S) (Bortoli, Robazza, 1996) with a scale ranging from 10 to 50 points. The Trait anxiety questionnaire was administered in a non competitive period. The State anxiety and the self-efficacy questionnaires were administered after the warm-up session of the RC and NC throughout a 2 year data collection period. The Friedmans Test ANOVA for repeated measures was used to examine statistical differences between State-Trait Anxiety responses, self-efficacy and performance ($p<0.05$). A Polynomial correlation was used between performance, State anxiety and self-efficacy.

Results: No significant difference was found for state anxiety and penalties obtained in competition. Throughout the two year period anxiety (RC: 2007 M=46 ± 13 vs 2008 M=45 ± 10; NC: 2007 M=50 ± 14 vs 2008 M=46 ± 12) and penalty during competition decreased (RC: 2007 M=0.69 ± 0.27 vs 2008 M=0.66 ± 0.27; NC: 2007 M=1.08 ± 0.42 vs 2008 M=0.84 ± 0.28). During RC anxiety decreased by 2% and during NC by 7%. In the RC penalties decreased by 4% and in NC by 23%. No correlation was found between state anxiety and performance. A negative correlation was found between anxiety and self-efficacy (Pearson's Correlation: Regional 2007=-0.913, 2008=-0.786; National 2007=-0.853, 2008=-0.869).

Discussion/Conclusion

The improvement in performance (decreased penalties) and the decrease in anxiety observed throughout the 2 year period can be attributed to the increased experience of the young gymnasts and by the fact that the exercise routine remained the same throughout the 2 year period. As already confirmed in previous studies, the athletes showed higher anxiety levels and penalties during the NC compared to the RC (Cottyn, et al., 2006).

References

Bortoli L Robazza C (1996). Didattica del movimento, 86/87,48-56.

Caroni AC Minganti C Zelli A (2005) J Sport Behaviour, 28(1):3-17.

Cottyn J De Clercq D Pannier J L Crombez G Lenoir M (2006). J Sports Sciences, 24(2):157-165.

Spielberger CD (1983). Consulting Psychologists Press, Palo Alto, CA.

VAULT RUN-UP CHARACTERISTICS AND THEIR INFLUENCE ON HIGH LEVEL FEMALE GYMNASTICS PERFORMANCE.

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Introduction: Vault is one of the four apparatus of the female gymnastics. Despite a large studies about the biomechanical aspect of the Vault skills, there are currently a paucity of data regarding the effectiveness of Vault run-up on exercise successful evaluated by judge score (Sands and McNeal, 1995, Krug et al., 1998). The aim of this study was to analyze the effects of vault run up parameters on quality vaulting performance.

Methods: Sixteen female gymnasts (age: 18±3 yrs; height: 154.1±7.3 cm; weight: 44.5±6.1 kg) of four different national teams (Italy, Brazil, Romania and Belarus) performed vault exercise during international competition (Mediterraneo Gym Cup). All the gymnasts performed vaults of Yourchenko type, which is characterized by a round off before the springboard impact. During vault performance contact time (CT), flight time (FT), step length (SL), step height (SH), run-up velocity (RV) and acceleration (RA) were assessed step by step using Optojump system (Microgate, Bolzano, Italy) along runway mat. Moreover judges' score were recorded. Judges' score is made up of A and B score. A score corresponds to the skill difficult, and B score corresponds to the judges' deductions. The final score results from the difference between A and B score.

Results: Correlation analysis was used to assess the relationship between all the run-up variables and judges' score. Last run-up step CT (0.12±0.01 s) and hurdle CT (0.11±0.01 s) were significantly ($p<0.05$) related to B (9.0±2.7 points; r= -0.515 and r= -0.512, respectively) and final scores (14.4±7.0 points; r= -0.5 and r= -0.512, respectively).

No significant correlations were found between all the other variables and judges' score.

Discussion: Our results, according with literature, showed that run-up velocity did not appear correlated with vaulting performance (Sands and Cheetham, 1986). This could be due to the gymnastics' focus on the springboard approach during the run-up, since before the springboard impact they have to be focused also on the round off. Our main finding was that higher judges' final scores were related to shorter contact time of the final run-up step and of the hurdle. These results showed how the vault run-up is characterized also by technical variables and not only by kinematics variables. Therefore future research must focus on last run-up step and on hurdle characteristics rather than on run-up speed.

References

Krug J, Knoll K, Kothe T, Zocher HD. (1998). ISBS'98 XVI International symposium on biomechanics in sports, Vol I p. 160-163.

Sands WA, Cheetham PJ. (1986). Tecnique, 6, 10-14.

Sands WA, McNeal JR. (1995). Tecnique, 15(5), 8-10.

COMPARISON OF VERTICAL JUMPING PERFORMANCE AMONG YOUNG SEDENTARY SUBJECTS, BASKETBALL AND VOLLEYBALL PLAYERS

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Introduction: The ability to jump high is considered important in a number of sports. It is commonly accepted that the use of the arms increases jump height (I). In particular, in some sport situations such as basketball and volleyball the ability to utilize arm swing is fundamental in order that players may reach the maximum performance. Instead, sedentary subjects are not usually able to utilize efficiently upper-limb motion compare to active people during vertical jumping performance.

The purpose of this study was to examine flight time (sec.) [Ft], jump height (cm) [Jh] during vertical jumping by countermovement [CMJ] with and without arm swing in young, sedentary subjects and basketball and volleyball players from similar category.

Methods: Thirty one young girls, 11 sedentary subjects [SS] (age: 15+/-1 years, height: 159.81+/-3.48 cm, weight: 53.90+/-5.62 kg, BMI: 21.10+/-2.09); 10 basketball players (age: 15+/-1 years, height: 160+/-4.44 cm, weight: 57.9+/-6.98 kg, BMI: 22.67+/-3.13) and 10 volleyball players (age: 16+/-1 years, height: 160.6+/-4.59 cm, weight: 57.2+/- 5.47 kg, BMI: 22.17+/-1.87) performed 2 jumping movements: CMJ with hands on hips (CMJ-HH) and CMJ with arm swing (CMJ-AS) that were analyzed by Optojump system (Microgate, Bolzano, Italy). The optical acquisition system allowed the measurement of contact and flight times during a jump to a precision of 1/1000s (II).

Results: Flight time (sec.) [Ft] and jump height (cm) [Jh] data obtained by both tests were higher in players than sedentary subjects. In CMJ-HH volleyball players had higher Ft and Jh than basketball players. In CMJ-AS the use of the arms was found to increase vertical jumping in all three groups. In particular, players showed a better vertical jumping performance than sedentary subjects because present an increased ability to utilize of arm swing. Moreover, Ft and Jh were higher in volleyball players than basketball players during CMJ-AS.

Discussion: A higher muscle power of lower limbs, motor coordination and upper body strength could be the cause of the better performance of players than sedentary subjects. Moreover, higher Ft and Jh in volleyballers than basketballers during CMJ-AS could be due to the different performance model of these sport situations. The volleyballers might develop a higher ability of muscle power than basketballers because during volleyball game they perform numerous vertical jumps in a smaller place than game ground of basketballers.

References

(I) Hara M et al: The effect of arm swing on lower extremities in vertical jumping. J Biomech. 2006;39(13):2503-11.

II) Di Cagno A et al.: Factors influencing performance of competitive and amateur rhythmic gymnastics-Gender differences. J Sci Med Sport. 2008.

DEVELOPMENT OF LONG JUMP TECHNIQUE IN YOUNG ATHLETES

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Development of long jump technique in young athletes

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Long jump is one of the most natural track and field disciplines but not the most simple. Long jump is divided in four fundamental phases: run-up, take-off, flight and landing. Run-up and take-off are the two phases that will determine the success in this event. Results from previous studies showed that take-off execution can discriminate between elite and non elite athletes (Chen-Fu and Chen-Shou 2007). Therefore, the purpose of the present study was to discriminate between different performance levels by measuring technical and cinematic parameters.

METHODS: Ten long jump and triple jump athletes were divided in two subgroups: specialized, S (age 17,6 ± 2,41, personal best 5,92 ± 1,07 m), and non specialized, NS (age 13,4 ± 1,1, personal best 4,59 ± 0,58 m) and tested during a training session. The following long-jump parameters were obtained through videoanalysis (Dartfish TeamPro): horizontal and vertical velocity and ankle angle at take-off and touch-down, knee flexion of the take-off leg at take-off, time on board, and differences between the last two steps (Hay 1992). Force related tests were performed on a force platform: counter movement jump (CMJ), drop jump (DJ), and standing long jump (SLJ). Differences between the long jump parameters of the two groups were analysed with unpaired student t test and a Pearson correlation was performed between tests and long jump parameters.

RESULTS: No significant differences were observed in performance between S and NS, however S jumped 12,76 % more. The length of the last two steps were significantly different between S and NS (S penultimate and last step 2,29 ± 0,21 and 2,03 ± 0,1 respectively; NS penultimate and last step 1,85 ± 0,08 and 1,77 ± 0,13 respectively). SLJ was significantly correlated with CMJ (r = 0,95) and performance measured in competition (r = 0,98) in S but not in NS.

DISCUSSION: The results of the present study demonstrate that technical abilities were significantly different between the two groups while the results of specific tests (CMJ, DJ, SLJ) did not differ. The NS still train and compete in different disciplines and therefore have

good strength and speed capacities but lack in technical precision. In order to improve as well, and try to reach the elite, they should concentrate on one preferred discipline only.

REFERENCES

Chen-Fu H., Chen-Shou K. (2007) Biomechanical differences between jumpers and sprinters on long jump performance. J. Biomech XXI ISB Congress, 2007.

Hay J. G. (1992) The biomechanics of sports techniques. Prentice-Hall, Inc, Englewood Cliffs.

AGE AND GENDER SPECIFIC PHYSIOLOGICAL CHARACTERISTICS OF TYROLEAN JUDOKAS

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Introduction: In judo, besides technical skills and tactical strategies, fitness is also indispensable for a successful performance. Few studies have examined physiological profiles of judo athletes and there are no laboratory tests lasting the duration of a judo competition which assess maximum arm and leg performance.

The aim of this study was to describe age and gender dependent maximum arm and leg performance of judo athletes, derived from laboratory tests, which are similar in duration to a judo competition (5 min).

Methods: The test group consisted of 7 juvenile female, F (1990-93) and 30 male (M) judokas: 7 children, C (1992-94), 10 juveniles, J1 (1990-91), 4 juveniles, J2 (1986-88) and 7 adults, A (1959-85), of different competitive level.

The test session took place in June 2006. Anthropometric measurements included stature, body mass and body composition (bio-impedentiometry). Physiological parameters at rest were measured. During and immediately after a ramp test (5W-increments) on an arm-crank ergometer (increments in W = ½ body mass/min) and on a cycle ergometer (increments in W = body mass/min) maximum power (Pmax), heart rate, ventilatoric parameters (i.e. VO2peak), perceived exertion and blood lactate 3 min post exercise (LA) were assessed.

Statistics: MANOVA and Pearson-correlations using SPSS.

Results: Upper body (UB): Pmax (W/kg): C 2.37, J1 2.60, J2 2.70, A 2.57, F 2.46; VO2peak (ml/min/kg): C 37.3, J1 39.2, J2 35.3, A 30.9, F 29.8; LA (mmol/l): C 7.8, J1 10.4, J2 11.8, A 11.4, F 6.5. Lower body (LB): Pmax (W/kg): C 5.28, J1 5.36, J2 5.76, A 5.38, F 4.81; VO2peak (ml/min/kg): C 52.6, J1 51.2, J2 50.0, A 45.0, F 45.3; LA (mmol/l): C 7.9, J1 11.1, J2 12.0, A 12.0, F 9.1.

Concerning UB, women's Pmax/kg was lower than values of J1, J2 and A. J1 had a higher arms' VO2peak/kg than A and F. C and F had lower values of LA after cranking compared to the other groups. Concerning LB, no significant differences were noticed. VO2peak/kg during both tests decreased and LA after cranking rose with increasing age among M.

Discussion: All these results confirm data from our laboratory (3) and literature. Gender differences are in accordance with scientific knowledge on muscle strength and power and with research on judokas (2, 3). Also the shown gender and age differences in VO2peak and LA are reported in the literature, which identifies the age (14-17 years) in which the highest relative VO2max values are reached (1). These trends probably reflect the lower volume and efficacy of strength training among young athletes and women.

References

1. Boisseau N, Delamarche P. (2000) Sports Med, 30(6), 405-422.

2. Little N G. (1991) J Sports Med Phys Fitness, 31(4), 510-520.

3. Pocecco E. (2008) Proceedings I Scientific European Congress on Judo, Lisbon.

LOAD ANALYSIS OF KARATE KATA SITUATIONAL TRAINING

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INTRODUCTION: Kata is a karate discipline comprised of basic karate techniques presenting the offensive and the defensive actions. As kata is performed identically on training and competition, it is relatively easy to assess actual competition load measuring performances during situational training. The goal of the research was to establish the level of intensity of 5 consecutive kata (Jion, KD, KS, GSS, Unsu) performances with 5 min rest periods.

METHODS: A member of Croatian national kata team (29 yrs;179 cm;91 kg) performed incremental treadmill test (0,5 km/h speed increase per minute, 1,5% grade) for determination of VO2max and HRmax (50.8 mlO2/kg/min;191 bpm) and anaerobic threshold (AnT -46.4 mlO2/kg/min;186 bpm). The level of intensity of 5 consecutive kata was measured through: heart rate (HR), blood lactate (LA; Lactate Scout, USA) and oxygen uptake (VO2; COSMED, Quark K4, Italy).

RESULTS: The duration of each kata was 102s in average. HR before each 5 performance was 137, 150, 150, 124 and 137 bpm (73.1% HRmax,75.1% HRAnT in avr) and after the kata performance 196, 197, 188, 193 and 189 bpm (100.1% HRmax,103.6% HRAnT in avr). VO2 before each kata was 14.7, 13.4, 19.9, 12.5 and 9.3 mlO2/kg/min (27.5% VO2max,30.1% VO2AnT in avr) and after the performance 39.1, 41.6, 33.7, 29.5 and 28.2 mlO2/kg/min (67.7% VO2max,73.8 VO2AnT in avr). LA before each kata was 1.2, 12.6, 14.2, 14.3 and 16.8 mmol/l; after kata 5.7, 13.2, 14.4, 14.4 and 13.0 mmol/l and 3 min after kata 11.3, 13.4, 14.0, 13.9 and 13.9 mmol/l.

DISCUSSION: HR after the kata performance indicates extremely high intensity of activity which goes even above the HRmax estimated on the treadmill test. The HRpeak was lower in the last 3 katas, which can be attributed to the more economical performances and accumulated fatigue. Analysing the VO2 after each performance, which is always lower than after the previous one, it can be concluded that anaerobic metabolism is increasing with each performance. It also indicates that 5 min break is not enough for complete recovery. This has also been supported by values of LA. Each consecutive kata has been performed with higher LA which also indicates insufficient recovery period and glicolitic character of the activity.

CONCLUSION: In comparison to already reported results, this case study presents higher physiological demands of kata performance. It is likely due to the highly trained subject examined and higher level of kata performances. Kata performance can be considered as high intensity anaerobic activity with high lactate tolerance demands of an athlete. Situational training (5 katas with 5 min recovery) can be considered as extremely demanding system in which the anaerobic metabolism is increasing with each consecutive kata and the rest period is insufficient for full recovery.

REFERENCES

Imamura, H. et al. (1999). Med. Sci. Sports Exerc., Vol. 31, No. 2, pp. 342-347

THE PHYSIOLOGY OF WORLD CLASS SPRINT SKIERS

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Introduction: During sprint competitions in cross-country skiing, athletes perform four separate races of 1200-1800m (2 to 4 min), starting with a time-trial qualification race, and thereafter heats based on a knock-out system. In order to better understand world class sprint performance, the present study investigated the differences between world class and national class sprint skiers with regard to their physiological characteristics. Methods: Eight world class (26.1±3.5 yr, 184.8±5.6 cm, 83.3±6.4 kg, sprint FIS-points 22.2±12) and eight national class (24.5±2.3 yr, 186.4±6.6cm, 82.8±6.6 kg, sprint FIS-points 100.6±45.6) sprint skiers participated in the study. They performed three standardized tests using the freestyle V-2 technique while roller skiing on a treadmill: 1) an absolute submaximal velocity test, 2) an incremental peak aerobic capacity (VO2peak) test, and 3) an incremental treadmill velocity test, leading to a maximal obtainable speed after 60-90s (Vmax). Moreover, all the subjects performed 30m acceleration and 30m maximal speed tests in the skating V-2 technique outdoors on an asphalt road. Additionally, the amount of training was quantified for different intensity zones, from low intensity endurance training to strength and speed training, according to training logbook entries. Comparisons between groups were made using the t-test procedure. Results: World class athletes showed significantly lower blood lactate levels, respiratory exchange ratio and heart rate, as well as better gross efficiency, at the submaximal velocity (all $P<0.05$). Furthermore, they had higher VO2peak, speed at VO2peak, Vmax-speed, and faster lactate clearance after the Vmax (all $P<0.05$). No differences in acceleration, maximal speed and peak lactate levels were found. World class athletes performed more endurance training and speed training ($P<0.05$). Discussion: World class sprint skiers are similar to national class sprint skiers as regards maximal speed and acceleration. However, they are superior in aerobic capacity, efficiency and lactate clearance. Among sprint skiers, we hypothesize that a certain level of speed is needed, however, the aerobic characteristics are what differentiates different performance levels. It is suggested that national class athletes with already high speed capacities should increase their emphasis on endurance training to further improve sprint performance.

MANIPULATION OF TRAINING INTENSITY DISTRIBUTION IN DISTANCE RUNNERS AND ITS IMPACT ON ENDURANCE PERFORMANCE: A CROSS-OVER STUDY

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Introduction: The training intensity distribution between elite and moderately-trained athletes is different (Seiler & Kjerland, 2006). Untrained or moderately-trained subjects commonly exercise following a "threshold-training" model allocating a high proportion of moderate intensity exercises while (international) elite athletes seem to prefer a "polarized training" distribution tending to minimise trainings between the first (VT1) and second ventilatory threshold (VT2). The purpose of the current crossover designed study was to evaluate the effect of a polarized training distribution on physiological determinants of performance in endurance runners.

Methods: In the first year and after a 12-weeks baseline period, fifteen well-trained recreational runners were randomly assigned for 10 weeks to either polarized training (POL) or a normal training (CON) period. According to a crossover design training groups were switched for the same training duration one year later. During POL the runners performed 70±7% of all endurance sessions in zone 1 (<VT1), 4±5% in zone 2 (between VT1 and VT2) and 26±6% in zone 3 (>VT2), while CON trained 50±18% in zone 1, 26±15% in zone 2 and 24±4% in zone 3. VO2max, maximal running speed, ventilatory thresholds, running economy, respiratory exchange ratio and anaerobic power were measured before the baseline period and each year immediately before and after the intervention period.

Results: VO2max increased significantly for CON (pre: 62.3±6.0; post: 64.9±6.2 ml•min-1•kg-1) but not for POL (pre: 62.1±6.6; post: 63.1±6.2 ml•min-1•kg-1). Maximal running speed, ventilatory thresholds and running economy did not change for POL and CON. Respiratory exchange ratio was significantly decreased at 10km•h-1 (pre: 0.92±0.02; post: 0.90±0.02), at 11.5 km•h-1 (pre: 0.94±0.03; post: 0.91±0.03) and at 13 km•h-1 (pre: 0.96±0.04; post: 0.94±0.03) after POL only. In the anaerobic 30-seconds Wingate tests peak power output (+4.1±4.0%, $p<0.01$) and mean power output (+1.8±2.7%, $p=0.07$) were only increased after POL. Despite unaltered training volume (~5h•week-1), body fat content was significantly higher after POL (pre: 8.6±2.9; post: 9.3±2.9%).

Conclusions: When frequency of high intensity training in zone 3 is fixed at around 25% of total endurance sessions, the relative contribution of low (zone 1) and middle (zone 2) intensity training does not affect maximal endurance performance in well-trained recreational runners. However a polarized training pattern seems to slightly modify substrate selection and improves anaerobic performance. Unlike for elite athletes, a polarized distribution of the training intensity seems not to be preferable for recreational runners performing low to moderate training volumes.

Reference

Seiler, KS and Kjerland, GO. Scand J Med Sci Sports 16(1): 49-56, 2006.

14:15 - 15:15

Poster presentations

PP-PS01 Psychology 1

ARE YOU IN THE MOOD FOR MOTIVATION?

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Although motivation has been thoroughly investigated and is still a current research topic, there has been little research concerning the interaction between affect and motivation (Matsumoto and Sanders, 1988). In the hierarchical model of motivation autonomy, competence and relatedness are key underlying factors in motivation within self determination theory; however, these have been found to relate more towards a global or personality form of motivation (Rhodes et al, 2006). At the situational level, the hierarchical model suggests that

motivation is similarly derived and mediated as at the global and contextual levels. It has been suggested that motives are related to emotion, personality and behaviour, consequently underpinning thoughts, emotions and behaviours across the lifespan (Robinson et al, 2005). Thus it seems logical to surmise that at this situational level, motivation is determined to a greater extent by the mood and emotion of the individual at that time (Barnett, 2006).

This study aims to ascertain possible links between mood, emotion and motivation using the Profile of Mood States (POMS), Sports Motivation Scale (SMS) and Sport Emotion Questionnaire (SEQ).

Second year sports students were recruited for this study (n=58). One hour prior to the activity participants were asked to complete an SMS questionnaire with the upcoming activity in mind. Ten minutes prior to participating in the activity participants were asked to complete the pre POMS and SEQ questionnaires. Participants then completed their selected activities for a period of 30 minutes. Immediately after a warm down, participants were asked to complete the post POMS and SEQ to ascertain post mood and emotion. Data was analysed using Pearson product-moment correlation to assess the relationship between motivation, mood and emotion.

Preliminary findings suggest that intrinsic motivation is strongly correlated to positive mood and extrinsic motivation shares a medium relationship strength with positive mood and emotion.

References: Barnett, L.A. (2006). Accounting for Leisure Preferences from Within: The relative contributions of gender, race or ethnicity, personality, affective style and motivational orientation. Journal of Leisure Research. 38 (4), 445-474.

Matsumoto, D., and Sanders, M. (1988). Emotional experiences during engagement in intrinsically and extrinsically motivated tasks. Motivation and Emotion. 12(4) 353-369.

Rhodes, R.E., Blanchard, C.M., Matheson, D.H. and Coble, J. (2006). Disentangling motivation, intention, and planning in the physical activity domain. Psychology of Sport & Exercise. 7 (1), 15-27.

Robinson, M.D. Meier, B.P. and Vargas, P.T. (2005). Extraversion, Threat Categorizations, and Negative Affect: A Reaction Time Approach to Avoidance Motivation. Journal of Personality. 73 (5), 1397-1436.

RELATIVE AGE IS ASSOCIATED WITH MALE SOCCER DROPOUT

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Introduction: The purpose of this study is to examine the birthdates distribution of French male soccer players who ceased their participation, so as to test whether the Relative Age Effect (RAE) is related to the dropout behaviour. We hypothesize that young players born late in the competitive year would be over-represented in the dropout sample. Conversely, because of their relative age and its associated advantages, the young players born early in the year should be under-represented in this sample.

Methods : At the end of the 2007-2008 season, the birthdates of the French male players (n = 363,590) licensed during the 2006-2007 season and that had not reiterated their licence during the following season were collected through the database of the French Soccer Federation (FSF). We waited until the end of the 2007-2008 season to collect the data, in order to avoid considering as dropout some players that took their licence while the new season had already begun.

For each of the 7 age categories distinguished by the FSF, the players' birthdates were classified into 4 quarters. As the cut-off date has changed in France, players born before 1982 were classified from Q1 (August-October) to Q4 (May-July), whereas those born in 1982 and after were classified from Q1 (January-March) to Q4 (October-December). Then, a chi square test was carried out to determine whether the observed distribution by quarter significantly differed from the theoretical distribution. The theoretical distribution was calculated from the corresponding population of licensed players, using weighted mean scores.

Results: An over-representation of players born in the last two quarters was found among dropouts, from the less than 9 to the less than 18 age categories, whereas the players born during the first two quarters were under-represented. No significant difference between the theoretical and observed distribution appeared concerning the less than 7 and adult categories.

Discussion: These results confirm that the RAE can act as a sport dropout factor from the less than 9 to the less than 18 age categories. For the players born in Q4, the differences in physical attributes and the subsequent reduced opportunities to play, associated with lowered self-worth perceptions and perceived competence, are likely to lead to higher dropout rates. Concerning the less than 7 category, the absence of effect can be explained by two elements. First of all, in this category, the differences in terms of physical attributes remain modest. Next, it must be outlined that the FSF does not organize official competition for them. Thus these players are less likely to be confronted to situations of failure or inferiority. Finally, a distribution conform to the one observed among the whole population of licensed adult players was observed among adult dropout players. This result is coherent with past studies having shown that RAE gradually declines with age.

MOTIVATION FOR SPORT IN YOUNG ITALIAN COMPETITIVE ATHLETES.

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Introduction: The study aimed to investigate the motivation to sport participation of young Italian competitive athletes in relation to gender, age and type of sport participation.

Methods: The Sport Motivation Scale questionnaire (Pelletier et al.1995) was administered to 354 subjects (197 girls and 157 boys) 232 swimmers and 122 gymnasts divided in 2 age groups 9-12 and 13-17 yrs. To test for significance ($p<.05$), a 2(gender) x 2(age) x 2(type of sport) MANOVA was applied with seven subscales of motivation as dependent variables.

Results: A main effect was found for gender (Wilks'Lamba(7,340)=2.6 $p<.05$ np2=.05) with significant effects for External Regulation ($F(7.340)=7.3$ $p<.05$ np2 =.02) with higher values of External Regulation for boys compared to girls (16.3±5.6vs14.2±5.6). A main effect was found for age (Wilks'Lamba(7,340)=5.5 $p<.05$ np2=.10) with significant effects for To Know ($F(7.340)=31.4$ $p<.05$ np2=.08) Stimulation ($F(7.340)=9.8$ $p<.05$ np2=.03) Accomplishment ($F(7,340)= 4.9$ $p<.05$ np2=.01) and Identified Regulation ($F(7.340)=4.6$ $p<.05$ np2 =.01) subscales. The 9-12 yrs showed higher values compared to the 13-17 yrs for To Know (19.6±5.2vs16.7±5.1) Stimulation (20.7±4.9vs9.6±4.7) Accomplishment (20.3±5.0vs19.4±4.8) and Identified Regulation (17.3±5.2vs15.9±4.3). A main effect for type of sport (Wilks'Lambda(7.340)=20.5 $p<.05$ np2=.30) emerged with significant effects for To Know ($F(7.340)=46.0$ $p<.05$ np2=.12) Stimulation ($F(7,340)=7.9$ $p<.05$ np2=.02) Accomplishment ($F(7,340)=32.5$ $p<.05$ np2=.09) Identified Regulation ($F(7.340)=26.2$ $p<.05$ np2=.07) and External Regulation ($F(7.340)=4.0$ $p<.05$ np2=.01) subscales, gymnasts showed higher values than swimmers for To Know (20.6±5.3vs6.9±4.9) Stimulation (21.2±4.6vs19.6±4.9) Accomplishment (22.1±4.7vs18.8±4.7) and lower values than swimmers for Identi-

fied Regulation (14.9±4.9vs17.6±4.6) and External Regulation (14.2±6.0vs15.7±5.4). Interaction gender x age (Wilks'Lamba(7,340)=2.6 p<.05 np2=.05) emerged with significant effects for External Regulation (F(7,340)=8.2 p<.05 np2=.02) subscale, with girls showing lower values of External Regulation compared to boys.

Conclusion/Discussion: Similarly to previous studies regarding motivation and gender, (Pethrick & Weigand 2002) young boys seem to engage in sport to obtain rewards, or avoid negative feedback. Regarding sport type, gymnasts seem to enjoy more their activity (Brustand 1988) and to desire to pursue challenges (Wong & Bridges 1995), while swimmers seems to train to satisfy an external demand and personal development (Fortier et al. 1995). Showing lower values of External Regulation compared to the other age groups, girls older than 13 seem to need less external approval.

References

Brustand RJ (1988) J Sport Ex Psychol 10, 307-321

Fortier MS et al. (1995) Int J Sport Psychol 26,24-39

Pelletier LG et al. (1995) J Sport Ex Psychol17,35-53

Pethrick CM & Weigand DA (2002) Int J Sport Psychol 33,218-237

Wong EH & Bridges LJ (1995) Adolescence 30, 437-452

ACHIEVEMENT GOALS, SELF-DETERMINATION AND BELIEFS ABOUT THE NATURE AND DETERMINANTS OF SPORT COMPETENCE – A STUDY OF PORTUGUESE FOOTBALLERS

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Frequently coaches, players and audience associate the collective and individual performance to different motivational states. In spite of the existence of a significant quantity of studies that examine motivation in the context of physical and leisure activities, very few coincide in contexts of a natural competitiveness. With this work we wanted to contribute to a better understanding of some aspects related to the motivation in Portuguese football players, namely their achievement goals, perceived autonomy and beliefs about the nature of sport competence. It was also our goal to analyze the existence of a pattern of relations between the motivational determinants above.

We recruited 577 football players. Ages ranged from 15 to 39 years (M=21.71±5.65). Participants completed the following tools: Task and Ego Orientation in Sports Questionnaire (TEOSQ), Self-Regulation Questionnaire (SRQ), Questionnaire relative to Beliefs about the Nature and Determinants of Sports Competency (QCNHS). All data were analyzed using descriptive statistics and Pearson correlation coefficient ($p < 0.05$).

Our data suggest that the footballers were preferentially task oriented (4.10±.59), tended to display higher levels for the highly autonomous forms of motivation, identified regulation (4.29±.62) and intrinsic Motivation (4.10±.68), and strongly believed that their sport competence is specific (3.83±.68), due to learning (4.44±.55) and is subject to improvement (4.18±.66). Pearson correlation analyses revealed that the task orientation were significantly correlated with the introjected R., intrinsic R., intrinsic motivation and with the beliefs that the sport competence is specific, due to learning and subject to improvement (r=.32; r=.46; r=.43; r=.17; r=.42; r=.27, respectively). On the other hand, ego orientation was significantly (p<0.05) correlated with the external R., introjected R. and with the beliefs that sport competence is stable, a gift and generable (r=.11; r=.15; r=.14; r=.24; r=.13, respectively).

In accordance with other studies with sport Portuguese footballers (Fonseca & Maia, 2000), the players were more task oriented, strongly believed that their sport competence is specific, due to learning, and is subject to improvement. This is a positive and desirable tendency, because these players showed a higher perception of control during the development of their competence (Sarrazin et al., 1995). In relation to the perceived autonomy, we have seen that the values reported to the identified regulation were higher than those related to intrinsic motivation. As such, the athletes, rather than for intrinsic reasons (associated, for example, with pleasure and satisfaction inherent in the practice of football), engage in practice motivated, above all, by issues related to the importance and the value attached to football.

Fonseca & Maia (2000). Motivação Jovens Prática Desportiva Federada. Lisboa: CEFD.

Sarrazin et al., 1995, Science & Motricité, 26, 21-32.

THE ITALIAN VERSION OF A SPORT ORIENTATION QUESTIONNAIRE: PRELIMINARY ANALYSES

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Introduction: Until recently, there were no sport questionnaires available in Italy that assessed sport orientation . This study investigates the reliability and validity of the first Italian version of such a questionnaire that is an adaptation of the Sport Orientation Questionnaire (SOQ) of Gill and Deeter (1988). The questionnaire was translated into Italian with the kind permission of Doctor Diane L.Gill and various other changes were also made as recommended by the literature (Vallerand and Halliwell, 1983; Streiner and Norman 1996).

Methods: The sample was formed of n=265 students from the University of Foggia 3 year degree course in Motor and Sport Sciences (n=109, Year 1; n=111, Year 2; n=45, Year 3); mean age 21.3±2.4 years. Statistical analysis was performed upon the results of the SOQ, considering the three subscales (Competitiveness, Win and Goal) and year groups separately. The distributions of the data were assessed for skewness and kurtosis and exploratory factor analysis (EFA) was performed using varimax rotation. The internal consistency of the three subscales was assessed using Cronbach's alpha.

Results: Statistical analysis (mean ± S.D. of Year 1, Year 2 and Year 3, respectively) of the SOQ subscales showed that the highest mean values belong to the subscale Competitiveness (52.26±5.2; 52.24±5.2; 52.19±5.2); whereas, the lowest mean values belong to the Win (25.42±4.5; 25.26±4.5; 25.24 ±4.5) and Goal (25.29±2.5; 25.25±2.5; 25.25 ±2.5) orientations.

Skewness was negative with values ranging between -1.77 and 0.45; the value of the kurtosis varied between 0.5 and 3.74. EFA indicated that the three factors explain 42.496% of the total variance. The Competitiveness orientation presented the majority of the items connected to the word "victory", while the Win orientation presented the items associated to the words "points" and "competition". Interpretation of the Goal orientation was complex because the items with highest scores were also recognised in the Competitiveness subscale. The internal consistency of the Competitiveness and Win orientation subscales was very good (α=0.84 and 0.79 respectively); the extent of internal consistency for the Goal orientation subscale was very low (α= 0.46).

Discussion: These results partially support the hierarchical model of three factors, as suggested by Gill and Deeter. They indicate that a clear distinction does not exist between the three subscales and that only two factors are recognised rather than the expected three. The

sample does not identify the Win orientation as being distinct. Further research is required to establish the psychometric characteristics that would form the basis of a future adaptation of this Sport Orientation Questionnaire.

References

Gill, D.L, Deeter, T.E (1988) Research Quarterly for exercise and sport, 59:3, 191:202

Vallerand, R.J., & Halliwell, W.R. (1983), Canadian journal of applied sport sciences, 8, 9:18

Streiner D.L., Norman G.R.(1996), Oxford University Press, Oxford

SEASONAL VARIATIONS IN SELF-DETERMINED MOTIVATION AND SYMPTOMS OF BURNOUT AND OVERTRAINING AMONG TOP LEVEL CROSS-COUNTRY SKIERS.

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COACHING AND PSYCHOLOGY

Theory: Fulfillment of the three basic needs for autonomy, competence and relatedness is crucial for individual development and well being [1]. The quest to fulfill these basic needs and whether one is successful at it will affect the quality of the motivation to initiate and pursue an activity. Thwarting basic needs and participating in sports for extrinsic reasons are believed to affect well being and lead to maladaptive behavioral outcomes [1]. Contemporary research in athlete burnout has suggested that seasonal variations in self-determined motivation are meaningfully linked to symptoms of burnout in elite athletes [2,3]. Athlete burnout is defined as a syndrome of "physical and emotional exhaustion, sport devaluation, and reduced sense of accomplishment" [4], and symptoms of overtraining have been found to be a precursor of athlete burnout [2]. Thus, the aim of this study was to add to the current body of knowledge and study how motivation and overtraining symptoms are linked to the development of burnout at a crucial training period of the season in elite x-c ski racers.

Method: A sample of elite Norwegian cross-country skiers (n = 32) aged from 18-23 years (Mode = 18), and training 700-800 hours a year participated in this study. Data were collected in November, in the pre-competitive phase, using the ABQ, SMS and SOSQ.

Results: Findings yielded a negative moderate relationship between self-determined motivation and burnout. Intrinsic motivation was moderately negatively related with the devaluation of the sport experience. A positive moderate relationship emerged between the emotional and physical exhaustion and externally regulated motivation. Additionally, amotivation was positively linked to burnout and the devaluation of the sport experience. Finally, results indicate that when athletes display high levels of self-determined motivation, overtraining symptoms are low; however when levels of self-determined motivation were low athletes experiences elevated symptoms of overtraining.

Conclusions: Current results support previous study findings in that levels of self-determined motivation in elite cross country skiers are meaningfully linked to overtraining and athlete burnout symptoms.

1. Deci, E.L., & Ryan, R.M. (2000). The "what" and "why" of goal pursuits: Human needs and the self determination of behavior. Psychol Inq 2000: 11, 227-268

2. Lemyre, P-N., Roberts, G.C., & Stray-Gundersen, J. (2007). Motivation, overtraining, and burnout: Can self-determination predict overtraining and burnout in elite athletes? European Journal of Sport Science, 7, 115-126.

3. Lemyre, P-N., Treasure, D.C., & Roberts, G.C. (2006). Influence of Variability in Motivation and Effect on Elite Athelete Burnout. Journal of Sport and Exercise Psychology, 12, 32-48.

4. Raedeke, T.D. (1997). Is athlete burnout more than just stress? A sport commitment perspective. Journal of Sport and Exersice Psychology, 19, 396-417.

CHILDREN'S MAP-READING IN ORIENTEERING; A STUDY OF NATURAL, 'REAL-WORLD' MAP-READING FOR WAYFINDING

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Introduction: Children's development of experience of map-reading for way finding is of great interest for the instructor in orienteering (Ottosson, 1987). From my point of view this is interplay between the map-reader, the map and the terrain. The relative importance of each component to the overall performance in the terrain is a debated issue (Sigurjónsson, 2007). The aim of my study was to study this interplay and to characterise children's development of experiences of map-reading in orienteering.

Methods: The empirical material was generated from audio and video-taped fieldwork in a naturalistic setting with follow-up conversations where specific situations from the fieldwork were watched on a television. The techniques of head-mounted-camera were used. The method both focus on children's attention towards the map and the attention towards the environment around them. Two fieldworks where carried out. One of them took place in a school area where 16 children - 8 girls and 8 boys aged 5:11 to 9:7 - participated. The other took place in woodland in the neighbourhood of the school and 12 children - 6 girls and 6 boys aged 9:11 to 12:6 - participated.

Results: The empirical material indicates two extremes with regards to describing the interaction in the map-reading ecosystem. At the one extreme there is behaviour which is characterised by a clearly defined readiness for the forthcoming movement. This gives focal awareness and active interaction between the child, the map and the terrain. At the other extreme there is behaviour where the child only to a small degree forms a readiness for his or her movement. This gives poor interaction in the interplay. The attention is pointed towards direction and less towards specific terrain detail. Therefore the children in this case experience hesitancy, and a more active reflection where they try to focus on specific terrain detail on the map and in the terrain is initiated.

Conclusions: An important finding in the study is that the symbolic map is experienced as a difficult aid for the beginner child. Therefore the children have difficulties in building up a good state of readiness for the terrain they are to move around in. The children in the primary school carry out parts of the course with perspective maps. With this aid they are able to form more clearly defined readiness and become more focused on specific terrain details. On the basis of the findings some implications for teaching map-reading and map-understanding are discussed and a model for a progressive approach is suggested.

My results suggest that cognitive expertise in the real-world represents a key factor in teaching in orienteering and that this accelerates the development of visual attention towards relevant terrain details.

References
Ottosson, T. (1987). Map-reading and wayfinding.
Sigurjónsson, T. (2007). Barns kartlesing.

RELATIVE AGE EFFECT AMONG SWEDISH ICE HOCKEY-PLAYERS: GENDER DIFFERENCES AND RELATION TO PERFORMANCE

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A systematic discrimination in sports due to birth date known as the relative age effect (RAE) has been established in both youth and professional sports. The phenomenon is explained by an over-representation of players born early in the year and under-representation of players born late in the year. This is a consequence of cut-off dates used in sports which may result in an 11 month difference in physical and cognitive maturity between a child born in January and a child born in December yet practicing in the same age group. Research on male youth ice hockey players have provided strong evidence of RAE but research on the RAE among female hockey players is lacking. Overall more RAE research among female sports is needed (Musch and Grondin, 2001). An overlooked area in the RAE field is the relationship between RAE and measures of performance. Thompson et el. (1991) attempted by looking at pitchers ERA stats in relationship to RAE but no correlation was found.

The aim of this study was twofold. First, an investigation of the distribution of birthdates among four groups of Swedish ice hockey players was conducted. Three male youth groups (n = 1188) and one female elite group (n = 180) was reviewed. The male youth players were divided into groups according to level, U-16, J-18 and J-20. Second, the relationship between distribution of birth date and performance, measured by points, goals, assists and plus-minus, was investigated. Results showed an over-representation of players born early in the year within all four groups, indicating that RAE is evident among both male youth and female hockey players in Sweden. Regarding the relationship between birth date and performance measures none reached statistically significant levels. Results are adding to the evidence of RAE among male youth players and also indicating that RAE exists among female elite players. The result of RAE among females supports Delorme and Raspauds (in press) findings, although interpretations of the result must be cautious due to the small sample size. They also provide a new dimension, RAE and performance measures, which according to results from this study indicate that players born early in the year do not perform better then players born late in the year. Results indicate that ice-hockey players are selected on criteria beyond their own control, which interferes with guidelines from the Swedish Sports Confederation, to provide equal opportunities and "Sports for All". Consequences of this discrimination will be discussed.

References
Delorme, N., & Raspaud, M. (in press).The relative age effect in young French basketball players: a study on the whole population. Scand J Med Sci sports.
Musch, J., & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. Dev Rev, 21, 147–167.
Thompson, A. et al. (1991). "Born to play ball": The relative age effect and major league baseball. Sociol Sport J, 8, 146–151.

THE CONNECTION OF SPORT STACKING AND EYE-HAND COORDINATION IN YOUNG EXPERTS

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Introduction: Sport stacking as a sport is developing fast. In the stacking community it is assumed that sport stacking promotes among other things eye-hand coordination and concentration. Till now only a few studies have been conducted in this regard (e.g. Udermann et al., 2004, Hart & Bixby, 2005). There exist no studies concerning the performance structure of sport stacking or the relevance of different motor abilities. It seems plausible to assume that eye-hand coordination is an important ability in the context of sport stacking. If eye-hand coordination has an effect on the stacking performance has not been investigated till now. The purpose of the following study is to analyse if there is a connection between eye-hand coordination and stacking performance.

Methods: We analysed 17 participants (6m, 11f) of the Sport Stacking World Cup 2007. Their age ranged from 11 to 15 years (mean=13.24, SD=1.48). All of them have at least a three-year expertise in stacking and practice three hours or more per week. To test the eye-hand coordination we used two rather general tests of the motor performance series by Schoppe (MLS, Neuwirth & Benesch, 2005). Furthermore we developed a rather specific "stack test" based on the "soda pop test" of Hoeger & Hoeger (2004). The reliability of this test was proved using a sample of 26 subjects (11m, 15f; 26,5 ± 6,2 yrs.). All tests were accomplished with the dominant (dh) and non-dominant (ndh) hand. Finally those test results have been compared to each other and to the performance in the three Stacking disciplines (3-3-3-Stack, 3-6-3-Stack and Cycle-Stack) using Pearson correlation statistics.

Results and Discussion: The test-retest-reliability indicates, that the Stack Test is reliable (dh: rtt=.81-.90, $p<.01$; ndh: rtt=.78-.89, $p<.01$). There are no correlations between the MLS tests and the Stacking disciplines. For the stack test performed with the dh we found significant correlations with the 3-6-3 ($r=.70$, $p<.01$), the Cycle ($r=.53$, $p<.05$) and no correlation with the simpler 3-3-3-Stack ($r=.23$, $p>.05$). We found no correlations for the ndh. There are also no correlations between the MLS and the Stack Test. Besides other things these findings indicate that for stacking-experts the non-specific eye-hand coordination does not have a performance defining influence. Furthermore the results denote that the eye-hand coordination of experts seems to be a task specific ability or that the eye-hand coordination adapts in a task specific way within the training process.

References
Hart, M. A. & Bixby, W.R. (2005). Research Quarterly for Exercise and Sport, 76 (1) Supplement, p. A-57.
Hoeger, W. W. K. & Hoeger, S. A. (2004). Principles and labs for fitness and wellness. (7th ed.). Belmont, CA: Wadsworth/Thomson Learning.
Neuwirth, W. & Benesch, M. (2005). Motor Performance Series, version 25.00. Mödlingen: Schuhfried.
Udermann, B. E., Murray, S. R., Mayer, J. M. & Sagendorf, K. (2004). Perceptual And Motor Skills, 98, 409-414.

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IS BICARBONATE A PERFORMING ENHANCING DRUG?

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Introduction: During past years numerous studies analysed the effects of bicarbonate loading on performance. These studies postulate different effects of bicarbonate on blood lactate concentrations and performance of exercise bouts of different durations. Purpose of the present study was to determine the effects of bicarbonate on blood lactate accumulation, metabolism and performance. To visualize the effects of HCO3 our aim was to exhaust the "normal" in-vitro buffer capacity by short all-out intervals.

Methods: 8 male athletes (27.4 ±6years, 182.3 ±8cm, 75.6 ±9kg, 67.9 ±4ml/kg/min) performed two seperated sessions each consiting of four 30 sec lasting bike sprints on a cycle ergometer. Between the sprints subjects remained in a sedentary position on the cycle ergometer for 5 min. The sessions started with a warming up of 10 minutes at an intensity of 1.5 Watt/kg. Subjects ingested either 0.3 g/kg of sodium bicarbonate (NaHCO3) or 2 g of a Placebo (P) (calcium carbonate) diluted in 0.02 ml/kg of water over a 90 min resting period before the warming up started. Arterialised capillary blood samples (115µl) were taken from the hyperemized earlobe before ingestion, post ingestion, after the warm up and during the rest periods between each bout (30˝, 4´).

Results: Prior the ingestion, pH and [HCO3] did not differ between the two interventions ((NaHCO3) vs. (P), 7.39 ±0.02 vs. 7.39 ±0.01, 24.6 ±0.8 mmol/l vs. 24.6 ±1.4 mmol/l). The pre exercise pH and [HCO3] (post warming up (WU)) were significantly increased after ingestion ((NaHCO3) vs. (P) 30.7 ±1.3mmol/l vs. 25.4 ±1.3mmol/l, 7.46 ±0.01 vs. 7.40 ±0.01). At the end of the trials the pH was significantly lower for the P condition (7.09 ±0.04 vs. 7.16 ±0.02). At the end of the tests lactate values showed significant differences between P (16.3 ±5.8mmol/l) and NaHCO3 (20.3 ±6.6mmol/l).

The mean power (MP) showed significant differences between both conditions. During the first and the second bout performance was nearly identical (1st bout: (NaHCO3) 768 ±219W vs. (P) 769 ±250W, 2nd bout: 697 ±203W vs. 698 ±224W). The performance during the third and the fourth bout were significantly lower in the P intervention (third bout: 632 ±197W vs. 581 ±213W, fourth bout: 606 ±209W vs. 536 ±184W).

Discussion: The results of our study show significantly higher MP values during the 3rd and the 4th test after bicarbonate supplementation. Lactate is transported in a symport with H+ ions by monocarboxylate transporter proteins. Bicarbonate which does not enter the muscle therefore increases the concentration gradient of H+ ions between the muscle and the blood causing a greater efflux of H+ ions out of the muscle accompanied by lactate into the blood. The supplementation seems not to increase only the 'in vitro' buffer capacity but also the 'in vivo' buffer capacity, which is the ability of a cell to regulate pH. It can be speculated that hence the muscle is capable of maintaining performance for a longer period of time.

HEART RATE VARIABILITY IN OBESE ADOLESCENTS

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Introduction: Obesity is an important risk factor for cardiovascular disease and obesity rates are increasing in all age categories including adolescents. Autonomic dysfunction is common in obese adults and adolescents. Heart rate variability (HRV) is a popular means of characterizing the autonomic nervous system since HRV values outside of the normal range are predictors of cardiovascular morbidity and mortality. The purpose of this investigation was to test the hypothesis that lifestyle modification therapies would positively affect frequency domain indices of HRV in obese adolescents. Methods: 34 Adolescents (aged 11-18) were recruited from an obesity rehabilitation centre (Maison d'enfants la beline, Salins les Bains, France). Treatment at the centre included dietary and psychological counseling as well as access to a variety of daily physical activities and medical intervention for co-morbidities. 17 adolescents followed this treatment plan and 17 attended supervised cycle exercise sessions in addition to the normal treatment. Before and after 8 weeks of exercise (2 weeks familiarization, 6 weeks training) heart rate was collected during 5 minutes of quiet, seated rest. Results: Power spectral analysis of RR intervals before and after the intervention period revealed that there were no significant changes in any frequency domain index of HRV ($p > 0.05$). Conclusion: Contrary to our hypothesis treatment for obesity did not improve HRV in adolescents. This work was funded by the Lawson Health Research Institute.

KINETICS OF O2 UPTAKE AND MUSCLE DEOXYGENATION DURING MODERATE AND SUPRA MAXIMAL INTENSITY CYCLING EXERCISE IN HUMANS

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Introduction: It is not still clear whether V'O2 kinetics at the onset of square-wave supra maximal (SM) exercise is faster (Hebestreit et al., 1998) or slower (Barstow and Molè, 1991, Hughson et al, 2000) than during moderate (M) intensity exercise. It has been also shown that muscle capillary perfusion response may be substantially slower than that of pulmonary gas exchanges and cardiovascular O2 delivery (Harper et al., 2006). As such, it may limit the V'O2 kinetics during exercise performed above peak O2 uptake. Therefore, the aim of this study was to analyse in parallel V'O2 kinetics and muscular deoxygenation responses at the onset of M and SM square wave exercise in humans.

Methods: 14 active male subjects (26 ± 5 yr; 175 ± 6 cm; 73 ± 5.7 Kg; V'O2max 4.13 ± 0.36 L min-1) were studied at the onset of square-wave cycling exercise of M (80% of maximal aerobic work rate) and SM (120% of maximal aerobic work rate) intensities.

B-by-B V'O2 at the mouth and muscle oxygenation of the right vastus lateralis were continuously measured (NIRS).

V'O2 kinetics at the onset of exercise was described by using two- or three-component exponential model, whereas that of the deoxygenated hemoglobin concentration ([HHb]) was described by using mono- or two-component models (DeLorey et al., 2003). This allowed calculating the mean response time (MRT) of the responses (McDonald et al., 1997).

Results: Steady state V'O2 during M corresponded to 67.8% of V'O2max; at the end of SM it equalled 95.4 % of V'O2max.

MRT of V'O2 kinetics during M was not significantly different (38.6 ± 10 s) from that found in SM (MRT 36.9 ± 9.5 s). MRTs of [HHb] kinetics were not significantly different between the two exercise conditions: M = 17.6 s ± 5.7; SM = 19.7 s ± 14.8.

Discussion: V'O2 kinetics did not differ in the two exercise modalities. These findings partially agree with of Hebestreit et al. (1998) who observed a faster V'O2 kinetics during SM exercise. However, the fitting procedure may have yielded a spuriously fast V'O2 response of SM exercise (Hughson et al, 2000). [HHb] response was similar to those described during M and severe intensity exercises (DeLorey et al., 2003, Grassi et al,, 2003). The low MRT values of [HHb] kinetics are compatible with a slow adaptation of muscular capillary blood flow at the onset of exercise (Harper et al., 2006). Nevertheless, this phenomenon, coupled with the large O2 request, did not seem to limit O2 uptake kinetics during SM exercise.

References

Barstow TJ, Molè PA. (1991). J Appl Physiol 71: 2099 - 2106.

Grassi B, Pogliaghi S, Rampichini S, Quaresima V, Ferrari M, Marconi C , Cerretelli P. (2003) J Appl Physiol 95: 149-158

Harper AJ, Ferriera LF, Lutjemeier BJ, Townsend DK, Barstow TJ (2006) Exp Physiol 91: 661 - 671.

Hebestreit H, Kriemler S, Hughson RL, Bar-Or O. (1998) J Appl Physiol 85: 1833 - 1841.

MacDonald M, Pedersen PK, Hughson RL. (1997) J Appl Physiol 83: 1318 - 1325.

DeLorey DS, Kowalchuk JM, Paterson DH. (2003) J Appl Physiol 95: 113-120.

A COMPARATIVE STUDY OF SKIN BLOOD FLOW AND SWEATING RESPONSES IN CYCLISTS OF DIFFERENT AGES DURING UPRIGHT AND SUPINE CYCLING.

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Introduction: Age related impairment in thermoregulation has been reported to be a result of a diminished capacity and/or sensitivity of the sweating response. There is evidence to suggest skin blood flow (SBF) is restricted in older adults through decreased vasodilation and splanchnic vasoconstriction. During exercise in the older trained cyclist, a diminished SBF response may be compensated for by an increased reliance on sweating. This is somewhat analogous to the onset of exercise when vasodilation is delayed and the increase in body temperature stimulates a compensatory increase in sweating. Comparing SBF and sweat responses during upright exercise and supine exercise, where SBF has been shown to increase 1, may potentially identify the relative contribution of SBF and sweating to thermoregulation in young and older trained cyclists.

Method: An older (50-70yrs, n=4) and younger (age 20-35yrs, n=4) group of highly trained male cyclists were recruited to the study. Testing was performed on an electromagnetically braked cycle ergometer modified to be used in the upright and supine positions. Each subject completed a VO2max test in the upright and supine positions, before 3 cycling sessions of 60mins in the same hot environmental conditions (35oC, 40%RH). The 3 heat tests varied in cycling position and intensity: 1) Cycling upright (U) at 70% Upright VO2max, 2) Cycling supine (SU) at 70% Upright VO2max, 3) Cycling Supine (SS) at 70% Supine VO2max. Rectal temperature (Trec), skin temperature (Tsk), Whole body sweat rate (Swb), Local sweat rate (Swl) and skin blood flow (SBF) were measured throughout each of the 3 exercise heat tests.

Results: All subjects completed the 60mins in the upright position but 5 could not complete the SU test (Y=4, O=1) and 2 could not complete the SS test (Y=2). Final Trec, Tsk and SBF values in the U, SU and SS heat tests were similar between the 2 age groups. Final Swl was similar in the U (1.56 ±0.24 mg.min-1.cm2, 1.65 ±0.42 mg.min-1.cm2), SU (1.39 ±0.19 mg.min-1.cm2, 1.39 ±0.26 mg.min-1.cm2) and the SS test (1.37 ±0.29 mg.min-1.cm2, 1.31 ±0.33 mg.min-1.cm2) for the young and older groups respectively. Swb was greater in the younger than the older group respectively for the U (1.91 ±0.29 L.hr-1, 1.62 ±0.19L.hr-1), SU (2.16 ±0.48L.hr-1, 1.68 ±0.13L.hr-1) and SS (2.09 ±0.39L.hr-1, 1.59 ±0.20L.hr-1) heat tests. Tsk and SBF values were higher and Swl lower for both age groups during the supine tests when compared to the upright test. No difference in Swb was observed between upright and supine tests.

Discussion:

Preliminary results suggest no observable differences in skin blood flow or sweating response in highly trained older and younger cyclists, in either upright or supine cycling positions. If age related differences do exist they may need a protocol that exposes cardiovascular limitations such as the decline in VO2max as a consequence of sedentary living or an inherent outcome of ageing.

USING META-ANALYTICAL AND EXPERIMENTAL APPROACHES TO EXPLORE WHETHER BLOOD PRESSURE STATUS REALLY IS THE MOST IMPORTANT DETERMINANT OF POST-EXERCISE HYPOTENSION

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Introduction: It has been maintained, both at the individual (Pescatello et al., 2004a) and whole-study (Pescatello and Kulikowich, 2001) levels, that blood pressure (BP) status is the most important determinant of post-exercise hypotension. This claim is incorporated into the ACSM position on hypertension (Pescatello et al, 2004b) and is based on reports that exercise-mediated changes in BP are correlated to BP measured pre-exercise (PRE). Recently, this analysis has been questioned on the basis of potential regression-to-the-mean (RTM) effects (Atkinson et al., 2005). Past syntheses of study results have also not involved standard meta-analytical weighting. The present aim is to examine the degree to which BP status moderates post-exercise hypotension, via a novel combination of formal meta-analytical and experimental approaches, while controlling for RTM.

Methods: As part of a systematic review of 67 studies (n=1155 participants), the reported exercise-mediated changes in daytime and nocturnal BP were meta-regressed against PRE, and against the mean of pre- and post-exercise BP, which is an index of BP status not prone to RTM. In a related experiment, 32 participants cycled for 30 min at 70% peak oxygen uptake (VO2peak). Systolic and diastolic BP, and mean arterial pressure (MAP) were measured (Portapress) at baseline and for 20 min following exercise. Relations between BP change, BP status and other potential moderators were described with regression analyses. Data are described as mean (95% confidence limits).

Results: The meta-analysed reductions in BP ranged from 3 to 7 mmHg, with larger declines found for studies with ambulatory BP monitoring periods of <24 h. For daytime BP, the regression slopes between BP status and change were ≈ -0.2 (P<0.00005) and consistent between PRE and mean BP status. For nocturnal BP, the relationship between BP status and change was clearly attenuated when RTM was controlled. In the experiment, the regression slope between PRE and change in MAP was -0.3 (0.0 to -0.6) mmHg (P=0.03), but this relationship did not exist when mean BP was used (P=0.99). Moreover, use of mean BP led to other moderators, such as age, BMI and VO2peak being statistically significant moderators of BP change (P<0.05).

Discussion: These data, collected at whole-study and individual levels, indicate that BP status is not as important as was thought in determining the degree of post-exercise hypotension, especially in past studies in which the follow-up period extended over the nocturnal period. This finding, together with our suggestion that other individual factors might be important moderators of post-exercise hypotension, should be used to update position statements on post-exercise hypotension.

Atkinson et al. (2005). J Hypertens, 23, 1271.

Pescatello and Kulikowich (2001). Med Sci Sports Exerc, 33, 1855-1861.

Pescatello et al. (2004a). J Hypertens, 22, 1881-1888.

Pescatello et al. (2004b). Med Sci Sports Exerc, 36, 533-553.

DOES CYCLING AFFECT MOTOR COORDINATION OF THE LOWER LIMBS DURING RUNNING TO EXHAUSTION IN WELL-TRAINED TRIATHLETES?

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PURPOSE – Triathletes report incoordination when running after cycling. In recent study, Chapman et al. [1] have tried to measure this on one muscle: the tibialis anterior (TA). They showed that TA recruitment does not change during cycling to running transition. However, running and cycling imply the coordination of many muscles, and lots of works showed that fatigue affect not only the TA but also the other muscles of the lower limb. Within this framework, the aim of this study was to analyse the effect of cycling on the locomotor pattern during running to exhaustion from measurements of the electromyographic surface activity of nine muscles of the lower limb.

METHODS – We compared surface electromyographic (EMG) recording from nine muscles of the lower limb (biceps femoris (BF), semitendinosus (SM), vastus lateralis (VL), the rectus femoris (RF), the vastus medialis (VM), the gastrocnemius lateralis (GL), the gastrocnemius medialis (GM), soleus (SOL) and tibialis anterior (TA)) during running to exhaustion (Tlim) immediately after 30min of cycling with a control-run (CR) test (no prior exercise). For each running test realised on a treadmill, intensity corresponding to the one measured at the second ventilatory threshold during a previous incremental running test. Three periods were compared: 75% of the five minute of the CR, 5% and 95% of the total time of the Tlim.

RESULTS – The magnitude of the mean EMG RMS over the complete stride for the SM decrease significantly (p<0.05) between CR and the 5% and 95% of the Tlim. The mean EMG RMS for the GM decrease significantly (p<0.05) from 5% to 95% of the Tlim. The k values resulted from the cross-correlation technique [2] indicated that the activity of all muscles measured were not shifted in the stride but variability in muscle recruitment between athletes is great.

CONCLUSION – Our results suggest that cycling does not influence running pattern of the main muscles of the lower limbs for well-trained population. However, using a treadmill modifies the EMG pattern of leg muscles [3] and could explain that. Moreover, contrary to previous studies, the leg muscle activity during running is not influenced neither by cycling nor fatigue except for SM and GM muscles. These results suggested that for training athlete locomotor pattern does not change over short period of running on treadmill even if it was conducted until exhaustion.

BIBLIOGRAPHY

1 Chapman AR, Vicenzino B, Blanch P, Dowlan S, Hodges PW. Does cycling effect motor coordination of the leg during running in elite triathletes? J Sci Med Sport. 2008. 11(4):371-80.

2 Dorel S, Drouet JM, Couturier A, Champoux Y, Hug F. Changes of pedalling technique and muscle coordination during an exhaustive exercise. Med Sc Sports Exerc. 2009. In Press

3 Wank V, Frick U, Schmidtbleicher D. Kinematics and Electromyography of lower limb muscles in overground and treadmill running. Int J Sports Med. 1998. 19: 455-461.

EFFECTS OF A SINGLE MANUAL MASSAGE TREATMENT ON THE SYMPTOMS OF EXERCISE-INDUCED MUSCLE DAMAGE IN YOUNG ACTIVE WOMEN

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Effects of a single manual massage treatment on the symptoms of exercise-induced muscle damage in young active women

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Introduction: Manual massage is a widely used treatment strategy for athletes preparing for, or recovering from athletic activity. Recent studies reporting the efficacy of massage on exercise-induced muscle damage however are equivocal. The aim of this study was to establish the effectiveness of a single bout of manual massage immediately following exercise on recovery from exercise-induced muscle damage (EIMD).

Methods : Sixteen physically active female volunteers (age 21.3 (1.6) y; height 1.66 (0.04) m; body mass 64.4 (7.3) kg) completed 5 x 8 min bouts of downhill running at -10% gradient and 12 km/h to induce muscle damage. Volunteers were randomly assigned to a control (n = 8) or treatment group (n = 8). A 30-min sports massage was administered by a qualified sports masseur to the legs of participants in the treatment group immediately following downhill running. Indicators of muscle damage (creatine kinase activity, perceived soreness, and maximal voluntary contraction of the quadriceps) were assessed immediately prior to and 1, 24, 48, 72, and 96 h following damaging exercise.

Results: Downhill running exercise had a significant (p ≤ 0.05) effect on all indices of exercise-induced muscle damage. No treatment effect was observed on creatine kinase activity or perceived soreness. However, the percentage peak torque decrement was moderated by the massage treatment (1 h, 81% v 91%; 24 h, 83% v 89%; 48 h, 82% v 87%; 72 h, 84% v 93%; 96 h, 90% v 97% following damaging exercise for the control and treatment groups respectively).

Discussion: Although manual massage treatment had no significant effect on perceived soreness or creatine kinase activity, it reduced the decrement in strength following EIMD. The positive effect of the massage treatment may be due to the early intervention in the inflammatory process, limiting the formation of oedema, and promoting an elongated period of neutrophil elevation, aiding the removal of cellular debris. Practically, athletes involved in multiple events in a short space of time may find performance is less adversely affected by a recovery strategy of this nature.

Keywords: Exercise-induced muscle damage; Massage; Recovery

EFFECTS OF COMBINED ENDURANCE AND STRENGTH TRAINING ON MUSCLE STRENGTH AND MORPHOLOGY IN 40-70 YEAR OLD MEN AND WOMEN

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Introduction: Strength training improves maximal strength through several mechanisms, e.g. increased voluntary muscle activation and changes in muscle morphology (1), not only in young but also in older adults (2). However, the strength gains and hypertrophy may be compromised in high volume combined endurance and strength training in young adults (3). This study examined the effects of combined training on muscle strength, fibre size and composition in 40-70 year old men and women.

Methods : 30 male (57 (SD 7) yrs) and 47 female (51 (8) yrs) volunteers completed a 21-week training period of either strength training (S, men n=11, women n=16), endurance training (E, M n=7, W n=16) or their combination (SE, M n=12, W n=15). Measurements included maximal isometric bilateral force of the lower extremities (F), and maximal aerobic power (Pmax) in a bicycle ergometer test to exhaustion. Muscle biopsies were obtained from VL for analyses of muscle fibre type and CSA. Progressive total body strength training with loads up to 80 % of 1RM was performed twice a week. Endurance training was cycling twice a week with intensity ranging from moderate in steady pace sessions to near maximal in short intervals. The combined strength and endurance training included both training programs, resulting in a total of 4 weekly sessions.

Results: Men and women in SE increased their F by 19 (14) % and 19 (19) % ($p<0.01$), and Pmax by 12 (7) % and 18 (9) % ($p<0.001$), respectively. In S the changes in F were similar, 15 (10) % and 22 (15) %, whereas Pmax only increased by 6 (4) % and 8 (11) % ($p<0.01$). In E Pmax increased 11 (7) % and 18 (8) % in men and women, but F did not change significantly. The CSA of type II muscle fibres increased ($p<0.05$) in S in both men and women, while in E only in women ($p<0.01$). The area of type IIA fibres increased in the male S and the female E group. No significant changes in muscle fibre size were observed in SE. The relative proportion of IIA fibres increased and IIAX decreased in both men and women in S. The proportion of IIAX also decreased in the female SE group ($p<0.01$).

Discussion: Strength training in both men and women, and endurance training by high intensity cycling in women only, elicited an increase in the CSA of type II muscle fibres in previously untrained older subjects. However, moderate volume combined training did not lead to significant increases in muscle fibre size in men or women, regardless of the same amount of strength training performed. This finding indicates possible interference of muscle hypertrophy when strength and endurance training are combined over a prolonged training period even in older subjects. Nonetheless, strength performance was improved with combined training similarly as with strength training alone possibly due to neural adaptations.

References

1. Aagaard P et al. (2001). J Physiol 534, 613-623.

2. Häkkinen K et al. (2001). Acta Physiol Scand 171, 51-62.

3. Kraemer WJ et al. (1995). J Appl Physiol 78, 976-89.

HAEMOGLOBIN MASS, HCT AND [HB] THROUGHOUT A 6 D UCI PROTOUR CYCLING RACE

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Introduction: Haemoglobin concentration [Hb] and haematocrit (Hct) generally decrease in response to multiple days of cycle racing due to a plasma volume expansion. In contrast, preliminary evidence suggests that Haemoglobin mass (tHb) remains stable during short stage races. The aim of this study was to document the variability of tHb, [Hb], and Hct in cyclists participating in a UCI ProTour event.

Method: tHb was measured using the carbon monoxide rebreathing test in 6 male cyclists (CYC; Mean ± SD age 24 ± 5y, height 179 ± 5cm, mass 71 ± 4kg) and 5 controls (CON; 31 ± 6y, 179 ± 6cm, 74 ± 6kg) throughout an international calibre stage race (Tour Down Under, UCI Pro Tour). The 6-day race covered 802 km in 19.5 h of racing during the Australian summer (24-39 C). tHb was measured on 7 consecutive days. Results from the first two tests were averaged to establish Baseline. On race days, tHb was measured daily within 4 h of the stage finish. No measures were performed on the last race day. Early morning, fasted venous blood samples were collected 2 d before the start of the tour (D0), after 2 d of racing (D4) and prior to the last stage (D6) in accordance with UCI guidelines. Venous blood was collected into an EDTA Vacutainer, and analysed within 12 h of collection for Hct and [Hb]. The reliability of the tHb technique was presented as a Typical Error (TE). Mean effects of log-transformed data were estimated via the unequal-variances t statistic computed for change scores between tests. A coefficient of variation (CV) was calculated for each subject to assess within-subject daily variability.

Results: TE for tHb at Baseline (n=11) was 1.3%. tHb of the CYC remained within ± 1.9% (20g) of baseline (mean ± SD; 997 ± 67g) throughout the tour (range: -1.9% D5 to 1.3% D2). Mean tHb of CON remained within 0.5% (5g) of baseline (D0 = 901 ± 113g) during the same period. There were no substantial differences in the daily change scores between CYC and CON. The mean CV for tHb during the tour was 1.5% in CYC vs. 1.2% in CON. Individual CVs ranged from 0.3-2.3% in CYC and from 0.7-1.7% in CON. CYC Hct (D0 = 0.44 ± 0.02) decreased by 5.7 ± 2.9 % at D4 and 8.1 ± 2.8 % at D6. However, CON Hct (D0 = 0.46 ± 0.01) was similar on D4 but 3.3 ± 2.6% lower on D6. CYC [Hb] (D0 = 154 ± 6.4 g.L-1) decreased by 7.7 ± 3.8% at D4 and 9.7 ± 3.2% at D6. CON [Hb] (D0 = 149 ± 9.6 g.L-1) remained similar on D4 and D6. The decrease in [Hb] at D6 was substantially lower in CYC vs CON ($p=0.003$).

Discussion: Similar to previous observations, a warm 6 d stage race can decrease Hct (~8%) and [Hb] (~10%) in professional road cyclists. In contrast, the individual CV for tHb was less than 2.5% in all cases suggesting that tHb remains relatively stable. These data indicate that a change from baseline values by as much as 2.5% during a 1 week stage race could be considered "normal". Further research is required to establish the normal variability of tHb during 1-3 wk stage races in elite cyclists.

THE DEPLETION OF A FIXED ANAEROBIC ENERGY STORE DOES NOT EXPLAIN TASK FAILURE DURING HIGH-INTENSITY EXERCISE

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THE DEPLETION OF A FIXED ANAEROBIC ENERGY STORE DOES NOT EXPLAIN TASK FAILURE DURING HIGH-INTENSITY EXERCISE

Introduction: Exercise at intensities above VO2max can only be sustained for several minutes. As the energy required to exercise at such intensities can, by definition, not be generated solely by the aerobic system, the cause of task-failure has often been attributed to the exhaustion of anaerobic energy stores. This is the basis of the critical power (CP) model, which states that, when the required power exceeds the maximum power of the aerobic system (the so-called CP), task failure will coincide with the depletion of a fixed anaerobic energy store. The obvious corollary of this is that following task failure, subjects will not be able to continue exercising unless the power output is decreased to below the CP. The purpose of the present study was to test this hypothesis.

Methods: Seven healthy males each performed an incremental test on a cycle ergometer to determine their power at VO2max (P100%), followed by a familiarisation trial and 4 time-to-task failure (TTF) tests at 120% of VO2max (P120%). The first 3 TTF tests were identical and used to determine TTF at P120% (TTF_120). To ensure that TTF_120 represented the maximum performance of the subjects at this intensity, only the best TTF of the three tests was used. The last TTF test was similar to the first three, but the subjects were now instructed to continue exercising until TTF_120, if possible, and at the moment they reached this time, power output was decreased to P105% and subjects were asked to continue again as long as possible (TTF_105). Capillary blood was sampled before each test, at task failure, and after 5 min of recovery at 60W.

Results: All subjects were able to reach TTF_120 (186 ñ 32 s) during the final TTF test. Six of the subjects were able to continue exercising at P105% for over 25 s (mean TTF_105 was an additional 61 ñ 48 s). There was no significant difference between the [BLa] of TTF_120 and TFT_105 measured during rest (0.9 ñ 0.2 vs. 0.9 ñ 0.1 mmol/L) or at task failure (13.9 ñ 2.7 vs 14.9 ñ 3.2 mmol/L), but [BLa] was significantly different after the 5 min of recovery (14.3 ñ 1.9 vs 15.6 ñ 2.1 mmol/l). Also the heart rate was significantly higher after TTF_105 (185 ñ 9 bpm) than after TTF_120 (179 ñ 8 bpm). There was no significant difference between the VO2 after TTF_120 and TTF_105 (49.0 ñ 5.6 vs. 51.3 ñ 4.0 ml/kg/min).

Discussion/Conclusions

After cycling to task failure at P120%, six of the seven subjects were able to continue exercising at P105%. These results cannot be explained by the critical power model, since this model predicts that the anaerobic work capacity must have been depleted at TTF_120, making it impossible to continue exercising at any intensity above CP (i.e., requiring a further anaerobic contribution). Thus, our results suggest that the depletion of a fixed anaerobic energy store does not explain task failure during high-intensity exercise.

HANDGRIP STRENGTH AND FOREARM VASCULAR FUNCTION IN PATIENTS WITH RHEUMATOID ARTHRITIS

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INTRODUCTION: Rheumatoid arthritis (RA) is associated with compromised arterial function (AF) attributed to endothelium-dependent and independent structural and functional changes. Additionally, physical activities (PA) play a critical role in enhancing vasodilatory capacity subsequent to improved fitness level (FL) in healthy and diseased populations. Despite the accumulating evidence describing the benefits RA patients gain from participating in regular PA, the relationship between FL and AF in RA patients is not clear. Accordingly, the current study examined the relationship between maximum handgrip strength (MHGS) and AF measures in RA patients.

METHODOLGY

Measures of AF and MHGS were examined in 22 RA patients (PT) and 13 healthy controls (CT) with age range (17-49). Dominant forearm arterial inflow (BF), at rest (RBF) and after 5 minutes of upper arm occlusion (IBF), were obtained using strain gauge plethysmography. Subsequently vascular resistances (VR) at rest (RVR) and after occlusion (IVR) were calculated with mean arterial pressure/BF. Average MHGS was calculated after 3 consecutive allout gripping trials with hand dynamometer. Student t-tests were used to compare forearm AF measures and MHGS between PT and CT groups whereas measures of forearm AF relationships with MHGS were evaluated using Pearson correlation.

RESULTS: Forearm RBF (CT: 3.8 ± 0.8 vs. PT: 3.0 ± 1.2 ml/100ml/min; p=0.03), and IBF (CT: 31.7 ± 7.3 vs. PT:18.0 ± 5.9 ml/100ml/min; p=0.0001) were greater in the CTs, whereas RVR (CT: 23.6 ± 3.9 vs. PT: 33.0 ± 15.4 U; p=0.01), and IVR (CT: 2.8 ± 0.5 vs. PT: 5.9 ± 3.9 U; p=0.001) were less in the CTs. Similarly, MHGS in the CTs was greater than in the PTs (CT: 32.5 ± 13.4 vs. PT: 21.3 ± 11.3 Kg; p=0.02). Finally, MHGS correlated positively with RBF (r=0.5; p=0.002), and IBF (r=0.7; p=0.0001) as well as negatively with RVR (r=- 0.3; p=0.07), and IVR (r=- 0.4; p=0.04).

DISCUSSION: The results confirm previous studies indicating diminished AF and MHGS in RA PTs. However the relationships between forearm AF and MHGS suggests that FL contribute to enhancing the vasculature in RA PTs. Additionally the association between forearm AF measures and MHGS suggest that AF is locally controlled in RA PTs.

14:15 - 15:15

Poster presentations

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MODULATION OF HOFFMANN REFLEX: THE ROLE OF GROUP III-IV MUSCLE AFFERENT FIBERS

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Introduction: The Hoffmann (H) reflex is frequently used to explore the spinal sensorimotor plasticity in response to physical exercise or to training. However, neural mechanisms responsible of H-reflex modulation after exercise remain unclear. Numerous studies suggested

that one pathway able to modulate H-reflex could originate from group III and IV afferent fiber activation. For the first time, we have identified directly the effect of metabosensitive group III-IV muscle afferent fibers on H-reflex changes in animal quadriceps and tibialis anterior muscles.

Methods: After identification of KCl doses able to elicit a maximal activation of group III and IV afferent fibers, we evoked consecutive H-reflexes on rat quadriceps or tibialis anterior muscles. Consecutive maximal H-reflexes (inter-stimulus: 10 s) and, then, consecutive evoked Mmax were elicited before and after intra-arterial KCl injections (0.5 mL). A capsaicin-treated group (suppression of thin muscle afferent) followed the same procedures. The Hmax/Mmax ratio and the corresponding MHmax/Mmax ratio were measured.

Results: A peak discharge was found after KCl injection at the dose of 10mM (+3.27±0.47 Hz, 108.9±1.2 % of the corresponding reference discharge). The Hmax/Mmax ratio was significantly attenuated after the KCl injection (-23.9±4.6% of the corresponding reference ratio, $p<0.01$) in quadriceps muscle. In capsaicin-treated rats, no significant decline in Hmax/Mmax ratio was observed after the KCl injections. No difference was observed in MHmax/Mmax ratio in all animals.

Discussion: Metabosensitive group III-IV afferent fibers from quadriceps muscle exerted an inhibitory effect on quadriceps H-reflex excitability. The Hmax/Mmax ratio declines in response to KCl injection reinforce the hypothesis that these thin muscle afferent fibers could exert reflex inhibition of α-motoneurons when metabolites accumulation in muscle occurs. This mechanism could explain the H-reflex decline reported during and after exhaustive exercises (Garland, 1991; Duchateau et al., 2002; Dousset et al., 2007).

References

Dousset E, Avela J, Ishikawa M, Kallio J, Kuitunen S, Kyrolainen H, Linnamo V & Komi PV. (2007). Bimodal recovery pattern in human skeletal muscle induced by exhaustive stretch-shortening cycle exercise. Medicine and science in sports and exercise 39, 453-460.

Duchateau J, Balestra C, Carpentier A & Hainaut K. (2002). Reflex regulation during sustained and intermittent submaximal contractions in humans. The Journal of physiology 541, 959-967.

Garland SJ. (1991). Role of small diameter afferents in reflex inhibition during human muscle fatigue. The Journal of physiology 435, 547-558.

CAN BIGOREXIA BE CONSIDERED AN EATING DISORDER?

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INTRODUCTION. Bigorexia, a frequent disorder among bodybuilders, is not yet included in actual classification systems. The aim of the study is to evaluate the possible association between exercise, body image disorders and eating disorders in bodybuilders and to compare to over-exercised women and to eating disordered women.

METHODS. 134 voluntaries who habitually train (86 men and 48 women) and 20 eating disordered women were enrolled and interviewed by observators with appropriate training in this field. All subjects have been evaluated using Eating Disorder Inventory-2 (EDI-2), Body Uneasiness Test (BUT), Muscle Dysmorphia Inventory (MDI) and a dieting and physical exercise behaviour questionnaire.

RESULTS. All women, patients (EDW) and over-exercised (OEW), would like to lose weight. The 55% of men would like to increase their weight (IWM) and the remaining to become thinner (DWM). IWM showed very significant differences from the other groups: they did not induce vomiting but they administrated themselves food integrators; there were any differences in the use of diuretics or laxatives between groups. Women (EDW & OEW) had higher mean values in EDI-2, body dissatisfaction and seemed to take care more about gaining weight than men (IWM & DWM) at BUT. In MDI the IWM showed the highest scores.

DISCUSSIONS. A similar behaviour has been observed in EDW, OEW and DWM regarding weight and body shape concerns. The behaviour of men bodybuilders to increase muscle mass seems very different and they risk becoming bigorexic. They consider the thinness as a physical defect: from the beginning, they habitually train until the training becomes a dependence looking for body perfectionism. Positive reinforcements are hyperproteic and hypolipidic diets and the use of anabolic substances. These results suggest to consider bigorexia a new cross disorder between eating and dysmorphic disorders.

REFERENCE

1 Chung B. Muscle dysmorphia: a critical review of the proposed criteria. Perspect Biol Med 2001;44(4):565-74.

2 Hildebrandt T, Schlundt D, Langenbucher J, Chung T. Presence of muscle Dysmorphia symptomology among male weightlifters. Compr Psych, 2006; 47:127-135.

3 Grieve FG. A conceptual model of factors contributing to the development of muscle dysmorphia. Eat Disord, 2007;15(1):63-80.

4 Bomber D, Cockerill IM, Rodgers S, Carroll D. Diagnostic criteria for exercise dependence in women. In British Journal of Sports Medicine, 2003;37, 393-400.

EFFECTS OF SUPINE POSITION WITH LOWER LIMB ELEVATED ON CARDIAC PARASYMPATHETIC REACTIVATION AFTER EXERCISE

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Introduction: We suggested supine floating after high and moderate intensity exercise could be increased the reactivation in cardiac parasympathetic which was inhibited by exercise. This is caused by increased venous return. At resting, supine position with lower limb elevated increase venous return. Purpose: The purpose of this study was to determine the effects of Supine position with lower limb elevated on cardiac parasympathetic reactivation after exercise. Methods: Seven healthy males volunteered for this study. Their mean age, height, and body weight were 22 ± 2 years (mean ± SD), 172.1 ± 6.5 cm, 64.5 ± 6.6 kg, respectively. All subjects signed an informed consent form prior to participation in this study. Subjects performed exercise with a cycle ergometer by 80 and 40% peakVO2 for 15 min., and recovered for 15 min. at supine position with elevation of lower limb (SELL condition) by 30 degree and at simple supine position (Control condition). Heart rate and cardiac autonomic nervous system activity assessed by heart rate variability (MemCalc method) were measured throughout experimental period. Cardiac parasympathetic nerve activity was evaluated by using high frequency (HF; 0.15-0.40Hz) in R-R intervals. HF domain was transformed into logarithmic values. We used the slope in regression line calculated by appearance time and peak of HF, as cardiac parasympathetic reactivation. Results and Discussion: Heart rate increased up to about 180 and 110 bpm during high and low intensity exercise period and was no significant differences between the SELL conditon and the Control condition, respectively. In high intensity exercise, log HF and slope in regression line in the SELL conditon was significantly higher than the Control condition, suggesting that elevation of lower limb at supine position may increase reactivation in cardiac parasympathetic nerv-

ous after exercise via the increased venous return during 0-5 min. recovery process. However, during 6-10 and 11-15 recovery period, there was no significant difference of log HF between the SELL condition and the Control condition. In high intensity exercise, there was no significant difference of log HF between the SELL condition and the Control condition. These data suggest increased cardiac parasympathetic nerve with high- intensity exercise may be improved early by elevated lower limb at supine position after high-intensity exercise. In conclusion, supine position with lower limb elevated after exercise may enhance the cardiac parasympathetic reactivation during recovery.

Reference: Kazuki Nishimura, Kazutoshi Seki, Kumiko Ono and Sho Onodera (2006); Effects of the Supine Floating on Rectal Temperature and Cardiac Parasympathetic Nervous System Activity after Exercise with a Cycle Ergometer. Japanese Journal of Aerospace and Environmental Medicine, 43(1), 11-18.

DYNAMICS OF OXYGEN CONSUMPTION AND WORKING MUSCLE OXYGENATION DURING EXERCISE WITH DIFFERENT LOAD PROFILES

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Cardio-respiratory indices respond to an abrupt increase of load with considerable time delays. These delays differ from one index to another. The goal of the study was to compare responses of cardio-respiratory system and oxygen consumption in working muscle during exercises with different load profiles.

7 endurance trained athletes gave their informed consent to participate in the experiment. VO2max and anaerobic threshold at blood lactate level 4 mmol/l (AT) were determined during ramp test on a cycling ergometer at the first day of an experiment. The next days the subjects performed two tests in random order. During the first test after 8 min warming up at 40% AT the load was abruptly increased up to 110% AT and then was gradually decreased during 4 min to the basic level of 40% AT. A reverse profile was used in a second test: gradual increase of load for the 4 min and then abrupt decrease to the initial level. Peak load and total mechanical work were the equal for both tests. oxygen consumption, HR, EMG activity of m. vastus lateralis, muscle oxygenation index (MOI) and deoxygenated hemoglobin (HHb) content in m. vastus lateralis were recorded continuously during the tests. Blood lactate concentration was measured every 30 s. In addition the subjective perception of exertion was evaluated for each exercise load.

EMG activity did not differ between loads with different power profiles. Total oxygen consumption and total number of heart beats during exercise and 2 min recovery period did not differ either. Peak values of oxygen consumption, HR, MOI and HHb were significantly ($p<0.05$) higher during exercise with gradual increment of load in comparison with abrupt load increase. At the same time peak lactate concentration in blood and subjective perception of exertion had a tendency ($p=0.09$ and 0.11) for an increase at exercise with a gradual load increment.

Thus during exercise with gradual load increment HR, the indices of oxygen consumption at muscle (HHb, MOI) and oxygen consumption of organism had enough time to adjust to load and recruitment of high-threshold muscle fibers at peak work intensities takes place under more aerobic conditions.

THE EFFECTS OF INCREASED VENTILATION DURING MODERATELY HEAVY AND MAXIMAL EXERCISE

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NORWEGIAN SCHOOL OF SPORT SCIENCE

Introduction: If the pulmonary ventilation is expressed in relation to the magnitude of oxygen uptake, it is 20 to 25 L per liter of oxygen at rest and during moderately heavy exercise. During maximal exercise it increases to 30 to 40 L per liter of oxygen (Åstrand et al. 2003). It takes some time before the ventilation reaches this ventilation demand. The aim of this study was therefore to make the subjects ventilate the ventilation demand from the start of the exercise, and see if there was any change in time to exhaustion. Furthermore, physiological parameters like arterial O2 saturation (SpO2), heart frequency (HF), VO2, VO2max and lactate concentration in blood [la] have also been studied.

Methods: 17 subjects, VO2 peak 4.16 ± 0.18 l/min (mean±SEM), performed all the tests running on a treadmill. On the first day of testing, the subjects performed a lactate threshold test, and a VO2max test. The second day they performed a performance test. All tests were completed two times, pre and post. The subjects performed the pre test without receiving any instructions considering ventilation. At post test they were asked to increase their ventilation from the start of the exercise, up to minimum of the ventilation demanded.

Results: The test time to exhaustion concerning the performance test increased from (mean±SEM) 316 ± 16.8 seconds (pre), to 342 ± 25.3 seconds (post) ($p=0.08$). SpO2 increased from pre to post in all three tests, with both significant ($p<0.05$) and non significant changes. HF tends to be lower at post test compared to pre test. At low and moderate intensity VO2 tend to decrease from pre to post. VO2max did not change from pre to post. From pre to post test [la] increased significant ($p<0.05$) at the performance test .

Discussion: The increase in time to exhaustion may be explained by the increased SpO2, since a high level of SpO2 is important to maintain an optimum oxygen delivery to the working tissue. The increase in [la] at the performance test can be explained by the increased time to exhaustion at the same test. Small or even lack of significant changes can be explained by the relative small number of subjects. It is also important to be aware that the subjects had a relative low aerobic capacity, which might have affected the Results: References

Åstrand et al (2003). Textbook of Work Physiology. (4 edition). New York: Human Kinetics

ESTIMATES OF VENTILATION FROM MEASUREMENTS OF RIB CAGE AND ABDOMINAL DISTANCES: AN INDIVIDUAL CALIBRATION PROTOCOL

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Preambule:

"The use of pulmonary ventilation as an index of energy expenditure (EE) has been proposed by Durnin and Edwards and by Sortorelli" [1]

Study objectives:
The purpose of this study is to validate a new device designed to measure ventilation (VE), tidal volume (VT), inspiratory time (TI), and expiratory time (TE) during daily life activities. The first part consists in establishing a calibration protocol (days 1 and 2), that takes into account the NEAT (Non Exercise Activity Thermongenesis [2]) components: sitting, standing and walking activities. The second part (day 3) evaluates the accuracy of this new device to measure VE, VT, TI and TE in these three different conditions.
Materials and Methods: Twelve healthy males (26.9 +/- 4.6 years) volunteered to take part in this study.
The calibration maneuvers (days 1 and 2) was made up of 3 successive sessions. The sitting and standing sessions were divided into 3 periods. During these 3 different periods the subjects were instructed to take breaths in a natural way, then while primarily using the rib cage and finally while primarily using the abdomen. The exercise session was composed of treadmill walking at 4, 5 and 6 km.h−1. A second session of measurements (day 3) was realized to apply and verify the validity of the calibration maneuvers. This second session consists of a sitting and a standing session at rest and a walking session on a treadmill.
The anteroposterior displacement of the rib cage and abdomen, and the axial displacements of the chest wall and the spine, were measured using two pairs of magnetometers (Nomics-WSL2, Belgium). VE was estimated from these four signals, and was simultaneously measured using a spirometer (SP304, Bioseb).
Results: A total of 1,439 breaths were analysed for resting conditions (sitting and standing) and 1,138 breaths were analysed for walking exercises. We compared VE, VT, TI and TE measured by magnetometers (VEmag, VTmag, TImag, and TEmag) with VE, VT, TI and TE measured by spirometer (VEspiro, VTspiro, TIspiro and TEspiro respectively). We found that VTmag was highly correlated with VTspiro in sitting (r^2=0.92) and standing position (r^2=0.94) at rest, and during walking exercise (r^2=0.90) for pooled data. TImag and TIspiro values and TEmag and TEspiro values also were highly correlated in sitting (r^2=0.99 and r^2= 0.97, respectively) and standing position (r^2=0.98 and r^2=0.96, respectively) at rest, and during walking exercise (r^2=0.96 and r^2=0.95, respectively). Finally, VEmag is predicted with an accuracy of 94%, 91% and 92% compared to VEspiro, during sitting, standing and walking session respectively.
Conclusion: This study revealed that this portable and non-invasive device provided a valid and reliable measure of VE and in fine an estimation of EE in free-living conditions and sports exercises.
[1] Amasa BF and Herman KH, (1959) JAP, 14(6), 891-93.
[2] Levine JA, Eberhardt NL and Jensen MD, (1999), Science, 283, 212-14.

HEART RATE DYNAMICS IN DIFFERENT LEVELS OF ZEN MEDITATION

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HEART RATE DYNAMICS IN DIFFERENT LEVELS OF ZEN MEDITATION
Introduction: The dynamic interactions among physiological rhythms imbedded in the heart rate signal can give valuable insights into autonomic modulation in conditions of reduced outward attention and voluntary responsiveness. Therefore, the aim of this study was to analyze the heart rate variability (HRV) and breathing behavior during Zen Buddhist meditation (Zazen).
Methods : Nineteen subjects with regular practice and variable experience in Zazen took part in this study. Data from heart rate and breathing were collected simultaneously during twenty minutes of quietly sitting meditation. Data analysis was performed using two methods: the Fast Fourier Transform, which reflects the strengths of the frequency components of the signal, and the Continuous Wavelet Transform, which decomposes a series into time-scale or time-frequency domains and allows for the identification of temporal changes of dominant modes of variability. We also did a Principal Components Analysis to distinguish the possible different cardiac responses among the participants.
Results: The principal components analysis has distinguished three different groups, with different HRV patterns. With more years of meditation, there is a tendency towards a coupling between the breathing and the rhythms underlying the low and very low frequency ranges of heart rate variability, producing a resonant peak in the frequency spectrum.
Conclusion: We found evidences that the evolution in Zen meditation can be characterized for specific patterns of cardiac variability. The evolution is coherent as regards the years of practice until certain level. Practitioners with more than 10 years of practice show different HRV patterns. The Wavelet Transform was more effective when identifying temporal patterns of behaviour during Zen meditation, especially in more advanced practitioners. This method shows that, even in no-characteristic RSA (Respiratory Sinus Arrhythmia) range, the respiration may modulate the HRV oscillations. As in Zazen the breathing is adjusted according to the mental process (quality of attention and focus), the cardio-respiratory interactions may play a very important role to understand the HRV dynamics in Zen meditation.

EFFECTS OF AN ACHILLES TENDON VIBRATION PROGRAM ON TRICEPS SURAE FORCE PRODUCTION

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Introduction: Many training programs exist to improve force production. In the last years, a new method based on vibration training has emerged (Luo and al., 2005). The effects of whole-body vibration are very dependant on the amplitude and frequency of the vibration, the position and the exercises made on the plate, and the intensity. To better understand the effects of vibration on muscle comportment, we propose in this study to apply vibration directly to the Achilles tendon and to analyze the effects of such a training program on triceps surae (TS) force production.
Methods: The subjects were tested before and after a 2-weeks Achilles tendon vibration program (1 hour daily, vibration frequency: 50 Hz). Maximal voluntary isometric torque was determined in plantar-flexion and then sub-maximal contractions were performed at three different torque levels (25, 50 and 75% of maximal voluntary torque). Surface electromyography was used to quantify muscle activation during efforts: activities of the soleus and gastrocnemius were summed up and rectified to give TS activation, and the activity of the antagonist, the tibialis anterior (TA), was recorded too. During contractions, twitch interpolation was used to determine an index of the deficit in TS activation. EMG – force relationships were established for each subject and the inverse of the slope of the relationship gave the neuromuscular efficiency in voluntary contractions. Another neuromuscular efficiency index was calculated as the ratio between maximal torque and maximal TS activation. A co-contraction index was calculated taking into account TS and TA activation during maximal contraction and sub-maximal contraction at 25% of maximum.

Results: After the vibration protocol, maximal voluntary isometric torque was enhanced for the 7 subjects engaged in this preliminary study. At the same time, TS EMG was enhanced and, consequently, neuromuscular efficiency (with the two counting methods) didn't change. The index of the deficit in TS activation and the co-contraction index both decreased.

Conclusion: In our study, TS force production is enhanced, which is the goal of almost every training. Gains in force may be explained by central (muscle activation) and/or peripheral (neuromuscular efficiency) adaptations (Moritani and De Vries, 1979). The vibration program was suspected to involve highly muscle spindles and to imply central adaptations more than peripheral ones: the increased maximal TS activity and the decrease in both co-contraction index and index of deficit in TS activation are in favor of such central adaptations and the constancy in neuromuscular efficiency indicates that this protocol fails to induce muscular adaptations.

To conclude, after 2 weeks of daily Achilles tendon vibration, TS force production is enhanced due, probably, to central adaptations.

Luo J, McNamara B and Moran K (2005), Sports Med. 35(1): 23-41

Moritani T and De Vries HA (1979), Am J Phys Med. 58: 115-130

Grant from Région Picardie

BILATERAL MANIPULATION OF SHEAR MODIFIES VASCULAR ENDOTHELIAL FUNCTION

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Introduction: Improvement in endothelial function is associated with decreased cardiovascular risk. Shear stress is an important stimulus to arterial adaptation in response to exercise and training. We recently observed significant reverse arterial flow and shear during exercise and different patterns of shear and flow in response to different exercise interventions. However, the impact of different patterns and magnitudes of shear stress on endothelial function is not known in humans. The aim of the study was to manipulate shear stress between the limbs of healthy subjects to determine the impact on endothelial function. Methods: We examined brachial artery flow mediated dilation (FMD), an assay of nitric oxide (NO)-mediated endothelial function was assessed before and after three 30-minute interventions consisting of forearm heating, recumbent cycling and handgrip exercise. Responses were manipulated such that mean shear rates were matched between these conditions, despite each being associated with different patterns of antegrade/retrograde flow and shear. During each of these bilateral interventions, a cuff was inflated to 60 mmHg around one forearm to alter mean shear and the pattern of shear, relative to the non-cuffed arm. Results: In the non-cuffed arm, each intervention enhanced FMD% ($P<0.001$) to a similar extent ($P=0.71$). Cuffed arm mean and antegrade shear rate during exercise were lower than in the non-cuffed arm for all conditions ($P<0.05$). FMD% in the cuffed arm did not change in either the heating or handgrip conditions and decreased in the cycling trial ($P<0.05$). Discussion: These results demonstrate for the first time in humans that both the magnitude and pattern of shear stress through conduit arteries in humans have important modulating impacts on endothelial function in vivo.

EXERCISE ENHANCES WHOLE-BODY CHOLESTEROL TURNOVER IN MICE BY REDUCING CHOLESTEROL ABSORPTION AND BY STIMULATING BILE ACID SYNTHESIS

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Rationale: There is a lot of information supporting a role of exercise (EX) as a preventative and therapeutic for cardiovascular diseases. While beneficial effects of EX on disturbed glucose, lipid and energy metabolism have been extensively documented, literature on the effects of EX on cholesterol metabolism is limited. Cholesterol is taken up from the diet or synthesized endogenously and can not be degraded in the body. Excess cholesterol is mainly excreted via the feces. Another major pathway for removal of cholesterol is via conversion into bile acids (BA) that eventually are lost in feces. An increased fecal BA excretion favors an increased de novo BA synthesis from cholesterol in the liver and, consequently, enhances cholesterol uptake from the circulation leading to a decreased serum cholesterol concentration.Very limited data indicate a role for EX to modulate BA metabolism in rodents. In this study, we establish the effects of EX on BA metabolism and cholesterol turnover in healthy mice.

Methods & Results: Male C57Bl6/J mice were either exposed to a voluntary running wheel for 2 wks starting at 11 wks of age (EX, n=10) or remained sedentary (SED, n=6). 48 h feces was collected at 2 wks of running wheel exposure (collected for SED at same time). Upon termination lipid profiles and hepatic and intestinal gene expression patterns were determined. Another 10 EX and 6 SED underwent a 30min gallbladder cannulation to determine bile flow and composition. EX mice had an increased feces production ($p<0.0001$), fecal BA output ($p=0.0012$), an increased fecal output of secondary BA ($p=0.02$) and increased total neutral sterol output ($p=0.0027$ vs. SED). EX induced specific changes in intestinal and hepatic gene expression patterns consistent with enhanced BA and cholesterol turnover. Paralleling the suspected increase in de novo BA synthesis to compensate for the fecal BA loss, EX had an increased biliary BA secretion ($p=0.012$). Indicating that EX increases cholesterol synthesis and decreases intestinal cholesterol absorption are the decreased plasma total plant sterol/cholesterol levels (marker of cholesterol absorption, $p=0.042$) in EX vs. SED, the increased plasma lathosterol/cholesterol levels (marker of cholesterol synthesis, $p=0.0017$) and the reduced intestinal gene expression levels of Npc1l1 ($p=0.013$), a protein required for effective cholesterol absorption.

Conclusion: EX appears to increase cholesterol and BA turnover via specific changes in the intestine that decrease intestinal BA and cholesterol absorption and hence promote their fecal excretion.The subsequent result appears to be an increased BA synthesis facilitated by an increased cholesterol synthesis to supply precursor availability for de novo BA synthesis.

Clinical Relevance: EX-induced modulations of BA and cholesterol turnover leading to reduced plasma cholesterol levels in humans might contribute to the beneficial effects of EX on cardiovascular diseases.

EFFECT OF SODIUM BICARBONATE INGESTION ON HCO3-, PH AND GASTRO-INTESTINAL SYMPTOMS

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Sodium bicarbonate (NaHCO3) is often ingested at a dosage of 0.3g.kg-1 body mass (BM), however ingestion protocols are inconsistent (McNaughton et al., 2008). Factors confounding ergogenic benefits include using solution or capsules, the ingestion period, combining NaHCO3 with sodium citrate (Na3C6H5O7), and co-ingested food and fluid. Purpose: To quantify the effect of ingesting 0.3g.kg-1 Na-

HCO3 on blood pH, HCO3- and gastro-intestinal (GI) symptoms over the subsequent 3-h using a range of ingestion protocols, and thus to determine an optimal protocol. Methods: In a crossover design, 13 physically-active subjects undertook eight NaHCO3 ingestion and one placebo protocol. Six protocols used either NaHCO3 capsules or powder (0.3g.kg-1 BM), ingested with either 7 or 14mL.kg-1 BM low-kilojoule cordial over either 30 or 60-min. The other three protocols were i) placebo (NaCl equimolar for NaHCO3 at 0.3 g.kg-1 BM with 14 mL.kg-1 BM of fluid ingested over 30 min), ii) NaHCO3 (0.3g.kg -1 BM) and Na3C6H5O7 (0.1g.kg-1 BM) in 14mL.kg-1 BM of fluid ingested over 30 min and iii) NaHCO3 capsules co-ingested with food (1.5g CHO kg-1 BM) over 30 min with 7mL.kg-1 BM of fluid. Capillary blood was taken every 30-min and analysed for pH and [HCO3-] (Radiometer ABL725). GI symptoms were quantified every 30-min via questionnaire. Statistics used were pair wise comparisons between protocols, and the probability that differences between protocols were greater than the smallest worthwhile change (Hopkins et al. (2009). Results: HCO3- and pH were substantially greater (>75% probability) than placebo for all ingestion protocols at almost all time points. The highest value (30.9mmol.L-1) and the greatest increase in [HCO3-] (6.6mmol.L-1) was at 150 min post-ingestion for NaHCO3 capsules co–ingested over 30min with 7mL.kg-1BM fluid and the meal. This [HCO3-] was substantially greater (92% probability) than the lowest value at 150 min (28.3mmol.L-1), after ingesting 14mL.kg-1 NaHCO3-Na3C6H5O7 solution over 30 min. The peak pH (7.487) and its greatest increase from baseline (0.075) was at 120 min post-ingestion of 14mL.kg-1BM NaHCO3 solution over 60 min, and these values were substantially different (99% probability) to the lowest value (7.454) after NaHCO3-Na3C6H5O7. Overall, there were minor differences in pH and [HCO3-] between the eight protocols. The greatest incidence of GI side effects was at 90 min post-ingestion of 7mL.kg-1 NaHCO3 over 30 min, and the least side effects were for NaHCO3 co-ingested with the meal. Discussion: The changes in pH and HCO3- for the eight NaHCO3 ingestion protocols were similar, therefore an optimal protocol cannot be recommended. However, our results suggest that NaHCO3 should be ingested 120-150 min prior to exercise to induce substantial blood alkalosis, and NaHCO3 co-ingested with a high-carbohydrate meal may reduce GI symptoms.

REFERENCES

Hopkins WG et al. (2009) MSSE 41, 3-12

McNaughton LR et al. (2008) Curr Sports Med Rep 7, 230-36

14:15 - 15:15

Poster presentations

PP-TT01 Training and Testing 1

THE EFFECT OF AMBIENT TEMPERATURE ON HEART RATE, ENERGY METABOLISM AND PERCEIVED EXERTION OF RECREATIONAL RUNNERS DURING A MODERATE TRAINING SESSION

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Recreational running is a worldwide common physical activity for an increasing number of young, middle aged and older adults. Training is usually practiced outdoor in public parks or woods, which leads to considerable differences in ambient temperature and humidity. Coaches, exercise physiologists and the sport industry recommend the monitoring of the training work load by means of heart rate. Frequently, age related formulas are used to determine an individual heart rate range which should guarantee an adaptation of performance capacity and avoid an overload stimulus.

In the present study we examined the effect of different ambient temperatures on several physiological and psychological data during a moderate run. On three experimental days interrupted by at least three days twelve male recreational runners (age: 28.9±6.2 yrs; size: 177.9±4.2 cm body mass: 76.2±5.9 kg) completed three 45 min runs on a laboratory treadmill with a constant velocity corresponding to 85 % of the 4 mmol/l threshold (v4). In a matched cross-over design the room temperature during the 1st, 2nd or 3rd experimental day was adjusted on 10°C, 20°C, or 30°C, respectively. Humidity did not differ during each temperature. Heart rate (HR), blood lactate concentration (LA), rate of perceived exertion (RPE), respiratory exchange ratio (RER) and core temperature (CT) were recorded every 9 minutes.

The following results (mean ± standard deviation) were calculated using a two factor ANOVA with repeated measurements: HR increased significantly in the course of the runs ($p<0.01$) and depended significantly ($p<0.01$) on the room temperature (after 45 min: 156±14 min-1 at 10°C, 162±15 min-1 at 20°C and 177±14 min-1 at 30 °C). A significant main effect of ambient temperature was also found for LA ($p<0.5$), RER ($p<0.5$) and RPE ($p<0.5$) pointing to higher values in the heat. Post exercise LA reached 1.27±0.52 mmol/l at 10°C ($p<0.1$ vs 20°C and 30°C), 1.67±0.44 mmol/l at 20°C and 2.20±1.15 mmol/l at 30°C, respectively. RER was significantly higher at 20°C (0.93±0.02) compared to 10°C (0.89±0.03). No rise of CT was observed during prolonged exercise at 10°C (35.9±0.54) while there was a slight increase at 20°C (36.7±0.51) and a considerable increase at 30°C (37.7±0.64, $p<0.1$). RPE remained similar during the runs at 10°C (12.7±1.4) and 20°C (13.2±1.5) but increased significantly at 30°C (15.2±2.2, $p<0.01$).

We conclude that the ambient temperature has considerable effects on cardiocirculatory, metabolic and mental responses in recreational runners. This can be mainly attributed to the increased demands on the CT regulation. A stronger activation of carbohydrate metabolism can be suspected. It cannot be recommended to use age alone for heart rate formulas for the individual monitoring of training, the ambient temperature and the training duration must also be considered.

RELATIONSHIP BETWEEN JUMPING PERFORMANCE AND RUNNING ECONOMY IN RUNNERS AND SOCCER PLAYERS

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Muscles, tendons and ligaments are able to store and then release energy during exercise (Anderson & Pandy, 1993) and can thus reduce energy cost of running (Alexander, 1991). The elastic abilities of the ankle joint (Achilles tendon and arch of the foot) are of special importance for increasing energy efficiency during running (Ker at al. 1987). The aim of the study was to analyse the relationship between jumping performance and running economy in runners and soccer players.

Method: Male soccer players (N=11) and runners (N=9) were tested. Jumping performance was determined by means of a drop jump test (30 cm platform) and calculated based on the contact time and the following jump. The subjects tried to minimize duration of ground contact and maximize the height of the vertical jump (support of arm action).

In order to analyse running economy, subjects performed an incremental exercise test on a motor-driven treadmill. Oxygen uptake (VO2) was measured continuously and blood lactate concentration (La) was measured at rest and after every load step (increments were 0.5 km/h every minute). Running economy was defined as the oxygen consumption at 11.7 and 14.9 km/h, which represents the mean running speed at the first (vLTP1) and the second (vLTP2) lactate turn point of both groups.

Results: Mean VO2max was 55.3±3.5 ml/kg/min in runners and 54.4±3.5 ml/kg/min in soccer players with no significant differences between them ($p>0.05$). The mean running speed of soccer players and runners at LTP1 was 11.3±0.5 km/h and 12.3±0.7 km/h respectively, while at vLTP2 it was 14.3±0.7 and 15.6±0.6 km/h respectively. Significant differences were found between groups both at vLTP1 and vLTP2 ($p<0.05$).

Mean drop jumping performance was 61.3±9.8 W/kg in runners and 62.0±10.3 W/kg in soccer players with no significant difference between the two groups ($p>0.05$). Jumping performance was significantly related to oxygen consumption in runners at 11.7 km/h ($r2=0.648$; $p<0.01$) and at 14.9 km/h ($r2=0.699$; $p<0.01$), but not in the soccer players ($p>0.05$).

Discussion: The significant correlation found between jumping performance and oxygen consumption (running economy) in runners may be explained by their superior running technique compared to a more inhomogeneous technical ability in the soccer players. Only some of the soccer players were able to use the elastic properties of the ankle in the way that highly trained runners do.

Conclusion: Drop jump performance is associated with running economy in technically educated runners.

References:

Alexander R. (1991) Energy-saving mechanisms in walking and running. J Exp Biol 160, 55-69

Anderson F.C., Pandy M.G. (1993) Storage and utilization of elastic strain energy during jump. J Biomechanics 26(12), 1413-1427

Ker R.F., Bennett M.B., Bibby S.R., Kester R.C., Alexander R. McN. (1987) The spring in the arch of the human foot. Nature 325 (7000), 147-149

EFFECTS OF WHOLE BODY STRENGTH TRAINING ON RUNNING PERFORMANCE AND RUNNING ECONOMY IN RECREATIONAL RUNNERS

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Millions of recreational runners worldwide are regularly participating in marathon and half-marathon competitions without being coached by professional experts. The training schedule of those persons usually consists exclusively in running. On the other hand elite long distance runners prefer more complex training methods including cross training, some aspects of running coordination as well as resistance training for trunk and leg muscles because this may improve running performance by increasing the running economy. In the present study we investigated the effects of a combined training protocol with recreational runners consisting in endurance plus additional strength training (ES) compared to exclusively running (E).

20 recreational runners (40.0±11.7 yrs; 180±9 cm; 73.7±10.8 kg) were matched into two groups (ES and E) each consisting of ten runners with identical VO2max (ES: 52.0±6.1 vs. E: 51.1±7.5 ml/min/kg) and anaerobic threshold (ES: 3.5±0.4 vs. E: 3.4±0.5 m/s). One group (ES) completed an 8-week strength training program while pursuing their usual running training. The other group (E) followed its usual running training without additional strength intervention. In ES strength training was carried out twice a week. On Tuesday the trunk muscles (reverse fly, bench press, lateral flexion, trunk extension, trunk flexion and trunk rotation) were trained (3 sets with 20 reps of the 25 RM). On Thursday a high resistance training for the leg muscles was completed (leg press, knee extension, knee flexion, hip extension and ankle extension) which aimed to an improvement of the motor recruitment patterns (4 sets with 3-5 reps of the 3-5 RM). With increasing strength weights were added to maintain the same relative resistance.

The following results (mean ± standard deviation) were calculated using a two factor ANOVA (main factors were training intervention and measurement time). No changes in body mass occurred during the intervention period. Only in ES maximum torque of knee extension (pre: 4.6±1.4; post: 6.2±1.0 Nm/kg) increased significantly ($p<0.01$). No intervention effects were found for running coordination (stride length, stride frequency and foot ground contact time). VO2 on defined moderate running velocities (v) remained unchanged in both groups. VO2max (ES: from 52.0±6.1 to 54.9±4.4; E: from 51.1±7.5 to 51.6±7.8 ml/min/kg; $p<0.05$) and velocity at the anaerobic threshold (ES: from 3.5±0.4 to 3.7±0.5; E: from 3.4±0.5 to 3.5±0.5 m/s; $p<0.01$) increased significantly in both groups, while no significant intervention x measurement effect was found.

Results suggest that running economy defined as lower O2-uptake at a given speed is not affected by strength training under the conditions of our study unless a clear improvement of isometric strength in the leg muscles was found. Nevertheless, the overall running performance and the VO2max were clearly improved especially in ES, which point to a better oxidative capacity induced by strength training.

CHILDREN TOLERATE INTENSIVE INTERMITTENT EXERCISE BETTER THAN ADULTS

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In exercise science literature a decreased capacity as well as a strongly reduced efficiency of the anaerobic metabolic pathway is awarded in children. The benefit and value of health of anaerobic training are questioned explicitly. Therefore the recommendations for endurance training with children in young age are usually focused on aerobic activities. In contradiction to this, an analysis of the self chosen leisure time movement patterns show that children prefer intermittent, explosive and intensive activities of very short duration.

The aim of this study was to investigate how children and adults tolerate short intensive and intermittent anaerobic demands. 22 trained children (C) (13 girls: 10.6±1.4 yrs; 152±8 cm; 41.5±9.1 kg; muscle mass 22.1±4.4 kg; 9 boys: 9.7±1.1 yrs; 143±6 cm; 34.5±4.4 kg; muscle mass 18.8±2.3 kg) and 26 athletic trained adults (A) (12 women: 22.5±2.2 yrs, 169±4 cm, 58.0±4.1 kg, muscle mass 34.4±2.8 kg; 14 men: 23.0±2.4 yrs, 181±6 cm, 72.5±7.3 kg, muscle mass 45.6±4.2 kg) participated in the study.

All athletes completed an identical intermittent sprint running protocol on an indoor track followed by an active (slow jogging) 30 min recovery. The protocol consisted of ten maximum 5 s sprints with a 40 s rest in between (2 min rest after 5 sprints). We recorded heart

rate (HR), rate of perceived exertion (RPE) and 15m time (t 15) of each sprint as well as blood lactate concentration (LA) and blood pH (pH) pre-exercise, after 5 and 10 sprints (s 10) and during the post exercise recovery.

The following results (mean ± standard deviation) were calculated using a multi factor ANOVA (main factors were age, sex and measurement time). Maximum LA and RPE were significantly lower ($p<0.01$) in children (LA 5.58±2.87 mmol/l, RPE 10.8±2.4) compared to adults (LA 10.02±3.07 mmol/l, RPE 16.7±1.8). Blood pH remained significantly higher ($p<0.01$) in children (pHs10 7.38±0.07) than in adults (pHs10 7.29±0.09). At similar sub maximum LA (6 mmol/l) pH remained higher in children. During recovery, the half time to reach a physiological LA was significantly shorter ($p<0.01$) in children (7.3±2.5 min) compared to adults (10.8±3.7 min). There was no significant difference in decrease of t 15 (t15 max – t15 min) between children and adults. A significant main effect of sex was only found for t 15m.

We conclude that anaerobic intermittent exercises can be considered in athletic training with prepuberal children without any risk of a metabolic or psychological overload. The striking pH stability and the quicker recovery of the children point to an overall better regulated acid-base balance. Several recommendations in exercise science literature cannot be justified under consideration of our data.

EFFECTS OF 3 DAYS TRAINING WITH HYPEROXIA ON METABOLISM AND SYSTEMIC CIRCULATION

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Introduction: Mankind's dreams of running faster on the track have lead sports scientists and coaches to work together to refine the athletes peaking cycle. In this study we looked at the 400m run which is a combination of speed and endurance. Therefore, the aim of this study was to design a training protocol consisted of 3 days training with hyperoxia on the treadmill. The goal was to enhance the athlete's performance by altering the metabolism and systemic circulation.

Methods: Training consisted of 3 days training on the treadmill under hyperoxic conditions. Six 400m male track specialist. The research test consisted of a 400m performance (pre - post test). Training tests were separated into day 1 (Tr-1) and day 3 (Tr-3) and represented the intermittent mode, and day 2 (Tr-2) represented continuous running. Intermittent workload Tr-1 and Tr-3 was set at 90 % of the subject's best time for (3x3x90 %); continuous running was sustained at 50 % performed on Tr-2.

Results: Results indicated five of the six subjects significantly increased their 400m speed 0.05-0.15 m/s. Only one subject showed no improvement (-0.19 m/s). In the two interval training sessions' (Tr-1, Tr-3) blood lactate concentration indicated a downward trend post test and in the 6th interval, and NH3 in 6th interval training and in the 3rd min of rest (E3) decreased significantly ($p <.05$). Free radicals(H2O2) indicated no significant change ($p>.05$). While looking at heart rate during interval training, Tr-1 and Tr-3 indicated a downward trend.

Discussion: In this study, lactic acid and NH3 showed a downward trend (Tr-1 vs. Tr-3 & T-1 vs. T-2), under high-intensity exercise with hyperoxia, that PCr (phosphocreatine) have diminished its efficiency (stellingwerff et al., 2006) and relative lower production of blood lactate (Hollmann et al., 2002). In this study H2O2 indicated no significant change which was different from Cooper et al (2002) findings. This could possibly be caused by antioxidants (Muna et al., 2001) and HSP70 (Kinnunen et al., 2005) but in order to better understand this further research would need to be conducted. Heart rate in Tr-3 were lower than Tr-1 but it weren't significant. In 400m speed performance were not significantly improved. These indicated that further time to adapt is required.

References

Cooper, C. E., Vollaard, N. B. J., Choueiri, T., & Wilson, M. T. (2002). Biochemical Society Transactions, 30, 280-285.

Hollmann, W., H. K. Strüder, S. Rojas Vega. (2002). BISp-Jahrbuch, 91-94.

Kinnunen, S., Hyyppä, S., Lappalainen, J., Oksala, N., Venojärvi, M., Nakao, C., Hänninen, O., Sen, C. K., & Atalay, M. (2005). European Journal of Applied Physiology, 93, 496-501.

Muna, K., Child, R. B., Mcardle, A., Brodie, D., Esanu, C., & Jackson, M. (2001). Journal of Applied Physiology, 90, 1031-1035.

Stellingwerff, T., Leblanc, P. J., Hollidge, M. G., Heigenhauser, G. J., & Spriet, L. L. (2006). American Journal of Physiology, 290, E1180-E1190.

HIGH DOSE MAGNESIUM SUPPLEMENTATION EFFECTS ON 400M SPRINT PERFORMANCE AND METABOLISM

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Introduction: Matwejews (1972) proposed the sports training 'period' he divided it into preparation periods (Ⅰ,Ⅱ), specific training periods (Ⅰ,Ⅱ), and a competition period. This type of process allow athlete to reach their best physical condition in specific period Ⅱ and maintain it through the competition period. It is still unclear whether other training methods can push the athlete to breakthrough through to new levels of peak performance. Therefore, the aim of this study was to observe the effects of short term and high doses magnesium supplementation before high intensity interval training on performance and metabolism for 400 m runners

Methods: Two tests were investigated in this study. The first was 400m test (pre and post test), the second was a training test (the 1st and 3rd day). The training program consisted of a high intermittent mode on the 1st and 3rd day and a continuous run on the 2nd day. The intermittent and continuous workload were set 90% (3x3x20s)and 50% (15min)of the individuals best performance time; each athlete took 400 mg magnesium with 200ml water and warmed up for 30mins before each of the three days of training sessions.

Results: During the training test (Tr-1 and Tr-3), blood lactate and NH3 concentrations decreased after Tr-3 ($p>.05$). During the 400m test, three subjects improved their range of speed performance by 0.01-1.80 s posttest; two subjects increased their range of speed performance by 0.21 and 0.54 s. Only one subject showed no increase in range of speed performance but still maintained pretest Results: Discussion: During the training test, blood lactate concentration and NH3 were decreased. Lukaski(1983)explained blood lactate concentration decreased by saying that magnesium stimulates the two-phosphoglycerate (2, 3-diphosphoglycerate, 2, 3-DPG) enzymes, while increasing red blood cells to release oxygen to work the application of muscle tissue. Bertschat et al.(1986)study indicated when looking at marathoners who supplemented with magnesium showed a significant reduction in competition protein degradation, and NH3 generated reduced. Hypothetically speaking, this may be due to the reduction of neonatal sugar resulting in a reducted its metabolites NH3, in addition to magnesium and is also involved in cell ammonia (ammonia) to eliminate an important enzyme. Golf et al.(1998) pointed out that triathlon competitors after four weeks of added magnesium reduced their race times. Comparison to this study only three subjects improved their 400m results, this may be due to the supplement ingestion time being only 3 days.

References

Bertschat, F., Golf, S.W., Riediger, H., Graef, V. & Ising, H. (1986). Magnesium. 8, 310-313.

Hutzelmann, A., Binder, F., Wagner,D., Kappes, S. (1993). Deutscher Sportärztekongress.33,754-757.

Lukaski, H. C., Bolonchuk, W. W., Klivay, M. L., Milne, B. D., & Sandstead, H. H. (1983). American Journal of Clinical Nutrition.37: 407-415.
Matwejews, L. P. (1972). Periodisierung des sportlichen Trainings Berlin – München - Frankfurt/M.

CARDIORESPIRATORY AND METABOLIC CHANGES DURING AND AFTER THREE DIFFERENT MODES OF EXERCISE

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Introduction: Reliable experimental forms are essential to gain insight into the cardiorespiratory and metabolic mechanisms underlying the effectiveness of training in different modes of exercise. The purpose of this study was to examine the cardiorespiratory and metabolic variations during exercise and passive recovery time (PRT) among three forms of exercise, namely active recovery (AR), passive recovery (PR) and continuous running (CR) in physically active male adults.

Methods

Fifteen physical education male students with subspecialty in soccer were studied (mean age 22.3±2.5yrs and years of training 12.3±2.5yrs). All participants performed a graded maximal test on a treadmill for the determination of VO2max using an open–circuit ergospirometric via breath–by–breath gas analyzer system. The AR exercise protocol consisted of running on a treadmill for 4min at 12km/h-1 followed by 4min at 8km/h-1. This was repeated four times and the exercise time was 32min. The PR protocol consisted of four bouts of 4min running at 12km/h-1 followed by 4min of rest in between bouts for a time of 32min. CR was also performed on a treadmill at a speed of 12km/h-1 without gradient. The running time was 32min. Blood lactate (BLa) measurement was carried out using capillary blood taken from a fingertip at 8, 16, 24 and 32 min of exercise, as well as at 10, 20 and 30 min of PRT after the end of exercise protocols.

Results: At the running speed of 12km/h, HR and VO2 did not differ among AR, PR and CR protocols in bouts 1 and 2. However, in bouts 3 and 4, HR and VO2 were significantly higher in CR compared to AR and PR ($p<.05$, $p<.01$). During the 4th bout the VO2 was in AR 82%, in PR 79% and in CR 100% of VO2max. In all bouts at 8km/h the HR and VO2 were found to be significantly higher in AR compared to PR ($p<.001$). BLa reached the highest values in the first 8min of exercise in all three protocols and was significantly higher in PR compared to AR ($p<.05$). At completion of exercise BLa values were significantly higher in CR compared to the values of AR and PR, respectively ($p<.001$). Ten and 30min after the end of exercise in PRT, BLa values were significantly higher in CR compared to AR and PR ($p<.001$). No significant differences in BLa values between AR and PR in PRT were found.

Discussion: The results of this study showed that HR and VO2 in all types of exercise gradually increased along with the muscle effort. Therefore, it was found that there is greater load in the cardiorespiratory and metabolic system with CR than AR and PR. The low BLa values that was found during AR may be due to its reduced muscle concentration and to its increased clearance from blood. In conclusion our study shows that during CR the cardiorespiratory system can be fully loaded without high BLa concentration in comparisons to the values that appeared during the first test for determination of VO2max.

PREDICTION EQUATION TO ESTIMATE VO2MAX IN BRAZILIAN YOUNGSTERS FROM A RUNNING PERFORMANCE TEST IN 1600M.

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Introduction: VO2max is considered a physiological parameter that evaluates functional capacity level of cardiorespiratory system and aerobic power (Basset and Howley, 1997), as well to physical training prescription (Billat et al., 1999). To estimate VO2max through equation represents a cheaper possibility and a larger practical application for a field test (Basset and Howley, 2000). Therefore, the aim of this study is to suggest a predictive equation for brazilians from 1600m running performance.

Methods: Took part on this study 30 physically active brazilians youngsters men (23±3.1yrs; 74.8±5.8kg; 1.78±0.05cm; 49.8±6.5ml.kg-¹.min-1) that were submitted to an incremental exercise test (IT) on treadmill until exhaustion with gas analysis. Subjects also performed a 1600-m running track as fast as possible. Then the volunteers were randomly allocated in two groups: G1 – to generate a specific predictive equation for VO2max, and G2 – to apply predictive equation to evaluate their validity on estimating VO2max in a Brazilian population sample.

Results: The relationship between the VO2max on IT and the running velocity on 1600-m as obtained for G1 resulted in the following predictive equation: VO2max=0.177ּ1600Vm + 8.101. When such new equation was applied on participants of G2, the predicted VO2max (50.1±7.2ml.kg-¹.min-¹) did not differ from VO2max determined directly on IT (50.1±7.1ml.kg-¹.min-¹) with a high correlation between them (r=0.81).

Discussion: The determination of VO2max, even when evaluated in indirect form, allows to evaluate cardiorespiratory fitness and to presume risk development of chronic illness pathologies (Moreira, 2007). The importance of predictions equations consists in the possibility to evaluate a large number of persons from a fast, non-invasive, low cost and practical way. Therefore, the predictive equation proposed on present study was considered valid for this purpose through the 1600-m running performance for our participants.

References

Basset DR, Howley ET. (1997). Med Sci Sports Exerc, 29, 591-603.
Billat VL, Flechet B, Petit B, Muriaux G, Koralsztein JP. (1999). Med Sci Sports Exerc, 31, 156-163.
Basset DR, Howley ET.(2000). Med Sci Sports Exerc, 32, 70-84.
Moreira SR, Simões GC, Hiyane WC, Campbell CSG, Simões HG. (2007). Rev bras fisioter, 11(4),253-259.

PECULIARITY OF THE O2 DELIVERY- O2 UTILISATION SYSTEM IN MIDDLE DISTANCE RUNNERS: CORRELATION WITH PERFORMANCE

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Introduction. Many studies conducted since the 1970s have investigated the particular physiologic characteristics of middle-distance athletes. Several authors (1,2) have focused on physiological parameters, such as maximal oxygen consumption, VO2max and velocity at VO2max (Vmax), that may determine/predict performance. However, at the moment there is no consensus. Our purpose was to evaluate

additional physiological parameters (VO2 kinetics, maximal capacity of muscle O2 extraction, presence of a slow component of VO2 and Delta[deoxy(Hb+Mb)], lactate concentration, time to exhaustion) that may better predict performance in an homogeneous group of international level middle-distance (1500m) runners (n=8).

Methods. After an incremental exercise (IE) to voluntary exhaustion on a treadmill, to evaluate peak VO2 and the ventilatory threshold (VT), athletes carried out two, 6-min, constant-load exercise tests below VT (<VT) and two constant-load exercise to exhaustion at the maximal velocity reached during IE. The test were performed on three different days. Pulmonary VO2, VCO2 and ventilation (VE) were determined breath-by-breath. Vastus lateralis oxygenation was determined by near-infrared spectroscopy (NIRS) and changes in deoxygenated hemoglobin+myoglobin concentration Delta[deoxy(Hb+Mb)] were taken as a muscle oxygenation index. A blood sample from ear lobe was also taken at baseline and at the end of each exercise, to evaluate the blood lactate concentration. The data were analyzed by correlation procedures and stepwise regression analysis.

Results. In contrast to previous research, we did not find a significant correlation between VO2peak and 1500-m velocity (r=0.057, non significant); the correlation between Vmax and 1500-m velocity approached significance (r=0.63, p=0.09). The only parameters that were significantly (p<0.5) correlated with the 1500-m velocity were the maximal capacity of O2 extraction (r=0.78) and the amplitude of the slow component of Delta[deoxy(Hb+Mb)] (r=0.74). All of the other parameters measured were not correlated with 1500-m performance.

Discussion. These results suggest that the best predictors of 1500-m velocity were related to the capacity of the muscle to extract O2, a peripheral parameter which reflects the muscle's capacity for oxidative metabolism (dependent on the number and quality of mitochondria, capillarisation, etc.). The relationship between the slow component of Delta[deoxy(Hb+Mb)] and 1500-m velocity can possibly be attributed to the Bohr effect, i.e. a greater increase in lactate by the better performing athletes may provoke a greater release of O2 from the hemoglobin and a subsequent improved aerobic efficiency of the muscle. Further research is required to better understand how to improve the capacity of the muscle to extract O2.

References.

1. Ingham SA et al (2008). Med Sci Sports Exerc 40: 345–350

2. Lacour JR et al (1990). Eur J Appl Physiol 60: 38-43

THE EFFECT OF VO2MAX PERCENT UTILIZATION AT 5KM COMPETITION AMONG ELITE DISTANCE RUNNERS

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Introduction: The aim of the present study was to explore to what extent maximum oxygen uptake (VO2max) and fractional utilization (% VO2max) in 5km competition speed correlate with 5km performance times among long distance runners at a national level, and to investigate if there is a significant difference between VO2max and %VO2max at 5km competition speed. Methods: Eight elite long distance runners with 5km performance times of 15.10 minutes (± 32 sec) were tested for VO2max during an incremental protocol and for % VO2max during an eight minute treadmill test at the velocity representing their 5km seasonal best performance time. In all cases, P≤0.05 was taken as the level of significance in two-tailed tests. Descriptive statistical analysis was made to display means and standard deviations (SD). To compare means, paired T-tests and independent samples T-tests were used. The data were tested for normal distribution using Quantile-Quantile (QQ) plots. Correlations were calculated by the Pearson correlation test. Results: The subjects average VO2max was 73 (±4.7) ml∙kg-1∙min-1 and 207.9 (±14) ml∙kg-0.75∙min-1. The results showed a strong correlation between performance and VO2max (R2 = 0.752 and 0.684 respectively). The average O2 expenditure of the subjects competition speed was 71.5 ml∙kg-1∙min-1 and 203.8 ml∙kg-1∙min-0.75. The mean values for VO2max was 73.1 ml∙kg-1∙min-1 and 207.9 ml∙kg-1∙min-0.75, which gives an average of 97.3 and 98 %VO2max. The results showed no correlation between fractional utilization and 5km performance. There was no significant difference between VO2max and the O2 expenditure during 8 minutes of running at the runners individual 5km competition speed. Discussion: Since %VO2max did not correlate with performance in this study, the differences in performance level among the runners must be due to another factor than the fractional utilization. Most likely, the better performance is a result from a higher VO2maks and/or a better running economy. To improve 5km performance time, the runner should focus on high intensity aerobic interval training (1) and maximal strength training (2). When improving VO2max and RE, the runner will run faster, and consequently utilize a higher percentage of VO2max during competition. Conclusion: The major finding in this study is that fractional utilization (%VO2max) does not correlate with 5km performance among elite distance runners. Training aiming to increase %VO2max may thus be of little or no importance in performance enhancement for competitions lasting up to approximately 20 min.

1. Helgerud J, Høydal K, Wang E, Karlsen T, Berg P, Bjerkaas M, Simonsen T, Helgesen C, Hjort N, Bach R, Hoff J. Aerobic high-intensity intervals improve VO2max more than moderate training Med Sci Sports Exerc 2007 Apr; 39(4): 665-671

2. Støren O, Helgerud J, Støa EM, Hoff J. Maximal Strength Training Improves Running Economy in Distance Runners, Med Sci Sports Exerc 2008; 40(6):1087-92

14:15 - 15:15

Poster presentations

PP-TT02 Training and Testing 2

LACTATE MINIMUM TEST PROVIDES A GOOD ESTIMATE OF THE MLSS RUNNING SPEED

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Introduction: To individually determine an exercise intensity which demarks the aerobic-anaerobic transition is of great practical interest, having been the focus of research for decades. The maximal lactate steady state (MLSS) is defined as the highest blood lactate concentration that can be maintained over time without continual lactate accumulation (Beneke, 1995; Billat et al., 2003). However, the classical MLSS protocol, considered by many as the gold standard in anaerobic threshold (AT) assessment, is tedious and time consuming. The

original LMT (Tegtbur et al., 1993) was develop to assess the maximal exercise intensity at which an equilibrium exists between the production and removal of lactate. Although not universally accepted, the LMT is an attractive test believed capable to estimate, in a single session, the individual AT. Nevertheless, contradictory results have arisen from research (Bacon and Kern, 1999; Jones and Doust, 1998). The aim of this study was to assess the validity of the LMT for the estimation of the MLSS.

Methods: Twenty male runners (mean[SD]: age 29.8[6.3] yr, height 1.75[0.05] m, weight 67.4[6.6] kg, VO2max 58.2[5.8] ml/kg/min) underwent a battery of running field tests within 4 weeks: Université de Montréal Track Test for the determination of maximal aerobic speed (MAS), LMT, and several constant-speed runs of 30-min duration each performed on different days for the precise determination (+/-0.25 km/h) of the MLSS velocity (MLSSv). Four different methods (visual inspection, 2nd order polynomial fit, 3rd order polynomial fit and cubic-spline fit) used to individually determine the lactate minimum speed (Vmin) were compared.

Results: MLSSv and Vmin were highly correlated (r=0.80-0.87 for the three mathematical methods employed) although mean Vmin (quadratic fit method) was significantly lower ($p<0.05$) than MLSSv (14.8[0.9] vs 15.1[1.2] km/h). Heart rate and rate of perceived exertion at Vmin and MLSSv were not significantly different. Blood lactate concentration at MLSS was 4.7[1.6] mmol/L, showed great variability between subjects (CV=35%), and was independent of performance.

Discussion: These results suggest that the LMT gives a good estimation of the MLSS running speed and can be considered a valid instrument for the field evaluation of runners. Of the three methods employed, quadratic fit seemed superior (r=0.87; $p<0.01$; SEE=0.52). A proposal is made for performing the two initial sprints of the LMT at 130% of MAS and the first stage of the incremental part of the test at 70% of MAS, something not specified in the original protocol but that has proved to be a valuable addition.

References

Bacon L, Kern M. (1999) J Sports Med Phys Fitness, 39, 300-308.

Beneke R. (1995) Med Sci Sports Exerc, 27, 863-867.

Billat VL, Sirvent P, Py G, Koralsztein JP, Mercier J. (2003) Sports Med, 33, 407-426.

Jones AM, Doust J. (1998) Med Sci Sports Exerc, 30, 1304-1313.

Tegtbur U, Busse MW, Braumann KM. (1993) Med Sci Sports Exerc, 25, 620-627.

NON FUNCTIONAL OVERREACHING DETECTED BY AN ONLINE TRAINING DIARY: A CASE STUDY

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Functional overreaching is defined as short term performace decrement without severe negative psychological or physiological symptoms. When the imbalance between training and recovery continues, non functional overreaching (NFOR) may occur. The distinction between NFOR and Overtraining syndrome (OTS) is very narrow, and occurs mostly on exclusion criteria (Meeusen et al. 2006). Although many markers have been proven to identify OTS, prevention remains the most important issue and training diaries with subjective perception of fatigue have been proven to be useful (Piacentini et al 2008). The purpose of the present study was to evaluate psychological, training diary data and blood analysis in an athlete with NFOR.

Methods: A female marathon runner (30 yrs) was followed for 2 years by means of a daily online training diary (BLITS®), a weekly POMS, monthly blood analysis. She filled in the task and Ego Orientation in Sport questionnaire (TEOSQ Duda 1989). In one year she ran 6 marathons. The last 2 ran 3 weeks apart were prepared doubling training volume and she was diagnosed as NFOR.

The training diary consists of 3 pages that include both objective and subjective data (muscle soreness, physical and mental well-being, training intensity and attractiveness) reported on a 10 cm visual analogue scale (VAS). Furthermore, parameters that quantify and summarize training and adaptation to training were calculated, such as training load (training intensity VASxduration), monotony of training (day by day variability in training), and the overall strain (Load x monotony). Moreover, we calculated a parameter (BLITS formula) that takes into account the subjective parameters collected from the diary: time x intensity x attractiveness x muscle soreness x mental well being

RESULTS: Tha data analysed regard the period november-december 2007 when the athlete was diagnosed as NFOR. Her POMS data showed a significant increase in fatigue, depression and decrease in vigour. Blood analysis showed anemia with a 14% decrease in red blood cells, a 30% decrease in hemoglobin, and a 25% decrease in hematocrit and she reported interrumption of her menstrual cycle. Results from the training diary show a 1617% increase in the BLITS formula data during the NFOR period while only an 86% increase in strain. All parameters restored after 3 months. Her TEOSQ shows that she is more task (3,8) than ego (3,16) oriented.

DISCUSSION: The results demonstrate that prior to performance decrements (marathon race perfomance) due to excessive load (given also by her high task orientation), training diary parameters detected with the BLITS formula are the most visible predictors of extreme fatigue, and strongly correlated with negative mood. Therefore, the use of the online training diary seems a valuble tool for training monitoring and prevention of OTS

REFERENCES

Meeusen et al. EJSS 6:1-14, 2006

Piacentini et al ECSS 2008

Duda J of Sport and Exerc Psychol 11, 318-335

HEART RATE DISTRIBUTION IN MASTER ENDURANCE RUNNERS DURING A HALF-MARATHON

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Introduction: Runners above 35 years of age that compete and train regularly are catalogued as Master athletes. But unlike professional or elite athletes, master athletes do not have the same technical support in terms of training and recovery (1) (2). Master athletes infact have to train between very busy schedules due to work or family duties, nevertheless some are able to reach pretty important results. The aim of this study was to determine heart rate and the rating of perceived effort (RPE) during a half-marathon (21 Km) competition

Methods: Five master runners, which regurarly train for endurance events, (age:.47,2 ±7 yrs; weight. 60 ±9,5 kg; height. 169±6 cm; bmi 20.78 ±2.0) competed in the master half-marathon regional championship (performance time 1h 26' 28" ± 4'30"). Their heart rate was monitored every five seconds with a heart rate monitor Accured plus (Polar Electro, Finland) (3) and RPE was measured using both the

Borg's scale (4) and a Visual Analogue Scale (VAS) at 30' after the end of competition. The maximun heart rate was determined using Tanaka's formula (208 - 0.7*age). Mean, standard deviation and Spearman's correlation were used for data analysis

Results: Mean RPE using Borg's scale (4.8 ±1.6) was strongly correlated with VAS (68 ±8) (r=0,87)

HR expressed as percent HRmax showed very high values throughout the whole race, with a uniform trend: 1st quarter 90.7 ±6.2 %(157.8 bpm ±14.4); 2nd quarter 93.3 ±6.0% (162.0 bpm ±7.2); 3rd quarter 95.8 ±4.8 %(166.5 bpm ±7.0); 4th quarter 98.1 ±6.2% (170.7 bpm ±13.3) (fig.2). The performance of the present competition was 93.9% ±3.2 of their personal best (1h 21' 01" ± 2'08")

Discussion: Athletes that are trained to perceive their fatigue can use either scale, or VAS or the Borg scale that were strongly correlated. However, the perception of fatigue data do not correlate with the HR measured during competition that was always above 90% of their HRmax. At the moment the athletes are asked to answer to the two different scales, most probably the sensation of fatigue is strongly reduced also by the satisfaction of a positive result and does not reflect the real fatigue they were actually feeling during competition.

References

1. Esteve-Lanao J., San Juan A. F., Earnest C.P., Foster C., Lucia A.: How do endurance runners actually train? Relationship with competition performance. Medicine & science in sport & exercise 0195-9131/05/3703-0496. (2005)

2. Esteve-Lanao J., Foster C., Seiler S., Lucia A.: Impact of training intensity distribution on performance in endurance athletes. Journal of strength and conditioning research. 21(3). 943-949 (2007)

3. Achten J., Jeukendrup E. A.: Heart Rate Monitoring Applications and Limitations. Sports Med 33 (7): 517-538. (2003)

4. Foster C., Florhaug A. J., Franklin J., Gottschall L., Hrovatin A. L., Parker S., Doleshal P., Dodge C.: A New Approach to Monitoring Exercise Training. Journal of Strength and Conditioning Research, 15(1), 109–115. (2001)

COMPARISON OF PHOTOCELL AND OPTOJUMP MEASUREMENTS OF MAXIMAL RUNNING VELOCITY

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Due to additional data on the stride length, the contact and flight times, a combination of photocells and optojump (OJ) measurements are lately being used to measure running velocity. As both systems are used to measure velocity, this research focused to ascertain whether velocity measurement results obtained by either photocells or by OJ are the equivalent.

The research involved 17 sprinters (11 male and 6 female). Their average best score in a 100 m run was 11.24 s (+-0.56), the age 19.9 years (+-3.4), height 1.74 m (+- 7.4), weight 65.6 kg (+-7.57). Each of them performed two sprints of 20 meters, flying start. For further analysis, the fastest sprint measured with the photocells was used. The velocity was simultaneously measured by the photocells (Brower timing, USA) and OJ (Microgate, Italy). The photocells were installed at four consecutive, 5 meters long sections. Photocells were installed at a 1.14 meter height. The OJ was installed from the first to the last pair of photocells. In measurements with OJ, foot contact closest to the photocells was used to determine the beginning and the end of an individual section. A t-test for related samples was used to compare the variables measured by photocells and by OJ. The ANOVA test was used to test the differences among the variables that were measured with the same method.

In measurements with photocells, the running velocity on the 10- to 15-meter section was 10% higher than the running velocity on 0- to 5-meter section. On the 0- to 5-meter section, the measured velocity was statistically significantly lower than the velocities measured on other sections. In OJ measurements, there were no statistically significant oscillations in velocities as per individual sections. Velocities measured with photocells and OJ statistically significant differed on two sections. The velocity measured with photocells on the 0- to 5-metre section was statistically significantly lower than the velocity measured with OJ. While on the 10- to 15-meter sections, the situation was just the opposite. Regardless of the section length (5, 10, 15, or 20 m), the average speed measured with the photocells was always statistically significantly lower than the average velocity measured with OJ.

The results of maximal velocity measurements with single beam photocells installed 1.14 meters high cannot be compared to results of maximal velocity measurement done by OJ in cases when the measurement sections are 5 to 20 meters long. Further researches should be carried out in order to ascertain which of the timing system gives the results that would be closer to the actual centre of mass velocity.

CREATINE KINASE MONITORING AND PERFORMANCE DURING 3 WEEKS OF HIGH ALTITUDE TRAINING IN ELITE MIDDLE AND LONG DISTANCE RUNNERS

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INTRODUCTION: Creatine kinase (CK) is a highly sensitive marker for muscle damage. It is well known that a wide range of exercise modalities such as high-intensity, volume training, and especially weight-bearing eccentric exercise cause the greatest rises in CK. Usually peak values are seen 24-48 hour after such exercise. Therefore a daily monitoring of CK and other exercise relevant strain markers could facilitate coaches in controlling training load. Especially, middle and long distance runners perform training camps in order to increase performance. Within these, training volume and/or intensity increases considerably compared to "normal" training procedures. Until today no clear consensus exists on which threshold of CK elevation correlates with changes in performance as well as other monitoring parameters.

METHOD: 9 (2 female) highly trained middle and long distance runners from the German National Track and Field team were monitored daily during a training camp at 2100m altitude. Values for CK, resting heart rate (HR) and body weight (BW) were collected in the morning hours between 7AM and 9AM. Additionally all athletes had to rate their overall body perception (BP) and quality of sleep (QS) on a six point scale (1=very good, 6=very poor). Running speed (V3) at 3 mmol/l blood lactate was assessed before and after the training camp. All middle and long distance runners performed the same amount of training session. Each athletes performed two to three training session per day. One day with less training volume and intensity was set after 3-5 consecutive days depending on training advancement. Training intensity was controlled by heart rate, lactate values as well as CK and perceptual values. One-two days of degraded BP and QS accompanied by elevated CK resulted in a reduction of intensity or training volume.

RESULT: V3 increase form 4.4±0.2 pre to 4.6±0.2. Baseline values for CK in mean were 163.1±43.8 U/L ranging from 96-241U/L. Highest values during the three weeks were found at day 17 of 20 ranging from 233 to 679 U/L. Mean CK Values for all athletes in three weeks was 346.5±146.5 U/L. The individual CK kinetics over the complete period of time revealed individuals with generally lower CK values 223 vs. individuals with considerably higher CK values (501 U/L) but same work load. Despite clear mean increase in CK body

weight remained unchanged from pre to post (66.7±10.6 vs 66.6±10.3kg). Mean SQ decreased by 0.5 points towards the end of the camp. Mean BP remained unaltered.

Summary: The results demonstrate low as well as high individual CK values despite equal work load. In this study mean CK values of 346.5±146.5 U/L over three weeks did not affect performance enhancement negatively. In several cases elevated CK kinetics correlated with degraded BP and QS. BW remained unaltered. The results in this study confirm the necessity to perform individual profiles of different markers in order control training over time.

SIMULATED ANALYSIS OF THE RELATIONSHIP BETWEEN TRAINING AND PERFORMANCE IN CYCLING

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Introduction: A model to investigate adaptive processes by means of antagonistic dynamics has been developed by Perl (2001). The PerformancePotential-Model (PerPot) helps to simulate the relationship between training and performance by using a state-event-model with adaptive delays. Due to the fact that training influences the delay of physiological responses, the PerPot software allows the determination of model parameters by constant (global) or varying delay parameters (local). We intend to determine whether PerPot can be used to validly analyse adaptations to training in elite cyclists (preparation period). Two different variables for training and performance were tested. Beyond that we used local delays to identify periods of different adaptation chronology.

Methods: Two road cyclists (S1, professional, 30,000km/year; S2, elite, 22,000 km/year) and one mountain biker (S3, elite, 13hrs/wk) collaborated voluntarily in our 5-month study. The training stimulus (input) was quantified daily by heart rate (TRIMP, Millet et al., 2002) and power output (P, Watt) (SRM-System). Performance (output) was determined three times weekly by cycle ergometer tests: an incremental exercise test to exhaustion (IET, kJ/kg) and a 10sec-Wingate-Test (WT, Watt). Additional physiological parameters (urea, creatine kinase, haematocrit, HRV) were measured before each testing. Intraclass Correlation Coefficient (ICC) between modeled and real performances was calculated to estimate model validity (model fit).

Results: An acceptable model fit (ICC) with global delay parameters for input TRIMP as well as P could only be achieved for S1 (TRIMP to IET/WT: S1 = .93/.76, S2 = .58/.38, S3 = .36/.18; P to IET/WT: S1 = .89/.56, S2 = .42/.42, S3 = .53/.16). A better model fit was achieved for IET than for WT, whereas no evidence for the benefit of either input alternative was found. With local delay parameters, we identified 3 to 5 adaptation periods. Afterwards the PerPot was fitted by using the subdivided datasets, whereby an excellent model fit (ICC) was achieved for both TRIMP (M = .86, SD = .14, range = .61 - .97) and P (M = .84, SD = .13, range = .63 - .98).

Discussion: The results confirm that long-term adaptation is characterised by phases of different time delay, so that a time varying model is useful for analysing training effects (Busso et al., 1997). The progression of the physiological parameters provides indications of the course of delay variation.

References

Busso, T., Denis, C., Bonnefoy, R., Geyssant, A. & Lacour, J. R. (1997). Modeling of adaptations to physical training by using a recursive least squares algorithm. J Appl Physiol, 82 (5), 1685-1693.

Millet, G. P., Candau, R. B., Barbier, B., Busso, T., Rouillon, J. D. & Chatard, J. C. (2002). Modelling the transfers of training effects on performance in elite triathletes. Int J Sports Med, 23 (1), 55-63.

Perl, J. (2001). PerPot: A metamodel for simulation of load performance interaction. Europ J Sport Sci, 1 (2), 1-13.

EXERCISE INTENSITY DURING A 700KM ONE LEG OFF-ROAD BIKING RACE

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The purpose of this descriptive study was to examine the exercise intensity of a continuous 700km off-road biking competition with a total of about 10,000 climbing meters across the Finnmark plateau in Norway. The race takes the bikers through cart roads and single-track paths. In some places, the bikers need to get across wild, pathless terrain, where technical challenges are frequent and the bikes often need to be carried. The competitors need to cross hundreds of brooks, creeks and a few large rivers. The race goes through twelve checkpoints 60-99 km apart (about 3 to 10 hours), lasting close to 5days. During the race there are three compulsory stops, each at a minimum of 2 hrs. The race is a team race, with two or three bikers in the team. Five male bikers 22-54 years old (mean age 40 years) volunteered to participate in the study during the 2008 test race.

Within a week before and after the race their anaerobic threshold (AT), maximal oxygen consumption (VO2max) and maximal heart rate (HRmax) were measured using a Lode Excalibur sport ergobike with a preferred cadence around 90 rpm. The bikers wore Polar ® HR belt and watches from testing until about 48 hrs after end of race. HR limits for the five intensity zones (Z) based upon the individual HRmax used by the Norwegian Olympic Committee were calculated for each biker: Z1:55.1 -72 % HRmax; Z2:72.1-82% HRmax; Z3:82.1-87% HRmax; Z4: 87.1-92% HRmax; Z5:92.1-97% HRmax. The times in minutes and as percent of total individual race time with HR in each intensity zone between each checkpoint (leg) were calculated for each biker. The average HR absolute value and as percent of HRmax on each leg were also calculated.

The bikers had an average VO2 max 73.3 ml/min x kg (65.2-82.4) before the race. Three bikers finished, two had to quit after finishing 60% of the race because of injuries. During most of the time during biking the bikers worked with HR intensity zone 1. One biker had periods in HR zone 3 during five of the eleven legs, the other bikers worked only in HR zone 3 during the first, fifth and the last leg. Two of the bikers had recorded HR in HR zone 4 for a maximum of 15 min during the race. None of the bikers worked in HR zone 5 during the race. The HR on the first leg (76.5km) showed the highest average value 70.9 %HRmax (74.3 %HRmax - 67.2 % HRmax) for all five bikers. The lowest average HR value for 3 of 4 bikers was on the 28.1 km long 8th leg (52.8 %HRmax – 55.1 %HRmax), while one biker had his lowest average HR on the 47.3km long 10th leg (58.6 %HRmax).

This study shows that this continuous off-road race is physically very demanding.

COMPARISON OF EXCESS POST-EXERCISE OXYGEN CONSUMPTION AFTER THIRTY MINUTES OF CYCLING AND CROSS-TRAINING EXERCISES

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Introduction: In the recovery period after exercise there is an increase in oxygen uptake termed excess post-exercise oxygen consumption (EPOC). The magnitude of EPOC after aerobic exercise may depend on duration and intensity of exercise, on type of exercise (split exercise or continuous sessions) and on training status and sex. It is not clear whether various modes of aerobic exercise affect EPOC differently (Børsheim, 2003). Cycling exercise (CE) has been compared with treadmill and arm crank exercise separately but the impact of cross-training exercise (CTE) on EPOC has not yet been examined. The aim of this study was to evaluate the acute effects of moderate intensity CE and CTE on EPOC.

Methods: 6 young moderately active female (age, 24,2±0,8 yr; BMI, 21,5±2,4 kg/m2; RMR, 1288±78,2 kcal/day) participated in the study over a 2-week period. In the first week subjects filled a Baecke questionnaire of habitual physical activity, undergone a resting metabolic rate (RMR) measurement and 3 incremental tests to exhaustion (V'O2peak at treadmill, cycle ergometer and arm ergometer). In the second week they completed two bouts of 30 min of exercise at 60% of V'O2peak separated by 48 hours of rest: a continuous CE and a combining running, cycling and arm crank for 10 min each. Before (30 min pre) and after (2 hours post) each exercise bout a RMR measurement was carried out in a sitting position (K4b2, Cosmed, Italy). A One-way Anova was used to analyse data and significance was accepted at $p<0,05$.

Results: Oxygen uptake (V'O2) and heart rate (HR) were significantly higher for CE during exercise when compared with CTE (CE: V'O2 1,4±0,2 l/min, HR 138±11 bpm; CTE: V'O2 1,1±0,2 l/min, HR 120±4 bpm; $p<0,05$). No difference was detected during exercise between groups for energy source utilization (CE 116,2±29,7 kcalCHO, 84,8±14,4 kcalFAT; CTE 83,3±25,2 kcalCHO, 75,8±12,5 kcalFAT; ns). O2 consumed during and after CE was higher than CTE (not significantly) even when normalized to the pre-exercise levels (CE: O2tot 71,2±8,1 l; O2net 37,5±11,2 l; CTE: O2tot 65,1±12,1 l; O2net 32,5±7,3 l; ns). On the contrary, EPOC magnitude was higher for CTE than CE, even if not significantly (CE 3,3±2,5 l; CTE 6,1±4,6 l; ns). EPOC accounted for 9,5% and 17% of total energy expenditure for CE and CTE, respectively.

Discussion: These results confirm the ones obtained by Lyons et al. (2006) showing that separating a continuous 30 min exercise into three 10 min exercises will elicit a small but higher EPOC. This could be beneficial for subjects with a low fitness level who are unable to perform one long-bout of exercise on the same ergometer, or to enhance exercise adherence (ACSM, 1998).

References

Børsheim E and Bahr R; Sport Med. 2003;33(14):1037-60

Lyons S et al.; Appl Physiol Nutr Metab. 2006 Jun;31(3):196-201

ACSM; Med. Sci. Sports Exerc., Vol. 30, No. 6, pp. 975-991, 1998

CYCLING PEFORMANCE AND CELLFOOD

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Introduction: Many supplements on the market today claim they can have a positive effect on adaptation/training process and sport performance. One of these is Cellfood (NuScience Corp., Lancaster, California, USA).The aim of our study was to evaluate the effect of Cellfood supplementation on the cycling performance during 5 weeks of training in the preparation period.

Methods: Subjects consisted of 16 highly trained male competition cyclists (1), age 24.9 ± 3.4 yr., body height (179.5 ± 6.2cm) and body mass (70.3 ± 3.5 kg). The primary mode of training was cycling 8 times per week (4 times aerobic, 3 times mixed aerobic + anaerobic and once per week speed-anaerobic type of training load).

Testing Procedures

After 15 min warm-up on their bicycle set up on a cycle ergometer (SpinTrainer - TechnoGymTM) cyclist proceeded with incremental test (initial load 150 watts (W), increase 20 W min-1 to volitional fatigue), (2,3). Heart rate, ventilatory and gas data were collected continuously during the test with Cosmed K4b2 portable device. Lactate samples (20µl) were analyzed on Eppendorf Ebio +.

Measurements and Supplementation Procedure

Cyclist were randomly divided in two groups: the first group (CF group) took 12 drops of CellFood dissolved in 0.15l of purified water, or juice, 3 times per day— once during physical activity. The second group (Control group C) took 7% saline solution and citrus artificial flavoring in original packaging to mimic the acidic taste of Cellfood. Both groups started with the procedure the day after the initial measurement and finish after 5 weeks. The second measurement was one day after the last day of supplementation.

Statistical Analyses

Descriptive statistics included mean, standard deviation and Student's t-Test for matched pairs (p value of < 0.05).

Results: Both groups demonstrated improvement in maximum power and VO2 max. In CF group the improvement was statistically significant (p ≤ 0.01) in maximal power and VO2 max, in the other hand, the control group showed statistically significant improvement (p ≤ 0.01) in VO2 max but not in maximal power. Lactate level and maximal hart rate were not statistically significant changed in both groups after 5 weeks of training

Discussion: Both groups showed similar trends of changes (maximal power, VO2 max, maximal lactate level) but more statistically significant improvements/changes are observed in the CF group (maximal power (p ≤ 0.01), VO2 max (p ≤ 0.01) and lactate level (p ≤ 0.01) compared with the control group (VO2 max (p ≤ 0.05). Based on this preliminary study results we cannot reject hypothesis that Cellfood is beneficial to the adaptation process for the period of 5 weeks training of highly trained (international level) cyclist. The mechanisms of the changes and the effect of Cellfood on adaptation will be the subject of future studies.

References

1. Hamilton L et all. J Sports Sci., 2002 Dec;20(12):1001-8

2. Bentley DJ et all. Sports Med. 2007;37(7):575-86

3. Wasserman K.et all.,JAP, 1986;60:2020–27

THE '4 X 3000M CYCLING FIELD TEST' CAN BE USED TO EVALUATE PERCEIVED EXERTION AND TO DETERMINE TRAINING ZONES FOR CYCLING

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Introduction: It is important that athletes in elite endurance sport train in specific training zones. Especially young athletes have to learn to correctly estimate the individual training intensities. It is not often possible to test young endurance athletes under laboratory settings and field tests can be an appropriate method to determine individual training zones. However, in most of these tests, the intensities are predetermined and it is difficult to evaluate, if young athletes correctly choose their training intensities. The aims of this study were: firstly, to examine, if Swiss national team cyclists are able to hit the four most common training zones in cycling in a new '4 x 3000m cycling field test' (FTE). Secondly, to investigate how heart rate (HR) at the anaerobic threshold (AT) determined in the FTE corresponds with the HR at AT from laboratory results.

Methods: 21 Swiss national team cyclists from the disciplines mountain bike, road and cycle-cross (15 males and 6 females; age = 15.3 ± 0.5 years) performed at first a progressive test in laboratory (PTL) to determine HR at lactate threshold (LT) as well as at AT (ADAPT-method; Bishop, Jenkins & Mackinnon, 1998). The HR training zones for cyclists were determined as follows: 'easy' < LT, 'medium' between 'easy' and 'hard', 'hard' HR ± 10 bpm at AT and 'all out' > 'hard'. Secondly, the athletes performed the FTE, where they cycled four times 3000m on a 400m track in steady intensities based on their perceived exertion. They tried to hit the training zones 'easy', 'medium', 'hard' and 'all out'. After each 3000m stage, the athletes had a two minute break, when blood lactate was measured. Thereafter, HR at AT in FTE was compared with the HR at AT in PTL (polynomial interpolation of lactate values from PTL at AT for the FTE to determine the corresponding HR).

Results: Nine of 21 athletes hit the four training zones in the FTE correctly. There was no difference in HR at AT (PTL: 178 ± 8 bpm; FTE: 175 ± 9 bpm; p = 0.06). There was no difference (p = 0.59) in HR at AT expressed as percentage of HRmax between PTL (93 ± 2 %) and FTE (92 ± 3 %).

Discussion and Conlusion

Our results showed that less than half of the U17 Swiss national team cyclists were able to hit the four most common training zones. This underlines the importance of training and testing the perceived exertion at this age. HR at AT corresponded highly between both tests, even when the training intensities where not chosen correctly. We suggest that the '4 x 3000m cycling field test' can be a useful tool to evaluate the perceived exertion and to determine the four most common training zones in cycling.

KUWAITI AND HUNGARIAN ELITE MAN HANDBALL PLAYERS

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Introduction: International scientists deal with handball players endurance tests and labor tests and matches analysis in Hungary since 2007. We want to reach, the teamsport should be more effective considerating individual differences.The Research Team could check Kuwaiti handball players in the time of their training camp in 2008.

Methods: The Kuwaiti's and Hungarian results comparison, the analysis of the match and a training performance benchmarking according to position the directions of the development of the efficiency.Body combination (with InBody 230), antropometrical indicators, BMI, the examinate of blood pressure, a pulse measurement, oxidative capacity, load tests, stamina runner and handballspecific tests, matches, trainingcontroll with the POLAR Team System.

Results: We experimented considerable, significant differences in the stamina runner tests the lengths (20m/piece) and in the look of the accomplished largest velocities (km/h). Group m1=Hungarian elite players, m2=Hungarian NB/II, k=Kuwaiti group. (Stamina runner test m1= 101, m2=98, k=85,velocities m1=13,8, m2=14, k=13) The best oxidative capacity it in the group m1 we measured, the other two group lagged behind the sport (handball) relative VO2 average (55-60 ml/kg/min), (m1=57,25, m2=51,7, k=50 ml/kg/min). The relative VO2 has significant contact with the bodyweight and the body fat. At the Left and Right Wing and Right Back in the handball players were better, than the other one (m1 W/B Pl.=60,5, m2=61, k=57). The HR maximum and restitution values the average pulse and the blood pressure and a significant contact/context was showed with the height.

Summary: The Hungarian elite handball players provided outstanding performance. For example based on the anaerobic threshold (AT) values the players in the extreme position were faster, but the pivot and shooting players were of stamina. But the Pendulum running test was distignuished by the Center Back players (142 lengths). The direction of the development has to the respect of the individual differences. The OwnZone special training plans into a respiratory period as a standlone program, in other training this period will be 1-2 times week, because the oxidative capacity, the calmness pulse and blood pressure will be right. The time regeneration and his quality is very important between the matches (much more aerob training- running, spinning, swimming- stretching with a suitable type, massage, and relaxing).

References: Loftin M, Anderson P, Lytton L, Pittmann, P, Warren B, Journal of Sport Medicine and Physical Ftness 1996. 36 95-99.

Horváth J, Juhász I, Mocsai L, Némerth A, Kézilabda Papirusz Duola 2004.

Györe I, Terhelésélettan, teljesítménydiagnosztikai lehetőségek a labdajátékokban 2008. OSEI Budapest

Jansen R, Schmidtbleicher D, Cabri J, Sportverletzung-Sportschaden, 2007.03.

Dömötör E, Pulzuskontroll, Carita Bt, 2005.

Jovanovic J, Jovanovic M, Medicinski pregled, 2005. 58 168-174.

Hottenrott K, Training with the heart rate monitor Meyer&Meyer Sport, 2007.

14:15 - 15:15

Poster presentations

PP-PP01 Physical Education and Pedagogics 1

ZEN AND THE ART OF SWIMMING – IMPULSES FOR TEACHING AND TRAINING

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Introduction: There is no other physical activity which concerns human beings as existentially as swimming. In a way our existence is connected with movement in water. If you cannot swim, you can loose your life when falling into water. The first movement after conception for all human beings is swimming in one's mother's womb. Regardless of culture, gender, nationality or religion, swimming has been seen as an essential and basic ability of human beings.

Methods: In this paper we shall have a look at a combination of spirituality, physical education and training, in relation to the learning and practice of swimming. For that purpose this study examines the Zen - Buddhist perspective regarding body and movement (cf. DESHIMARU-ROSHI 1984; MOEGLING 1987; SEKIDA 2005). Some elementary concepts from the Zen Buddhist philosophy shall be discussed, in order to reveal and compare constructive elements for and with the "Art of Swimming". By using text analysis and empirical case studies the main aim is to give new impulses for teaching and training swimming activities.

Results/Discussion: At first the combination of Zen and Swimming may seem unusual, but on closer scrutiny Zen Buddhist philosophy and spiritual practice highlights factors supporting the experience of swimming. Notably for tackling problems during the learning process, spiritual experiences from Zen may be complimentary. The paper aims to show some associations and parallels between the concepts of emptiness, wholeness, being vs. non-being as well as meditation techniques of breathing and awareness with important elements of swimming on different levels. Those provide new impulses for teaching and training swimming.

References:

BISSIG,M./GRÖBLI,C.: SchwimmWelt. Schwimmen lernen – Schwimmtechnik optimieren. Bern: Schulverlag 2004

BOTTINI,O.: Das große O.W.Barth-Buch des Zen. . Frankfurt/Main: Barth 2002

CSIKSZENTMIHALYI,M./JACKSON,S.A.: Flow in Sports. Champaign/IL /Leeds: Human Kinetics 1999

DESHIMARU-ROSHI,T.: Zen in den Kampfkünsten Japans. Weidenthal: Kristkeitz 1984

MOEGLING, K.. Zen im Sport. Haldenwang: Schangrila 1987

SEKIDA,K.: Zen Training. Methods and Philosophy. Boston/London: Shambhala 2005

SHAW,S.: Master the Art of Swimming. London: Collins &Brown 2006

SPRAWSON,C.: Ich nehme dich auf meinen Rücken, vermähle dich dem Ozean .Die Kulturgeschichte des Schwimmens.Hamburg: Marebuchverlag 2002

STEVENS,J.: Budo Secrets. Teaching of the Martial Arts Masters. Boston/MA: Shambhala 2002

SUZUKI,D.T.: Die große Befreiung. Einführung in den Zen Buddhismus. Frankfurt/Main: Barth 1976/2005

MULTIVARIATE TIME SERIES MODELING OF THE TRAINING-PERFORMANCE RELATIONSHIP WITH ARTIFICIAL NEURAL NETWORKS

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Introduction: The knowledge of the highly individualised and complex relationship between training and performance is important to manage athletes' training programs. Modeling the training-performance relationship makes a contribution to optimize training load and regeneration. So far different models have been developed. They either model only a bi-variate relationship between a global training input and the performance output (Banister et. al, 1975; Perl et al., 2001; Brückner and Wilhelm, 2008) or they don't handle the training process as time series (Edelmann-Nusser et al., 2002). Hence no time series model reflects simultaneously the multi-faceted training input that affects performance development. Therefore, the aim of this study was to develop a multivariate times series model to reproduce and predict the individual relationship between training and performance.

Methods: A backpropagation net was used for multivariate time series modeling. The artificial neural net (ANN) consisted of 12 input, 8 hidden neurons and 1 output neuron. Data consisted of a four week endurance training period (Brückner and Wilhelm, 2008). Training loads and ratings of perceived exertion (RPE) were recorded as training input daily. The performance output was also measured daily. All time series were divided into four day sections. Four sequenced values t-1, .., t-4 of all time series were used as net training input and the performance data at the time t as net training output. The ANN should learn to predict the fifth value on the basis of the last four values. Hence 34 training patterns with 12 input and 1 output data were used for the net training. Four subsequent values were predicted.

Results: The original data set was quite well reproduced by the model. Significant correlations were observed between the original data and the modeled performance ($r = 0.86$, $P<0.001$). The prediction of the four subsequent values showed less optimal results. The mean absolute error (MAE) was 0.1 or 10%.

Discussion: Time series modeling of the training-performance relationship upon ANN seems to be a quite powerful method. For the first time it is possible to take the multi-faceted factors that affect performance development into account. The goodness of the model adaptation can be compared to the results by Brückner and Wilhelm (2008). Since this paper documents work in progress even better results for model adaptation and prediction are expected in future.

Literature

Banister EW, Calvert TW, Savage MV, Bach A (1975). Austr J Sports Med, 7, 170-176.

Brückner JP, Wilhelm A (2008). Leistungssport, 2, 21-26.

Edelmann-Nusser J, Hohmann A, Henneberg B (2001). Europ J Sport Sci, 2, 1-12.

Perl J, Dausher P, Hawlitzky . (2001). Int J Comp Sci Sport, 1, 56-57.

COGNITION AND PHYSICAL ACTIVITY IN KINDERGARTEN - DEVELOPMENT OF A PHYSICAL ACTIVITY PROGRAM FOR THE IMPROVEMENT OF COGNITIVE ABILITIES AND THE QUESTION OF HOW TO ASSESS COGNITIVE CONTROL

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Introduction: Physiological processes in the brain, visualized by new technologies (fMRT) since the early 90s, have shown that physical activity has a positive impact on brain function. Scientific studies involving motor and cognitive ability tests came to the same positive conclusion.

Motor activity and cognition:

There appears to be a strong link between coordinative abilities (e.g. balance) and cognitive abilities (e.g. concentration). However, there is a lack of research in controlled evidence based intervention studies relating to transfer effects from motor ability programs to cognitive abilities.

Moreover, the relation between more specific components of motor and cognitive abilities (e.g. selective attention, inhibitory control, behavioral self-monitoring) remains largely unclear.

Methods: The purpose of the first study is the evaluation of the question whether the transfer effects of a physical activity program (e.g. balance) for preschool children lead to the improvement of cognitive abilities (e.g. concentration, memory). In a pre- and post-test experimental design, 75 kindergarten children (3-5 years) participated in a three-month physical activity program, while those in the control groups, divided into an internal (n= 75) and an external (n=20) control group participated in the regular curriculum. The treatment (5times/week) ended after 12 weeks and the follow-up evaluation was conducted after another 12 weeks. Both groups were tested for motor skills and cognitive abilities. The CoMiK-study is a longitudinal and intervention study.

The purpose of an additional second study was the assessment of different measures of cognitive control. Selective attention and behavioral self-monitoring was measured with an Erikson-Flanker task. Inhibitory control was measured with a stop-signal task. In both paradigms, reaction time data is collected. The Erikson Flanker task is a widely used paradigm in which participants have to suppress irrelevant information and focus on relevant information in the environment. In the stop-signal task, a primary response has to be inhibited on some trials whenever a stop-signal appears. The response latency to the stop-signal serves as a measure for the ability to inhibit a prepotent response.

Results and discussion: Results of the first study can support the hypothesis of a positive impact of a physical activity program for preschool children. The experimental group showed improvement compared to the control groups on the concentration task, which were statistically significant for the external control group.

Results from the second study show the usefulness of more specific theoretical constructs for a deeper understanding of the relation between motor and cognitive abilities.

Conclusion: More research in experimental design studies needs to be undertaken to support and substantiate the transfer and causation hypothesis.

EFFECT OF COORDINATIVE EXERCISES ON CHILDREN'S ATTENTION

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Introduction: The mandatory primary school Italian Physical Education (P.E.) curriculum is structured to promote children physiological, emotional, social and cognitive development. Many studies revealed evidence of the positive effects of P.E. on children psychophysical development (Serbescu et al., 2006), but there is a lack of studies focusing on the contribution of P.E. on their cognitive development and attentional performance (Tomporowski, 2003). Moreover, little is known about the positive effects of coordinative exercise on cognitive functioning during development (Budde et al., 2008). Therefore, the purpose of this study was to assess the effects of two different physical exercise conditions on children cognitive performance. In particular, the study was performed to investigate whether acute coordinative exercises during the school time may have positive effects on concentration and attentional performance in young children.

Methods: Nineteen children aged 9-10 years of a primary school were tested using the d2-test to assess their attention and concentration. Children performed the d2-test before and after a traditional and an experimental P.E. characterized by a high variability of motor coordination and skill learning demands. The total number of items processed (TN) within the d2-test, the percentage of errors (E%), and the concentration performance (CP) were calculated and used as a parameter for sustained attention and concentration. TN value was a quantitative measure of the working speed, E% was a qualitative measure of performance, representing the proportion of errors made within the area of all items processed, and CP was an objective measure of concentration, representing the number of the correct responses minus the errors. Exercise intensity was monitored using Rating of Perceived Exertion Scale (RPE) (Borg, 1982).

Results: The TN and the E% did not significantly change after the two P.E. conditions while the CP significantly improved after the experimental P.E. lesson ($p<0.01$). Finally, RPE revealed that the traditional P.E. lesson was more intense than the experimental lesson ($p<0.05$).

Discussion: The only improvement of CP after the experimental P.E. lesson could be partly explained by the lower intensity of the experimental than the traditional lesson and partly by the coordinative character of the experimental lesson that could induce improvement in concentration performance due to the neuro-physiological adaptations induced by the motor complexity of the coordinative exercises (Budde et al., 2008).

References

Borg GA. (1982). Med Sci Sports Exerc, 14, 377-381.

Budde H, Voelcker-Rehage C, Pietrabyk-Kendziorra S, Ribeiro P, Tidow G. (2008). Neurosci Lett, 441, 219-223.

Serbescu C, Flora D, Hantiu I, Greene D, Laurent Benhamou C, Courteix D. (2006). Acta Paediatr, 95, 1258-1265.

Tomporowski PD (2003). Pediatr Exercise Sci, 15, 348-359.

PARENTAL PERCEPTION OF CHILDHOOD OBESITY IN AN INNER-CITY AREA OF PALERMO, ITALY

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Introduction: The prevalence of overweight and obesity in Sicilian schoolchildren is one of the highest ever reported: indeed, prevalence of overweight and obesity appears to be nearly 40% at age 11 and over 25% at age 15. Excessive weight during childhood stems from

several interacting factors, including poor diet and exercise habits. The objective of this study was to evaluate in a sample of parents living in an inner-city area of Palermo, Italy, the perception of weight excess as a problem in childhood and the awareness about the role of physical activity, beliefs about contributors and parties having responsibility in counteracting the obesity crisis.

Methods: A cross-sectional survey was performed on a convenience sample of parents of 6-13 year-old children who attended grades 1, 3 and 5 of primary and grades 1 and 3 of secondary public schools, respectively. Thirteen schools were selected in an inner urban district of Palermo, Italy, this district being characterized by having a population of low to medium income residents. Parents were asked to come to the school and participate in the investigation. The survey was administered in the spring of 2006. After a descriptive analysis, role of specific demographic and social characteristics – education, gender, age class and BMI - of respondents was assessed by univariate and multivariate logistic regression analysis.

Results: Three hundred eleven parents completed the questionnaire. Eighty-three percent believed that being obese in childhood is a serious health hazard, but one third still interpreted the child's weight excess as an expression of health. The most significant contributors to childhood obesity were thought to be junk food and beverages (78.0%) and fast food (63.2%), followed by lack of exercise in school curriculum (48.7%). Beliefs about responsibilities for combating childhood obesity significantly varied according to education level. Logistic regression revealed that a lower mother's education level was negatively and significantly associated with perception of junk food and beverages, lack of exercise at school, lack of places to exercise and lack of security as health threats in childhood. Furthermore, mother's low education was negatively associated in a statistically significant manner with attribution of responsibility to fight overweight to food companies, school and healthcare services.

Discussion: Public support for environmental changes could more effectively rise with the increasing public awareness that many interrelated obesogenic factors in the modern environment are playing a key role.

PHYSICAL ACTIVITY AND ACTIVITY TYPE DURING SCHOOL RECESS IN ELEMENTARY SCHOOLS

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Background: It is recommended for children to engage in at least one hour of moderate to vigorous physical activity (MVPA) every day. Non- intervention school recess can contribute substantially (5-40%) to this guideline (1). Does school recess contribute to motor skill development as well?

The purpose of this study was to investigate the variability in physical activity and activity type during recess on 4 elementary schools in the Netherlands.

Methods: SOFIT (System for Observing Fitness Instruction Time) (2) and SOPLAY (System for Observing Play and Leisure Activity in Youth) (3) were integrated and modified specifically for this study to measure the amount of moderate-to-vigorous physical activity (MVPA) and the activity type. 343 Children (4-12 year) were observed by trained observers during 24 breaks.

Results: Inter-observer reliability physical activity exceeded 71% (average: 76%); activity type exceeded 74% (average 81%). Children engaged in MVPA 22,5% of recess time and in vigorous physical activity (VPA) for 7,1%. 10-12 Year old boys were significantly more active than girls at this age (22,7% vs 15,7%; $p<.05$).

More than one third of the time (38%) children showed no specific activity; 29% was spent walking and running. Other activity types (e.g. climbing, balancing, jumping, ball play) were performed less than 8% of the time each.

Girls spent significantly ($p<.01$) more time tumbling and jumping, boys more time with ball play ($p<.01$).

4-6 Year old children spend significantly ($p<.01$) less time walking/running, jumping and romping games, than older children, but were more active ($p<.01$) on bikes and play-cars (these being unavailable to the older children).

Conclusion: There is relatively little complex (non-ambulatory) activity in Dutch elementary school recess, and MVPA is relatively low; school recess contributes only 5,6% to the desired daily MVPA of children. Both findings could be due to short recess-times, usually 15 minutes morning break for 6-12 year old children. This might be too short to commence more complex activities needing a certain level of organisation. In order to stimulate physical activity and motor development in schools, studies might aim at developing interventions that can be implemented during recess. We speculate that elementary school physical education could play an important role herein.

References:

1. Ridgers, N. D., Stratton, G., & Fairclough, S. J. (2006). Physical Activity Levels of Children during School Playtime. Sports Medicine, 36(4), 359-371.

2. McKenzie, T. L. (2006). SOFIT. (System for Observing Fitness Instruction Time) Generic Description and Procedures Manual. San Diego: San Diego State University.

3. Mc Kenzie, T. L. (2006). SOPLAY. System for Observing Play and Leisure Activitiy in Youth. Description and Procedures Manual. San Diego: San Diego State University.

FUNDAMENTAL MOTOR SKILLS OF PREADOLOSCENTS IN NORTHERN ITALY: A CROSS-SECTIONAL COMPARISON BETWEEN THE 70'S AND THE PRESENT DAYS

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INTRODUCTION : Among the most common gross-motor abilities running, jumping and throwing have been considered some of the most important fundamental motor skills (FMS).Their development, 30 years ago,was guaranteed and performed throught a natural and active life style.Today the scholastic sport activitie and the structured extra scholastic sport activities are not enough to guarantee quantity and quality of motor development of our preadolescents. The study shows how since the late 1970s one can see a progressive motor impoverishment related to the principal gross-motor abilities(1),caused by the diminution of movement opportunities for our children(2)and by the advent of computers,cellular telephones and electronic static games.

METHODS :In the year 1976 a test battery was proposed to 1000 students.The same test battery was proposed to 500 students in 2007.The data have been collected through the scholastic system by submitting tests during PE lessons after a 20 minutes warm-up.Test battery: Speed run (boys mt.80; girls mt.60), Endurance run(mt.1000), Long Jump, High jump, precision throw (Basket drought) and strength throw (one hand throwing of a little ball), twine-skip test and pole-climb test.

RESULTS :After 30 years significant differences have been noticed in the weight, in the height and in the Body Mass Index. Today boys and girls are taller and heavier and we can also notice a marked increase in BMI.All data have been compared with NCHS Growth Charts(3).

In all tests we noticed a loss of ability. These differencies are more evident in endurance and power abilities than in precision tasks. Regarding the gender, these difference are more evident in the girls (increase average of failure 18,59 %) than the in boys (increase average of failure 15,31 %). Differences among the participants according to their ages and birth date were analysed with Pearson's Chi-square test and statistical significance have been confirmed by the O.R.(odds ratio) values.

DISCUSSION:The lack of motor activities in natural environment, the increase of static games, the disappearance of the old courtyard games, the lack of suitable scholastic programs are the causes that, in our opinion, have led to a reduction of FMS. To solve these problems, the following actions seem mandatory: 1)Increase the sporting offer inside the scholastic system;2)Invite P.E. teachers to propose more coordinating exercises based on gross-motor abilities;3)Allocate at least two free afternoons for sporting activities;4)Support a closer interaction and collaboration between scholastic system, out-of-school sportive system and families, in order to enhance a better lifestyle necessary to preserve children health.

REFERENCES

1) F.Casolo et al (2007). Abstracts of PWP Congress, Tallin,,Vol 14:64-65

2) F.Casolo et al (2006). Proceedings of the Sport for all Congress, Havana

3) NCHS, CDC Growth Charts (2000) , Hyattsville USA

PRELIMINARY RESEARCH ON PHYSICAL ABILITIES IN CHILDREN FROM 8-10 YEARS IN GARBAGNATE MILANESE (MI)

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Preliminary research on physical abilities in children from 8-10 years in Garbagnate Milanese (MI)

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This research in 2007-2008 considered 331 children attended the 3th, 4th and the 5th class of Primary School in Garbagnate Milanese (MI) and has been completed with the cooperation of Catholic University of Milan – Motor Science and Sport - graduated students.

The main goal is to know which are the factors that influence overweight and obesity as: the lack of any kind of physical activities, the presence of 'paramorfismi', a poor diet or a wrong feeding.

This work used a questionnaire on the children's habits and style of life, a series of antrophometric and physical test. A medical visit, has been done in each school in order to measure the height, weight, skinfolds, and circumference of the waist..

The trend of the height and weight between these children is nearly equal between males (137, 54 cm ± 6,59; 35,61 kg ± 8,67) and females (136,49 cm ± 7, 06; 35,76 kg ± 7,51). The body mass index it has quite a similar trend between males (18,66 kg/m 2 ± 1) and females (19,11 kg/m 2 ± 1).

The medical visit has underlined that the majority of children does not show accentuations or meaningful reductions of the physiological curves dorsal and lumbar. Booth in females and in males, that there is a slight prevalence of dorsal cifosis level in males and the lumbar lordosis level is greater in females. In overweight children, the presence of knees valgus and varus and of flat feet (around 55%) is frequent specially in males.

In the 40 meters fast run ('shuttle run') males (9,65 s ± 1,02) are faster compared to the females (10,28 s ± 1,04), but not in a significant way ($p<0.002$). In the long standing and forward throw Minibasket ball, the trend is analogous between males (151,50 cm ± 24,75; 4,17 m ± 0,74) and females (129,65 cm ± 24,59; 3,84 cm ± 0,72).

In stick test, males (63,8 cm ± 11,74) obtain better results than females (58,13 cm ± 12,39); in the sit & rich test females (2,83 cm ± 6,84) obtain better results than males (-1,66 cm ± 6,96).

The information from the questionnaire outlined that males (23%) spent more than an hour and half playing, instead females (19%) one hour, come child (4%) told they never play.

About the sport activity practice, males prefer playing soccer, basketball and swimming instead females prefer gymnastic, swimming and volleyball; the 3% of children told they do not play any sport activities.

The few sport activity is associated to a bad way of eating. Only few children (4%) prefer eat meat, cheese and vegetables.

References

A.A.V.V. The motor activity and the feeding in the Elementary School, C.O.N.I., 2002

A.A.V.V. The feeding in the Elementary School, C.O.N.I., 2002

TRACING THE DYNAMICS OF SOME PSYCHOMOTOR PROPERTIES CHANGES, NECESSARY FOR A GOOD PROFESSIONAL REALIZATION OF HIGH GRADUATE ENGINEER SPECIALISTS

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The opportunity for a market realization of the young people in a global aspect is one of the most serious problems nowadays. This vitally important problem corresponds directly to the quality of their professional training of different stages of University education and covers : scientific and theoretical knowledge, also development of some psychomotor properties, connected with the profession.

The study of the upcoming changes of dynamics of some psychomotor properties necessary for students professional realization is one of the essential problems of the theory and pedagogical practice in the area of physical culture and sports.

During the analysis through the years some standard psychodiagnostic tests have been implemented in order to define the properties of the attention and evaluation of functional condition of the motive analyzer.

The depth analysis of the results obtained allows some generalization to be reached, which can be expressed as follows :

- Deviations of dynamics changes are established. They are inessential, but in a regressive plan;

- The prognostic matter of the test implemented allows the test to be used at the beginning of the students course of education, so the quality of the preliminary selection of students be improved.

SCHOOL SPORTS PARTICIPATION OUTSIDE IN TOTAL PHYSICAL ACTIVITY OF CHILDREN

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Low physical activity by children is a risk factor for several chronic diseases. Active children perceive themselves as healthier and fitter than sedentary ones. The aim was to investigate the influence of sports participation on perceived and actual physical fitness, and total physical activity in youth.

METHODS: Participants were 525 10-17-yr-old boys and girls.Children's Physical Activity Index (PAI) was calculated (Telama et al., 1996). Self-perceived endurance, strength, flexibility and body composition were measured by Lamb and Haworth (1998). Questions about the satisfaction of physical activity, participation in organized physical activity and in competitions and watching competitions were taken from the questionnaire of Telama, et al. (1996). Several EUROFIT (1988) tests were used and sum of skinfolds measured.

RESULTS: Correlations between participation in organized sports and PAI in all age and sex groups ranged from r = 0.30 to 0.61. From the perceived motor abilities, the endurance correlated with the satisfaction of exercising (r = 0.28 – 0.49). Endurance shuttle-run test results correlated with satisfaction with exercise (r = 0.29 –0.50). Participation in organized physical activity was correlated significantly with perceived endurance (r = 0.37 – 0.44) and strength (r =0.29 – 0.70). However, actual results of endurance shuttle-run test correlated with participation in organized physical activity only in 12-13 and 14-15-yr old groups (r = 0.32 – 0.61). Participation in competitions in the youngest age group correlated with perceived endurance (r =0.30), strength (r =0.48) and flexibility (r =0.28) in boys. Actual results in endurance shuttle-run test correlated with the participation in competition in every age and sex group (r = 0.30 – 0.44). Watching competitions was not correlated with perceived or actual motor abilities except perceived endurance (r = 0.28), strength (r = 0.48) and flexibility (r = 0.27) in 16-17-yr-old girls.

DISCUSSION: Sports participation, especially in girls, decreased between the ages of 13 and 18. Self-perceived endurance and strength correlated with satisfaction of exercising.

The relationship between health-related physical fitness and physical activity in children was significant but moderate.

REFERENCES

Delignieres, D., Marcellini, A., Brisswalter, J., & Legros, P. (1994). Perc Motor Skills, 78, 843-851.

EUROFIT. (1988) European test of physical fitness. Rome: Council of Europe.

Lamb, K. L., & Haworth, W. B. (1998) .Eur Physic Educ, 3, 167-177.

Telama, R., Leskinen, E., & Yang, X. (1996) .Scand Med Sci Sport, 6, 371-378

14:15 - 15:15

Poster presentations

PP-PP02 Physical Education and Pedagogics 2

CONTRIBUTION OF PHYSICAL EDUCATION LESSONS TO PHYSICAL ACTIVITY LEVELS OF DUTCH PRIMARY AND SECONDARY SCHOOL STUDENTS

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Introduction:

Dutch youngsters' overweight and obesity rates are alarming and physical activity (PA) guideline compliance is low, especially in urban areas and ethnic minorities.1 Physical education (PE) could make a meaningful contribution to the daily accumulation of physical activity needed for health benefits. However, to date, the contribution of PE to the daily accumulation of PA in Dutch youngsters is unknown.

Objective: To establish the contribution of primary and secondary school PE to the accumulation of daily moderate-to-vigorous physical activity (MVPA), as recommended in recent PA guidelines for children and adolescents.2

Methods: Data was collected from August 2008 until February 2009 in 12 primary schools and 12 secondary schools, distributed equally over the country. Heart rate data of 261 primary school children (age range 8-13) and 383 secondary school children (age range 14-18) was collected during PE-lessons. Primary school lessons were either taught by a specialized PE-teacher or by the classroom teacher. Secondary school PE-lessons were solely taught by specialized PE-teachers.

Results: Percentage MVPA during PE was 50% ± 19% vs. 38% ± 23% or 19 ± 10 vs. 21 ± 14 min per lesson (primary vs. secondary school; p<.000). No difference was observed between primary school boys and girls or between lessons taught by specialized PE or classroom teachers. In secondary schools however, boys were more active during PE than girls (32% and 45% of MVPA respectively p<.003). Assuming an average of 2 PE-lessons per week, contribution of PE to the total weekly amount of PA needed for health benefits was 9% and 10% respectively for primary and secondary school students.

Discussion and Conclusion: In the U.S., Healthy People 20103 stated that MVPA during PE should be 50%. There are no similar guidelines in the Netherlands. Time spent in MVPA during primary school PE-lessons in the Netherlands is exactly conform the U.S. Healthy People 20103 objective, while secondary school PE was well below this level. Intervention strategies to increase PE-time spent in MVPA should therefore primarily be focused on secondary school students and on secondary school girls in particular. However, increasing the frequency and duration of PE-lessons might be a more effective strategy to increase children's' and adolescents' daily PA through PE-lessons.

References

1. Hildebrandt VH, Ooijendijk WTM, Hopman Rock M. Trendrapport Bewegen en Gezondheid 2004/2005. 2007.

2. USDHHS. Physical Activity Advisory Guidelines Committee Report 2008. Washington, DC: U.S. Department of Health and Human Services 2008.

3. USDHHS. Healthy People 2010. Washington D.C.: Government Printing Office 2000.

4TH GRADERS' SOCIAL STANDING WITH PEERS – A PROSPECTIVE STUDY ON THE ROLE OF 1ST GRADE PHYSICAL ACTIVITY, WEIGHT STATUS AND MOTOR PROFICIENCY

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Introduction: Young peoples' physical - motor function and status when entering primary school may impact on their later psychosocial development (Cummings et al., 2005). In order to identify targets for interventions to promote a healthy psychosocial functioning and development during school years, the relative role of various influencing factors seem important to identify. In the present study we examined the role of 1st grade pupils' physical activity involvement, weight status, and motor functioning capability for their social status among class peers four school years later, in 4th grade.

Methods: The total number of children originally sampled consists of 118 Norwegian 1st grade children (Girls N= 64; Boys, N= 54) representing 3 different schools. These children were followed from grade 1 (6 year old) to grade 4 (9 year old) in a study with the overall purpose to examine determinants of children's physical activity, and to study possible consequences of children's physical and motor status, functioning and development for their psychological and social development. The 80 children Girls N= 44; Boys, N= 36) that provided data at both grade 1 and grade 4 make the sample for the present study. Measures included records of objectively measured physical activity, weight status (BMI), test of motor proficiency (KTK) and a peer nomination procedure to obtain sociometric status among peers.

Results: When controlling for sociometric status at time 1 (beta = .20, p<.001) in a first step (R2change=0.04), objectively reported physical activity (CSA) in grade 1 (beta = .22, p<.001) and motor ability (KTK) in grade 1 (beta = .20, p<.001), were both genuine and positive predictors of sociometric status in 4th grade (R2change=0.09). In contrast, neither 1st grade Body mass index (BMI) (beta = -.05, p>.05) nor gender (beta = -.04, p>.05) did predict sociometric status four school years later (grade four). Interaction findings also revealed that 1st grade healthy weight children benefit more in terms of their social standing among peers in 4th grade by also being proficient in the motor domain than do 1st grade overweight children. A gender moderation effect was also seen in that being physically active seems of greater importance for these 1st grade girls' 4th grade social standing among peers than is the case for the 1st grade boys.

Discussion: Findings point to the role of motor functioning and physical activity for young peoples' social standing among peers in school. Results may inform early intervention efforts in school to enhance a healthy psychosocial development among school children in the primary school years.

References

Cummins, A., Piek, J. P., & Dyck, M. J. (2005). Motor coordination, empathy, and social behaviour in school-aged children. Developmental Medicine and Child Neurology, 47, 437-442.

BODY AND HEALTH: THE CALORIC EFFECTS OF A DIDACTIC FOCUSED ON THE BODY AND MOVEMENT FOR THE ACCESS TO KNOWLEDGE

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Introduction: The lack of methodological and didactic knowledge, that would allow the teacher to offer educational activities suitable to the different needs of students, makes the enhancement of body-centered teaching methods essential. These methods are related to various psycho-educational and philosophical, neuropsychological, neurophysiological and neurobiological models that give value to the didactic-educational potential of the movement.

Objective: The objective of this work was to identify significant differences in the use of traditional teaching methods and body-centered didactics, through the measurement of energy expenditure during school activities in order to implement the use of motor activities in the school.

Material and Methods: The study has been carried out within an action-research in 14 schools affiliated with the Department of Educational Sciences of the University of Salerno.

The experimental protocol was previously established through a joint action between the school teachers and researchers, who shared the methodology to be used during the action- research.

The difference in energy expenditure during traditional teaching/learning activities and activities centered on the body and movement was measured quantitatively through the use of calorimeters.

The study was carried out on a sample of 95 children (45F-50M) aged between 7 and 10 years and 12 to 15 years, attending primary school and low secondary school in the province of Salerno (Italy).

This sample was divided into two groups:

1) the control group, which lived an experience of traditional teaching/learning activity (frontal lesson);

2) the experimental group which performed bodily/motor activities using a teaching method aimed to transfer knowledge from other disciplines (in particular the historical and spatial area) through body and movement .

Physiological variables and data of physical activity were sampled during the school activities through the use of multi-sensor monitor Sense Wear Armband, put on the right triceps of the students during the school activities.

Results: Data related to the energy expenditure, levels of activity and other parameters has allowed to analyze a relationship between the considered variables and the teaching methodology used.

References

- Babin, J., Vlahovic, L., Bavcevic, T., (2008). Influence of specially programmed PE lessons of morphological characteristics changes of 7 year-old pupils. Proceeding Book of the 5th International Conference on Kinesiology. Zagreb (Croatia).

- Cooper, A. & Page, A. (2006). Childhood obesity, physical activity end the environment. Childhood Obesity : Contemporary Issues

- Rennie, K. L., Livingstone, M. B. E., Wells, J.C.K., McGloin, A., Coward, W. A., Prentice, A. M. & Jebb S.A. (2005). Association of physical activity with body-composition indexes in children aged 6–8 y at varied risk of obesity. American Journal of Clinical Nutrition, Vol. 82, No. 1, 13-20, July 2005.

POSSIBLE INTERPRETIVE KEYS ON THE RELATIONSHIP BETWEEN THE PHENOMENOLOGICAL AND BEHAVIOURIST THEORIES ON THE DIDACTICS OF MOVEMENT AND RESULTS OF NEUROSCIENTIFIC RESEARCH ON MIRROR NEURONS

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Introduction: Recent findings about some specific neurons have demonstrated the ability of certain cells of the brain to fire when they see, hear, feel or imagine a movement as well as demonstrated by the use of instruments for neuro-imaging. The functionality of these structures offers new perspectives on the teaching and specifically on 'teaching methods and didactics of motor activities" questioning the theories on motor control.

In this perspective, action, perception and knowledge are a single process and can no longer be considered separately:

1. perception,
2. processing
3. planning
4.execution

Objective

Defining possible interpretations keys on the relationship between the phenomenological and behaviourist theories on the teaching of the movement and results of neuroscientific research on mirror neurons

Methods: The present research is a theoretical and argumentative one:

• On models and methods of teaching activities according to the main lines of psycho-pedagogic research based on behaviourism and phenomenology;

• On the relationship between the results of research on mirror neurons and the teaching of movement

Results: The method of motor activities teaching to improve performance has long been the demonstration of gesture and technical action and the education action has been the mirror of this approach in Italy. The fundamentals of this theoretical model are to be found in behaviourism which was based on external sensory stimulation mechanism and the predetermined response, induced and required at all.

The phenomenology, a philosophical approach, focused the attention on the function of the interaction body-environment and person-subject in the mechanisms of learning, knowing and anticipating the knowledge of the real functioning of perceptual phenomena (mirror neurons). The discovery of mirror neurons found evidence and consistent interpretative keys in his phenomenology of perception (Iacoboni, Welsh 2008) that binds together perception and knowledge in a continuous process , offering new perspectives on different teaching methods and activities motor.

Discussion: The results show a substantial relationship between the recent neuroscientific findings on mirror neurons and the phenomenological and behaviourist theoretical system.

References

- Iacoboni, M. (2008). Mirroring People. The new science of how we connect with others. New York: Farrar Strauss & Giroux.
- Rizzolatti, G. (2006). So quel che fai. Il cervello che agisce e i neuroni specchio. Milano: Raffaello Cortina Editore.
- Merleau Ponty, M. (1945). Phenomenologie de la perception, Paris: Libraire Gallimard.
- Husserl, D. (1936). Die Krisis der europaischen Wissenscaften und Die transzendentale Phanomenologie, Belgrado: Philosophia.
- Mackenzie, B. D (1977). Behaviourism and the limits of scientific method. London: Routeledge & Kegan Paul.
- Skinner, B. F., (1969). Contigencies of Reinfourcement. New York: Appleton-Century-Crofts.

PRIMUS-STUDY - PSYCHOSOCIAL RESOURCES IN YOUTH SPORT: CONCEPT, IMPLEMENTATION AND EVALUATION

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Introduction: Organized youth sport is often associated with capabilities for individual development. On the one hand it is assumed that sports contribute to the promotion of psychosocial re-sources (e.g. social support, self-efficacy). On the other hand, we know that psychosocial resources contribute to the development of capacity for action and performance in sports.

The conceptual framework „Psychosocial Resources in youth sport" (Sygusch, 2007) is an approach for the promotion of self-concept, self-efficacy, social competence and group cohesion. This approach orientates on the requirements of daily routine of training and competition in different sports. For the promotion of the resources, the concept formulates targets and develops methods for realization in training. Meanwhile there exist transfer concepts for gymnastics and handball.

To evaluate these transfer concepts they have been realized in 33 training groups (age 12-16 years) over seven months. In the current research of evaluation it is recommended to examine the effectiveness of the program in relation to the realization of the program (exposure and adherence) (Dane and Schneider, 1998; Mittag and Hager, 2000).

Methods: For the evaluation of program realization, exposure and adherence of implementation (de-gree of realization) have been examined via interviews with the coaches (n= 35). For the evaluation of program effectiveness, a controlled trial (n= 400) with three data collections has been carried out. Changes of self-concept, self-efficacy, social competence and group cohesion have been recorded via questionnaires.

Results: The results for the evaluation of program realization show that most coaches arranged the recommended methods in the sense of the concept (adherence) and used them frequently or occasionally (exposure). This percentage of coaches, loyal to the concept, even in-creases from 77% during the first phase of realization to 92% at the end of the interven-tion. The existing data for the evaluation of the program effectiveness are analyzed at the moment and will be presented at the congress.

Discussion: The results of the evaluation of program realization indicate that the transfer concepts are realizable in the daily routine of training and competition in gymnastics and handball. These results are the basis for an improvement of self-concept, self-efficacy, social com-petence and group cohesion in the analyzed training groups. The evaluation of program effectiveness examines the development of psychosocial resources depending on the de-gree of realization as it is recommended in the current research of evaluation (Dane and Schneider, 1998).

References

Dane AV, Schneider BH. (1998). Clinical Psychology Review, 18, 23-45.

Mittag W, Hager W. (2000). Ein Rahmenkonzept zur Evaluation psychologischer Interventionsmaßnahmen, 102-128. Huber, Bern.
Sygusch R. (2007). Psychosoziale Ressourcen im Sport. Hofmann Verlag, Schorndorf.

SEDENTARY BEHAVIOURS IN RELATION TO BODY-MASS-INDEX DEFINED EXCESS OF WEIGHT IN TEENAGERS LIVING IN A SMALL URBAN CENTRE OF SICILY, ITALY

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Introduction: Epidemiological studies indicate that sedentary behaviours are associated with obesity independently of physical activity. The aim of this study was to investigate the association of sedentary behaviours with excess of weight in a sample of children living in a smallest Sicilian town where several confounding factors could be presumed to play a limited role because of a very homogeneous daily lifestyle.
Methods: The investigation involved a randomly selected sample of 100 pupils attending the first grade of secondary education school of a smallest town with 5,485 inhabitants. Sedentary behaviour was assessed by administering a questionnaire including questions about time spent on television and other screen-based entertainment in the week during school and vacation periods. Time spent in daily activities, such as sleeping and meals, and physical activity was also evaluated. Height and weight were measured by the interviewer, BMI was calculated and then categorized in two strata of over- and normal weight. Cross tabulation with chi-square statistics and a one-way analysis of variance (ANOVA) were used to evaluate the relationship between behaviours and BMI. Differences were considered significant at P ≤ 0.05.
Results: The participants were between 11 and 16 years old (median age 13). Forty-three were female. Overall, 68 had a normal weight, whereas 20 were overweight and 12 obese. Normal and overweight subjects did not significantly differ by sleeping hours and time spent having meals, though those overweight were likely to spend less time at lunch and dinner than normal weight pupils (15 minutes or less vs. 30 or more). Similarly, the two BMI groups did not significantly differ by the average weekly hours they spent in physical activity during both school and vacation periods. Time spent in watching TV was also not significantly different during both periods. A strong positive relationship was observed only between BMI and other screen-based entertainment times (videogames, internet) during school period (normal vs overweight, weekly hours mean 3,64, SD 3.66 vs 6.12, SD 5,12, P = 0.01). Remarkable, but not significant, differences were detected between the same behaviours during the vacation period (normal vs overweight, weekly hours mean 6.15, SD 6.05 vs 9.64, SD 9.43, P = 0.08).
Discussion: As a cross-sectional survey, the issue of causality direction remains unsolved and overweight could cause increased time spent in screen-based entertainment activities. However, it is interesting to observe that sedentary behaviours alone appear to be associated to differences in BMI within children and adolescent who were likely sharing most activities at school, such as mandatory physical education or artistic activities, but likely out school also, because of the secluded social setting. More effective public health recommendations should include limiting sedentary behaviours, not only promote physical activity.

THE HELP PROGRAMME: A HEALTH INTERVENTION FOR EMIRATI ADOLESCENTS

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Research has shown that 30% of children in the United Arab Emirates (UAE) are overweight; while the incidence of adolescent (aged 14-17 yr) obesity could be as high as 13% (Malik and Bakir, 2007). This prevalence has contributed to the UAE having the second highest global incidence of diabetes with 29% of the population affected (Saadi et al., 2007).
As lifestyle behaviours are established early in life, intervention strategies to combat the early onset of obesity should be considered. The aim of this study was to pilot a health intervention programme (HELP: Health Education; Lifestyle; Physical activity) on male Emirati adolescents during a residential school camp in the United Kingdom.
Eighty males (Mean ± SD: age 15.5 ± 0.9 yr; BMI 23.0 ± 4.8 kg/m2) participated in the four week study; control group (N = 46; age 15.5 ± 0.9 yr; BMI 22.1 ± 4.6 kg/m2) and HELP group (N = 34; age 15.6 ± 1.0 yr; BMI 24.2 ± 5.0 kg/m2). All subjects completed a Health and Fitness Questionnaire consisting of two sections: International Physical Activity Questionnaire; Lifestyle and Health Knowledge. The HELP group participated in eight 60 minute educational workshops and received a health booklet before the final questionnaire. Educational posters were also displayed in the HELP group's accommodation.
In total, 20% of subjects were overweight, 19% obese and 1% underweight, with no difference between groups. The HELP group experienced significant changes in physical activity (PA) compared to the control group, with increased time spent in vigorous-intensity PA (155 ± 267 min/wk vs. 4 ± 135 min/wk; P < .01) and decreased time spent sitting (-152 ± 216 min/wk vs. 134 ± 303 min/wk; P < .001). Although not significantly different, the HELP group reported an increase in self-reported time spent in moderate-intensity PA compared to the control group (126 ± 481 min/wk vs. -15 ± 210 min/wk; P = .117). The HELP group exhibited an increase in health knowledge (6.8 ± 18.4%; P = .038), while no improvement was reported in the control group (3.1 ± 6.8 %; P = .101). In addition, the HELP group experienced a significant increase in self-reported daily water consumption (490 ± 731 ml; P < .001) and a non-significant increase in self-reported nightly sleep (0.4 ± 1.4 h; P = .160). No change in either variable was reported in the control group.
Improvements in physical activity, lifestyle and health knowledge highlight the benefits of the HELP programme and warrant its inclusion in the daily school routine of students at risk of health complications. Further work to investigate the longitudinal influence of the HELP programme on obesity, and associated diseases, is required.
1. Saadi H et al. (2007). Prevalence of diabetes and its complications in a population-based sample in Al Ain, United Arab Emirates. Diab Res Clin Pract 78: 369-77.
2. Malik M and Bakir A (2007). Prevalence of overweight and obesity among children in the United Arab Emirates. Obes Rev 8: 15-20.

THE MRI DETERMINATION OF THIGH SUBCUTANEOUS FAT

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Introduction. Magnetic resonance imaging (MRI) gives the most accurate results of human body tissue measurements. Advantages of this method are distinguishing boundaries between different tissues. The objective of this study was to measure the volume of subcutaneous fat of thigh.

Methods. 87 male subjects of different physical conditions from the ages of 18-45 years were tested for 23 anthropometric characteristics and MRI of right thigh. The subjects were placed so that the MRI imager covered his anatomical formations well determined during palpation. The first cross-section was made in the lower part body across the anterior iliac spines. The last section coincides with the medial knee joint cleft. The total number of sections in the thigh was 20-25, with thickness equal 10 mm. To identify the location of the axial sections a longitudinal section of tested area was made to scale in each segment. The volume of subcutaneous fat was determined by multiplying the areas of adjacent segments section by the distance between the sections.

Results. The average body length was 176,8 6,5 cm, body weight 74,0 9,4 kg. Proximal thigh circumference – 55,6 4,1 cm. The thickness of the middle skin fold on ventral thigh surface – 12,5 5,3 mm. The coefficients of variations (V) for different anthropometrical parameters, except body weight, were less then 8%. Fat subcutaneous volume reached the value 2205 882 cm (V=40%, with maximum value 4218 and minimum value 945 cm). Linear regression equation was calculated to determine the fat volume of the thigh using some anthropometric measurements. The correlation coefficient between the measured and calculated data was r=0,97, with error 198 cm .

INFORMATIVE AND HEALTH-IMPROVING TECHNOLOGIES IN HIGH SCHOOL PHYSICAL EDUCATION OF MEDICALLY FRAGILE STUDENTS

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Research actual continuity. One of the most upcoming trends of physical education in high school at the present moment is the development of scientific principles for students' health monitoring as well as for their motor education based on actual information technologies.

Academic process methods and management for medically fragile students have their particularities depending on the disease present. Therefore, there is necessity to develop new trends and improve the academic process and programs, elaborate and introduce innovative approaches and technologies.

Research tasks.

1. Development of quantitative model to estimate the medically fragile students health rate.

2. Use of computer-assisted automatic diagnosis equipment (ADE) to appreciate medically fragile students' performance, progress and health rate.

Research methods. The following research methods were applied:

1. Theoretical study and generalizations of existing scientific sources, of progressive and advanced practical experience,

2. Combination of psychologist and pedagogical techniques,

3. Examination of functional body status dynamics Polyvalent estimation of functional body status and health rate of medically fragile students is possible only if based on theoretic and systemic approaches and methods. The modeling systemic approach allowed to represent human health as complex four-level system.

We used a specially designed computer-assisted automatic diagnosis equipment (ADE) to appreciate medically fragile students' performance, progress and health rate. The ADE helped to examine 120 students on their prior diseases among them 80 students in addition were examined on associated diseases using 2 or 3 secondary diagnostic procedures.

Considerable amount of academic and statistics information processing was affected and implemented in academic process of data management. The rising intellectual and psycho-emotional load on major subject, inefficient and low students motor activity bring to progressive health deterioration. At the present moment it is necessary to use express diagnostic methods of observation (monitoring) students health rate based on actual information technologies.

Research conclusions.

1. The additive (summary) model of health rate monitoring was developed. This helped to introduce the rating system to appreciate medically fragile students' performance, progress, health level as well as their physical development grade. The rating system of health status was implemented consequently in the academic process.

2. The development of computer-assisted automatic diagnosis equipment (ADE) to appreciate medically fragile students' health functional status using electrophysiological indicators.

TRADITIONAL NORDIC OUTDOOR LIFE IN RELATION TO WEIGHT STATUS

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Introduction: A special feature with the Nordic countries is the public rights and access to the countryside, which indeed promotes outdoor recreational life. Most traditional outdoor activities involve some kind of physical activity. Some also involve nutrition, e.g. food gathering, fishing and hunting. Berries, fish and game are among the most nutritious foods there is (Bere & Brug, 09). Therefore, traditional Nordic outdoor life has a great health promoting potential. The purpose of this study is to assess the relationships between four traditional Nordic outdoor activities and weight status, and also to assess potential moderators (sex and SES) of these relationships.

Methods: A questionnaire survey (Sept 08) was conducted among 6th and 7th graders and one of their parents in 27 random schools in two Norwegian counties (Hedmark and Telemark) as part of the FVMM project. A total of 1016 parents participated in the survey (78% women). Family trips in nature (dichotomised into: ≥once a week vs. not), gathering of berries/mushrooms, fishing and hunting (all three dichotomized into: ≥sometimes vs. not), weight, height, sex and family education level (dichotomized into: one or both parents had higher education vs. none) were all reported in the parent questionnaire.

Results: Those engaging in family nature trips (32% overweight) and gathering of berries/mushrooms (39% overweight) were LESS frequently overweight than those respectively not engaging in family nature trips (44% overweight) and not gathering (45% overweight). Those engaging in fishing were MORE frequently overweight than those not fishing, respectively 48% and 37% were overweight. Adjusting for all outdoor activities; those engaging in nature trips (OR=0.54; 95%CI=0.38-0.76) and those engaging in gathering (OR=0.74; 95%CI=0.56-0.99) were still less frequently overweight, while those fishing (OR=1.81; 95%CI=1.35-2.44) were still more frequently overweight. After also adjusting for sex and SES, nature trips (OR=0.49; 95%CI=0.34-0.71) and fishing (OR=1.58; 95%CI=1.16-2.17) were still significant, gathering was not.

Discussion: Bringing your family on frequent trips to nature was associated with a 50% reduction in risk of being overweight, also after adjusting for sex and SES. Gathering of berries/mushrooms was also related to being less frequently overweight. However, this association was affected by sex and SES (women and those in families with higher education are both leaner and engage more often in gathering of berries/mushrooms). Fishing was clearly associated to increased frequency of being overweight, also after adjusting for sex and SES. Hunting was not associated to weight status.

References

- Bere E & Brug J (2009). Towards health promoting and environmentally friendly regional diets – a Nordic example. Public Health Nutrition, 12, 91-96.

THE EFFECT OF LATERALITY ON YOUNG ATHLETS IN FLAT WATER CANOEING

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Introduction: Laterality, the dominance of one hemisphere, and the effect of these two phenomena on sports performance capacity have yet to be described in detail.

Methods: 275 kayakers and canoeists were examined twice annually using extensive kinetic and biomechanical equipment. The athletes were members of a state-wide canoeing club (national junior elite athletes). The main focus of the study was the correlation between (a) force differences arising between the left and right upper extremity and (b) athletic performance under laboratory conditions and field conditions (flat water). The following data was gathered: selected strength capacities (maximum force [FMax]) of the upper arm flexor at a static strength measurement system, force curves at the measuring paddle during exercise tests using the canoe counter current system and canoeing times in flat water over 250 m and 2,000 m during the course of the year.

Results: The results of the static maximum force test showed that the difference in maximum force between the left and right arm increases with age. As maximum force increases, the difference in the mean value of maximum force seems to increase as well. The longitudinal study included only right-handed athletes. In the longitudinal group the assumption seems to be confirmed that right-handers also have greater force in their preferred extremity. Further longitudinal analyses showed that the higher maximum force achievement changes from the right into the left arm with some test subjects.

Discussion: These results show that it is not always possible to determine which side has greater maximum force solely on the basis of handedness. According to Vagenas & Hoshizaki (1988) bilateral differences, which are frequently observed during symmetrical physical activities, may be attributable to the systematic combination of structural and neuromuscular factors. However, there is ongoing controversy about the relationship between preferred extremity (preference dominance) and the extent of force development (achievement dominance). The preferred extremity is commonly believed to possess the higher maximum force level.

Therefore it could be concluded that the morphological organization of the human locomotor system forms the very basis for locomotor movement symmetries. However, due to diverse factors such as differences in extremity lengths and the attendant force levels, movement asymmetries may arise during cyclic movements such as walking and running. This observation is consistent with Starosta's (2002) theory, which holds that ontogenetically induced upper extremity growth differences lead to different leverage lengths and attendant levels of force. Apart from that, the dominant extremity might be used instinctively for movement guidance e.g. during strength training.

References

Starosta W: Die Symmetrie und Asymmetrie der Bewegung gemäß der Bernstein–Theorie. Leistungssport 2002; (32), 1: 59–62.

Vagenas G, Hoshizaki B: Evaluation of rear foot asymmetries in running with worn and new running shoes. Int J Sport Biomech 1988, 4: 220–230.

14:15 - 15:15

Poster presentations

PP-SM01 Sports Medicine 1

EFFECTS OF FUNCTIONAL FATIGUE ON JOINT POSITION SENSE IN MALE ELITE HANDBALL PLAYERS

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Background: Worsening of joint position sense due to fatigue results in a worsening of performance in strength and flexibility, and furthermore coincides with an increased risk of trauma. In the present study we investigate the effect of a standardized handball specific fatigue protocol on joint position sense in male elite handball players to localize joints at risk for injury. Material and Methods: Eighteen (9 under-21 players/9 professional players) male handball players (age: 22.3±4.9 years; weight: 85.1±11.3 kg; height: 185.4±5.2 cm) participated in this trial. After a standardized warm up session the athletes participated in a fatigue protocol lasting 45 minutes and 27 seconds. It consisted of 81 accelerations, 9 throws, 18 jumps, 180 ball contacts, 234 changes in direction, 225 changes in speed and a total distance of 4680 m. Of this total distance 7.7 % (360 m) were run faster than 5.2 m/s, 26.9 % (1260 m) between 5.2 and 3.1 m/s, 30.8% (1440 m) between 3 and 1.5 m/s and 34.6 % (1620 m) slower than 1.4 m/s according to present literature on characteristics of professional handball matches. The joint angle as a measure of joint position sense was measured before and after the above protocol in the right and left hips, knees and shoulders by a gravity inclinometer (Plurimeter). The blindfolded athletes had to reproduce a random angle in a standardized position within the range of motion of the investigated joint. The difference between the angle shown and the one reproduced was calculated. Error scores were defined as the sum of two measurements for each joint. Results: The fatigue protocol was performed at an average heart rate of 145±16 bpm. The assessment of joint position sense showed a worsening in 8/18 (44 %), 11/18 (61 %) and 10/18 (56 %) of the athletes' hips, knees and shoulders, respectively. The sum of the error scores of all six investigated joints remained unchanged in 10/18 (56 %) athletes, worsened in 7/18 (39 %), and only improved in 1/18 (6 %). The mean change worsened from 29.2°±13.3° at pre-test to 40.8°±17.0° at post-test (p=0.03), i.e. +11.6°±19.2° or 37 %. On average athletes were able to reproduce angles with an error of 3°±6° (p=0.09), 2°±13° (p=0.52) and 7°±12°(p=0.02) in hips, knees and shoulders, respectively. No difference was ob-

served comparing the dominant versus the non-dominant shoulder or under-21 athletes versus professional players. Conclusion: Joint position sense abilities worsened in the shoulders, whereas measurements for hips and knees remained essentially unchanged. Joint position sense of the shoulder, but not the hip or knee can be altered with a handball specific fatigue protocol. Sensomotoric training as well as prevention and rehabilitation of joint injuries might help to correct this important factor in handball.

THE EFFECT OF TARGETED ENDURANCE/STRENGTH TRAINING ON SELECTED PARAMETERS OF LIPOMETABOLISM OF NON INSULIN DEPENDENT DIABETICS

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Introduction: Type 2 diabetes is increasingly among the overweight and obese. An essential therapeutic approach to treating the disease involves endurance training. The benefit of strength training is inconsistently discussed. Therefore, the aim of this study was to examine the effects of three month endurance/strength training regime on the anthropometric data and on selected laboratory parameters (Leptin, Adiponektin, Resistin), of 46 male non insulin diabetics.

Methods: The initial (T1) and final (T2) examination of anthropometric and laboratory data was assessed after a 12 hour period of fasting. 31 subjects (58,6±9,2 yr., 1,79±0,10 m, 108,5±14,0 kg, 33,7±4,3 kg/m²) completed endurance training (ET), while 15 subjects (61,7±9,0 yr, 1,79±0,1 m, 89,1±11,7kg, 27,9±3,5) completed strength training (ST). The two groups differed with regard to weight and BMI (p≤0,001 respectively). The training took place twice a week for a period of 60 minutes.

Results: Following the intervention, a reduction of BMI (0,34±0,59 kg/m² (p=0,005)) was documented in the ET and an increase of watt performance (13,3±22,9 Watt (p=0,041)) was documented in the ST. With respect to the laboratory parameters, a decrease in the Resistin level (47,0±66,7 pg/ml in the endurance group and 27,7±29,3 pg/ml in the strength group (p<0,05 respectively)) was observed in the endurance group and strength group respectively. The remaining parameters revealed no significant change. No significant difference between the endurance group and the strength group, adjusted for age, BMI, and results of the entry examination, was observed.

Conclusion: A 3 month exercise program, independent of the type of exercise program among type 2 diabetics, leads not only to a decrease in the BMI and increase in physical strength, but also to an improvement of the Resistin level. Further studies with higher frequency and/or intensity of exercise are needed, to elucidate the effects.

UNSUPERVISED HOME-BASED PROPRIOCEPTIVE TRAINING REDUCES THE INCIDENCE OF ANKLE SPRAIN RECURRENCES: REPORT OF A RCT.

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Objectives: To evaluate the effectiveness on ankle sprain recurrences of an unsupervised proprioceptive training programme, that was applied after the usual care of individual athletes who had sustained an acute sports-related lateral ankle ligament injury.

Methods: 522 male and female athletes, who recently had sustained a lateral ankle sprain, were followed prospectively for one year. Athletes were randomized after usual care treatment to an intervention group (256 athletes) or a control group (266 athletes). Intervention athletes followed a prescribed proprioceptive training programme; control athletes only underwent usual care. A sub-group analysis was performed between medical treatment and self-treatment. Outcomes were assessed at baseline and every month for 12 months. Analyses were performed according to intention to treat.

Results: Significantly less recurrent ankle sprains were found in the intervention group compared to the control group. This effect was found for subjectively reported recurrent ankle sprains (RR=0.63; 95% CI: 0.45 – 0.88), for recurrent ankle sprains leading to loss of sports participation (RR=0.53; 95% CI: 0.32 – 0.88), as well as for recurrent ankle sprains resulting in costs through direct health care costs or indirect costs due to absenteeism from work (RR=0.25; 95% CI: 0.12 – 0.50). No significant differences were found between self-treated intervention group athletes and medically treated controls. This was shown for self reported recurrences (RR=0.71; 95% CI: 0.43 – 1.18) and for recurrences leading to sports absence (RR=0.54; 95% CI: 0.26 – 1.14). A lower recurrence risk leading to costs was found for the self-treated intervention group compared to the medically treated control group (RR=0.32; 95% CI: 0.13 – 0.81).

Conclusions: The use of a proprioceptive training programme after usual care of an ankle sprain is effective for the prevention of ankle sprain recurrences. A proprioceptive training after self-treatment of the initial ankle sprain is equally effective as post-injury medical treatment only.

COMPRESSIVE SLEEVE IMPROVES THE PASSIVE ELBOW POSITIONING SENSE

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Several studies demonstrated an improvement of joint position sense with a brace, and this effect is attributed to the stimulation of cutaneous mechanoreceptors (Khabie et al., 1998). However, it is unknown if this effect is proportional to the pressure or not. The objective of our study was to examine the effects of different compressive pressures on elbow joint positioning sense.

Twelve healthy participants (age 27.2 ± 3.5 yr) volunteered to this study. Their dominant forearm was passively moved from the start position angle (-45° to the horizontal plane) towards one of the three different target angles (- 25°, 0°, 40° to the horizontal plane). Subjects were told to stop the moving arm, using the hand held disengage switch, when they detected the prepositioned angle. Each target was repeated while wearing sleeves with different pressures (0, 10, 15 and 20 mmHg) in a randomized order. All trials were blindfolded and performed using an isokinetic system at a constant angular velocity of 4°/s (Biodex System 3, Biodex Corporation, Shirley NY, USA) with the subject sitting. The elastic compression sleeve was applied 2 cm below the elbow.

Absolute and variable position errors increased with movement amplitude ($P < 0.05$), but they were systematically lower ($P < 0.05$) with compression sleeves (10, 15, 20 mmHg). Joint position sense was improved to 25, 32 and 33 % for 10, 15 and 20 mmHg, respectively in comparison to without pressure. However post-hoc analysis revealed any difference between compression sleeves. No interaction was observed between pressure and amplitude.

We conclude that compressive sleeves improve passive elbow positioning sense and that this effect is equally present since low pressures. These findings suggest that the stimulation of cutaneous mechanoreceptors with low pressure compressive sleeves could be

useful to enhance proprioceptive acuity. More studies are necessary to understand the role of cutaneous receptors in the joint position sense and beyond in the movement.

Khabie V, Schwartz MC, Rokito AS, Gallagher MA, Cuomo F, Zuckerman JD. The effects of intraarticular anaesthesia and elastic bandage on elbow proprioception. J Shoulder Elbow Surg. 1998; 7(5):501-4.

THE INFLUENCE OF TRANSVERSUS ABDOMINIS CONTRACTION ON POSTURAL SWAY IN PERSONS WITH AND WITHOUT LOW BACK PAIN.

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NORWEGIAN SCHOOL OF SPORTS SCIENCES

Introduction: Spinal instability is identified as a possible cause of low back pain (LBP). The transversus abdominis (TrA) has been focused on as an important "stabilizer" of the spine, and the recruitment of TrA is shown to be delayed in subjects with LBP (1). However, based on recent biomechanical studies it has been argued that TrA alone cannot have such a major role as a spine stabilizer (2). Other studies on LBP-patients have shown increased postural sway compared to non-LBP patients, and it has been hypothesised that the increase in postural sway may contribute to the chronification of LBP (3). The aim of the present study was to evaluate whether a voluntary contraction (VC) of TrA influence on the degree of postural sway in standing position in persons with and without low back pain.

Methods: Twenty-five subjects were included in this experimental cross-sectional study, 12 LBP patients and 13 healthy controls. Mean age in the two groups were 26.2 (SD 6.2) and 27.8 (SD 8.7) years respectively. Postural sway was measured as center of pressure (COP)-excursion while standing on foam surface. Measurements for 20 seconds were done on a force platform: 1)eyes open, 2)eyes closed, 3)eyes open and VC of the TrA and 4)eyes closed and VC of the TrA. The VC of the TrA was taught and verified using real time ultrasound (US). Paired samples t-test and independent samples t-test were used for the statistical analysis, and a p-value of <0.05 was considered statistically significant.

Results: When comparing postural sway without and with VC of TrA the healthy controls had a 14 % reduction in both trace-length and velocity with eyes closed ($p = 0.024$, $p = 0.024$). The same trend was seen in the LBP-group with a 7 % reduction of both trace-length and velocity with eyes closed ($p = 0.059$, $p = 0,059$), although not significant. Independent samples t-test with regards to degree of changes when contracting TrA showed no significant differences between the two groups.

Discussion: Contraction of the TrA seems to have some influence on postural sway in standing in healthy subjects. However, this study did not show any close relation between the TrA-muscle function and degree of postural sway in LBP patients, and there were no significant differences between participants with and without low back pain. This study indicates that the role of TrA-contraction may not be as important as previously suggested, but some caution must be taken due to the sample size. Further studies are warranted to understand the role of TrA in stabilization of the spine in standing position.

References

1. Hodges PW, Richardson CA (1996). Spine 1996;21(22):2640-2650

2. Mercer, S. (2005). Nordic Physiotherapy congress, Helsingør June 1.-3. 2005

3. Volpe Rd et al (2006). Gait Posture. 2006 Nov;24(3):349-55.

IS 1 MET REALLY 1 MET?

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Introduction: The metabolic equivalent (MET) represents the amount of oxygen necessary at the body during rest, it's the equivalent of resting metabolic rate (RMR) and it's equal to 3,5 mlO2•kg-1•min-1 (1 kcal•kg-1•h-1) for every age and subjects. The MET value used in the physical exercise prescription to calculate the energetic cost of several activities as multiple of resting oxygen consumption.

Recent studies have hypothesized that the standard 1 MET value (3,5 mlO2•kg-1•min-1) could overestimate the actual resting oxygen consumption (VO2 resting) and resting metabolic rate (RMR). Our goal was to compare the traditionally accepted value for 1 MET (3,5 mlO2•kg-1•min-1) to direct measures of resting oxygen consumption (VO2 resting) in a group of overweight and obese subjects.

Methods: 22 subjects (3 men and 19 women, mean age 42±12,8), with body mass index (BMI) up to 25,5 kg/m2 (mean BMI 32,6±5,9), have been underwent direct measure of resting oxygen consumption with indirect calorimetry (Fitmate Pro, Cosmed, Italy).

Results: The mean resting oxygen consumption value (VO2 resting) etween BMI and was 2,52±0,54 mlO2•kg-1•min-1, evidently lower than accepted 1 MET value (3,5 mlO2•kg-1•min-1). Furthermore we observed a significant correlation between BMI and VO2 resting (r=-0,534, p=0,005).

Discussion: Established that a correct physical exercise prescription is important an accurate evaluation of the resting oxygen consumption and energetic spending. Our data confirm that in the overweight and obese subjects the standard 1 MET value (3,5 mlO2•kg-1•min-1) determines an overestimation (mean 28,1%) of the real resting oxygen consumption, so an insufficient prescription of the physical exercise. The inverse correlation with the BMI suggests the necessity to individuate a specific correction factor, in order to optimize the results of a protocol of physical exercise with therapeutic aim.

References

1) Byrne, Nuala M., Andrew P. Hills, Gary R. Hunter, Roland L. Weinsier, and Yves Schutz. Metabolic equivalent: one size does not fit all. J Appl Physiol 99: 1112–1119, 2005.

2) Kwan M, Woo J, Kwok T. The standard oxygen consumption value equivalent to one metabolic equivalent (3.5 ml/min/kg) is not appropriate for elderly people. Int J Food Sci Nutr. 2004 May;55(3):179-82.

3) Savage PD, Toth MJ, Ades PA. A re-examination of the metabolic equivalent concept in individuals with coronary heart disease. J Cardiopulm Rehabil Prev. 2007 May-Jun;27(3):143-8.

RISK FACTORS FOR THE USE OF MEDICATION IN ELITE ATHLETES

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Legal and illegal use of medical substances is widespread in international elite sports. Current literature mainly focuses on illegal, hence doping substances. However, concerns about the ample use of painkilling medications, β2-agonists, and antibiotics in top-level athletes have been raised by several authors, since their use, not only when administered in excess, may potentially be harmful under certain circumstances or for certain individuals.

As much as 31 – 51% of the athletes are taking some sort of medication, and 20 – 35% are taking nonsteroidal anti-inflammatory drugs (NSAIDs) prior to competition. Although evidence-based guidelines do not exist for the use of medication and NSAIDs in athletes, the reported results are alarming and might suggest an abuse of legal substances.

The analysis of different sports disciplines highlights several risk factors for the high use of medication in athletes. Team physician and geographic origin have the highest influence. African and Asian athletes were found using half of the medication reported by European and North American track and field athletes. Female athlete – without considering contraceptive medication –, physical demands, age, and competition were other parameters related to increased use of medication. No correlation was found between the intake of medication and success. In professional football players, no difference was found between players participating in the match and substitutes.

The reported use of medication and the gender and geographic differences are difficult to interpret, since current literature does not provide any conclusive evidence. Whether some athletes are overmedicated or undersupplied with medical substances can not be elucidated and therefore need special regard in the future for equal chances in the competition. However, differentiation between indication, wrong application and misuse of prescribed medication is difficult to ascertain. Therefore, it is absolutely essential to establish evidence-based guidelines for the use of medication, especially of painkilling substances in sport.

1. Tscholl P, Alonso JM, Junge A, Dolle G, Dvorak J. The Use of Medication and Nutrional Supplements in Track and Field Athletes. Am J Sports Med 2009;submitted.

2. Tscholl P, Feddermann N, Junge A, Dvorak J. The Use and Abuse of Painkillers in International Soccer. Am J Sports Med 2009;37:260-265.

3. Tscholl PM, Junge A, Dvorak J. The use of medication and nutritional supplements during FIFA World Cups 2002 and 2006. Br J Sports Med 2008;42:725-730.

ENDURANCE AND STRENGHT EXERCISE EFFECTS ON CORTISOL METABOLISM

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Introduction Intense physical exercise is known to increase the activity of the hypothalamic-pituitary-adrenocortical (HPA) axis. In addition to the widely investigated effects on the HPA axis, physical activity has been shown to modulate glucocorticoid (GC) sensitivity at the target cell level. In recent years, attention has been drawn to 11beta-hydroxysteroid dehydrogenase (11beta-HSD) type 1 and 2 as major determinants of tissue sensitivity to GCs. In the present work we show that intense physical exercise (of either endurance or strenght type) is able to increase acutely systemic 11beta-HSD type 1 activity, and suggest that such an increase represents an early step of the stress response to exercise.

Methods Fifteen healthy, trained males (age: median 29, range 20-36 years, BMI 24.6, 20.7-34.3 kg/m2) were assessed on three non-consecutive days: at rest, during an endurance and a strength sessions. Preliminarily, maximal oxygen uptake (VO2max) and maximal power (one-repetition maximum, 1RM) were assessed. During each session, between 10.00 and 16.00 h, 6-h urine and 4 salivary samples were collected. Urinary total tetrahydrocortisol, tetrahydrocortisone, cortisol and cortisone were measured with HPLC-tandem mass spectrometry; urinary unconjugated cortisol and cortisone were measured by HPLC-UV. Salivary cortisol were measured by RIA and ELISA, respectively.

Results Both endurance and strength exercises caused an increase in tetrahydrocortisol/ tetrahydrocortisone ratio (endurance: mean±SE 1.90±0.07 vs. 1.63±0.06, P<0.01; strength: 1.82±0.05 vs. 1.63±0.06, P=0.03), consistent with increased systemic 11beta-HSD type 1 activity. No relationship was found with age, BMI, VO2max, maximal power load. No significant change was apparent in cortisol/cortisone ratio, an index of 11beta-HSD type 2 activity. No effect of exercise on salivary cortisol was observed, whereas a significant effect of sampling time was found, with cortisol decreasing in the 10.00-16.00h window.

Discussion This study shows that intense physical exercise acutely increases urinary tetrahydrocortisol/tetrahydrocortisone ratio in humans, consistent with increased systemic 11 beta-HSD type 1 activity. Under heavy muscular work, the role of muscular tissue in cortisol generation may become remarkable, due to redistributed blood flow, hence the availability of substrate (cortisone) which is freely diffusible in myocytes from the vascular compartment. Cortisol generation at the tissue level is conceivably an early component of adaptive response to physical exercise, which occurs independently of increased cortisol secretion.

14:15 - 15:15

Poster presentations

PP-SM02 Sports Medicine 2

SELF-REPORTED VERSUS DIAGNOSED STRESS FRACTURES IN NORWEGIAN FEMALE ELITE ATHLETES

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Introduction: The prevalence of stress fractures among female athletes ranges from 4% to 52%. Thorough physical examinations and imaging is recommended for adequate diagnosis of stress fractures. Still, many studies on female athletes use self-reported stress fracture data, and no studies have compared self-reported stress fractures with diagnosed stress fractures in athletes. Furthermore, even

if stress fractures are seen upon as a sport-related injury, also physically active non-elite athletes may theoretically experience such injury. The aims of this study were therefore to determine the prevalence of self-reported versus diagnosed stress fractures in athletes, and to investigate whether stress fractures are prevalent also in the general population.

Methods: A random sample of Norwegian elite athletes from the national teams, aged 13-39 years (n = 186) and a random sample of non-athletic controls (n = 145) in the same age group participated in the study. The athletes represented a junior- or senior team, or a recruiting squad for one of these teams, in one of 46 different sports/events. This was a two-phase study including: 1) a questionnaire, and 2) an interview. The diagnosis of a stress fracture was based on a confirmation of the subjects past stress fracture by plain radiography, nuclear scintigraphy, computed tomography (CT), magnetic resonance imaging (MRI), or a combination of these modalities taken short time after their injury occurred.

Results: A higher percentage of athletes self-reported stress fractures (14.0%) compared to those diagnosed with stress fractures (8.1%) ($p < 0.001$). Six controls self-reported stress fractures, but none of them were diagnosed with stress fractures. The total training volume was higher for the athletes diagnosed with stress fractures (17.0 ± 5.8 hours/week) compared with the athletes without diagnosed stress fractures (13.0 ± 5.5 hours/week) ($p < 0.05$). Nine of the 15 athletes diagnosed with stress fractures represented high impact sports, while six represented medium impact sports. None of the athletes diagnosed with stress fractures represented low impact sports. Eight of the 15 stress fractures were found in the metatarsals.

Discussion: By using a questionnaire to collect stress fracture data, the results consist of what the subjects report that they have experienced or have not experienced. We found that 42.3% of the athletes were classified as false positive subjects (b/(a+b)=11/26). Thus, our results indicate that self-reporting of stress fractures has low validity. Furthermore, all of our non-athletic controls were classified as false positives, which indicate that stress fractures are a sport related injury. We recommend that future studies in this field should be carefully using self-reporting as a measurement method.

VARIATIONS IN EXERCISE LOAD, IMUNOGLOBULIN STATUS AND UPPER RESPIRATORY TRACT INFECTIONS IN ULTRA-MARATHON RUNNERS

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UNIVERSITY OF KWAZULU-NATAL

Introduction: Few studies that have been able to demonstrate a direct association between a specific measure of exercise-induced impaired immune function and increased incidence of clinically confirmed infection and the aetiology of upper respiratory tract infections (URTI) in endurance athletes, remains uncertain. This study was designed to examine the effect of variation in exercise load over a six-week period on immunoglobulin status in the saliva and blood and the incidence of self-reported URTI symptoms in ultramarathon runners. This included a four-week taper period before and two weeks following participation in a competitive Ultramarathon event.

Methods: Daily training distance and self-reported URTI symptoms were recorded in fourteen male runners registered for a 86.5 km Comrades Marathon during the six-week period before and after the race. Saliva samples were collected at 28, 14 and one day (01PRE) prior to the race, immediately post-race(IPR) and one (01PR), three and 14 days post-race and blood samples at 01PRE, IPR and 01PR. Salivary IgA and IgM concentrations were determined by sandwich ELISA and serum immunoglobulin (IgG, IgM and IgA), leukocyte and cortisol concentrations were adjusted for plasma volume changes occurring following the race.

Results: Initial mean weekly training distance was 89.4 km.week-1 (± 28.9) and mean race finishing time, 9h33 (± 1h02). Absolute (µg.ml-1) and relative (µg.mg protein-1; µg.ml-1) IgA, and IgM concentrations were unaffected by taper in training during the four-week period prior to the ultramarathon ($p > 0.05$). Mucosal IgA and IgM secretion rates ($p = 0.018$; 0.008) decreased significantly and plasma volume adjusted serum cortisol and leukocyte concentration increased ($p < 0.001$) following the race. There were no significant changes in serum IgG, IgM and IgA concentrations at IPR, but serum IgG concentration increased significantly ($p = 0.009$) at 01PR.

No significant association was detected between secretory IgA and IgM concentrations or blood IgG, IgM and IgA status and incidence of self-reported symptoms of pre- or post-race URTI. The maximum incidence of self-reported symptoms of URTI (64%; n = 9) was recorded 7-14 days post-race. Fifty-seven percent (n = 8) of subjects had also reported symptoms at 28-21days prior to the race, while 36% (n = 5) reported symptoms that were indicative of local rhinopharangitis only.

Discussion: Non-infectious inflammatory responses to increased pulmonary ventilation and/or the possible reactivation of viruses which were present during the pre-race period, during the post-race fortnight, are proposed in the aetiology of symptoms of URTI experienced by endurance athletes during the post-race fortnight.

ELECTROMYOGRAPHIC AND KINEMATIC TRUNK ANALYSIS DURING THE STRAIGHT PUNCH.

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HOSEI UNIVERSITY

Introduction: The contribution of the trunk muscles to spinal stability is well established. However, there is little investigative research about trunk investigating the trunk muscles in sport. The aim of this study was to analyze the electromyographic activity of trunk muscles and the three-dimensional kinematics of the trunk between skilled and novice boxers in the straight punch of the dominant hand.

Methods: The participants who volunteered for this study were fifteen university age males with no history of chronic low back pain. The participants were ranked as experienced (N = 8) or novice (N = 7). We used a surface electromyographic (SEMG) system and a three-dimensional motion analysis system. The straight punch was divided into 3 phases: a primary phase, a throw phase and a return phase. SEMG was used to measure activity in the superficial lumbar multifidus, transverse fibers of internal oblique, external oblique and rectus abdominis. The average-rectifird-value (ARV) electromyographic amplitude for each phase was calculated and normalized to the highest ARV amplitude from a straight punch, which attempted to elicit maximal voluntary isometric contractions (MVIC) for each muscle. The three-dimensional motion analysis was performed calculate the horizontal angle of acromion, anterior superior iliac spine (ASIS) and greater trochanter, respectively. The value which subtracted the angle of ASIS from the angle of acromion and the angle of greater trochanter from the angle of acromion were computed as an acromion / ASIS twist angle and an acromion / greater trochanter twist angle, respectively.

Results: In SEMG, the activity of the non-dominant transverse fibers of internal oblique was significantly greater in the novice boxer than in the experienced boxer at primary phase (experienced: 29% and novice: 130% MVIC). And the activity of the dominant transverse fibers of internal oblique was significantly greater in the novice boxer than in the experienced boxer at throw phase (experienced: 85% and novice: 173% MVIC). In the three-dimensional motion analysis, the results of investigation show differences between experienced and novice

boxers in terms of the horizontal angle of greater trochanter and anterior superior iliac spine. An acromion / greater trochanter twist angle in the novice boxers was larger ($p<0.1$).

Discussion: Since the straight punch of the novice boxer was unfamiliar the transverse fibers of internal oblique in the novice boxers might be larger than in the experienced boxers. The experienced boxers rotated the whole trunk and had struck the straight punch. On the other hand, the novice boxers had struck the punch with twisting of the upper body.

References

Urquhart DM, Hodges PW. (2005). Eur Spine J, 14(4), 393-400.

EFFECTS OF JOINT ANGLE ON VOLITIONAL AND MAGNETICALLY-EVOKED NEUROMUSCULAR PERFORMANCE

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Peripheral magnetic stimulation (MS) has become popular in estimating neuromuscular performance capacity in healthy and in clinical populations to evaluate the effects of exercise and where traditional volitional testing is not appropriate[1,3,4,5]. Indices of knee-extensor volitional and magnetically-evoked neuromuscular performance (N= 8 healthy males; 20.3 ± 0.5 years; 80.0±9.4 kg; 178.4±6.5 cm) were obtained at 3 functional joint angles (25°; 35° and 45° knee flexion; 0° = full extension) that were randomly presented over three days, each separated by 48-hours.

A significant interaction ($F[2,14] = 6.8$ $p<0.05$) associated with repeated-measures (RM) ANOVA showed that magnetically-evoked electromechanical delay (EMDE) values of the vastus lateralis were statistically similar across all joint angles, however, volitional electromechanical delay (EMDV) values were quicker at greater knee flexion angles; EMDV scores at 45° were 25% quicker than at 25°. EMDE values were on average 33% shorter than EMDV at joint positions proximal to full extension (EMDV: 26.2±6.1ms; 24.3±8.7ms vs. EMDE: 17.8±1.2ms; 17.0±1.3ms, at 25° and 35°, respectively). Consistent with the muscle length-tension relationship, a significant interaction ($F[2,14] = 13.8$ $p<0.001$) associated with RM ANOVA showed that volitional peak force (PFV) and magnetically-evoked peak twitch force (PTFE) scores were superior at greater knee flexion angles. However, the relative changes of joint angle on performance were larger for PFV compared to PTFE (PFV: 9.8% and 27.1% greater at 35° and 45° vs. 25°; PTFE: 8.8% and 17.5% greater at 35° and 45° vs. 25°).

The importance of MS is exemplified in the assessment of muscle performance in patients who are unable to maximally activate their muscles[2]. The current results suggest that experimenters must exercise caution when using MS, since joint angle manipulation was associated with differential changes to volitional vs. evoked estimates of performance. Furthermore, indices of magnetically-evoked performance capacity at knee angles proximal to full extension where key ligamentous structures are under greatest strain, may offer an over-estimation of performance capabilities (EMDV vs. EMDE).

References

[1] O'Brian TD, et al. (2008). Assessment of voluntary muscle activation using magnetic stimulation. Eur J Appl Phys;104:49-55

[2] Hamnegard, C-H, et al. (2004). Quadriceps strength assessed by magnetic stimulation of the femoral nerve in normal subjects. Clin Physiol Funct Imaging; 24: 276–280

[3] Minshull C, et al. (2007). Effects of acute fatigue on the volitional and magnetically-evoked electromechanical delay of the knee flexors in males and females. Eur J Appl Phys;100:469-78

[4] Polkey MI, et al. (1996). Quadriceps strength assessed by magnetic stimulation of the femoral nerve in man. Muscle Nerve;19:549-55

[5] Vivodtzev I, et al. (2005). Changes in quadriceps twitch tension in response to resistance training in healthy sedentary subjects. Muscle Nerve;32:326-334

PREVALENCE OF ELECTROCARDIOGRAPHIC ABNORMALITIES AND VARIATIONS IN ATHLETES.

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The athlete's heart goes through certain adaptations as a consequence of the stimulus of continuous physical exercise training. These adaptations are seen in electrocardiography, which shows certain variations of normality. The aim of this descriptive study is to asses the prevalence of electrocardiographic abnormalities and variations in athletes undergoing a sport-medical examination in the Effort Physiology Laboratory of the Physical Activity and Sports Science College at Polytechnic University of Madrid. Methods: the population in this study includes 52 healthy asymptomatic athletes on a range of age from 14 to 49 years, training different endurance Sports (cycling, running, triathlon, and others), undertaking a sport medical examination including a 12 lead electrocardiography test. Athletes underwent a medical examination; afterwards, the 12 lead electrocardiography recordings were gathered and analyzed in order to value the prevalence of abnormal findings and variations in athletes. The electrocardiographic patterns were evaluated according to commonly used clinical criteria. Results: most frequently electrocardiographic variations found were sinus bradychardia (43,63%), early repolarisation pattern (34,54%), left ventricular hypertrophy signs (16,36%), incomplete bundle branch block (10,90%), first degree atrioventricular block (3,63%), non specific intraventricular conduction delay (3,63%) and left anterior fascicular block (1,81%). 15 individuals (27,27%) were found to have a completely normal electrocardiographic study. In conclusion, electrocardiographic variations in the athlete's heart are very common, however abnormal patterns suggesting cardiac disease has a much lower prevalence.

MORPHOLOGICAL AND MATURITY PROFILE OF YOUNG SOCCER GOALKEEPERS WITH 11-14 YEARS OF AGE

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Studies regarding young soccer players have been increasing in the last decade. However, studies that associate age-group and field position are missing, particularly the characterization of young soccer goalkeepers. Regarding this limitation the purpose of this study is to define the morphological and maturational profile of young soccer goalkeepers according to their age-groups.

The sample consisted of 17 male soccer goalkeepers included in two age groups: 11-12 (n=8) and 13-14 (n=9) years-old. For morphological profile were included the following variables: height, weight, arm span, body mass index (BMI), bicristal/biacromial ratio, sitting height/height ratio, adiposity (sum of four skinfolds – tricips, subscapular, suprailiac and calf). Somatotype (Carter & Heath, 1990) was calculated. Maturation was assessed through somatic indicators such as maturity offset (Mirwald et al., 2002) and percentage of predicted adult height (%PAH – Khamis & Roche, 1994).

In sequence by age-group, 11-12 and 13-14 years old, respectively, the following trends were noted: Chronological age (12.0, 14.2) height (147.9, 166.9); weight (42.9, 59.8); arm spam (147.5, 171.5); BMI (19.43, 21.24); bicristal/biacromial ratio (72.8, 73.1); sitting height/height ratio (51.0, 50.6) and adiposity (42.0, 33.4). In both somatotypes mesomorphism is the most representative category (3.4-4.7-2.9, 2.3-4.4-3.3). However the 11-12 years-old group has a higher value for endomorphism and the 13-14 age-group a higher value for ectomorphism. Looking at the mean values for the maturational indicators, the maturity offset (-2.02, 0.15) shows that the 13-14 years-old players have already cross the peak height velocity, being this difference in the maturity process corroborated by the %PAH (84.9, 91.6).

Malina et al., 2004 found similar results for height and weight in young soccer players for different field positions (defense, midfield and forward). This suggests that, at these ages, the morphological profile of young soccer goalkeeper is not different from that shown by other players in different positions. However more studies regarding the characterization of young soccer goalkeepers using a more extensive pool of variables are needed.

Carter JEL, Heath BH (1990). Somatotyping: Development and Applications. Cambridge University Press

Mirwald, R.L., Baxter-Jones, A.D.G., Bailey, D.A., & Beunen, G.P. (2002). An assessment of maturity from anthropometric measurements. Medicine and Science in Sports and Exercise, 34 (4), 689-694.

Khamis, H.J., Roche, A.F. (1994). Predicting adult stature without using skeletal age: the Khamis-Roche method. Pediatrics, 94(4), 504-507.

Malina, R.M., Eisenmann, J.C., Cumming, S.P., Ribeiro, B., & Aroso, J. (2004). Maturity-associated variation in the growth and functional capacities of youth football (soccer) players 13-15 years. European Journal of Applied Physiology, 91, 555-562.

HEMOGLOBIN AND HEMATOCRIT VALUES DUE TO TWO DIFFERENT MEASUREMENT SYSTEMS

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Introduction: The measurement of hemoglobin (Hb) and hematocit (Hc) is of great interest to exercise science as well as in high performance sport. Especially the effect of high altitude training is presented trough Hb and Hc measurement. High Hb concentrations measured in athletes during competitions can have profound consequences to them. From this point, the measurement of hematological parameters needs to be at high quality. But unfortunately it is not always possible to use the same devices to control these parameters or to document time series. The aim of the study was to detect inter-device variability in the measurement of Hb and Hc.

Methods: For this, blood samples of 95 athletes where measured with two different devices: KX-21N, Sysmex (A), Germany and ABX Micros 60 (B) from Horiba, France. The results were classified (device A as reference method) and absolute value differences were demonstrated. Mean differences of Hb and Hc classes were statistically calculated.

Results: With device A the lowest Hb of 11.2 g/dl and highest of 17.0 g/dl was measured. The range from device B ranged from 10.8 g/dl to 15.3 g/dl. The average of the value differences is 0.6 g/dl with a standard deviation of 0.6 g/dl. For example Hb (g/dl) of 15.6 (A) vs. 13.4 (B) an 17.0 (A) vs. 14.9 (B) were found. Although the correlation of the two devices is high (r=0.88) significant statistical differences in all Hb-classes between the two devices were found (p=<0.001). Device B shows systematically lower values. The differences of Hc values (%) seems to be lower and the correlation is very high (r=0.96). Also, the mean differences are significant (p=<0.05).

Discussion: The data collected in this study shows that it is necessary to detect the measurement variability between devices. Further, it is important to define a standardized method/machine for the determination of Hb and Hc concentration which can to be used for blood profiles or anti doping testing.

14:15 - 15:15

Poster presentations

PP-PH01 Physiology 1

HYDRATION AND SWEATING RESPONSES TO HOT WEATHER FOOTBALL COMPETITION

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Introduction: Football is played worldwide and takes place in a variety of environmental conditions. Competitions are often held in environments which differ from the conditions that players typically experience. The aim of this study was to investigate hydration and sweating responses of players during a match played in hot weather conditions.

Methods: Twenty-two males completed a FIFA-regulation football match in 34.3±0.6oC, 64±2% relative humidity. On arrival at the stadium, ~45min prior to the match start, players emptied their bladder and the specific gravity of the urine (Usg) was determined by refractometry. Then from 30-15min prior to the match start all players were weighed to the nearest 20g on an electronic balance when wearing only underwear. Immediately after being weighed players were prepared for sweat sample collection (Maughan et al 2007). Sweat collection patches were removed at half-time and samples were analysed for sodium and potassium concentration by flame photometry. On match completion players were reweighed wearing only underwear within 15min of the match end. During the match players had access to drinking water via individually numbered bottles. Drinking was neither encouraged nor discouraged during the match and players were left to behave as they wished with regards to drinking. All drink bottles were weighed on electric scales measuring to the nearest 1g, prior to and at the end of the match to determine the volume consumed by each player. Data are presented as mean±SD.

Results: Pre-match Usg (1.011±0.006) indicated that players started the match in a euhydrated state. Players lost 1.51±0.64kg over the duration of the match ranging from a gain of 0.12kg to a loss of 2.92kg. This is equivalent to a body mass loss of 2.2±1.0%. Players drank 1653±487ml, so their estimated sweat volume was 3.1±0.6l. Sweat sodium concentration was 45±9mmol/l and potassium concentration 3.5±0.4mmol/l. This translated into losses of 139±39mmol of sodium or ~8.1±2.3g of salt.

Discussion: Although Usg indicated that most players started the match in a euhydrated state (<1.020; Sawka et al, 2007), individual data indicated that two players presented with pre-match USg greater than 1.020 which may be indicative of hypohydrateion.

It is clear that some players developed significant hypohydration over the course of the match, and it would be predicted that their performance would be reduced. None-the-less, because of the high sweat rates in some players (in the order of 2.5l/h) these individual are unlikely to be able to prevent the development of hypohydration with the current match format.

References

Sawka MN, Burke LM, Eichner ER, Maughan RJ, Montain SJ, Stachenfeld NS. (2007) Med Sci Sports Exerc, 39, 377-390.

Maughan RJ, Watson P, Evans GH, Broad N, Shirreffs SM. (2007) Int J Sports Nutr Exerc Metab, 17, 583-594.

NO EFFECT OF MUSCLE FIBER TYPE ON MECHANICAL EFFICIENCY DURING CYCLE EXERCISE AT 1.5 HZ

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Background: There are conflicting views on the effect of muscle fiber type on mechanical efficiency during exercise. Former studies have possible experimental shortcomings that may have influenced their conclusions. Therefore, in properly standardized experi-ments, the mechanical efficiency has been determined for 23 healthy young men with different proportions the two main fiber types to study possible effects of muscle fiber type on efficiency during cycle exercise.

Methods: Each subject cycled for 10 min at in average 19 different powers ranging from 1.0 to 4.6 W/kg (70–370 W) while the pedaling frequency was kept constant at 1.5 Hz. The rate of energy release was determined from the steady state O2 uptake measured near the end of each 10 min exercise period. Delta efficiency was taken as the inverse of the slope of regression of O2 uptake on power (dP/dnO2). Gross effi-ciency at 3 W/kg was established, and finally, the efficiency was taken from each subject's slope of O2 uptake versus power using a common, fixed Y-intercept. Several muscle biopsies were taken from the lateral portion of the knee extensor muscle of each subject, and muscle fibers were classified as type 1 or type 2.

Results: The proportion of type 1 fibers was 0.50 ± 0.13 (mean ± s), delta efficiency was 0.262 ± 0.010, and gross efficiency was 0.213 ± 0.005. There was no significant correlation between any efficiency measure and the proportion of type 1 fibers. A two-sided 95% confidence interval on the data suggests that if the efficiency of the two fiber types differed, the differ-ence was less than 12%. For the same subject the efficiency did not differ more than a few percents between low powers where type 2 fibers may be little engaged and high powers where both fiber types are active.

Conclusion: The data support the idea that the efficiency does not differ between type 1 and type 2 fibers during cycling at 1.5 Hz.

Reference

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ADIPONECTIN RESPONSE TO MAXIMAL CYCLING EXERCISE IN ELITE MALE CYCLISTS

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FACULTY OF MEDECINE

Introduction: Less is known about the effects of acute exercise on adiponectin concentrations (Simpson and Singh, 2008). Few studies have investigated the adiponectin response to acute exercise in trained subjects (Jurimae et al., 2005; 2006). Actually, two trials reported significant delayed increases (30 min) in adiponectin concentrations (Jurimae et al. 2005; 2006). The aim of the present study was to analyse the effects of acute maximal exercise followed by 60 minutes of recovery on plasma concentration of adiponectin, insulin and glucose in elite male cyclist.

Methods: Eleven elite male cyclists participated in this study (mean and SD) (age : 19.82 ± 4.67 years; body mass: 65.64 ± 6.09 kg; height: 176.82 ± 7.19 cm; BMI : 20,97 ± 1.35 kg.m-2; VO2max: 59.68 ± 4.85 ml.min.kg-1). Subjects performed maximal cycling exercise followed by 60 minutes passive recovery. Blood samples were obtained before, at the end and after 30 and 60 min of recovery.

Result: Adiponectin concentrations were unchanged after exercise and during recovery. However, insulin concentrations were significantly lowered during recovery (-13.66, $P<0.05$ after 30 min recovery and -77.57, $P<0.01$ after 60 min recovery). In the other hand, plasma glucose rose after 30 min of recovery (26.90, $P<0.01$).

Discussion: The present study indicated that acute exercise failed to induce significant changes in adiponectin concentrations in elite trained subjects. These results were confirmed by several other studies (Punyadeera et al., 2005, Jamurtas et al., 2006). Hyperglycemia was associated with hyperinsulinemia soon after a brief bout of exercise greater than 85% of VO2max (Kreamer et al., 2003). Further, there is evidence that insulin is an inhibitor of adiponectin gene expression (Fasshauer et al. 2001), yet with an increase in circulating insulin concentrations in the present study, no discernible changes in adiponectin were observed. Our results suggested that acute maximal exercise not stimulate the production and the release of adiponectin during 60 min recovery post-acute exercises. Furthermore, it appears that after acute maximal exercise adiponectin is not associated with insulin and/or glucose modifications in elite cyclists.

References

Fasshauer M, Klein J, Neumann S, Eszlinger M, Paschke R. (2001). FEBS Lett, 26, 507(2), 142-146.

Jamurtas AZ., Theocharis V, Koukoulis G, Stakias N, Fatouros IG, Kouretas D, Koutedakis Y. (2006) Eur J Appl Physio, 97, 122-126.

Jurimae J, Hofmann P, Jurimae T, Mäestu J, Purge P, Wonisch M, Pokan R, von Duvillard SP. (2006) 27, 272-277.

Jurimae J, Purge P, Jurimae T. (2005), 93, 502-505.

Kraemer RR, Aboudehen KS, Carruth AK, Durand RT, Acevedo EO, Hebert EP, Johnson LG, Castracane VD. (2003). Med Sci Sports Exerc, 35, 1320-1325.

Simpson KA, Singh MA. (2008) Obesity (Silver Spring), 16(2), 241-256.

Punyadeera C, Zorenc AH, Koopman R, McAinch AJ, Smit E, Manders R, Keizer HA, Cameron-Smith D, van Loon LJ. (2005). Eur J Endocrinol, 152, 427-436.

NON-LINEAR INCREASE IN RPE DURING CONSTANT LOAD EXERCISE TO VOLITIONAL EXHAUSTION

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It has been proposed that during constant load exercise to exhaustion, the increase in RPE throughout is linear and that termination usually occurs prior to attainment of the highest possible RPE score (Noakes 2004). This suggests that the rate of increase in RPE during constant load exercise, in addition to the highest RPE that can be sustained, determines the duration that a constant workload can be maintained for. This study models the increase in RPE during constant load exercise to exhaustion at supra lactate threshold intensity using both the Borg Category (C20) and Category-Ratio (CR10) scales.

Ten recreationally active male participants performed an incremental exercise test on an electronically braked cycle ergometer to allow visual identification of the workload that coincided with the lactate threshold (LT). Participants then performed two trials to volitional exhaustion at a workload 60W above LT. RPE was recorded at 60s intervals using either the C20 or CR10 scale. Participants were familiarised with the scales in advance, and the order was randomised. For both scales, RPE data was subsequently scaled as a percentage of total exercise duration for each participant.

Total exercise duration was similar regardless of whether participants reported RPE using the C20 (16.7+5.3min) or CR10 (17.1+8.1min) scales (P>0.05). During every individual trial, participants reported achieving maximum possible RPE regardless of the scale used. When reporting RPE using C20, termination coincided with achievement of maximal RPE in 30% of participants. When reporting RPE using CR10, on no occasion did termination coincide with achievement of a maximal RPE. As a group, participants spent 17+14.2 % of total exercise duration at maximal RPE when using the C20 scale, and 21 +12.0% when using the CR10 scale.

These results suggest that in recreationally active participants, the rate of increase in RPE during constant load exercise is not linear and that termination does not always coincide with attainment of the highest possible values. Therefore, regardless of the RPE scale used, the findings of this study disagree with the contention of Noakes (2004) that RPE is the real determinant of the fatigue point during prolonged sub maximal exercise at a fixed work rate. It is possible, however, that the observed relationship between RPE and termination of exercise may depend to some extent on the training status and experience of participants in these studies.

Reference

Noakes, T. D. (2004) Linear relationship between the perception of effort and the duration of constant load exercise that remains, J Appl. Physiol. (96) 1571-1573.

TASK FAILURE DURING HIGH-INTENSITY EXERCISE IS ASSOCIATED WITH A CRITICAL REDUCTION IN TISSUE OXYGENATION

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Introduction: Task failure is an important feature of performance, ageing and many diseases. Three popular models suggest that task failure may be due to: a) a failure of skeletal muscle motor unit recruitment (1); b) depletion of a fixed, critical, muscle energy store (2); or c) a critical reduction in tissue oxygenation (3). The purpose of this study was to assess the hypothesis that task failure during high-intensity, whole-body exercise may be associated with a critical reduction in tissue oxygenation.

Methods: Six well-trained cyclists (VO2max: 67.6 +/- 6.3 mL/kg/min) performed an incremental test to exhaustion on a cycle ergometer. They then performed a familiarisation session, followed by, in a random order, constant-load exercise tests at 100, 110 and 120% of VO2max until task failure. During these trials, near-infrared spectroscopy (NIRS) was used to monitor changes in the concentration (μM) of oxygenated haemoglobin (Hb) and myoglobin (Mb) (delta[02Hb]), deoxygenated Hb+Mb (delta [HHb]) in the right vastus lateralis muscle and the frontal cerebral cortex. Oxygen uptake (VO2) and rating of perceived exertion (RPE) were also monitored during all 3 trials. The study had ethics approval and all subjects signed a statement of informed consent prior to the study.

Results: At task failure, there was no significant difference between the three conditions for delta[HHb] (40 +/- 5 vs 39 +/- 8 vs 37 +/- 7 μM; P>0.05), delta[02Hb] (23 +/- 5 vs 26 +/- 6 vs 22 +/- 3 μM; P>0.05), VO2 (67.6 +/- 4.5 vs 67.4 +/- 3.8 vs 64.7 +/- 4.1 mL/kg/min) or RPE (20 vs 20 vs 20; P>0.05). There were also no significant differences between trials for cerebral oxygenation levels.

Discussion: Our delta[02Hb] and delta[HHb] values, for both the right vastus lateralis muscle and the frontal cerebral cortex, are similar to those previously reported in the literature (3). We report for the first time however, that task failure during 3 different exercise intensities occurred at similar tissue oxygen (and oxygen consumption) levels. While further research is required, our results raise the possibility that task failure during high-intensity exercise (at sea level) may be associated with an inability to further increase the rate of aerobic energy supply.

References

1. Davis, J. M. and S. P. Bailey. Med Sci Sports Exerc. 29:45-57, 1997.

2. Monod, H. and J. Scherrer. Ergonomics. 8:329-338, 1965.

3. Subudhi, A. W., A. C. Dimmen, and R. C. Roach. J Appl Physiol. 103:177-183, 2007.

CARBOHYDRATE SUPPLEMENTATION PREVENT PROTEIN METABOLISM IN A LONG DISTANCE MOUNTAIN BIKE TREADMILL

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Introduction: As a consequence of its intensity and duration, Mountain Bike (MTB) can induce an increase in serum urea concentration as the final product of protein metabolism. This may be explained by the significant reduction in muscle glycogen with the duration of the event. In order to prevent muscle glycogen depletion and afterward protein metabolism, we searched if carbohydrate ingestion during a long distance MTB treadmill can prevent protein metabolism.

Methods: Ten male athletes aged between 15 and 46 yrs took part in this study (average=32±8.7 yrs). All the subjects performed a 59.14 km MTB treadmill in 5.71 hours (±0.76) during which a carbohydrate supplementation (glucose concentration of 0,7g/Kg/h) was given to each athlete and heart rate was monitored through Polar S625X.

Results/Discussion: Bearing in mind heart rate data, our results revealed that the MTB treadmill was performed with an average intensity of 82.4%. Although relative values of serum urea concentration were significantly increased (15.55%; p=0,012) at the end of the MTB

treadmill, in what concerns to absolute values (22.79 and 26.36 mg/dl respectively before and after the MTB treadmill), they remained normal. The results of this study pointed out for a contribution of protein metabolism to energy production in MTB events of long distance that could be prevented by an adequate carbohydrate supplementation.

EFFECTS OF STATIC STRETCHING ON PROLONGED INTERMITTENT EXERCISE PERFORMANCE

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PURPOSE: The purpose of this study was to investigate effects of static stretching on prolonged intermittent exercise performance. METHODS: Eight male university football players (age; 20±1 yr, height; 172.5±5.3 cm, weight; 65.6±4.9 kg, mean±SD) participated in this study. They completed two 30min intermittent pedaling exercises with a 10min interval under three experimental conditions (passive rest (PR), active rest (AR), and static stretching (SS)). The intermittent exercise protocols consisted of thirty sets, each set including 5-s maximal sprint against a resistance of 7.5% body mass, 25-s active recovery, and 30-s passive rest. During the maximal sprint, peak-pedaling frequency, mean power output, and mean power rate against peak power were evaluated and mean values of 30 sets were used for analysis. Rate of perceived exertion (RPE) and blood lactate concentration (La) were determined at rest, 10, 20, and 30th set during the first intermittent exercise, five and ninth min in the interval, and 10, 20, and 30th set during the second intermittent exercise. In addition, a recovery rate of La was calculated as follows: La recovery rate = (mean La at the first intermittent exercise – mean La at the interval) / (mean La at the first intermittent exercise - La at rest). In the interval between exercises, subjects were performed three treatments as follows; 6min PR, 6min AR or 6min SS. For PR, subjects were required to sit the chair in a relaxed position for 6min. For AR, subjects performed light pedaling on a cycle ergometer (10%load of 0.075kp/kg) at 50rpm for 6min. For SS, thigh (hamstrings and quadriceps) and hip were stretched to the point where they perceived discomfort. During the SS, subjects held at the stretch position for 30s and repeated it two times for each leg. The experimental conditions order was randomly assigned on three non-consecutive days, to rule out order effects. RESULTS: La was significantly decreased by all treatments but the La recovery rate did not different among conditions (PR; 31.6±15.2%, AR; 42.4±21.5%, SS; 39.3±13.5%). Peak pedaling frequency and mean power were not altered by any conditions (peak pedaling frequency: PR; 163±10, 162±11rpm, AR; 161±6, 160±8rpm, SS; 164±10, 164±10rpm, mean power: PR; 675.3±100.1, 672.1±94.2W, AR; 657.2±73.2, 663.9±83.5W, SS; 672.8±92.0, 685.8±88.0W). Mean power rate significantly increased after SS ($p < 0.05$) whereas PR and AR produced no changes in mean power rate (PR; 85.8±5.1, 86.0±5.2%, AR; 85.2±4.5, 86.0±4.4%, SS; 85.0±3.0, 87.0±3.2%). CONCLUSIONS: The SS may increase the prolonged intermittent exercise performance although the SS does not facilitate La removal.

PREDICTION OF MAXIMUM AEROBIC POWER AND MAXIMUM POWER OUTPUT FROM THE RESULTS OF 30-S ANAEROBIC WINGATE TEST

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Introduction: Laboratory exercise testing in athletes is based on aerobic and anaerobic tests. In general, aerobic exercise tests are time consuming and demand for highly sophisticated equipment, e.g. gas analysers and ventilometers that should be precisely calibrated. Contrary to this, anaerobic exercise test are usually less time consuming and based on relatively simple principles. The aim of the study was to verify the possibility to predict the main parameters of aerobic tests from the results of anaerobic exercise test, i.e. 30-s Wingate test.

Methods: Altogether 152 top league ice-hockey players (age: 25.96 +/- 4.72 (SD) years; mass: 87.73 +/- 8.17 kg; height: 182.4 +/- 5.7 cm) participated in the study. They were examined at the end of preparatory period before the season. In the same day they were tested by a 30-s Wingate test at a resistance 6 W.kg-1 (=0.104 kg.kg-1), and after 2-hour-lasting recovery break they were loaded by the stepwise maximum cycle ergometry. The statistics included multiple stepwise linear regression analysis using SPSS statistical package. Age, body mass, height, fat-free mass, and Wingate test results were considered independent variables whereas maximum aerobic power (VO2max) and maximum power were considered dependent variables. As peak blood lactate concentration (LA) in the Wingate test is sometimes (but not as a standard) included to the results of the Wingate test, the results were computed both with and without LA as an independent variable.

Results: Pmax [W] = 351.227 + 0.322*Pmin [W] – 2.867*MP/PP [%] + 0.880*Age [y]

r= 0.685; SEE= 25.159; sign. 2.976E-20

Pmax/kg [W.kg-1] = 9.016 – 0.055*Body mass [kg] – 0.004*Pmin [W] – 0.039*MP/PP [%] + 0.012*Age [y]

r= 0.694; SEE= 0.287; sign. 3.559E-20

VO2max [l.min-1] = 0.487 + 0.003*Pmin [W] + 0.015*Body mass [kg] + 0.053*LA [mmol.l-1]

r= 0.662; SEE= 0.372; sign. 1.750E-18

VO2max [l.min-1] = 1.375 + 0.003*Pmin [W] + 0.015*Body mass [kg]

r= 0.641; SEE= 0.380; sign. 7.453E-18

VO2max/kg [ml.kg-1.min-1] = 36.437 + 2.935*Pmin/kg [W.kg-1] - 0.166*Body mass [kg] + 0.603*LA [mmol.l-1]

r= 0.539; SEE= 4.301; sign. 4.972E-11

VO2max/kg [ml.kg-1.min-1] = 47.670 + 2.797*Pmin/kg [W.kg-1] - 0.174*Body mass [kg]

r= 0.506; SEE= 4.388; sign. 2.621E-10

Discussion: Regardless the substantial differences in the nature of the aerobic cycle ergometer test and anaerobic Wingate test the results had demonstrated the possibility to predict the parameters of aerobic tests from the results of the 30-s Wingate test. The standard errors of the estimate obtained form these equation seem to be considerably low and therefore acceptable, however coefficients of correlation (r) ranging 0.506 to 0.694 and/or coefficient of determination (R2) 0.256 to 0.482 may limit the predictive validity of VO2max and Pmax from the Wingate test Results: References

Inbar O, Bar-Or O, Skinner J.S. (1996). The Wingate Anaerobic Test. Human Kinetics, Champaign.

Carey D.G., Richardson M.T. (2003). J. Sports Sci Med (2003) 2, 151-157.

COMPARISON OF SLEEP BETWEEN ATHLETES RUNNING SEVEN MARATHONS ON SEVEN CONTINENTS IN SEVEN DAYS (7MM)

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The completion of seven marathons, on seven continents, in seven consecutive days involved circumnavigating the globe, travelling more than 35,000 miles, through 24 different time zones and required substantial physical and psychological endurance. Intercontinental travel results in the disruption of normal circadian rhythms and is associated with fatigue and a range of symptoms, commonly referred to as jet lag. Disturbance in the sleep-wake cycle is of particular concern as appropriate sleep is vital to promote the recovery process post-exercise and facilitate subsequent physical performance. Exposure to day light is required to facilitate re-entrainment of circadian rhythms. Thus the disruption in sleep may be exacerbated in a visually impaired (VI) athlete.

PURPOSE: To compare the quantity of sleep achieved between a VI athlete and his guide (N) runner during an extreme endurance challenge.

METHODS: Sleep was possible during the 63 h and 40 min of total flight-time and 19 h 20 min of hotel visits. Sleep was measured using a body monitoring device, which was placed on the right tricep of each runner throughout the duration of the challenge. A classification algorithm incorporating structured statistical measures from aggregated observations was used to detect sleep. This involved evaluation of instantaneous agitation and sequences of motion, differential and proportional changes in heat-flux and skin temperature, the galvanic skin response and the proximity to motion signatures. Comparisons in the quantity of sleep obtained between each marathon were made using a one-way ANOVA.

RESULTS: The mean quantity of sleep achieved was 3 h 20 min + 1 h 23 min (range 1 h 0 min – 4 h 45 min) vs 5 h 27 min + 2 h 18 min (range 2 h 26 min – 7 h 26 min) for the VI and N runner, respectively. There was a subsequent difference in the total amount of sleep achieved, 19 h 58 min (VI) compared to 32 h 41 min (N). Although there was evidence of a disparity in the quantity of sleep achieved, this difference was not significant ($P>0.05$).

CONCLUSION: This study indicates that the VI athlete experienced greater difficulty initiating and maintaining sleep throughout this extreme challenge. This information may be relevant for practitioners developing preparation strategies for visually impaired athletes requiring travel through multiple time zones to competition venues.

COMPARISON OF VO2 KINETICS IN WALKING AND RUNNING AT THE 'ENERGETICALLY OPTIMAL' GAIT TRANSITION SPEED

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Background: The metabolic costs for walking and running intersect at a speed (termed the energetically optimal transition speed, EOTS) that is significantly higher than the preferred gait transition speed (Hreljac 1993; Brisswalter and Mottet 1996; Tseh et al. 2002). None of the studies to date, considered the influence of a slow component of VO2 kinetics for walking and running in the determination of EOTS.

Purpose: The aim of this study was to examine VO2 kinetics during walking and running at the energetically optimal gait transition speed (EOTS).

Methods: Twenty-two physical education students (21.4±2.4y, 182±7cm), performed three incremental treadmill tests for determination of EOTS, the aerobic gas exchange thresholds (for walking, ATw, and running, ATr) and VO2max. Thereafter, they completed two square-wave 30-minute walking (W30) and running (R30) tests at the EOTS; VO2 was determined breath-by-breath, and computorised non-linear regression techniques were used to describe either a mono-, bi- exponential or exponential+linear VO2 response. ANOVA for repeated measurements was used to test for differences between walking and running parameters.

Results: The VO2 and speed of locomotion at the EOTS were 32.8 ml/kg and 8.2±0.2 km/h, respectively. Four subjects had to discontinue the W30 test before completion, due to fatigue and pain in the shins. All W30 tests were distributed within the heavy and very heavy intensity domains, while all R30 tests were distributed within the moderate and heavy intensity domains. The time constant for the fast VO2 component (tau1) in the 30-minute tests was significantly smaller for running than for walking (29.0±9.1 s vs 33.7±9.8 s, $p<0.01$), while the amplitudes of the primary VO2 response (A1) did not differ (18.1±1.9 vs 17.9±1.9 ml O2/min/kg). The VO2 slow component was greater for W30 than R30 (275±220 ml/min vs 146±104 ml/min, $p<0.05$) and more often present (22/22 vs 19/22). A steady-state VO2 was reached by 12/22 subjects in the W30, and by 18/22 in the R30 test. The aerobic energy cost derived from VO2 centered at the 3rd minute of exercise (C3) was significantly lower than the one derived from the steady-state VO2 (Css) in both, W30 (187±17 vs 208±23 ml O2/kg/km) and and R30 (188 vs 199±17 ml O2/kg/km) ($p< 0.05$). Only in the R30 test, C3 explained effectively the variability of Css ($r2 = 0.94$ and 0.50, for R30 and W30, respectively).

Conclusions: Current methods used for EOTS determination are inadequate, as the slow component of the VO2 kinetics has to be considered. The VO2 kinetics (tau1) are significantly faster in running compared to walking at the energetically optimal gait transition speed in young, healthy subjects. Pain located in the shin region may cause an increased perception of local effort, and cause exhaustion in less than 30 min of walking at the EOTS.

References

1. Barstow TJ, Mole' PA (1991). Linear and nonlinear characteristics of oxygen uptake kinetics during heavy exercise. J Appl Physiol 71(3):2099-106.

EFFECTS OF PRIOR EXERCISE USING REMOTE MUSCLE GROUPS ON INDICES OF AEROBIC FUNCTION AND THE POWER-TIME RELATIONSHIP

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The tolerable duration of high-intensity exercise is described by a hyperbolic function of the power output, whose asymptote and curvature constant denote critical power (CP) and anaerobic work capacity (W'), respectively. W' has been described as a finite intramuscular energy store that is utilised when exercise intensity exceeds CP (Ferguson et al. 2007). Alternatively, exercise intolerance above CP may result from the accumulation of fatigue-inducing metabolites at a rate proportional to the rate of W' utilisation. We therefore examined the

effects of metabolite accumulation, achieved by prior exercise using remote muscle groups, on responses to incremental cycling exercise and the power-time relationship.

Five recreationally active males performed a maximal incremental cycling test (20 W/min, starting at 20 W) and four exhaustive constant power tests (exercise duration: 3-15 min) to determine the hyperbolic power-time relationship. The battery of cycling tests was then repeated following prior high-intensity intermittent arm-cranking exercise comprising 8 x 1 min exercise bouts, interspersed by 30 s rest intervals, at an intensity of 1.5-2.0 W/kg body mass. Upon completion of the arm-cranking exercise subjects transferred to the cycle ergometer and rested for 4 min before performing the prescribed cycling test. Arterialised venous blood was sampled from a dorsal hand vein.

Compared to rest the arm-cranking exercise performed prior to the incremental test caused a reduction in blood pH (mean (SD)) (7.400 (0.001) vs. 7.256 (0.018), P<0.01) and an increase in blood lactate concentration ([La]B) (0.78 (0.35) vs. 9.59 (1.15) mmol/L, P<0.01); similar changes were observed when arm-cranking exercise preceded constant power exercise. [La]B following the incremental test (11.04 (1.70) mmol/L) was not different from that measured when the test was preceded by arm-cranking exercise (9.39 (1.48) mmol/L), although blood pH was lower (7.232 (0.024) vs. 7.293 (0.023), P<0.05). Prior arm-cranking exercise caused reductions in the aerobic gas exchange threshold determined using the v-slope method (oxygen uptake = 2.95 (0.48) vs. 2.08 (0.35) L/min) and maximal values for cycling power (350 (29) vs. 318 (31) W, P<0.01), oxygen uptake (4.19 (0.64) vs. 3.47 (0.41) L/min, P<0.05), and minute ventilation (160.4 (20.7) vs. 139.7 (36.4) L/min, P<0.01). CP was unaffected by prior exercise (268 (25), SEE = 1 (1) vs. 260 (29), SEE = 3 (1) W), whereas AWC was reduced (13.5 (3.1), SEE = 0.8 (0.4) vs. 10.3 (2.0), SEE = 1.3 (0.6) kJ, P<0.05).

In conclusion, our data suggest that metabolite accumulation resulting from prior exercise using remote muscle groups causes reductions in several indices of aerobic function during incremental exercise. The reduction in W' due to prior exercise using remote muscle groups also supports the notion that W' reflects, in part, metabolite accumulation to a critical level.

Reference

Ferguson C et al. (2007). J Appl Physiol, 103, 812-822

14:15 - 15:15

Poster presentations

PP-PH02 Physiology 2

CARDIOVASCULAR AND THERMOREGULATORY RESPONSES TO PROLONGED EXERCISE IN HOT-DRY AND HOT-HUMID CLIMATIC CONDITIONS

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Introduction: Sweat evaporation plays a critical role in maintaining body temperature during exercise in the heat. During intense prolonged exercise sweat production may exceed 2 L.hr-1 resulting in a significant body water deficit. In a hot-dry environment most of the sweat produced is evaporated. However in a hot-humid environment the small difference in vapour pressure between the skin surface and surrounding environment limits evaporative heat loss. The resulting skin wettedness has been associated with the phenomenon of hidromeiosis, whereby sweating is reduced in humid conditions. This study examined whether sweat rate was impaired with prolonged exercise in a hot-humid (HH) condition.

Methods: Eleven un-acclimatised male distance runners (age: 36±9 yrs; VO2max: 63±6 ml.kg -1.min-1) were randomly assigned to undertake treadmill running exercise in a climate chamber for 60 minutes at 70%VO2max in a hot-dry (HD, 30oC and 20%rh) and a HH (30oC and 70%rh) condition. A rectal temperature probe and 4 skin thermocouples provided continuous monitoring of body core temperature and skin temperatures. Change in bodyweight provided an estimate of sweat rate. Heart rate was measured continuously via heart rate telemetry and respiratory gas exchange and cardiac output (CO2 rebreathing method) measures were taken at 10, 30 and 60 minutes.

Results: Both rectal temperature (Tre) and mean skin temperature (Tsk) were significantly (P<0.05) higher post exercise in the HH compared with the HD environment (Tre 39.5  0.3oC vs. 38.7  0.3oC; and Tsk; 33.2  0.8oC vs. 31.7  0.9oC, respectively). While the skin surface area was fully saturated (ω ≥ 100%) in the HH condition, there was no significant difference between the HH and HD condition in sweat production (49.1 ± 5.5 g.min-1 and 47.0 ± 4.9 g.min-1 respectively). Thermal comfort (TC) and perceived exertion (RPE) ratings showed that subjects felt warmer and found exercise more difficult to perform in the HH environment compared with the HD trial (TC: 15  3 vs. 13  3, respectively; and RPE: 6.7  0.5 vs. 5.8  0.9, respectively). There was a significant (P<0.05) increase in VE in HH compared with HD at 60minutes, while there was no difference between all other respiratory exchange measures. Heart rate steadily increased in both HH (+21bpm) and HD (+16bpm) to reach 92%HRmax and 90%HRmax respectively. Cardiac output remained constant (20 – 21 L.min-1) in both conditions over time.

Discussion: This study has shown that the drive for sweating is maintained in well trained endurance runners undertaking prolonged exercise in HH conditions, despite considerable skin wettedness. Although we were unable to quantify the sweat drippage that occurred in the HH condition, the significant increase in rectal temperature in this condition suggests that a volume of sweat produced was ineffective in terms of heat dissipation. The upward drift in VE and HR in the HH condition is a typical response associated with an elevated body temperature.

HEAT ACCLIMATION AND ACTIVATION OF A CYTOPROTECTIVE PATHWAY

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Heat acclimation and activation of a cytoprotective pathway

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Animal studies have shown that heat acclimation (HA) is neuro-protective against traumatic brain injury, and provide cardio-protection, following an ischaemic attack. The pathways associated with HA and its protective nature, have been found to be linked in animals with the induction of hypoxia inducible factor 1α(HIF-1α) and heat shock protein 72(Hsp72). HA has also been shown to upregulate Epo receptor (EpoR), a target gene for HIF-1α, providing neuron and myocardium protection in animals. However, whether similar protective adaptations to HA occur in humans is yet to be confirmed. The aim of this study was to investigate the impact of HA on HIF-1α and Hsp72 induction and their effect on EpoR regulation in human subjects. We hypothesise that HA will upregulate HIF-1α and Hsp72 and this upregulation will increase EpoR expression.

To test this hypothesis, healthy, highly trained male cyclists/triathletes, with a mean age of 30.26±7.49 yrs and a VO2max of 58.55±5.91 ml/kg/min, were randomly assigned to a heat group (HG = 10 subjects) or a neutral group (NG = 11 subjects). Aerobic fitness and acute exercise have been shown to impact on Hsp72 and HIF-1 regulation. In an effort to limit the impact of these potentially confounding factors, only highly fit subjects were recruited and maintained the same level of training during the HA. Subjects in HG trained for 6 consecutive days on a bike for 1 hour per day at 70% of their VO2max, in 35° C and 40% humidity. Subjects in NG performed the same training sessions at 22° C and 40% humidity. Venous blood samples were collected at rest, and 60 minutes into recovery following the 1h exercise. Flow cytometry was used to assess levels of HIF-1α, Hsp72 and EpoR expression in monocytes at the various time points.

There was no significant difference between the 2 groups before HA in terms of anthropometric data or on proteins expression. Following the intervention, HG showed an average drop in core body temperature of 0.3° C post-exercise, a hallmark of acclimation to heat. Post intervention, no significant increase in HIF-1α, Hsp72 or EpoR levels was observed in the NG. In contrast, , a significant increase in resting HIF-1α, Hsp72 and EpoR expression (average upregulation of 111%, 29% and 13% respectively) was observed in the HG.

HIF-1α targeted pathways are activated by HA in animal studies, and contribute to various tissue protection. HA in human subjects also involves an upregulation of HIF-1α, Hsp72 and EpoR potentially implicating these proteins in the protective pathways associated with HA. Further work is required to investigate these proteins and their protective nature in human tissue.

THE EFFECT OF MENSTRUAL CYCLE ON CARDIOVASCULAR AND SUBJECTIVE RESPONSES DURING PROLONGED SUB-MAXIMAL EXERCISE IN THE HEAT.

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Purpose: Women before menopausal are exposed physiological and psychological changes by hormonal variation during menstrual phase. Although only a few studies with hormonal verification have investigated cardiovascular and subjective responses to submaximal exercise in the heat, no changes were found over the menstrual cycle for these responses. As the cause of "no changes", it should be pointed out the problem of the exercise protocol (exercise intensity and duration). This study was examined the effect of menstrual cycle on cardiovascular and subjective responses during prolonged submaximal exercise for young adults women in heat.

Methods: Six healthy young women with regular menstrual cycle (age=21.7±0.7yr, VO2max=35.7±3.4ml/kg/min) completed two trial consisting of 90 minutes cycling exercise at 50%VO2max in the heat (temperature; 30℃, humidity; 50%) during the folicular phase (FP; day 2-7) and luteal phase (LP; day 18-24) of their menstrual cycles in a randomized, crossover design. Before and after exercise, blood sample was taken to measure sex hormone concentrations. Subjects did not ingest any fluid during cycling exercise. During cycling exercise, VE, VO2, VCO2, respiratory rate (RR), respiratory exchange ratio (RER), heart rate (HR), body core temperature (BCT), RPE-Overall (RPE-O), RPE-Cardiovascular (RPE-C) and RPE-Legs (RPE-L), blood glucose, blood lactate were measured every 15 minutes.

Results: Serum estradiol and progesterone concentration were higher during LP compared FP (estradiol; 162±45 vs. 74±25pg/ml, P<0.05, respectively, progesterone; 7.9±1.9 vs. 1.2±0.5pg/ml, P<0.05, respectively). During cycling exercise in the heat, body weight loss at LP trial was higher than FP trial (1.13±0.16 vs. 0.93±0.13kg, P<0.05, respectively). During cycling exercise, VO2, HR, RR and BCT were significantly increased at both FP and LP trials. Although RER during LP trial was higher than FP during cycling exercise, any other cardiovascular parameters did not differ between FP and LP trial. All RPEs were significantly increased during cycling exercise at both trials. RPE-Overall and RPE-Legs during LP trial were higher than FP trial all over the cycling exercise (RPE-Overall; 14.2±1.2 vs 13.2±1.5, P<0.05, RPE-Legs; 14.8±1.1 vs 13.7±1.4, P<0.05, respectively, at the end of exercise).

Discussion; This study suggested that a physiological and psychological strains increased for the luteal phase during prolonged submaximal exercise in heat condition. VO2, VE, HR, BCT and RPE-Cardiovascular did not change over menstrual cycle. These results support most previous studies that cardiovascular responses during prolonged exercise in the heat were not changed over menstrual cycle. The higher RPE-Overall and RPE-Legs found for LP trial accompanied by a higher RER. Furthermore, these results may lead to a decrease in prolonged exercise performance in the heat.

NO CUMULATIVE EFFECT OF HOT AND HYPOXIC ENVIRONMENT ON THERMAL, CARDIOVASCULAR OR METABOLIC STRAINS DURING EXERCISE

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Introduction: Exercise in either hot or hypoxic conditions poses a severe challenge to multiple regulatory systems. However, the cumulative effect of these environmental stressors on exercise performance and underpinning limiting factors is still unknown. This study aimed to determine whether performance limitation when exercising in both a hot and hypoxic environment is associated with different thermal, cardiovascular and metabolic strains and perception of effort when compared to each individual environment condition.

Methods: 11 recreational athletes cycled to exhaustion at an intensity corresponding to 66% of their VO2max in four different conditions [Neutral/Sea level (CON), Hot/Sea level (HOT), Neutral/Hypoxia (HYP) and Hot/Hypoxia (H+H)]. Neutral and hot conditions were 22°C/30%rH and 35°C/40%rH, respectively; Hypoxia corresponded to a simulated altitude of 2500 m. The following parameters were recorded at exhaustion: core (Tcore, ingestible pill) and skin (Tskin, adhesive patch on the calf) temperatures, heart rate (HR), percent arterial oxygen saturation (SpO2), rating of perceived exertion (RPE, Borg scale) and blood lactate concentration ([La], fingertip). Data were compared by a two-way ANOVA (Temperature x Altitude) for repeated measures.

Results/Discussion: As expected, time to exhaustion was reduced (P < 0.05) in HOT (39 min 33 s ±20 min 59 s) or HYP (37 min 44 s ±14 min 39 s) when compared to CON (61 min 17 s ±27 min 48 s). H+H further decreased (P < 0.05) performance (26 min 32 s ±9 min 0 s), suggesting a parallel and cumulative effect of these two stressors on performance.

Hot conditions increased significantly HR (+9 ±5 bpm) and Tskin (+5 ±1°C) independently of the simulated altitude (both P < 0.001), whereas altitude exposure reduced SpO2 independently of the environmental temperature (96 ±1 vs. 88 ±4% in sea level and hypoxic conditions, P < 0.001). [La] values failed to be significantly different within conditions (5.6 ±3.4, 8.7 ±2.6, 7.9 ±6.2 and 10.0 ±5.4 mmol.L-1 in CON, HYP, HOT and H+H, respectively). There was no significant interaction effect between temperature and altitude on HR, Tskin, SpO2 and [La].

However, our data displayed a significant (P = 0.011) interaction effect on time to exhaustion. This interaction was due to a slightly reduced effect of either a hot (-34.6 ±14.8% from CON to HOT vs. -25.6 ±19.9% from HYP to H+H) or an altitude (-35.7 ±14.5% from CON to HYP vs. -26.0 ±19.7% from HOT to H+H) exposure when the other stressor is already present. That suggests that some limiting factors for performance are common to both a hot and hypoxic environment. In line with this, subjects stopped exercising at equivalent Tcore (38.5 ±0.6, 38.2 ±0.6, 38.4 ±0.7 and 38.4 ±0.5°C) and RPE (18.7 ±1.7, 19.3 ±1.0, 19.2 ±1.3 and 19.3 ±0.9) in CON, HYP, HOT and H+H.

Conclusion

There is no cumulative effect of combining hot and hypoxic environment on cardiovascular, metabolic or perceived strains despite exercise performance being reduced.

HYPERTHERMIA INDUCES OXIDATIVE STRESS IN RESTING BUT NOT IN EXERCISING HUMANS

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Hyperthermia imposes a severe stress to multiple regulatory systems including the redox system which is important for maintaining cellular homeostasis in resting and exercising humans. Glutathione (GSH) protects cells against oxidation by providing a substrate for glutathione peroxidase. GSH removes hydrogen ions and organic peroxides resulting in the formation of oxidized glutathione (GSSG). Therefore, the GSH/GSSG ratio is a sensitive marker of oxidative stress. The aim of this study was to determine the effects of isolated hyperthermia on oxidative stress in resting and exercising humans. We hypothesized that isolated hyperthermia would increase oxidative stress as indicated by alterations in GSH metabolism reflecting a decrease in GSH/GSSG ratio ([GSH-GSSG]/[GSSG]). Eight healthy males took part in this study. Participants wore a water-perfused suit and performed a 6 min one-legged knee extensor exercise at 50% of their predetermined maximal peak power output both under control and hyperthermic conditions while maintaining euhydration by ingesting1.3 ± 0.3 L of water. Following the control trial and a 15 min resting period, hot water (~ 48°C) was perfused through the suit for ~75 min in order to increase rectal temperature from 37.0 ± 0.3 to 38.3 ± 0.4 °C and skin temperature from 33.1 ± 1.6 to 38.7 ± 0.9°C. Blood samples were withdrawn before and at the fifth minute during both exercise bouts for determination of GSH and GSSG concentration by spectrophotometry assay. At rest, hyperthermia did not alter GSH (620 ± 289 vs 693 ± 379 µM, p= 0.093), but increased GSSG (6 ± 4 vs 12 ± 8 µM, p = 0.012), thereby leading to a significant reduction in the GSH/GSSG ratio (127 ± 84 vs 64 ± 51 µM, p= 0.017). This indicates an independent hyperthermia-induced oxidative stress. Conversely, during exercise hyperthermia increased both GSH (569 ± 313 vs 821 ± 440 µM, p = 0.036) and GSSG (6 ± 3 vs 16 ± 17 µM, p = 0.012). Consequently, GSH/GSSG ratio did not change (108 ± 71 vs 88 ± 67, p = 0.208). In conclusion, these results in humans demonstrate that hyperthermia induces oxidative stress at rest but not during exercise because a parallel increase in antioxidant defense offsets hyperthermia-induced oxidative stress.

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EFFECT OF WORKING IN HOT ENVIRONMENT ON HEALTH AND PHYSICAL ABILITIES: AN OIL AND GAS INDUSTRY STUDY

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ASPETAR

Purpose: To investigate the alterations in physical work capacity occurring in the summer of a Middle Eastern country (Qatar – outside temperature between 40 and 50°C).

Methods: A group of 40 workers (oil and gas industry) with no previous experience of working in a Qatari summer volunteered to participate in a one-year follow-up project.

- Blood pressure and arterial oxygen saturation were obtained during the pre-experimental screening (April, before their first summer) as well as before (6 a.m.) and after (4 p.m.) work in the summer (August) and the following winter (January). Handgrip force was measured at the same time.
- Normalised physical activity (tri-axial accelerometer) and core temperature (ingestible pill) were recorded during the same working day.

Results: Blood pressure recorded before work decreased (P < 0.001) from April to August (from 136 ±13 and 84 ±11 to 125 ±11 and 77 ±9 mmHg for systolic and diastolic, respectively) but returned (P < 0.05) close to baseline values in January (130 ±16 and 80 ±11). Oxygen saturation decreased also (P < 0.01) from pre-screening (98.5 ±1%) to the summer (98.0 ±1%) and increased (P < 0.01) the following winter (98.5 ±1%). Both blood pressure and oxygen saturation were reduced (P ≤ 0.05) following the day of work but without interaction with the period of the year. Maximal handgrip force was significantly lower (P < 0.005) in August (38 ±7 kg) than in January (40 ±8 kg) independently of time-of-day.

Data at work. The normalised physical activity (acceleration) during the working hours was significantly (P < 0.02) lower in the summer (0.10 ±0.04 g) as compared to the winter (0.11 ±0.03 g). Average core temperature during work was significantly (P < 0.005) higher in August (37.4 ±0.2°C) than in January (37.2 ±0.2°C). However, no workers became hyperthermic as the highest observed value during the continuous recording was 38.3°C.

Discussion: The Company in which this survey was performed applies safety rules based on heat index (HI). The work/rest period (minutes) were reduced to 30/10 for a HI of 39-49, 20/10 for a HI of 50-53, and work stopped for a HI > 54. The summer data presented here were obtained on days with the highest HI (up to 53). Our data showed a reduced activity during the summer as a consequence of both these safety rules and the self-pacing of the worker. However, despite this reduced activity, central temperatures were higher in the summer month and workers presented with symptoms consistent with chronic fatigue (reduced blood pressure and saturation) associated with reduced maximal voluntary strength capacity.

Conclusion: None of these alterations were dependent of being tested before or after work suggesting that there were not linked to acute fatigue due to the day of work but rather to the presence of chronic alterations persisting during the summer months.

DOES PRECOOLING IMPROVE 1500 M SWIMMING PERFORMANCE?

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EMPA, SWISS FEDERAL LABORATORIES FOR MATERIALS TESTING AND RESEARCH

Introduction: The literature suggests that precooling can increase exercise performance in a warm ambient. In particular, this is true for cycling and running performance (1, 2). However, it is unclear how precooling affects swimming performance. The present study aimed to investigate the effect of precooling on 1500 m swimming performance.

Methods: Eight subjects, 4 female and 4 male triathletes, participated in the study. Their average ± SD age was 29 ± 6 yr., height 173 ± 11 cm, weight 69.3 ± 12.1 kg and VO2peak 60.2 ± 6.3 ml•min-1•kg-1. Control (CON) and precooling (COOL) trials were performed on the same time of a day, at least one week apart. Both trials consisted out of: i)10 min warm-up at 40% of subject's VO2peak on a cycle-ergometer, followed by ii) 1500 m swimming at competition speed in water with the temperature of 27.6 ± 0.1 °C. In addition, during COOL trial subjects wore an ice vest (Arctic Heat, Burleigh Heads, QLD, Australia) 35 min preceding the warm-up and during the warm-up. During the trials, gastrointestinal temperature (Tc) and skin temperature on four body locations (Tsk) were continually registered. In addition, the subjects were asked to rate their thermal perception (TP) prior the warm-up and post swimming. Finally, the time for swimming 1500 m was noted.

Results: The effect of precooling was reflected in a significant 0.17 ± 0.18 °C decrease (p=0.045) in Tc and a 0.79 ± 0.33 °C decrease in Tsk (p=0.001). Lower Tc, observed for COOL trial, persisted till the end of swimming. In particular, Tc at the end of swimming was 37.89 ± 0.34 °C in COOL and 38.31 ± 0.34 °C in CON (p=0.049). In contrast, Tsk was not significantly different at the end of swimming among the trials. Prior to swimming, subjects rated TP in CON and COOL as slightly warm (1 ± 1) and cool (-2 ± 1; p=0.015), respectively. Likewise, at the end of swimming, subjects rated TP in CON trial as hot (3 ± 1), while in COOL trial as warm (2 ± 1; p=0.021). The swimming performance was with 22:29 ± 2:00 min significantly shorter in COOL trial compared to 23:04 ± 2:02 min observed for CON trial (p=0.014).

Conclusion

The observed results suggest that precooling with an ice vest, prior and during the warm-up significantly decreases Tc. Since lower Tc persisted through swimming it is suggested that this effect enables subjects to improve swimming performance.

References

1.Marino FE. Methods, advantages, and limitations of body cooling for exercise performance. Br J Sports Med 36: 89-94, 2002.

2.Quod MJ, Martin DT, and Laursen PB. Cooling athletes before competition in the heat: comparison of techniques and practical considerations. Sports Med 36: 671-682, 2006.

THE EFFECT OF WORKING IN A HOT ENVIRONMENT ON MARKERS OF THE IMMUNE RESPONSE: AN OIL AND GAS INDUSTRY STUDY

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Introduction: Physical activity in a high ambient temperature in comparison to neutral conditions has been demonstrated to impact on a number of immune markers. However, recent research shows little support for the previously held contention that physical activity in a hot environment further compromises the immune system in comparison to a neutral environment. However, due to ethical restrictions in laboratory-based research, investigations are limited to acute exposures of extreme heat. Indeed, some occupations involving fire fighters, soldiers and miners are required to live and/or work in extreme conditions. Subsequently, this study sought to determine the chronic effect of living and working in an extremely hit environment on immune system markers.

Method: The present study examined 30 apparently healthy (125/77 ± 11/9 mmHg systolic and diastolic blood pressure) male participants in hot (August; 410C) and neutral (January; 220C) conditions. Throughout the day, changes in core temperature were assessed by ingestible pills. In addition, blood was sampled from the antecubital vein before (5:30am to 7:00am) and after (3:30 to 5:00pm) their working day to assess changes in immune markers. A two-way repeated measures ANOVA was used to determine significant main effects and interactions.

Results: Mean core temperature was significantly ($p<0.01$) higher in August than in January (37.4±0.2 0C vs. 37.2±0.20C). There was a significant main effect of time-of-year ($p<0.05$ & $p<0.001$) for monocytes (7.1%) and lymphocytes (13.0%) with higher values obtained in August compared to January. A significant time-of-day effect ($p<0.001$) was observed from pre- to post-work in monocytes (16.1%), lymphocytes (26.3%) and neutrophils (7.0%). There was no significant time–of-year or time-of-day effects in interleukin-6, C-reactive protein or tumour necrosis factor. Furthermore, no significant interactions were identified.

Discussion: Despite significant increases in mean blood markers of immune function, the resultant values remained within a healthy reference range. Indeed, this result is not unexpected given the significant but modest changes observed in core body temperature. For safety reasons, the company involved in this study allowed their employees greater rest periods during times of extreme heat, which appeared to have a positive impact on the overall heat stress the employees experienced.

Conclusion: The present study showed that working in extremely hot field-based environment does significantly raise core body temperature in comparison to a neutral condition. However, due to the safety procedures put in place by the company, this increase was still within a normal range and subsequently the impact on the immune system whilst significant, values were still within a healthy reference range.

THE RELATIONSHIP BETWEEN FINGER SKIN TEMPERATURE AND THERMAL SENSATION DURING COLD WATER IMMERSION

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Introduction: We reported that mean finger skin temperature during ice water immersion and the coefficient of variation obtained from its standard deviation were useful indicators of cold-induced vasodilation (CIVD) response patterns and for evaluating local resistance to cold stress in different groups (Taimura et al., 2007, 2008). The purpose of this study was to analyze the relationship between finger skin temperature and thermal sensation during fingertip immersion in cold water.

Methods

Subjects were 17 male and 13 female college students who consented to participate in the present study. Subjects were not permitted to consume alcohol on the day before the test, engage in exercise on the day of the test, or eat during the 2 hours prior to the start of the test. After 60 min resting state in a controlled environment (room temperature, 27°C; relative humidity, 50%), a thermistor thermometer was placed on the middle finger. The middle finger was immersed in cold water (5.0°C), and finger skin temperature and thermal sensation were measured for 30 min. From the skin temperature and thermal sensation during cold water immersion, the CIVD and thermal sensation parameters were calculated.

Results: Subjects were divided into two groups those who had a rise in temperature before thermal sensation of the first rise (n=16, temperature first group (T)) and those who had a rise in thermal sensation before temperature of the first rise (n=14, sensation first group (S)). Mean skin temperature (MST), temperature of the first rise (TFR), time of temperature of the first rise (TTR), and amplitude of temperature and thermal sensation (AT) in the T-group and S-group were 9.92±1.91°C, 10.64±1.88°C, 7.27±1.67°C, 7.93±1.79°C, 5.79±1.56 min, 5.46±0.79 min, 5.36±2.12°C, and 5.33±2.92°C, respectively. Mean thermal sensation (MSS), thermal sensation of the first rise (SFR), time of thermal sensation of the first rise (TSR), and amplitude of thermal sensation (AS) in the T-group and S-group were 1.73±0.69, 2.49±0.58, 1.22±1.06, 0.83±0.56, 8.33±4.32 min, 3.82±0.86 min, 2.59±1.22, and 3.44±1.50, respectively. There were significant differences in TSR and MSS between the two groups. The mean values of AS/AT in the S-group (2.49±0.58) were significantly higher than that of the T-group (1.73±0.69). The time difference of TTR and TSR was smaller in the S-group.

Conclusion: The sensitivity of the thermal sensation was higher in the S-group during finger immersion in cold water. These findings suggest that the resistance to cold stress of the S-group is higher than that of the T-group, and this difference is related with complaints of unusual coldness. In future studies, we plan to investigate the relationships among factors such as sex, age, and level of exercise and training.

References

Taimura A, Matsunami M, Nakagaichi M and Sugawara M (2008). Med Sci Sports Exerc, 40(5), s229.

Taimura A, Matsunami M, Nakagaichi M and Sugawara M (2007). Med Sci Sports Exerc, 39(5), s275.

THE EFFECT OF CRUSHED ICE INGESTION ON 40 KM CYCLING TIME-TRIAL PERFORMANCE.

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Pre-cooling is a temperature regulation strategy whereby core temperature (Tc) is lowered prior to exercise, and has been consistently shown to improve endurance capacity and athletic performance. However, pre-cooling protocols such as water immersion and cold air exposure are time consuming, logistically demanding and in some instances may result in adverse thermal responses, making these conventional methods impractical as a pre-event strategy.

Endogenous cooling methods (i.e. fluid ingestion) have been shown to attenuate the rise in Tc during exercise. Despite the positive effects of fluid ingestion on Tc responses to exercise, the effect of fluid temperature has been less established. As such, it was the purpose of this study to examine the effect of crushed ice ingestion as a pre-cooling method on body temperature response and cycling time-trial performance.

Seven trained male athletes completed a familiarisation, and two experimental 40 km cycling time trials (CTT) on a wind-braked cycle ergometer in a climate controlled chamber, set to 30oC and 75% relative humidity. The two experimental CTT included one trial preceded by a 30 min period of thermoneutral (26.8 ± 1.3°C) water consumption (CON), and the other by a 30 min period of pre-cooling via crushed ice (1.4 ± 1.1°C) consumption (ICE). The fluid volumes in each trial amounted to 6.8 g•kg-1 body mass. The order of trial completion was randomised, counterbalanced and completed within 14 days following the initial session. Each 40 km CTT required athletes to complete 1200 kJ of work in the fastest time possible. During the CTT, skin temperature (Tsk), Tc, cycling performance time, power output, heart rate (HR), blood lactate (BLa), and ratings of perceived exertion (RPE) / thermal sensation (RPTS) were measured at set intervals of work.

Pre-cooling lowered the Tc after ICE (36.74 ± 0.67°C) significantly more than CON (37.27 ± 0.24°C), ($p>0.05$). This difference remained evident until 200 kJ of work was completed on the bike (ICE: 37.43 ± 0.42°C, CON: 37.64 ± 0.21°C). The CTT completion time was 6.5% faster in ICE when compared to CON ($p<0.05$). No significant differences existed between conditions at any time point of the CTT for Tsk,, HR or RPE ($p>0.05$). The RPTS was significantly higher in CON at 200 kJ of cycling compared to ICE ($p<0.05$).

Ice ingestion was effective in lowering Tc and improved subsequent 40 km cycling performance in a hot / humid environment. A reduced thermal strain was evident in ICE compared to CON at the start of the CTT. Interestingly, split time data indicated that the latter parts of the CTT (900-1100 kJ) were significantly faster in ICE compared to CON despite no significant differences in HR, BLa, Tc, RPE and RPTS. The lower thermal strain evident in ICE compared to CON at the start of the CTT may have provided a greater heat storage capacity and muscle energy reserve that was used towards the end of the CTT, resulting in an enhanced time trial performance.

LOWER HEAD TEMPERATURES DID NOT AFFECT SELF-PACED RUNNING VELOCITY IN CHILDREN WEARING A CAP UNDER THE SUN

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Objective: Aim of the present study was to test the hypothesis that the use of a cap represents a barrier against sun radiation which would allow a lower heat accumulation during a 6 km self-paced run in children and, therefore, a higher running speed. Methods: Nineteen healthy boys and girls inhabitants of a tropical region (19,9° S of latitude and 43,9° W of longitude) (10,3 ± 0,7 and 10,2 ± 1,0 years old; 148 ± 6 and 145 ± 8 cm body height; 39,1 ± 6,1 and 34,8 ± 4,1 kg body mass; 1,3 ± 0,1 and 1,2 ± 0,1 m2 BSA, 17,8 ± 2,1 and 16,6 ± 1,8 BMI and VO2peak of 45,9 ± 1,9 and 42,5 ± 2,4 mL.kg-1.min-1 for boys and girls, respectively), took part in 4 experimental situations: 2 initial exercise sessions for familiarization and 2 self-paced 6 km runs with (CAP) and without (NOCAP) a cap (an all white polyester "Nike Dry-fit" cap, 7 cm brim length). CAP and NOCAP had their order randomized and balanced, were carried out in an external environment under sun radiation and at least 3-7 days apart. Each 6 km run was divided in 4 x 1,5 km exercise bouts with 3 minutes rest intervals. Subjects received information regarding distance yet to run every 100 m. Environmental variables were measured every 10 minutes during exercise protocols and physiological variables immediately before and after each run, and during the 3 minute rest intervals. Results: WBGT temperature, environment luminosity, running velocity (Vrun) and average skin temperature diminished during CAP and NOCAP, but were not significantly different. A higher Vrun was observed for the boys in both CAP and NOCAP, but no significant differences were observed between CAP and NOCAP for boys and girls, and also for all subjects when genders were treated together. Vrun decreased during the exercise bouts in all exercise situations. Mean luminosity at the forefront was reduced in 218 Lux (93%) and

mean head temperature was 1,7 ºC lower in CAP for boys and girls together. Mean heart frequency (HF) during rest periods was lower than during the exercise bouts, but was not statistically different between CAP and NOCAP. RPE and perception of thermal comfort (PTC) were not altered due to cap use, but increased during the exercise bouts in CAP and NOCAP. A positive correlation was observed between Vrun and VO2peak (r=0,64; p=0,002; r2=0,4). Conclusions: Cap use led to a decrease in mean head temperature. However, it was not sufficient to alter Vrun. Vrun decreases during all exercise bouts may have occurred due the action of a neural mechanism for homeostasis protection.

LAMBERT, E.V., GIBSON, A St CLAIR and Noakes, T.D. Complex systems model of fatigue: integrative homoeostatic control of peripheral physiological systems during exercise in humans. Br J Sports Med 2005; 39: 52-62.

MUNDEL, T.; BUNN S, J.; HOOPER, P.L.; JONES, D.A. The effects of face cooling during hyperthermic exercise in man: evidence for a integrated thermal, neuroendocrine and behavioral response. Exp Physiol 2006; 92: 187-195.

15:15 - 16:45

Oral presentations

OP-NU02 Nutrition 2

EFFECTS OF EARLY-EVENING EXERCISE ON ACYLATED GHRELIN, LEPTIN AND PERCEIVED HUNGER MEASURED DURING A SUBSEQUENT SIMULATED NIGHT-SHIFT

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Introduction: Shift-work, and particularly night-work, is common in Europe and is an independent risk factor for obesity (Atkinson et al., 2008). Shift-workers tend to 'graze' on high-fat foods during a night-shift and postprandial thermogenesis is lower at night, which, in combination, may compromise energy balance (Romon et al., 1993). Thus, a reduction in energy intake, by suppressing hunger could benefit the night-worker. Exercise in the late morning suppresses perceived hunger and associated regulators such as ghrelin (Broom et al., 2007) and leptin, for many hours. Although it is known that these hormones show circadian variation when measured at rest, no examination of the responses of these variables to exercise over a subsequent period of night-work has been attempted. We hypothesise that the responses of perceived hunger, ghrelin and leptin are different when awake and eating at night compared with previous studies undertaken during the day.

Methods: Six healthy males (age: 30±8 y, body mass: 74.1±6 kg, height: 178±8 cm) completed two trials (exercise and control) in a random order. In the exercise trial, participants fasted from 10:00 h, consumed a test meal at 18:00 h and then cycled at 50% peak oxygen uptake between 19:00-20:00 h. Participants then remained awake until 05:00 h, consuming two identical meals at 22:00 and 02:00 h. Participants rested between 19:00 and 20:00 h in the control trial. During each trial, venous blood samples were drawn at 1-h intervals between 20:00-05:00 h for the determination of acylated ghrelin, leptin, insulin and glucose concentrations. Perceived hunger was also recorded at these times. Data were subtracted from baseline and analysed with two factor (trial x time) linear mixed models. Data are described as mean±SD.

Results: Perceived hunger increased by 0.3±2.0 units throughout the night-work after exercise compared with a reduction of 1.2±2.3 units in the control trial ($P<0.0005$). Acylated ghrelin increased by 25.7±40.1 pg/ml during the night after exercise compared with 11.6±51.5 pg/ml in control ($P=0.004$). Insulin decreased by 37.8±136.8 pg/ml after exercise compared with a decrease of 95.0±116.2 pg/ml in control ($P=0.008$). Changes in glucose and leptin concentrations during the night-shift were unaffected by prior exercise ($P>0.05$).

Conclusions: We report, for the first time, that evening exercise increases perceived hunger and acylated ghrelin concentration during a subsequent night-shift. These data are in contrast to those from studies on diurnally-active individuals in which an exercise-mediated suppression of acylated ghrelin was observed (Broom et al., 2007). Therefore, the effects of exercise on appetite and its regulators appear different in the nocturnal period, which may help to explain the higher long-term risk of obesity in shift-workers.

References

Atkinson et al., (2008). Sports Med 38:671-85

Broom et al., (2007). J Appl Physiol 102: 2165-2171

Romon et al., (1993). Am J Clin Nutr 57: 467-480

SHORT-TERM MEMORY IN POSTMENOPAUSE. WEIGHT OF DIFFERENT PREDICTORS VARIABLES

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Introduction: Literature widely shows the memory decline age-related, even if, on the other side, it documented the protective role of physical exercise, diet, and both hormonal and anthropometric pattern on memory. Aerobic fitness protects and enhances memory through hippocampal neurogenesis related to the increase of cerebral blood flow exercise-dependent. The dietary habitudes play a fundamental on the memory functions through its quantitative and qualitative characteristics that can lead to diabetes, hypertension, stroke and excessive oxidative stress altering brain structure and functions. Both estrogens and leptin patterns have positive functional implications in memory processes, as excessive stress hormones have a negative role. So that, menopause-related hormonal modifications becomes important in memory decline. Because the aromatasic activity of adipose tissue may partially replace estrogens deficit after menopause, in this period, body fat (FM%) has been shown positively related to memory. The aim of this study was to investigate the influence of dietary, anthropometric, and physiological parameters on short-term memory (STM) in postmenopause.

Methods

25 postmenopausal healthy sedentary women (53.46±3.32 yrs) were recruited by general physicians attesting no metabolic, cerebrovascular and cognitive diseases. Body composition was assessed by multi-frequency electrical bioimpedance (Ds Medica, Italy). Qualitative and quantitative characteristics of daily meals were estimated by a dietician from three-day dietary records, covering two weekdays and one weekend day, using WinFood-due software (Medimatica, Italy). STM was measured though Digit Span Test, composed by both forward and backward numbers repetition, included in Attenzione e Concentrazione software (Erikson, Italy). VO2max was estimated (VO2maxest) by Rockport Fitness Walking Test after the STM test.

Results: Nobody had results of STM test below the reference values. Participants had 35.01±6.92 of FM% and a VO2maxest comprised between 26.90 and 40 ml/kg/min. A multiple regression model (p=0.008) was performed taking Digit Span Test score as dependent variable, while VO2maxest, FM%, diastolic blood pressure, intake of percentage lipids and carbohydrates, folic acid, vitamin A, D, B complex, and E were predictors variables. Only vitamin D intake (coeff. est.=0.732, t=4.950, p<0.001) was significant as predictor of STM. The same was obtained taking only backward numbers repetition result as dependent variables.

Discussion

Vitamin D intake seems to be the best predictor of STM in an integrated regression model taking into account several influencing variables. Literature suggest that the neurocognitive benefits of vitamin D seems to be related to the increase of acetylcholine concentration, neurotrophin synthesis and antioxidant capacity in the brain. So, to reach the recommended daily intake of vitamin D could lead to have both cognitive and skeletal health in postmenopause.

IS THERE A MINIMUM REQUIREMENT FOR FAT INTAKE IN ATHLETIC NUTRITION?

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Introduction: In contrast to extensive research on the significance of dietary carbohydrates and proteins for performance and health, the possible existence of a minimum requirement of fat in athletic nutrition has received little attention.

The intake of important fat soluble vitamins may be limited when the nutritional content of fat is reduced, and increasing evidence of low dietary intake of vitamin E in modern Western societies has been presented within the general population. population (Maras et al., 2004). Additionally, a low fat diet is suspected to reduce the absorption and bioavailability of vitamin E (Wolf, 2007), making dietary estimates an uncertain predictor for vitamin E status.

Among the components of vitamin E in blood, alpha-tocopherol is the most potent antioxidant, protecting cell membranes from oxidative damage, and as athletic anemia has been frequently discussed, it was of interest to investigate if a low vitamin E bioavailability in athletes on a low fat diet could possibly cause damage to red blood cells.

Subjects and Methods: To investigate this aspect two groups of sub-elite athletes participated. One group had regular menstrual function R and the other was irregular (IR). The two groups had similar height, weight and athletic success.

While intakes of protein and carbohydrates were similar and within normal range in the two groups, the daily intake of fat was significantly lower in the IR group (61± 6g; 1.1±0.1g/kg), than in the R group(98±12g; 1.7±0.2 g/kg). In order to determine the resistance of red blood cells to haemolysis, 13 participants, exercised for 20 min at the anaerobic threshold (HF =171±2 in R and HF = 172±3 in IR).

Results: Normal serum levels of alpha-tocopherol was found in the R group (27.3±3.6 micromol/L), while the IR group had a very low content (15.7 ± 0.8 micromol/L).

In blood sampled after the exercise, osmotic fragility of red blood cells (%hemolysis) was found to be significantly negatively related to serum levels of alpha-tocopherol.

Conclusion: A low fat content in the food may indicate a reduced alpha-tocopherol levels in blood which seems to render the red blood cells more susceptible to haemolysis in connection with physical activity. This should be taken into account when nutritional guidelines are given.

References

Maras, J. E., Bermudez, O. I., Qiao, N., Bakun, P. J., Boody-Alter, E. L., & Tucker, K. L. (2004). Intake of alpha-tocopherol is limited among US adults. Journal of the American Dietetic Association, 104, 567-575.

Wolf, G. (2007). Estimation of the human daily requirement of vitamin E by turnover kinetics of labeled RRR-alpha-tocopherol. Nutrition Reviews, 65, 46-48.

PHYSICAL ACTIVITY AND ADHERENCE TO THE MEDITERRANEAN DIET INCREASES TOTAL ANTIOXIDANT CAPACITY: THE ATTICA STUDY

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Introduction: The beneficial effects of the Mediterranean diet on human health are well documented. Simultaneously, physical activity has been evolved as a significant factor in the prevention of many cardiovascular and metabolic diseases as well as some kinds of cancer, while the determination of antioxidative capacity is a well established tool in medical diagnosis and treatment of such diseases. One of the most widely accepted index of whole body antioxidant ability is the total antioxidant capacity (TAC). Therefore, the aim of this study was to investigate the association of physical activity and the Mediterranean diet, on total antioxidant capacity.

Methods: A random sample of 1514 men and 1528 women was selected from all areas of Attica region (including 78% urban and 22% rural areas). Physical activity was assessed with a translated version of the validated "International Physical Activity Questionnaire" (iPAQ) categorizing the subjects to: inactive, minimally active and HEPA active (health enhancing physical activity; a high active category). Food consumption was evaluated through a validated FFQ. Adherence to the Mediterranean diet was assessed by the MedDietScore that incorporated the inherent characteristics of this diet.

Results: TAC was positively correlated with the degree of physical activity (p<0.05). TAC was also positively correlated with MedDietScore (r=0.24, p<0.001). Stratified analysis by diet status revealed that the most beneficial results were observed to highly active people (HEPA active) compared to inactive, who also followed the Mediterranean diet (19.7±7.4 μmol/L, p=0.03), after adjusting for various confounders.

Discussion: Both, intense physical activity and Mediterranean diet were positively correlated with increased total antioxidant capacity, with the most beneficial results observed among people that have both the highest level of physical activity and the greater adherence to

the Mediterranean diet. Therefore it is concluded, that the combination of increased and frequent exercise and the adoption of low fat dietary patterns, like the Mediterranean diet, enhances antioxidant defenses.

IRON STATUS IN YOUNG ELITE ATHLETES: INFLUENCE OF DIET, EXERCISE AND GENDER

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GERMAN SPORT UNIVERSITY COLOGNE

INTRODUCTION: Despite widespread research and education, iron still has to be considered as one of the most critical nutrients in public health as well as in exercise nutrition. The prevalence of iron depletion among athletes tends to be higher than in the general population. Additionally, there is sufficient evidence that suboptimal iron status may influence exercise capacity and/or sport performance.

Hence, the present study was designed to identify the influences of gender, diet and exercise on iron status across a wide range of sports and levels of competition in young elite athletes.

METHODS: Diet, exercise and haematological data from 177 junior elite athletes (100 f, 77 m; 16.3 +- 3.0 y, 64.8 +- 13.5 kg, 174.3 +- 10.9 cm) from 32 different sports were analyzed retrospectively. Diet and exercise data were collected during seven days using a standardized and validated record. Following the recording period, fasting blood samples were obtained from the athletes.

RESULTS: Among all athletes, approximately 40 % had reduced serum ferritin levels. About 4 % of the athletes were anaemic. Female athletes had significantly more abnormal haematological values and consumed significantly less dietary iron, cobalamin (both $p < 0.001$) and folic acid ($p < 0.01$).

Athletes with low ferritin levels indicative of iron depletion consumed significantly less meat and fish ($p < 0.01$) than athletes with regular levels. Female athletes with iron depletion had a significantly lower iron density in their diet (5.8 +- 0.9 vs. 6.5 +- 1.1 mg/1000 kcal, $p < 0.01$), which was not the case in male athletes. However, only in male athletes ferritin levels were significantly affected by practice duration and energy expenditure ($p < 0.05$).

DISCUSSION: There were a noticeable number of cases with low ferritin levels indicative of iron depletion among young elite athletes. Our results suggest that the interrelations between an athlete's iron status and his/her diet and exercise regimen is affected by the athlete's gender: in female athletes, iron depletion was more prevalent and serum ferritin levels were primarily affected by dietary iron density; in male athletes, energy expenditure and practice duration seemed to influence iron status strongly.

DEVELOPMENT AND VALIDATION OF A FOOD FREQUENCY QUESTIONNAIRE TO ASSESS SHORT TERM ANTIOXIDANT INTAKE

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A quantitative food-frequency questionnaire was developed to determine habitual antioxidant intake. Measures of semi-concurrent validity were obtained for 81 participants by comparing antioxidant intakes from the questionnaire with those from a 7-d food diary completed in the week following administration of the questionnaire. Measures of construct validity were obtained for 96 participants by comparing concentration of a biomarker of antioxidant capacity (ferric reducing ability of plasma) in a blood sample taken at the time of administration of the questionnaire with antioxidant intakes from the questionnaire. Validity between the food diary and antioxidant biomarker was obtained for 63 participants. The correlation between the diary and questionnaire energy-adjusted estimates of antioxidant intake was modest ($r = 0.37$; 90% confidence limits, ±0.14). The correlation between the questionnaire estimate and biomarker was also modest ($r = 0.33$; ±0.15), whereas the correlation between the diary estimate and biomarker was negligible ($r=-0.06$; ±0.15). The correlation between the food diary and questionnaire food groups were high for both cereals ($r = 0.55$; ±0.11) and coffee and tea ($r = 0.51$; ±0.15), moderate for fruit ($r = 0.31$, ±0.16) and vegetables ($r = 0.34$; ±0.16). Cereals contributed a major proportion (31.6%) of the total antioxidant intake. One-week test-retest reliability of the questionnaire's estimates of antioxidant intake in 20 participants was high ($r = 0.81$; ±0.16).

The food-frequency questionnaire is less labour intensive for participant and researcher than a diary and appears to be at least as trustworthy for estimating habitual antioxidant intake.

15:15 - 16:45

Oral presentations

OP-PS01 Psychology 1

PILOTSTUDY: ROLE OF MOTIVATION IN ELITE AND NON-ELITE YOUTH BASKETBALL PLAYERS

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Personality characteristics could be a critical factor in distinguishing successful players from their less successful counterparts (Williams & Reilly, 2000). Motivation is claimed to be such a personality characteristic and is best predicted by two attributes, i.e., effort and self-efficacy (Hong & O'Neil, 2001). Effort is believed to be a crucial component to commit to the deliberate practice that is needed to reach successful performance (Ericsson, Krampe & Tesch-Römer, 1993). Self-efficacy refers to the beliefs about one's capability to execute actions in order to reach a certain goal (Bandura, 1997). Even though motivation plays a crucial role, it is still not fully understood whether motivation should be measured as a more general personality characteristic, or as a more domain-specific personality characteristic related to reaching (top) sport performance.

This study is a part of a larger study that will examine the role of motivation in a wider range of elite and non-elite youth indoor ball team sport athletes. To gain more insight in the role of motivation, it was decided to first examine possible differences in generalized effort and self-efficacy. The purpose of this pilot study is therefore to examine the role of motivation between elite (n=22, mean age ± SE: 15.13 ±

1.45 yrs) and non-elite youth male basketball players (n=18, mean age ± SE: 14.06 ± .998 yrs). Players were classified elite when they were playing in international or national youth competitions and were classified non-elite when they were competing at regional level. Motivation was assessed with a questionnaire pertaining questions about two aspects of motivation: generalized effort and self-efficacy. Multivariate analysis of covariance with performance level as factor (elite versus non-elite) and age as covariate was conducted. A significance level of .05 was adopted. The results revealed no significant differences between elite and non-elite players on either effort or self-efficacy ($p > .05$). However, there was a trend with elite players outscoring their non-elite counterparts with moderate effect sizes on both motivational attributes ($d = .42$ on effort and $d = .43$ on self-efficacy). The findings of our study showed that elite athletes did not score higher on either generalized effort or self-efficacy. Nevertheless, based on the medium effect sizes found, the results might mean that general motivation is partly needed to reach higher sport performance. Yet, it would be interesting to further examine whether larger differences can be found when motivation would be measured more sport specific.

Bandura, A. (1997). Self-efficacy, The Exercise of Control. New York: Freeman.
Ericsson, KA, Krampe, RT, & Tesch-Römer, C. (1993). Psych Rev 100: 363-406
Hong, E & O'Neil, HF (2001). Int J Psych 36: 186-194
Williams, AM & Reilly, T (2000) J Sports Sci 18: 657-667

TOWARDS AN UNDERSTANDING OF DEBRIEFING IN SPORT

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Over the past twenty years, post performance evaluation has been increasingly utilized in sport to facilitate learning, to inform training and to improve performance (Hogg, 2002). Debriefing has been described as an extension of post performance evaluation in that in addition to learning and performance improvement, it incorporates the aim of facilitating mental and emotional recovery post competition (Hogg, 2002). Whereas post performance evaluation has received a significant amount of attention in the motor learning, behaviour and control literature, very little attention has been given to the process of debriefing in applied sport psychology (Hogg, 2002). The purpose of this study was to ascertain if athletes' and coaches' experience and understanding of debriefing aligned with the existing conceptualization of debriefing in sport (see Hogg, 2002). Factors thought to influence the debriefing process (e.g. timing of the debrief) were also investigated.

This study used a qualitative method of inquiry to explore the participants' subjective debriefing experiences. Seventeen participants, six coaches and eleven competitive athletes from both team and individual sports participated in semi-structured interviews. Athletes ranged in age from 18 to 29 years ($M=21.09$, $SD=3.30$). Employing inductive analysis, the results indicated that coaches' and athletes' understanding of debriefing was similar to Hogg's (2002) model of debriefing in sport in many respects. Both coaches and athletes perceived debriefing as an opportunity to exchange views on performance so that the athlete or athletes could learn from the experience. It was also generally believed that debriefing provided a focus for training and fostered motivation. However, no coach or athlete explicitly stated that they viewed debriefing as a means of facilitating mental and emotional post performance recovery.

Similar to empirical research in clinical psychology, the results indicated very little consensus as to "the ideal time" to conduct a post performance debrief. Athletes who participated in team sports were more likely to experience 'delayed' debriefing whereas those in individual sports were more likely to experience 'immediate' debriefing. Overall, the results suggest that athletes' and coaches' experience and understanding of the debriefing process was more closely aligned to models of debriefing in education versus the current conceptualization of debriefing in sport. Given the paucity of studies in the area of debriefing in sport, the current study provides a useful starting point for this line of research.

Hogg, J. M. (2002). Debriefing: A means to increasing recovery and subsequent performance. In M. Kellmann (Ed.). Enhancing recovery: Preventing underperformance in athletes (pp 181-198). Champaign, IL: Human Kinetics.

SUCCESSFUL ICE HOCKEY OFFICIATING: WHAT SKILLS ARE NECESSARY?

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Introduction: Self-efficacy is the degree to which an individual feels confident in their abilities to execute specific skills necessary for successful completion of their task (Bandura, 1997). In the context of sport, self-efficacy research has been conducted and applied mainly with athletes and coaches. There is, however, a group of individuals on the playing field that have, for the most part, been neglected. We recognize this group as sports officials. To be able to understand the antecedents and consequences of self-efficacy of sports officials, the first step is to determine what skills and abilities are necessary for successful officiating. The purpose of this research is to identify specific skills and abilities deemed essential by officials for successful officiating experiences in the sport of ice hockey.

Methods: Through collaboration with Justplay Sport Services, data were collected via a secure internet website. Participants were asked to complete an open-ended questionnaire. designed to identify those skills necessary for officiating.

Results: Responses from 121 ice hockey officials were obtained. Through content analysis, responses were coded as either technical skills (abilities that require the application of a specific technique) or as mental skills (abilities that involve the mind and various mental processes). Further analyses showed the predominant technical skills to include: knowledge of game/rules; communication skills; physical abilities/attributes; experience. The mental skills included: heightened awareness; decision-making processes; attitudinal skills; judgment skills; confidence; affective capabilities; passion; conflict management skills; mental preparation abilities.

Discussion: The identification of the skills ice hockey officials feel are crucial for successful performance is the first step in understanding the relationship between self-efficacy for ice hockey officiating and officials' performance, training, and retention. The information gathered by this research will be essential in the development of sound psychometric instruments assessing self-efficacy for ice hockey officiating.

References

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: Freeman.

DIFFERENTIAL COUNSELING FOR LEISURE SPORT AND EXERCISE - A CLUSTER-ANALYTICAL APPROACH

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UNIVERSITY OF BERN

Current reviews concerning the psychological benefits of physical exercise often conclude that the low to moderate effects can't be generalized. There is little knowledge about the causal mechanisms and additionally a lot of moderators have to be considered. Further research has to address the question, for which person could which kind of exercise lead to which psychological effects under which circumstances. Answers to this question can partly illuminate the affect-adherence-link, which is assumed to be of particular relevance for the maintenance of physical exercise.

Our study approach faces this question by analyzing the effects of individually matched exercise programs on psychological well-being and exercise adherence in a quasi-experimental design. We argue that an individually matched exercise program has to fit the individual needs and expectations to attain improvements of psychological well-being in the long run. If the exercise program succeeds in this regard, exercise adherence will be promoted as well.

The study design started with a matching process, which at first included a comprehensive assessment of n = 231 middle-aged adults. During a 90-minutes test session the participants were interviewed about their past and current physical exercises and sport activities. Furthermore, we used a computer-assisted assessment of various motives for leisure sports and we tested the participants' motor abilities. In a next step we conducted a cluster-analytical classification of the target group with respect to their motives for leisure sports. After that we developed target-group specific exercise programs and invited the participants to take part in two 13-week-intervention periods. The effectiveness of these individually matched programs was analyzed based on changes of psychological well-being and program attendance from the beginning to the end of the intervention periods. By comparison with a control group causal mechanisms were also examined.

In the paper, we present the results of the cluster-analytical classification of the target group in terms of nine typologies of motive profiles. Further these typologies will be compared with psychological and motor variables, which are known as important for the maintenance of regular exercise as well as for the designing of tailored exercise programs. Against this background we point out the five conceived intervention programs and we present results of the first intervention period in regards to effects on subjective well-being and related parameters.

STEROID HORMONES IN THE SALIVA OF ADOLESCENTS AFTER EXERCISE AND THEIR INFLUENCE ON COGNITION

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It is well known that physical activity increases serum steroid hormone (SH) levels such as Testosterone (T) (Maresh et al., 1988) and Cortisol (C) (Kirschbaum & Hellhammer, 1994). This is of particular interest since glucocorticoids (Lupien et al., 2005) and T (Hampson, 1995) in young adults have been shown to influence cognitive performance. Little is known, however, about the influence of different exercise intensities on cognition, the concentration of SH, or their interaction in adolescents. 60 high school students from the 9th grade were randomly assigned to two experimental (EG) and a control group (CG). Saliva collection took place after a normal school lesson (T1) and after a 12-minute resting control or exercise (T2) in a defined heart rate (HR) interval. Maximum HR (HR max) was measured one week prior to the investigation and used to ensure that the exercise levels were related to the individual HR max. (EG 1: 50-65%, n = 18; EG 2: 70-85% HR max, n = 20; CG: no intervention, n = 21). Saliva was analyzed for T and C. Cognitive performance was assessed using a working memory task (Letter Digit Span; LDS), which took place after T1 and T2. C and T levels of the high intensity group (EG 2) were significantly increased after 12 minutes of exercise training (T2). The repeated measure ANOVA revealed a significant group by test interaction, indicating an increase of C and T level for the EG 2 but not for EG 1 or CG. Results for the working memory task, showed a significant improvement due to exercise when groups were split into low and high performer at pre-test with a higher improvement of the low performers. In addition, there was a moderate correlation between T level and change in LDS-performance (r = -.40) in the EG 2, indicating a detrimental effect of increased T concentration on working memory. The results indicate that the concentration of the SHs C and T are intensity dependent, and that mainly low intensity exercise improves working memory in low performing adolescents. Only increased T, however, seems to be related to pre-to-post-test changes in working memory by having a detrimental effect on performance.

• Hampson E (1995) J Psychiatry Neurosci 20: 397-404
• Kirschbaum C, Hellhammer DH (1994) Psychoneuroendocrinology 19: 313-333
• Lupien SJ, Fiocco A, Wan N, Maheu F, Lord C, Schramek T, Tu MT (2005) Psychoneuroendocrinology 30: 225-242
• Maresh CM, Cook MR, Cohen HD, Graham C, Gunn WS (1988) Aviat Space Environ Med 59: 1139-1145

ARE THERE A CONNECTION BETWEEN SOCIAL REPRESENTATIONS OF AGGRESSION IN LIFE TODAY AND SPORT PRACTISE? THE CASE OF ATHLETIC AND NON-ATHLETIC YOUTHS

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Introduction: Many authors suggest that our beliefs (SR) are related to our behaviour. They may influence the direction of aggressive comportments (Archer et al, 1997b). However, sport is a space of learning rules, duties and control of violence. Parisot, (1991) confirmed that the social skills developed in sport may be transferred in social life. The aims of our study are: on the one hand, we compared the SR of violence in sport and social life in athletic and non-athletic youths. On the second hand, we studied the link between daily social and sport representations of aggression among adolescent sport participants and non-participants.

Method

Participants:

265 adolescents (N = 123 athletics and N = 145 non-athletics) have answered on the Expagg and the social representation of violence in sport (QRVS) instruments.

Results: Only 23 questions in Expagg (9 expressive aggressions (EA)) and (16 instrumental aggressions (IA)) and 22 questions in QRVS (7 no violence (NVs), 6 verbal aggression (VAs) and 9 physical aggressions (PAs)) were retained after a Varimax Rotation exploratory factor.

Comparisons of scores

Compared to the non-participants in sport the athletic group scored less in total and IA of aggression (p<.001). Yet, there was no difference in EA. In SR of sport violence, the scores of PAs of the athletic group were weaker than those of the non-athletic adolescents (p<.001). There was no difference in VAs in the two groups. The athletic group scored more than the non-participants sport in NVs (p<.01).

Correlations in scores

There was a negative correlation between IA and PAs (r=-.20 p<.05) in the athletic group and a positive correlation in non-athletic youths (r=.35 p<.05). There was a negative correlation between VAs and EA in non-athletic youths (r=-.28 p<.05). But, no correlation was found in athletic youths.

Discussion: Our results of SR are similar of Bushman and al. (1999). Athletic adolescents are perhaps more self confident than non-athletic youths, that is why they have less aggressive beliefs than their fellows. The negative correlations in (IA and PAs) and (VAs and EA) confirmed that the connection between sport and daily life aggression is reversed. Athletic adolescents use sports like a space of violence to control social violence in every day life. They maintain a weak level of aggression compared to the non-athletic youths because they respect the rules and the duties in sport. We think that our research should be reinforced by the use of the aggression instrument to be more explicit in the study of the connection between SR and behaviour.

References

Archer, J. and Haigh, A. (1997b). Aggressive Behavior, 23, 405-415.

Bushman, B.J., Baumeister, R.F. , & Stack,A.D. (1999). Journal of Personality and Social Psychology, 76, 367-376.

Parisot, D. (1991). Villeurbanne, 6 et 7 décembre

15:15 - 16:45

Oral presentations

OP-HI01 History

THE POLITICAL USES OF SPORT IN THE UNITED STATES: HISTORICAL PATTERNS AND CONSEQUENCES

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This study will examine the political uses of sport in United States colonial and military occupational practices over the last century. Applying a Gramscian hegemonic framework it assesses the initiation and attempted cooptation of indigenous cultures through the introduction and inculcation of western sport forms. It also addresses the indigenous reactions to those practices in a variety of locations in Asia, Hawaii, and the Caribbean region.

The US has preached the doctrine and ideology of democracy, liberty, and equality; but actual practices have not always adhered to the rhetoric expounded. Dictators who upheld American commercial interests were supported and financed. US government initiatives to utilize sport as a means to sell American products were initiated as early as the 1920s.

There has been a close relationship between religion, race, and capitalism in the construction of an American empire. This study analyzes those relationships through the sporting practices of the American military, colonial governing bodies, and religious organizations to conclude that the historical patterns established more than a century ago are still prevalent in American Mideast policies today.

COLLECTIVE MEMORIES, POLITICAL MYTHS, TURNER IDEOLOGIES AND GERMAN IDENTITIES

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Since the publication of Pierre Nora's monumental seven-volume "Les Lieux de Mémoire" (1992), research into "remembered places" is being carried out throughout the world with growing enthusiasm. The study of cultures of 'remembering' makes use of various research approaches and strategies. However, there is a consensus, that cultures reconstruct their pasts in communicative processes and incorporate those events into their collective memory, which they require for their current circumstances. Myths are a particular form of collective memory composed of narratives offering a selective and condensed account of events from the distant past. They appeal to the emotions, confer legitimacy on social organizations and structures, rationalize ideologies and norms, and lend meaning to a community's quest for self-reassurance (Flood 1996).

Myths of origin allude to persons, events and/or places who or which play a key role in the development of a community. Myth of origin are often combined with myths of persons, which focus on someone whose historical achievements are augmented, embellished and construed as being superhuman (Hein 2006). This is especially true of Friedrich Ludwig Jahn, the Turn Father in Germany, but also for the sport heroes in many countries.

The aim of this paper is, firstly, to examine the changing significance of Turnen festivals for the Turner identity and the creation of an "imagined community" and, secondly, to re-construct the place which the Turnen movement occupied (or saw itself as occupying) in German society. The contribution analyses the "places of memory" and myths (above all those surrounding the politics of gymnastics) created by the rituals and enactments that took place at Turnen festivals along with the declarations and messages that issued from them. This makes it possible to trace not only the image which the Turner had of themselves (and which was dependent on the prevailing political and socio-cultural circumstances) but also the nationalist discourses rooted in broad sections of the German populations in different historical epochs. The contribution focuses on the Turnen festivals held in Berlin in 1861 and in Leipzig in 1913. Sources are the Deutsche Turnzeitung and the commemorative publications of the Turnen festivals.

P. NORA, Les Lieux de mémoire (seven volumes). Paris 1984-1992.

C. FLOOD, Political myth: A theoretical introduction, New York, 1996

H. HEIN, „Texte zu politischen Mythen in Europa. Eine Bibliografie zur historisch-politischen Mythosforschung", in: Mythos 2(2006), pp. 227 – 230

THE IMPACT OF ATHLETICISM ON THE EARLY EVOLUTION ON FOOTBALL

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Abstract

J. A. Mangan claim in his article in Soccer & Society in April 2008 that the impact of the educational ideology athleticism, was more important to the evolution of English Association Football than earlier presumed. He does not give any specific definition of the concept athleticism but in this article we can understand it as a game ethos which was taught the Victorian and Edwardian bourgeois youth. The aim was to "play the game" in the right way with moral values and fairness as guiding lines. The idea of athleticism had been an important part of the English educational institutions in the second part of 1900 Century. It had "both an ulterior and altruistic impact in the universities, public and grammar schools of the middle classes and ...on the teacher-training colleges and elementary schools of the working class" (Mangan 2008:174). In short, athleticism can be used as an analytic factor when it comes to explaining the spread and democratisation of modern football. The proletarian adopted athleticism when school teachers used it as a part of the teaching. Moral values as honesty, courage and fair play could be practised at the pitch but could also be transformed to other parts of life. Football could be used to teach good manners in social life for young people.

In this paper I'll try to explore and "translate" the use of athleticism into Norwegian terms. How important was the ideology of education for the spread and growth of football in Norway?

Matti Goksøyr and Finn Olstad used, in their book Fotball! (Goksøyr M, Olstad F, 2002), the concept of youth revolt to explain the development of football and its role in an early phase, as Rune Slagstad did it in his book on history of ideas of Norwegian sport (Slagstad 2008). Slagstad writes that Norwegian football developed most like a youth revolt where the young people their self made written and unwritten laws and administrated the football association (Slagstad 2008: 188). The youth was driven by a playful approach to football. PE-teachers and the School as a whole did not get the control they wished, claim Slagstad (ibid). That means the pedagogical ideas on character building (athleticism) were not important for the development of football in Norway in an early phase. I will question this, and try out if athleticism had some impact on the early evolution of football, maybe more impact than Goksøyr, Olstad and Slagstad are claiming. Overall we can ask if athleticism can be used as a factor to explain popularity for football in Norway.

References

Goksøyr M, Olstad F. Fotball! Norges Fotballforbund 100 år. [Oslo] 2002, 4, 360.

Mangan J. A. Missing men: Schoolmasters and the early years of Association football. I: Soccer & Society Vol 9, No.2, April 2008, 170-188.

Slagstad R. (Sporten). En idéhistorisk studie. Pax Forlag A/S. Oslo 2008, 188.

- YOU MUST BE A "TRØNDER". SOCCER FANS CONSTRUCTING COMMUNITY ON WWW.RBK.NO AND WWW.KJERNEN.NO

KRØVEL, R.

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(Quote: Nils Arne Eggen to a talented African player on trial with Rosenborg).

Introduction: Groups or cultures have values that are largely shared by their members. But what happens to groups, community and values when global flows of people, capital, goods and ideas challenge existing boundaries? This paper will investigate the process of construction or re-constructing the imagined community of supporters and members of Rosenborg Ballklubb (RBK) and the fan club Kjernen.

RBK went through a period of profound change in the years after approximately 1999 (Svardal 2007). The club had been founded by players in a traditionally working class neighborhood of Trondheim. During the 1960s and 1970s, RBK, the most successful team in Trondheim, also became the dominating team in the region of Trøndelag. Under the leadership of Coach Nils Arne Eggen, the club went on to win 15 national championships after 1990. This meant that the club represented Norway in the Champions League in a period when incomes grew dramatically because of increased earnings from television and commercials. RBK thus became the richest and dominating club in Norway, but still professed an intention to recruit mainly local players.

Method: The investigation will focus on the period from 1999 to 2008, and take a historical perspective. It will therefore focus on changes in the discursive construction of what it means to be "trønder", i.e. from the region of Trøndelag. The paper investigates the struggle to construct "trønder" as it is played out among fans on rbk.no and kjernen.no. Discursive analysis is applied to selected texts published online. These texts are compared with discussion and interviews in the dominating regional newspaper Adresseavisen. In addition, key members of both RBK and Kjernen have been interviewed.

Results and Discussion: This changed gradually after approximately 1999 when more and more international players joined the club. In 2007 RBK sometimes fielded a team of one Canadian, one Fin, two Swedes, one Slovakian, two Ivorian and one from Burkina Faso, in addition to three or four Norwegians. This development stimulated a heated debate among fans, journalists and members of the club (still run and owned by members). Some, like the former coaches Nils Arne Eggen and Ola By Rise, claimed that the club would be best served by maintaining a majority of locally or regionally raised players, "trøndere", with whom local audience could identify. Others felt that the new multicultural outlook of the team could help include excluded or marginalized groups in the local community, thereby aiding a necessary re-construction of the local imagined community. Some of the most dedicated fans in the group called "Kjernen" began using "trønder" as an honorary title, not given only to those born or raised in Trøndelag, but, for instance, also to African or Latin-American players found to "deserve" it because of their display on the field.

References

1. Svardal, Geir. 2007. Historien om Rosenborg ballklub : 1917-2007 / . Trondheim.

SPORTS DEVELOPMENT AID: THE CASE OF NORWAY AND TANZANIA

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In 1983 the Norwegian Confederation of Sports, NIF, implemented a rather ambitious sports development project, "Sport for All", aiming to help building sport structures in and around the city of Dar es Salaam, Tanzania.

This paper examines the motives and means for the first Norwegian sports aid to a developing country in the early 1980's, and aims to place the sports aid in a wider context outside the sports field. The main research questions are; a) What were the motives and means for the Norwegian Confederation of Sports to initiate a sport development aid project in Africa in the 1980's?; b) What kind of arguments characterized the internal discussions about the sports aid? c) How did the sports aid fit with the development aid policy of the Norwegian government at the time? And finally; d) How can we understand and explain the relationship between the Norwegian Confederation of Sports as donor and the Tanzanian Sport Council as recipient?

In-depth archival studies at the Norwegian Confederation of Sports (NIF) and the Norwegian agency for development cooperation (NORAD) as well as public documents are the empirical base of this study, and document analysis was used to examine the policies and major decisions of NIF as the implementing party. These have been supplemented by interviews with key actors involved in the first Norwegian sport aid project, both within NIF, NORAD and the Tanzanian Sport Council.

There were several motives for NIF to engage in sports development aid, and the most conspicuous ones seem to have been the perception that Norwegian sport "as an industrialised country in regards to sport" had something to offer to the developing world. The fact that other Nordic countries also initiated sports aid is likely to have been an important motive for the Norwegian involvement. Further, the sports aid was an obvious result of ongoing changes in the political strategies of Norwegian development aid, which made funds available for private organisations with development projects. Hence the arguments for initiating sports aid had to fit with NORAD's priorities. This is reflected in the public documents: the rhetoric used in the sports aid discussions is clearly in line with the development aid jargon at the time.

When discussing the relationship between NIF as donor and the Tanzanian Sport Council as recipient, I make use of the term power effects, which explains that power appear as a result of relations, and can not in itself be used as the explanation to such relations. I ask whether such power effects were created by NIF, and what impact this may have had on the sports aid relationship.

THE HISTORY OF SPORTS TRAINING AND COACHING IN NORWAY WITH PARTICULAR FOCUS ON THE NORWEGIAN COACH STEIN JOHNSON.

NIESEN, J.J.

NORWEGIAN SCHOOL OF SPORT SCIENCE

Introduction: Cox (2008) mentioned in his review of Polley's (2007) introduction in Sport History, that the only thing missing is more insight in research issues like the history of sports training. However, there is not much research on that topic by sport historians.

In 2007 the Norwegian sports coach Stein Johnson, delivered his private archive to the National Coaching Centre and the Norwegian School of Sport Science in Oslo. Johnson was successful in sports coaching within 11 sports during his about 43 year long career as a trainer. This paper is based on research that tried to explain his success and influence on coaching in Norway. With describing the development of sports training science and practice in a national and international perspective, I tried to set Johnson's work in a national and international frame.

Methods: Krueger (1996) names four approaches for insight on the methodology of the history of Sports Coaching. This study is based on literature analysis, biographies and oral history. The main source was the archive of Stein Johnson.

Leading works on Sports History in Norway barely mention the history of sports training and coaching (Olstad, 1987; Tønnesson, 1986; Goksøyr, 1991; 2008). In addition, articles from history and coaching science build the basis for the history of coaching part.

Results: My research showed that psychological and pedagogical skills were the main reasons for the success of Johnson. He developed a basic training plan for the ice skaters, which he adapted later to several other sports. Main research about the development and history of sports coaching in Norway showed, that this nation was competent in adapting and developing new training methods from other countries.

Discussion: This study shows that the personality and individual work of coaches is apparently for sport practice much more important as theoretical skills and developments in sport science and physiology. That means that a history of coaching can not just look at textbooks and scientific articles but also depends on oral history. Combination of qualitative and quantitative research methods are nearly indispensable.

References

Cox, R. (2008). Sports History. A Practical Guide. Book Review. In: Sport History Review. 39, 1.

Goksøyr, M. (1991). Idrettsliv i borgerskapets by. En historisk undersøkelse av idrettens utvikling og organisering I Bergen på 1800-tallet. Oslo: Dr. scient.

Goksøyr, M. (2008). Historien om Norsk Idrett. Oslo: Abstrakt.

Krueger, A. (1996). The History of Middle and Long Distance Running in the Nineteenth and Twentieth Century. In: Krüger, A & Teja, A. (Eds.) La Comune eredità dello sport in europa. Atti del 1° Seminario Europeo di Storie dello Sport. Palermo:

Polley, M. (2007). Sports History. A Practical Guide. New York: Palgrave.

Olstad, F. (1987). Norsk Idretts Historie. Forsvar, sport klassekamp 1861-1939. Oslo: Aschehoug.

Tønnesen, F. (1986). Norsk Idretts Historie. Folkehelse, trim, stjerner 1939-1986. Oslo: Aschehoug.

15:15 - 16:45

Oral presentations

OP-RE01 Rehabilitation 1

DIFFERENCES IN STRENGTH AND JUMPING TECHNIQUE BETWEEN ACL-RECONSTRUCTED AND NON-INJURED HAND-BALL PLAYERS

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: About one third of ACL-injured elite handball players are unable to return to their pre-injury sport participation level. It is still unclear to what degree the ACL-reconstructed athletes returning to sports regain symmetrical landing patterns and thigh strength after rehabilitation. Altered motion patterns and side-to-side differences may predispose players to new ACL injuries. Based on this we investigated differences in strength and knee motion between legs in ACL-reconstructed handball players and differences in knee motion between ACL-reconstructed and non-injured handball players.

Material and Methods: All players in the Norwegian female elite handball series were invited for testing and 184 players (about 85%) were tested. Of these, 20 players had an unilateral ACL reconstruction (mean time since injury 3.5±2 (SD) yrs, 8 patellar and 12 hamstrings grafts). These were matched with twenty uninjured players (age 24.5±4.6 vs. 24.3±4.3 years, height 176.2±6.9 vs. 175.8±6.0 cm). All test subjects were fit for match play on the day of testing. The players completed maximal isokinetic quadriceps and hamstrings strength testing at 60 °/s. An eight-camera motion analysis system captured the motion of three maximal 30 cm vertical drop jumps at 240 Hz. Key kinematic and kinetic values were calculated and the average of three jumps was used for all analyses.

The ACL-reconstructed leg of injured players was compared with the uninjured leg using paired t-tests. The averages of both legs were compared between groups using independent t-tests.

Results: When comparing legs of previously injured players, the ACL-reconstructed leg had lower quadriceps (170.2±6.5 (SEM) Nm vs 181.6±5.8 Nm, p=0.046) and hamstrings (100.6±5.8 Nm vs 108.6±4.8 Nm, p=0.012) strength. For the drop jumps no differences were found between legs for maximal knee joint moments or maximal knee joint moments during the first 50 ms.

Significant differences in knee flexion at initial contact were found between the groups of players. The ACL-reconstructed group landed with less knee flexion compared to the non-injured group (29.6°±1.4° vs 34.6°±1.4°, p=0.015), but there was no difference in valgus angles at initial contact. ACL-reconstructed and non-injured players displayed similar values of maximum knee flexion and knee valgus as well as maximum knee flexion moment (211±8 vs 204±11 Nm, p=0.605) and valgus moment (38±6 vs 40±5 Nm, p=0.779) during landing phase.

Conclusion

ACL-reconstructed players display significant strength differences between legs, with the reconstructed leg being weaker than the uninjured leg. This suggests that rehabilitation before return to sport may be inadequate. Despite the strength imbalances, the injured players display symmetrical motion patterns an land similar to non-injured players, with an exception of knee flexion at landing. This may protect against new injuries, although differences in joint loading patterns may be revealed with more demanding tasks.

MEDICAL INFRARED THERMOGRAPHY AS A SCREENING TOOL FOR KNEE INJURIES IN PROFESSIONAL JUNIOR ALPINE-SKI-RACERS IN AUSTRIA – FINDINGS OF A PILOT STUDY

HILDEBRANDT, C.

UNIVERSITY OF INNSBRUCK

INTRODUCTION: Medical Infrared Thermography (IFT) is a non-radiating and non-invasive analysis tool for physiological functions related to skin-temperature control. In the past it has been successfully used in veterinary medicine for injury prevention and management in race horses (TURNER et al. 2000). Any significant asymmetry of more than one degree centigrade from two sides of the body may indicate a pathophysiological process. Knowing that similar anatomical and physiological conditions exist, it can be assumed that IFT is a helpful to manage injuries

in human athletes. But there is a lack of evidence, demonstrating the successful use with the advantage of twenty first century technology (DIAKIDES 2008).

The knee is a weak link and the frequently affected in alpine skiing (PUJOL et al 2007). Long-term consequences such as osteoarthritis and high treatment costs raise safety concerns.

Valid and reliable measurements are crucial to evaluate IFT as a screening tool in the prevention, diagnosis and rehabilitation of knee injuries in athletes. For this purpose the standardisation methods, proper recordings and the optimal image analysis were defined.

METHODS: We conducted a pre-season measurement of 35 female and 52 male junior alpine ski racers (non-injured, previous injury and acute injury) aged 14-19 years from the "Skigymnasium Stams". After an acclimatisation period of 20 minute we recorded an image of the anterior/posterior and medial/lateral aspect of both knees with an infrared camera (TVS500EX). To analyse the images we used the software GORATEC Thermography

Studio Report. A physiotherapist examined the functional aspect of the knee.

RESULTS: In 6 male athletes intra-individual thermal asymmetries of 1.4 (±0.58) degree Celsius over the tibia revealed overuse reactions such as Osgood-Schlatter disease. The clinical examinations confirmed these findings. The evaluation of 7 feminine and 1 male athlete with an operation of the knee over the last 6 months clearly demonstrated the localisation and extent of the affected area.

DISCUSSION: This study was instrumental in learning how to use the technology. It clarified the potential of IFT for a more objective and uncomplicated evaluation of knee injuries. Pre-season measurement will be compared with post-season measurements to evaluate the physical stress.

In case of thermal asymmetries of more than one degree Celsius they will be analysed with structural measurements such as magnetic resonance imaging and X-ray. These results can be used to adjust the training programs of the at-risk athletes and may lessen the severity and frequency of overuse and acute knee injuries.

REFERENCES
DIAKIDES N.A.; BRONZINO J.D.; Medical Infrared Imaging; BOOK, CRC PRESS; 2008
PUJOL et al., Am. J. Sports Med. 35(7): 1071-1074; 2007
TURNER et al., Vet. Clin. North. Am Requine Pract. 17(1): 95-113; 2000

THE COL12A1 GENE IS ASSOCIATED WITH INCREASED RISK OF ANTERIOR CRUCIATE LIGAMENT RUPTURES IN FEMALES

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UNIVERSITY OF CAPE TOWN

Introduction: Anterior cruciate ligament (ACL) ruptures are among the most severe musculoskeletal soft tissue injuries. However, the exact mechanisms which cause these acute injuries are unknown. Recently, two genes, namely COL1A1 and COL5A1, which code for the {alpha}1 chain of type I collagen, and the {alpha}1 chain of type V collagen respectively, have been shown to be associated with increased risk of ACL ruptures. The TT genotype of the functional COL1A1 Sp1 binding site polymorphism was under-represented in participants with ACL ruptures when compared to the control participants, whereas the CC genotype of the COL5A1 BstUI restriction fragment length polymorphism (RFLP) was significantly over-represented in the female control participants when compared to female participants with ACL ruptures. Type XII collagen, similarly to type I and type V collagen, is a structural collagenous component of the most basic unit of ligament, the microfibril. Type XII collagen is a homotrimer consisting of 3{alpha}(XII) chains, which are encoded for by a single gene, COL12A1. Therefore the aim of this study was to investigate whether sequence variants within a third gene, namely COL12A1, are associated with ACL ruptures.

Methods

129 subjects with clinically and surgically diagnosed ACL ruptures, as well as 216 physically active controls subjects (CON) without any history of ACL injury were included in this case-control genetic association study. All subjects were genotyped for the previously characterised non-synonomous AluI and BsrI RFLPs within exon 65 and exon 29 respectively.

Results: There was a significant difference in the genotype frequency between the ACL and CON groups among the female, but not the male participants. The AA genoptype of the AluI RFLP was significantly over-represent in the female ACL participants (OR=2.4, 95% CI 1.0 – 5.5, P=0.048). There were no genotype effects between the ACL and CON group for the BsrI RFLP.

Conclusion

The COL12A1 AluI RFLP is associated with ACL rupture in females. The results suggest that females with an AA genotype are at increased risk of ACL ruptures. These initial genetic-association studies should be further investigated and if confirmed, incorporated into multifactorial models developed to identify predisposed individuals.

References

1. Posthumus, M. September, A. Keegan, M. O'Cuinneagain, D. van der Merwe, W. Schwellnus, M. Collins, M. (2009). Genetic risk factors for anterior cruciate ligament ruptures: The COL1A1 gene variant. Br J Sports Med, In press.

2. Posthumus, M. September, A. O'Cuinneagain, D. van der Merwe, W. Schwellnus, M. Collins, M. (2009). The COL5A1 gene in associated with increased risk of anterior cruciate ligament ruptures in female participants. Am J Sports Med, Revised manuscript in review.

3. September, A.V. Posthumus, M. van der Merwe, L. Schwellnus, M. Noakes, TD. Collins, M. (2008). The COL12A1 and COL14A1 genes and Achilles tendon injuries. Int J Sports Med, 29:257-263.

FUNCTIONAL PERFORMANCE AND SELF-REPORTED KNEE FUNCTION IN MENISCECTOMIZED PATIENTS 2 YEARS AFTER SURGERY COMPARED TO AGE- AND GENDER MATCHED CONTROLS.

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UNIVERSITY OF SOUTHERN DENMARK

INTRODUCTION: Meniscectomized patients have a high risk of developing knee osteoarthritis (1). Furthermore, decreased muscle function is thought to play a key role in disease development and progression (2). Previous studies on muscle function in meniscectomized patients have used the non-operated leg as a healthy control, possibly underestimating any bi-lateral impairment.

Purpose: To identify differences in functional performance tests and self-reported pain, function and knee-related quality of life between meniscectomized patients and age- and gender matched controls.

METHODS: Patients: Thirty-one patients (21 men, 46±6 yrs, 175±7 cm, BMI 26±4, 21±6 month post-surgery) operated for a non-traumatic medial meniscal posterior horn tear. Thirty-one controls (19 men, 46±6 yrs, 175±10 cm, BMI 26±4) identified through the social security number system. Strict in-/exclusion criteria were followed for both groups.

Self-reported outcomes: The Knee Injury and Osteoarthritis Score (KOOS) were used to assess knee-related pain, symptoms, function in daily life, sports and recreation function and quality of life (3). Separate subscale scores from 0 to 100, worst to best, were calculated.

Functional performance tests: One-leg hop for distance and maximal number of knee bendings/30 s (4). Mean of both legs were calculated for the controls.

Correlations: To determine if self-reported and objectively measured physical function represent similar constructs correlations were calculated between all KOOS subscales and the two functional tests.

RESULTS: KOOS: Large differences were observed between patients and controls; Pain 83±16 vs. 97±5 ($p<0.001$), symptoms 82±16 vs. 94±9 ($p<0.001$), ADL 89±14 vs. 99±3 ($p<0.001$), Sport/Rec 69±24 vs. 95±8 ($p<0.001$), QOL 69±23 vs. 91±11 ($p<0.001$).

One-leg hop: No difference between operated vs. healthy leg in patients (83±30 vs. 85±28 cm, $p=0.33$) and no significant difference compared to controls (83±30 vs. 91±24 cm, $p=0.27$).

Knee bendings/30 s: No difference between operated vs. healthy leg in patients (26±10 vs. 26±9, $p=0.56$) and no significant difference compared to controls (26±10 vs. 29±10, $p=0.24$).

Correlations: Moderate correlations were identified between all KOOS subscales and maximal number of knee bendings/30 s ($r=0.39$-0.49, $p=0.03$-0.006) in the patient group.

CONCLUSION

Self-reported outcomes were significantly worse in meniscectomized patients compared to controls at 2 yrs post surgery. Similarly, clinically relevant differences of ~10 percent were seen in functional tests though not reaching statistical significance. KOOS scores were best

reflected in the maximal number of knee bendings/30 s test suggesting that this test resembles self-reported knee function in meniscectomized patients.

REFERENCES
1. Englund & Lohmander, Arthritis Rheum 2004;50(9):2811-9.
2. Bennell et al., Rheum Dis Clin N Am 2008;34:731-754
3. Roos et al., J Orthop Sports Phys Ther 1998;28(2):88-96.
4. Bremander et al., Scand J Med Sci Sports 2007;17(2):120-7.

ACL INJURED AND UNINJURED PROFESSIONAL ALPINE SKIERS- A DESCRIPTIVE COMPARATIVE STUDY ON POSSIBLE INTRINSIC AND EXTRINSIC RISK FACTORS

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THE SWEDISH WINTER SPORTS RESEARCH CENTRE

Background: Alpine skiing is a very popular sport for children and adolescents. However, it is not without risks of injuries. The majority of injuries in alpine skiing are knee sprains and in particular anterior cruciate ligament (ACL) injuries, which is the most serious one. An ACL injury has consequences for the athlete, in terms of lost time from sports and a great risk for osteoarthritis in the future. The most optimal injury prevention program should be based on both intrinsic and extrinsic risk factors.

Aim of study: The aim of this study was to describe possible intrinsic- and extrinsic risk factors for ACL injuries related to professional alpine skiers.

Subjects and Methods: In this study, ongoing for forth years, we are prospectively following all alpine ski students from all Swedish Ski High Schools, in order to define injury risk factors. Prior to each ski season the skiers have been clinically examined, according to a specific protocol including control of general joint laxity, knee alignment, anterior knee laxity, muscle flexibility and three different functional performance hop tests for instance. Then the skiers were prospectively followed in terms of ACL injuries, during the ski season.

Results: Preliminary results will be present from this ongoing study. The study has been ongoing for four years.

15:15 - 16:45

Invited symposia

IS-SS02 Reconceptualising sports coaching: A sociological endeavour?

'RECONCEPTUALISING SPORTS COACHING: A ROLE FOR SOCIAL THEORY?'

JONES, R.L.
UWIC/NSSS

Recent research has begun to argue that at the heart of coaching lies a sociological endeavour. It is based on the premise that coaching, as opposed to being a knowable sequence, is fundamentally intertwined with social perceptions at the micro-interactive level within given situational constraints. Taking such a position as a starting point, the general purpose of this symposia, and of this introductory presentation in particular, is to (a) question the legitimacy of such a position; (b) strengthen the primary case made; and (c) demonstrate how previously under-discussed sociological theories (e.g., social exchange theory) can contribute to our understanding of sports coaching.

STOCKS OF KNOWLEDGE AND SOCIAL POSITIONING: USING GIDDENS' WORK TO UNDERSTAND COACHING

PURDY, L.
UNIVERSITY OF LIMERICK

As the social complexities inherent in sports coaching are being increasingly recognised (e.g., Purdy, Potrac & Jones, 2008), researchers are drawing on strands of social thought to better understand the activity. The use of sociological theories and perspectives are aimed at gaining a deeper understanding of coaching by appreciating the social networks and values within each context. For example, Giddens' (1979) work on stocks of knowledge and social positioning demonstrates the importance of social expectations between coach and athletes. Here, preliminary findings indicate that such expectations have to be at least partially met if the coaching contract is to be honoured. Not meeting expectations in relation to actions associated with individuals' social positionings puts at risk the respect of athletes, without which coaches simply cannot operate (Jones, 2006). This on-going work extends previous research in coaching by examining the various layers of social interaction within it, thus stressing the interdependent, problematic nature of the coach-athlete relationship.

HOW CAN LUHMANN'S COMMUNICATION THEORY INFORM SPORTS COACHING?

RONGLAN, L.T.
NORWEGIAN SCHOOL OF SPORT SCIENCES

The German sociologist Niklas Luhmann developed a theory (systems theory) which does away with the notion of system in all its traditional wordings. Luhmann's theory is not about control or determinism but rather the opposite, namely the non-linear, contingent, temporal and rather surprising rise of order out of chaos. As a sociological theory it is a theory about complexity and communication. Luhmann insisted that one does not locate society inside individuals, but between them. Thus, the fundamental unit of society is communication, not the single actor. And communication cannot be reduced to the thoughts of Ego and Alter; it represents something else; a third dimension, which both parties observe while communicating, and through which they understand each other. Communication presupposes individuals – it does not take place beyond, outside or separate from individuals. But humans are more than communication, and communication is more than action and consciousness.

Based on this theoretical perspective, the aim of the paper is to look at coaching in sport as communication processes. The paper has a threefold intention. First, given that Luhmanns texts to a little extent are accessible in English, his notions communication, complexity, and system will be outlined. Second, I will state the reason for why a shift from action to communication as the key concept may be suitable for grasping more of the complexity in coaching situations. Finally, the limitations imposed by linear models will be discussed, and I will argue that communication theory is less reductionist: it enables a closer look at the ambiguities and the diversity that mark social interaction.

15:15 - 16:45

Invited symposia

IS-SM01 Physical activity during pregnancy and after childbirth

EVIDENCE FOR EXERCISE IN PREVENTION AND TREATMENT OF PREGNANCY-RELATED LOW BACK

STUGE, B.

OSLO UNIVERSITY HOSPITAL, ULLEVÅL, OSLO

Introduction: Pain in the lumbo-pelvic area is a widespread problem of pregnancy. About 50% of pregnant women suffer from low back pain (LBP) or pelvic girdle pain (PGP) during pregnancy. PGP is stated to be an identifiable form of LBP that can occur separately or in conjunction with LBP 2. The prevalence of PGP during pregnancy is 20 %. Most women recover after delivery, especially in the first month after delivery; however studies indicate that about 7 % still suffer from PGP postpartum. Suggestions to help manage the womens' pain and disability are varied and include different kind of treatment regimes, exercises being one of them. The question is on what evidence are the treatments and exercises based?

Method: This review included randomised controlled trials. Methodological quality was assessed using a quality assessment form for internal validity. For identifications of studies a search strategy was used for relevant databases.

Results: For treatment of pregnant women ten RCT's were identified; one of them examining prevention of LBP and/or PGP. Three RCT's examining postpartum LBP and/or PGP were found. The methodological quality of the studies for pregnant women tended to be rather poor with potential for bias in the results. Those who participated in an exercise program in addition to their prenatal usual care, regardless of the treatment program, reported less intense pain than those who received usual care alone. However, one cannot rule out a possible placebo effect in studies that looked at usual prenatal care (no treatment) versus active participation in exercise programs. Interventions, subjects included and outcomes were not sufficiently similar to perform a meta-analysis to determine size of effect. The studies examining postpartum LBP and/or PGP showed high methodological quality. However, only one study demonstrated statistically and clinically significant positive and long-lasting effects 1. The treatment program studied focused on exercises for motor control and stability of the pelvic girdle.

Discussion: Good methodological quality of a study is important to rely on the results. The quality of the interventions studied is another important aspect to consider when evaluating the results of an effect study. Many questions are then to be raised. How to exercise with PGP? Is stabilizing exercises the answer? Are there any exercises and movements women with PGP should avoid? Why did the study by Stuge and co-workers 1 show long-lasting effects of 11 individual treatments and exercising for 20 weeks?

References

1. Stuge B, Veierød MB, Lærum E et al. The efficacy of a treatment program focusing on specific stabilizing exercises for pelvic girdle pain after pregnancy. A Two-Year Follow-up of a Randomized Clinical Trial. Spine 2004;29:E197-E203.

2. Vleeming A, Albert HB, Ostgaard HC et al. European guidelines for the diagnosis and treatment of pelvic girdle pain. Eur.Spine J. 2008.

THE IMPACT OF MATERNAL LIFESTYLE ON CHRONIC DISEASE RISK.

MOTTOLA, M.

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Obesity and diabetes have reached epidemic proportions in our society today. Recent literature has suggested that the maternal environment plays an important role in the future risk of chronic disease in the offspring. Infants of obese or gestational diabetic women are at risk for obesity, type 2 diabetes and cardiovascular disease later in life. Large for gestational age babies and small for gestational age babies are on the extreme ends of the birth weight continuum and are most often born to obese and gestational diabetic women. These babies are at risk for chronic diseases later in life. Gaining excessive weight during pregnancy and then retaining weight during the postpartum period may also contribute to the obesity crisis, especially for women of reproductive age. Women with gestational diabetes are at risk for type 2 diabetes later in life. Maternal lifestyle, including eating a healthy diet and being active during pregnancy can prevent excessive weight gain and prevent gestational diabetes. In addition, providing a healthy fetal environment may help prevent childhood obesity and reduce the risk of chronic disease later in life. We have developed a Nutrition & Exercise Lifestyle Intervention Program (NELIP) that is an effective tool for preventing excessive weight gain and gestational diabetes in overweight and obese pregnant women. Preventing excessive weight gain during gestation improves glucose tolerance and provides a healthy environment for fetal growth and development. Perhaps childhood obesity may be prevented by initiating a healthy lifestyle started early in life through pregnancy and in the first year postpartum.

Healthy mothers = healthy babies = healthy futures!

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THE EFECT OF PREGNANCY AND CHILDBIRHT ON PELVIC FLOOR FUNCTION AND THE NEED FOR STRONG PELVIC FLOOR MUSCLES IN SPORT

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The pelvic floor muscles (PFM) forms the floor of the abdominal cavity, and are essential in closure of the pelvic openings. They should automatically contract before and during increase in abdominal pressure and form a structural support for the pelvic organs. Pelvic floor dysfunction may lead to urinary incontinence, fecal incontinence, pelvic organ prolapse, sensory and emptying abnormalities of the lower urinary tract, defecatory problems (constipation), chronic pain syndromes and sexual disorders. During pregnancy and after childbirth hormonal changes with loosening of the connective tissue, weight of the baby and stretching and tears of the connective tissue, musculature and peripheral nerves increases the risk of pelvic floor dysfunction. Theoretically high impact activities and activities increasing intra-abdominal pressure eg heavy weight-lifting during pregnancy may add to this risk. Since stress urinary incontinence occurs during increase in abdominal pressure, one would expect that female elite athletes in general are at risk. The prevalence during sports among young, nulliparous elite athletes varies between 0% (golf) and 80% (trampolinists). The highest prevalence is found in sports involving high impact activities such as gymnastics, track and field, and some ball games. A "stiff" and strong pelvic floor positioned at an optimal level inside the pelvis may be a crucial factor in counteracting the increases in abdominal pressure occurring during high-impact activities.

There are no randomised controlled trials or reports on the effect of any treatment for stress urinary incontinence in female elite athletes. However, strength training of the pelvic floor muscles has been shown to be effective in treating stress urinary incontinence in parous females in the general population. In randomised controlled trials, reported cure rates, defined as <2g of leakage on pad tests, varied between 44% and 80% (1). To date there are 4 RCTs evaluating the effect of antenatal pelvic floor muscle training. Three of these studies show favourable results. The study showing no effect included only one session with the physiotherapist. There are 3 RCTs and one matched controlled study in prevention of urinary incontinence postpartum, all but one show positive results (3). The matched controlled study demonstrated 50% less women with urinary incontinence in the exercise group. The study with no effect used a very weak intervention with only 3-4 visits with a midwife. Pelvic floor muscle training has no serious adverse effects and has been recommended as first-line treatment in the general population. Use of preventive devices such as vaginal tampons or pessaries can prevent leakage during high impact physical activity. The pelvic floor muscles need to be much stronger in elite athletes than in other women. There is a need for more basic research on pelvic floor muscle function during physical activity and the effect of pelvic floor muscle training in female elite athletes.

15:15 - 16:45

Invited symposia

IS-PH03 Cross-Country skiing

THE COMPETITIVE XC SKIER - FROM AN INTEGRATIVE PERSPECTIVE

HOLMBERG, H.C.

SWEDISH WINTER SPORTS RESEARCH CENTRE

Cross-country skiing (XC) is a demanding endurance sport. The skiers compete on hilly tracks with a combination of steep uphill, flatter terrain and technically demanding downhills. This imposes physiological as well as coordinative challenges due to the frequent transitions between, and the use of, different skiing techniques. During the last decade there has been an increased scientific emphasis on upper body development (1) and biomechanical modifications to different skiing techniques (2-4). The greater emphasis on upper body training has markedly improved skiers' endurance and muscle strength in the arm and torso region. Furthermore, the innovative technical development of specific techniques has contributed to higher racing velocities (3, 4) and a better use of energy (2). Although there has been considerable progress in overall XC performance during the last years, the new demands of the sprint and mass-start events imply further improvements. One potential area for development is increasing the understanding of the XC race and its components. Recent development of more advanced methodology in the lab and the integrative use of physiological and biomechanical methodologies have contributed to better and more circumstantial analysis of several determining aspects of the sport. Areas that would be interesting to explore more specifically in the field are the velocity profile, technique transitions and the dynamics of different physiological, as well as biomechanical, variables in races using different ski techniques and of varying duration. This has the potential to improve our understanding of the demands of the sport, but also the importance of recovery during continuous intermittent exercise, as well as the development of fatigue. A closer cooperation between sports science and the rapidly growing research field of sports/performance technology has the potential to provide new possibilities and perspectives. A key factor in athletes' success will always be improving their physiological capacities, but also the more effective use of biomechanical knowledge to optimise technical performance, assisted by better equipment, for example. In this context the use of an integrative biomechanical and physiological approach is an important tool towards greater understanding and enabling further improvements to XC performance.

References

1. Holmberg H-C. The physiology of cross-country skiing: with special emphasis on the role of the upper body. Stockholm,: 2005, p. 90 s.

2. Holmberg HC, Lindinger S, Stoggl T, Bjorklund G, and Muller E. Contribution of the legs to double-poling performance in elite cross-country skiers. Med Sci Sports Exerc 38: 1853-1860, 2006.

3. Holmberg HC, Lindinger S, Stoggl T, Eitzlmair E, and Muller E. Biomechanical analysis of double poling in elite cross-country skiers. Med Sci Sports Exerc 37: 807-818, 2005.

4. Stoggl T, Muller E, and Lindinger S. Biomechanical comparison of the double-push technique and the conventional skate skiing technique in cross-country sprint skiing. J Sports Sci 26: 1225-1233, 2008.

LACTATE IN WHOLE BODY EXERCISE; AN ANAEROBIC END PRODUCT AND AN AEROBIC SUBSTRATE

VAN HALL, G.

RIGSHOSPITALET

Lactate in whole body exercise; an anaerobic end product and an aerobic substrate

G van Hall

Department of Biomedical Sciences, University of Copenhagen & Metabolic Mass-Spectrometry Facility, Rigshospitalet, Copenhagen, Denmark

Lactate has been considered a dead end waste product of glycolysis due to hypoxia and a major cause of fatigue. The produced lactate thought to be cleared by the liver for gluconeogenesis. However, it has become clear that skeletal muscle continuously produces lactate, and during exercise without an apparent lack of oxygen. The increase of lactate production with exercise is depending on the acceleration of glycolysis causing and increase in pyruvate and NADH concentration that will shift the equilibrium enzyme lactate dehydrogenase to lactate formation. Moreover, during exercise the active muscles are by far the most important tissue for lactate uptake and subsequent oxidation. Thus, the muscle net lactate release, and to a large extent the systemic lactate concentration, is depending on the balance between the active muscle lactate production and simultaneous utilization. This concept becomes very clear during diagonal stride roller-skiing at about 75% VO2max (van Hall et al., 2003). A relative small increase in arterial lactate (~2.5 mmol/L) occurs despite a very high whole body lactate production (~14.1 mmol/min) caused by the large release of lactate by the arms and legs. However, the legs are taking up and oxidizing substantially more lactate than they produce. Thus, due to the large leg muscle mass and energy requirements for contraction the legs are able to clear and oxidize most of the lactate that is produced during diagonal stride roller skiing keeping systemic lactate concentrations low. In addition, the arms showed to be equally efficient in lactate utilization per kg of muscle than the legs, however, the arms produced far more lactate than they consumed, i.e. are more glycolytic than legs. These findings imply that systemic lactate levels are no measure for aerobic/anaerobic capacity of athletes in different sport disciplines. Moreover, sports that use both the arms and the legs like rowing, swimming and cross-country skiing the lactate levels will depend on the relative utilization of arms versus legs. This implies that blood lactate levels cannot be used to evaluate training status or technique (Mittelstadt et al., 1995; Larson, 2006).

References

Van Hall G et al. Leg and arm lactate and substrate kinetics during exercise. Am J Physiol Endocrinol Metab 284: E193-E205, 2003.

Larson AJ. Variation in heart rate and blood lactate threshold due to exercise model in elite cross-county skiers. J Strength Cond Res 20:855, 2006.

Mittelstadt SW et al. Lactate response to uphill roller skiing: diagonal stride versus double pole technique. Med Sci Sport Exerc 27: 1563, 1995.

SPRINT COMPETITIONS AND MAXIMAL SPEED IN CROSS-COUNTRY SKIING - A PHYSIOBIOMECHANICAL UPDATE.

STÖGGL, T., MÜLLER, E., HOLMBERG, H.C.

UNIVERSITY OF SALZBURG, MIDSWEDEN UNIVERSITY

Due to the recent introduction of sprint races and an increasing number of mass start competitions in the World Cup series, new aspects of training and testing are becoming fields of research. This could be attributed to the upcoming specialization of athletes in sprint racing, as well as to the technical modifications demonstrated for selected techniques, eg. double poling (Holmberg et al. 2005) and double-push skating (Stöggl et al. 2008a). Both technical modifications were found to be superior to the conventional skiing style. In addition, the mean skiing velocity in WC sprint races has shown a steady increase in skiing speed (Stöggl et al. 2008b), reaching mean race speeds of up to 9.5m/s in classical style and up to 10m/s in skating. It should be noted that skiing speeds in the majority of scientific studies are quite apart to these values. It was demonstrated that there is a moderate to high correlation between sprint performance and performance in distance races (Stöggl et al. 2008b).

It was recently shown that short duration maximal skiing speed and specific maximal and explosive strength are good predictors of cross-country skiing sprint performance (Stöggl et al. 2007a,b 2009). Interestingly it was found that skiers with higher maximal power output and maximal skiing speeds showed, in addition to their higher performance, less fatigue during all-out tests of the same duration as a sprint race. These results may be coupled to the prerequisites of modern sprint techniques, as characterized by high peak forces and high force impulses over a short time. The combination of high force output over a short time and thus a longer recovery time was found to be faster and more economical (Holmberg et al. 2005; Stöggl&Müller 2009). Furthermore, it was found that cycle length but not cycle rate was related to performance, especially at submaximal velocities. This was particularly true of the V2 technique and diagonal stride, whereas in double-poling there seems to be an optimum cycle length and cycle rate pattern (Stöggl&Müller 2009). Measures of aerobic capacity (VO2max) showed only low correlations to sprint performance. However, it should be noted that a high level of VO2max should be the basis but also that other factors that are mainly associated with neuromuscular factors and anaerobic capacity discriminate between weak and strong sprint skiers.

These findings should lead to a reconsideration of concepts in the training and testing of cross-country skiers. In addition to common VO2max and incremental step tests, also strength and speed tests should be included. Maximal and explosive strength training sessions could also be useful additions to conventional aerobic and strength endurance training.

References

Holmberg et al (2005). Med Sci Sports Exerc. 37:807-818.

Stöggl et al. (2007) Scand J Med Sci Sports. 17:362-372.

Stöggl et al (2007) Med Sci Sports Exerc. 39:1160-1169.

Stöggl et al (2008) JSports Sci. 26:1225-1233.

Stöggl et al (2008) Competition analysis. ICSS4 657-677.

Stöggl & Müller (2009). Med Sci Sports Exerc. press.

MUSCLE FATIGUE IN ELITE CROSS COUNTRY SKIERS; A LINK BETWEEN SARCOPLASMIC RETICULUM FUNCTION AND GLYCOGEN AVAILABILITY?

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The consistent observations that muscle glycogen (Gly) stores at the beginning of exercise are closely related to endurance capacity and that the point of exhaustion after prolonged exercise coincides with low muscle Gly levels clearly suggest a role for muscle Gly in fatigue (Hermansen et al. 1967). However, the link between Gly and impaired muscle function during fatigue is not well understood and a direct cause-and-effect relationship between Gly and muscle function remains to be established. Here presented a system where events in the excitation-contraction (E-C) coupling are affected by Gly content and localisation.

We examined the effect of Gly content on the sarcoplasmic reticulum (SR) function in the arm and leg muscles of elite cross country skiers (n=10, VO2max 72 ml kg-1 min-1), before, immediately after, and 4h and 20h after a fatiguing 15-km race. During the first 4hrs of recovery the skiers received either water or carbohydrate (CHO), and thereafter the same CHO enriched food. Straight after the race arm Gly was reduced to 31±4% and the SR Ca2+ release rate had decreased to 85±2% of their initial levels. After a 4h recovery with CHO, the SR Ca2+ release rate was fully normalized and Gly had noticeably recovered (59±5% initial). However, if CHO was absent during the first 4h recovery, the muscle Gly and the SR Ca2+ release rate remained low and reduced (29±2% and 77±8%, respectively), with both parameters being normalized after the remaining 16h recovery with CHO. Leg muscle Gly decreased to a lesser extent (71±10% initial) and there were no effects on the SR Ca2+ release rate. Importantly, these data demonstrate a strong association between low Gly levels and muscle E-C coupling even after long recovery periods where adenine nucleotide levels may be normalised. Additionally, SR function is estimated in vitro under constant energy levels. Thus, although related to muscle Gly levels, the impaired SR function is not due to a diminished energy metabolism at low Gly levels.

In line with this, transmission electron microscopy (TEM) reveals that Gly is located in distinct compartments close to different sites of E-C coupling (Marchand et al. 2002). We have shown that 72±3% of intramuscular Gly is located in the intermyofibrillar space (between the myofibrils) and 28 ± 3% in the intramyofibrillar space. Additionally, in single fibres the intramyofibrillar Gly content is positively correlated with fatigue resistance capacity, and intermyofibrillar Gly is inversely correlated with tetanic half relaxation time.

Together, these results demonstrate that two distinct subcellular populations of Gly have different roles in contracting single muscle fibres. This is consistent with the idea that the Gly localisation modulates the E-C coupling, thereby affecting muscle contractility and fatigability.

References

Hermansen, Hultman & Saltin (1967). Acta Physiol Scand 71, 129-139.

Marchand, Chorneyko, Tarnopolsky, Hamilton, Shearer, Potvin & Graham (2002). J Appl Physiol 93, 1598-607.

15:15 - 16:45

Oral presentations

OP-ST01 Sports 1

EFFECTS OF MATURATION ON THE RELATIONSHIP BETWEEN SPEED AND ENDURANCE IN CIRCUM-PUBERTAL SOCCER PLAYERS

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Effects of maturation on the relationship between speed and endurance in circum-pubertal soccer players

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Introduction: Morphological and physiological considerations suggest that sprinting ability and endurance capacity put conflicting demands on the design of a human's locomotor apparatus and therefore cannot be maximized simultaneously (Van Damme et al., 2002). However, in children the ability to demonstrate this specialization is less apparent (Rowland, 2002). That is, children who perform well in sprinting tasks also perform well in endurance activities. In this regard, it has been suggested that specialization into endurance or sprinting "types" occurs during late-puberty stages (Falk and Bar-Or, 1993). However, few studies have assessed these associations in children and adolescents of different maturational levels spanning a wide circum-pubertal spectrum. Moreover, the ability to demonstrate this specialization has yet to be tested in young soccer players where players are expected to be selected and/or trained to develop both qualities (i.e., speed and endurance) (Reilly et al., 2000). In the present study we aimed at determining whether maturation affects the relationship between sprinting speed and endurance in a group of circum-pubertal soccer players.

Methods: Sprinting speed and endurance capacity were measured in 14 early-pubertal male soccer players (16.9 ± 0.7 yr old; mean ± SD), mid-pubertal male soccer players (14.3 ± 0.9 yr old) and 26 late-pubertal male soccer players (12.3 ± 0.7 yr old). Each player performed an incremental field test to exhaustion for the determination of maximal aerobic speed (MAS) (i.e., endurance capacity) and a 40-m running sprint test for the assessment of maximum sprinting speed (MSS). Relationships between size-corrected MSS and MAS measures were examined.

Results: MSS was correlated with MAS (r = 0.66 ± 0.15; 95% confident limits, moderate to very large). The MSS/MAS ratio did not differ among the three groups; early-pubertal soccer players (1.16 ± 0.06; mean ± SD), mid-pubertal soccer players (1.18 ± 0.07) and late-pubertal soccer players (1.16 ± 0.06).

Discussion: Within this cohort of highly trained young soccer players, which spans a wide circum-pubertal spectrum, speed and endurance capacity coevolved. In conclusion, the development of sprint capacity appear not to be constrained by the need of endurance capacity and vice versa.

References

Falk B, Bar-Or O. (1993). Pediatr Exerc Sci, 5, 318-331.

Reilly T, Bangsbo J, ranks A. (2000). J Sports Sci, 18, 669–683.
Rowland T. (2002). Pediatr Exerc Sci, 14, 315-320.
Stølen T, Chamari K, Castagna C, Wisløff U. (2005). Sports Med, 35, 501–536.
Van Damme R, Wilson RS, Vanhooydonck B, Aerts P. (2002). Nature, 415, 755-756.

EFFECT OF EXTREME ENVIRONMENTAL CONDITIONS ON PHYSICAL ACTIVITY PATTERNS OF SOCCER PLAYERS

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Soccer teams may sometimes be obliged to play under difficult environmental conditions. Activity patterns of players of different standards have been analyzed by time-motion analysis, but there is dearth of knowledge how the players' match performance is affected by environmental conditions.
Purpose: This study aimed to evaluate changes in the activity patterns during a soccer match played in different conditions of environmental temperature and humidity.
Methods: Non-acclimatized soccer players (n=10, the goal keeper was excluded, 20 ±2 y, V'O2max=63 ±7 ml/min/kg) played 2 matches in different environmental conditions. Players ingested telemetric core temperature (Tc) sensors prior to each match and wore a heart rate (HR) and global positioning system (GPS) monitor during the match. A computer based analysis program was used to evaluate heart rate and speed changes during the match. The following locomotor categories were used: standing (0 – 0.4 km/h), walking (0.5 – 7.5 km/h), jogging (7.6 – 14.5 km/h), low – moderate running (14.6 – 19.5 km/h), high speed running (19.6 – 25.5 km/h) and sprinting (> 25.6 km/h). These were later divided into five categories: (1) standing; (2) walking; (3) running, encompassing jogging and low – moderate intensity running and (4) high intensity running, consisting of high speed running and sprinting.
Results: The average ambient temperature for the June 2007 match was 34 ± 1 ⁰C with a relative humidity of 38 ± 2 %. In the July 2007 match, ambient temperature was recorded as 36 ± 0 ⁰C with a relative humidity of 61 ± 1 %. Peak Tc values recorded for June and July matches were 39.1 ± 0.4 ⁰C, and 39.6 ± 0.3 ⁰C respectively. Total distance covered during June and July matches was 8.6 ± 0.6 and 8.1 ± 0.7 km respectively. The total distance covered in the first and second halves were: 4.4 ± 0.4 and 4.2 ± 0.3 km for June and 4.3 ± 0.5 and 3.8 ± 0.4 km for July matches. The difference between the halves of the July match was significant. The running distance covered in the second half of the July match was significantly shorter than first half of July and second half of June matches (2.1 ± 0.4 and 1.9 ± 0.3 km for the first and second halves of June and 1.9 ± 0.5 and 1.3 ± 0.4 km for the first and second halves of July matches;$p<0.05$)
Conclusion: In soccer matches played in high environmental temperature and humidity, the physical performance of the players may decrease due to high thermal stress. In the present study, the players' increased body core temperature at half time was followed by a decrease in total distance covered in the second half of the game. This may point to a centrally-driven performance reduction.

COOLING INTERVENTION AND SOCCER UNDER EXTREME HEAT CONDITIONS

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Whole body pre-cooling with fluid ingestion had been discusses as one of the main interventions to improve athletic performance in extreme heat conditions. Extensive research had been performed to evaluate the effect of precooling on athletic performance and body core temperature, but the influence on a soccer match had not been investigated. Purpose: The aim of this study was to investigate the effect of cooling intervention on athletic performance and body core temperature during a competitive soccer game. Methods: 11 soccer players aged 21 ± 2 y (mean ± SD) with V'O2max of 59.8 ± 5.0 ml/kg/min volunteered to play two matches (without – C and with cooling intervention-CI) for this study. The ambient temperature and humidity was 34.3 ± 0.6 oC and 64 ± 2 % for the first and 34.0 ± 0.5⁰C and 62 ± 0 % for the second game (CI) respectively. Players had opportunity to consume ad libitum plain water during the C, plain water or sports drink by choice during CI study. A cooling tent and icy water filled buckets placed beside the soccer field were used for cooling intervention. Match activity was recorded by a global positioning system. Thermosensor pills were used for body core temperature (Tc) measurements. Blood samples were withdrawn from an antecubiteal vein 5 hours before and immediately after the game to determine hematocrit (Htc), hemoglobin content (Hb), calculate plasma volume loss, and changes of serum electrolytes. ANOVA and paired sample t-test was used to evaluate the level of significance, and p values < 0.05 were accepted as significant. . Results: The highest Tc value recorded during the last ten minutes of the first half and the difference between C and CI groups was not significant (39.54 ± 0.5 vs 39.3 ± 0.5oC respectively). Total liquid consumption was measured as 1473±422 ml for C, and 1230±494 ml for CI group (926±604 ml plain water, and 304±240 ml sports drink). Post-match dehydration % was similar for both C (2.49±0.67) and CI match (2.54±1.21). Pre- and post-match Htc (48.9±3.3 vs 49.2±3.3 %) and Hb (161±14 vs 163±13 g/L) were used to calculate % plasma volume change (0.1±5.5 %) for the C match. The plasma volume loss for the CI group was calculated as -5.1±5.6 with pre- and post-match Htc (46.2±2.3 vs 46.9±2.1) and Hb (153±10 vs 156±9) content. Plasma volume loss for C and CI groups were not significant. Pre- and post-match difference of serum Na (145±2.5 vs 144±3 mmol/L), and K (5.4±0.4 vs 5.4±0.4 mmol/L) for C and CI groups were not significant. CI did not change distance covered during the game significantly (8298 ± 589 meters vs 8315±549 meters for C and CI groups respectively)
Conclusion: Cooling intervention was not sufficient to reduce Tc and improve match performance significantly. Slight reduction of Tc that observed with whole body cooling, may be important for prevention of heath related problems that occur in extreme heat conditions.

PLAYING FOOTBALL <SOCCER> UNDER EXTREME HEAT CONDITIONS – EFFECT OF ACCLIMATISATION

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Exercise intensity is an important factor to induce thermal strain, and soccer is a challenge for the players who have to play under extreme heat conditions. Acclimation is an important intervention to improve thermal tolerance and endurance capacity.
Purpose: We aimed to evaluate effect of acclimation on sportive performance during a game played under extreme heat conditions
Methods: 11 male acclimated soccer players (age 23  2 y, VO2 max 61.8  1.1 ml.min-1.kg-1) and 10 unaccli-

mated male soccer players (age 21  1 y, VO2 max 62.3  1.5 ml.min-1.kg-1) volunteered to participate in this study. Acclimated (A) and unacclimated (UA) teams played separately against a high level competitive local team at the second half of July 2007. Acclimated players played with an ambient temperature and humidity of 35.6  0.3 oC and 46  2 % respectively. Temperature and humidity was recorded as 36.00.2 oC and 61  1 % during the UA match. Match activity was recorded by a global positioning system. Thermosensor pills were used for body core temperature (Tc) measurements. Blood samples taken 4 hours before and immediately after the game to determine hematocrit (Htc), hemoglobin content (Hb), calculate plasma volume loss, and changes of serum electrolytes. Urine analyses performed before the game. ANOVA and paired sample t-test was used to evaluate the level of significance, and p values < 0.05 were accepted as significant. . Results: The highest Tc value recorded during the last ten minutes of the first half and the difference between A and UA groups was not significant (39.0  0.3 vs 39.51  0.3oC respectively). Urine specific gravity value of A players (10206) was significantly lower than UA players (10277) (p < 0.05). Pre- and post-match Htc (43.5  3.3 vs 46.1  2.5 %) and Hb values (153  11 vs 154  12 g/L) were used to calculate % plasma volume change (-4.38.13 %) for the A players. The plasma volume loss for the UA players was calculated as -4.82.8 % with pre- and post-mach Htc (45.8  2.6 vs 47.0  1.3) and Hb (161  7 vs 166  9; p<0.05) content. Difference of plasma volume loss for A and UA football players was not significant. Post-match serum Na (1412 vs 1424 mmol/L), K (4.30.3 vs 4.60.4 mmol/L) for A and UA players were not significantly different from each other. The difference of total distance covered by A (8514  630 m) and UA (8154  731) players were not significant. Average distance covered by A players during the second half of the game was significantly higher then the UA players (4156  354 vs 3761  358 m respectively; p<0.05). Conclusion: Playing football in extreme heat conditions is an important challenge for adjustment of thermal balance. Increased body temperature together with dehydration may reduce exercise capacity. Acclimatisation is an important intervention to reduce heat strain. The increased sportive performance may be interpreted as another beneficial effect of acclimatisation.

HORMONAL AND NEUROENDOCRINE RESPONSES AND TRAINING ADAPTATIONS FOLLOWING 8-WEEKS OF PRE-SEASONAL PREPARATION PERIOD IN YOUNG HIGH-LEVEL SOCCER PLAYERS

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Introduction: Various hormonal responses to training-stress are measured for examining training adaptations particularly in adults' athletes. However, little information is available regarding hormonal and neuroendocrine responses to intense pre-seasonal preparation training in young athletes, in particular in youth soccer-players. The purpose therefore of the present study was to examine neuroendocrine and selected hormonal responses and their association with physiological adaptations to 8-weeks of pre-seasonal preparation training in young high-level male soccer-players.

Methods

All anthropometric measurements, physical fitness components and neuroendocrine and hormonal responses of eighteen (n = 18) well-trained players were evaluated in three occasions: at base-line, immediately prior to the initiation of preparation period (pre-conditioning) and 48-hours following the completion of the 8-weeks' training program (post-conditioning).

Results: Total IGF-1, growth hormone (GH), plasma testosterone (T) and cortisol (C) and T:C ratio were not different between assessments but plasma prolactin (Prl) (p = 0.001) was significantly lower at post-training period. Body weight (p = 0.349), BMI (p = 0.266), resting systolic (p = 0.230) and diastolic (p = 0.527) blood pressure and sit and reach flexibility (p = 0.61) were not different among measures but HRmax (p = 0.014) was significantly lower at post-conditioning evaluation. Body fat percentage (%) (p = 0.0005) was lower and aerobic capacity (p = 0.0005), leg explosiveness (p = 0.0005), and muscular endurance [1 min-sit-ups (p = 0.001) and 1 min-push-ups (p = 0.029)] were improved by the end of preparation period. There was a significant negative correlation between endurance capacity and resting plasma Prl levels. No correlation was observed between plasma IGF-1, GH, T, C and the other fitness components, which all were examined separately.

Discussion: The present study suggests that although the overload pre-seasonal training program improved soccer-specific fitness components of young high-level soccer players, several selected hormonal responses (e.g. total IGF-1, GH, plasma T and C and T:C ratio) were not influenced by the pre-seasonal training program with the exception of the reduction in resting plasma Prl concentration. Consequently, this response may reflect an increase in brain serotonergic system adaptations and/or tolerance to intense soccer pre-seasonal training. The present study provides preliminary evidence for using resting levels of plasma Prl as an indicator for training adaptations to pre-seasonal preparation period in young sub-elite soccer players.

AGE-RELATED DEVELOPMENT OF BIOLOGICAL - AND PERFORMANCE INDICES OF AUSTRIAN SOCCER PLAYERS

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Introduction: Soccer is characterized by numerous sprint bursts interspersed by brief recovery periods over an extended period of time (60-90 minutes) activating both, the aerobic and the anaerobic energy systems. This study was intended to examine the age-related development of aerobic endurance and sprint velocity of seven age-related sub-groups of adolescent soccer players ranging from 7-18 yrs in comparison to elite players of the Senior League.

Methods: The sample included 105 soccer players (at least 11 players were tested in every sub-group). Biological development of height, body mass and body mass index were measured and two tests of functional capacity: Aerobic fitness 20-m multistage shuttle run (20 SRT) and sprint running abilities (sub-intervals and total time of a 30 m dash measured electronically) were administered. Estimated relative maximum of oxygen uptake (rel. VO2max) was predicted from age and maximum speed of the 20 SRT.

Results: Anthropometric data, sprint abilities and endurance performance improved continuously with increasing age. However, the performance improvement in speed and endurance capabilities was only significant in teams having an age difference of 3 and more years. The only exception in this respect was detected is between the players being 14 yrs old and those being 16 yrs old were a significant gap in performance indices existed probably due to the growth spurt. It is remarkable however, that there are no significant differences between the teams of the under 16 – and under18 year old soccer players, and players of the male elite team in aerobic performance measures and sprint abilities. Surprisingly there was a highly significant correlation between endurance performance and quickness of the tested players leading to the result that those players who had higher developed aerobic endurance performance also were the fastest players.

Conclusion
The biological maturity status significantly influences the functional capacity and athletic performance (speed and aerobic endurance) and highlights the inter-relationship of growth, maturity and functional characteristics of youth soccer players. The lack of further improvements in aerobic endurance capacity and sprint abilities of soccer players being 16 yrs and older detected in this study underlines the importance of continuing and improving the proportion of athletic training in adult soccer players.

15:15 - 16:45

Oral presentations

OP-PH15 Physiology 15

HIGH INTENSITY SHOCK MICROCYCLES: AN EFFICIENT METHOD FOR IMPROVING VO2MAX IN JUNIOR ALPINE SKIERS

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Introduction: Maximal oxygen consumption (VO2max) is often used to predict aerobic endurance capacity. In already-trained soccer players, VO2max can be further improved by performing high-intensity interval training (HIT) sessions twice a week over two months (Helgerud et al., 2001). Alternatively, it seems that VO2max can effectively be increased when HIT sessions are performed once or twice daily within a condensed 10-day shock microcycle (Stolen et al., 2005). Such a concept could be particularly useful for athletes who cannot afford the time for extensive endurance training due to high technical and strength demands of their sport. The aim of our study was to investigate the effect of an 11-day high-intensity shock microcycle on endurance and jump performance in junior alpine skiers.

Methods: Six female and sixteen male subjects (age: 17.0 ± 1.1 yr, body mass: 67.3 ± 10.4 kg) were matched and randomly assigned to either a high-intensity interval training group (HIT, N = 13) or a control training group (CON, N = 8). HIT performed 15 HIT-sessions (12 on a cycle ergometer, 3 on an obstacle course) during 11 days. Each session consisted of 4×4 min at 90-95% of the individual maximal heart rate (HRmax), separated by 3-min recovery periods. CON continued their normal mixed training including endurance and strength sessions. Before, 24 hours and seven days after the training period, anthropometric data were gathered and ramp tests to exhaustion on a cycle ergometer were performed to determine HRmax, VO2max, peak power output (PPO) and the first and second ventilatory thresholds (VT1, VT2). At the same time-points, countermovement and squat jumps were performed on a force plate.

Results and discussion: Body mass and fat-free mass were reduced in HIT only (-1.0%,-1.1% ($P < 0.05$), respectively). Seven days post-intervention HIT significantly improved VO2max by 6.0% (pre: 53.0 ± 4.6, post: 56.2 ± 5.1 mL•kg-1•min-1; $P < 0.01$) and PPO by 4.4% (pre: 5.2 ± 0.4, post: 5.5 ± 0.5 W•kg-1; $P < 0.01$). CON showed slight but nonsignificant improvements in VO2max (+3.0%) and PPO (+2.0%). Power output at VT2 increased in HIT by 9.6% ($P < 0.01$), but not in CON, whereas jump height was unchanged in both groups. In the HIT-group the described functional improvements were already present but to a lesser extent in the post 24-hours measurements.

Our results show that high-intensity interval block training might be a very time efficient way to improve VO2max, PPO, and the power output at VT2 in junior alpine skiers. Accumulated fatigue of such an intense training cycle seems to delay the development of the functional adaptations. Therefore, athletes and coaches should plan rest-days to ensure adequate recovery and maximal training effect.

- Helgerud J. et al., 2001; Med Sci Sports Exerc 33(11): 1925-31
- Stolen T. et al., 2005; Sports Med 35(6): 501-536

ACTIVE OR PASSIVE - THE INFLUENCE OF TWO DIFFERENT REST PROTOCOLS ON POWER OUTPUT, LACTATE AND PH TIME COURSE AND PEAK OXYGEN UPTAKE DURING HIGH INTENSITY TRAINING <HIT>

HAEGELE, M., ZINNER, C., WAHL, P., SPERLICH, B., MESTER, J.

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Introduction: During past years much scientific effort has been undertaken to observe the effects of high intensity training (HIT) on endurance performance. Although many studies used varying intensities during the exercise bouts, much less data exists describing how the recovery periods between the intense bouts should be realized. To answer this question, the role of lactate and hence pH has to be considered, since the accumulating lactate during passive recovery is still often considered as major parameter causing muscle fatigue. Latest scientific research reports by contrast that lactate acts as energy reservoir and signal molecule. Due to these findings, the aim of this study was to compare the effects of two different rest protocols power output and physiological parameters.

Methods: 12 male endurance athletes (age: 24,4 ± 3,9 years, height: 183,9 ± 4,6 cm, weight: 76,2 ± 7,2 kg) completed two testing sessions on a cycle ergometer. Each testing session consisted of a 10min warm up at 2 Watt/kg followed by four 30sec maximal sprints. The 10min recovery periods between the sprints were either active (ACT, cycling at 1,5 Watt/kg) or completely passive (PAS), which was assigned randomly. Peak Power (PP) and Mean Power (MP) were detected for each sprint. During the recovery intervals capillary blood was used to detect lactate concentrations (Lac) at 0, 1, 3, 5, 7 and 9min. Furthermore pH was measured at 2, 6 and 9min, whereas oxygen uptake (V02peak) was observed during the whole training session.

Results: MP was 749 ± 120, 741 ± 122, 720 ± 120 and 709 ± 108 Watt for ACT and 740 ± 109, 712 ± 91, 660 ± 90 and 653 ± 93 Watt for PAS. The difference between the two recovery protocols reached statistical significance at the 3rd & 4th bout. Lac were similar 0, 1, 3 and 5min after the first bout but the concentrations in ACT decreased significantly from 7min and remained lower for all following points of measurement. pH differed significantly from 9min after the second bout, showing higher values for ACT. Analysis of spirometric data revealed no statistical difference for VO2peak during the bouts.

Conclusion: Our study revealed that the active recovery protocol was more sufficient to sustain power output over four consecutive maximal bouts. Furthermore it can be speculated if an active recovery process allows an athlete to perform more intense intervals in a row. Anyhow, dependent on the aim of a training intervention one should consider possible differences in metabolic stimuli due to different recovery protocols and resulting lactate concentrations as well as acid-base balances. Several studies provide evidence for an impact of acidosis and lactate on growth hormones and transcription factors which would favor passive recovery protocols due to greater physio-

logical stimuli. To assess these stimuli and characterize subsequent adaptations, not only the character of exercise but also recovery should be considered when developing new training strategies.

HIGH INTENSITY PHYSICAL ACTIVITY CORRELATES WITH IMPROVEMENT IN VASCULAR FUNCTION IN 9-11 YEAR OLDS.

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Background. The prevalence of obesity and physical inactivity in Western countries has increased in recent years. Both are modifiable risk factors for cardiovascular disease. Endothelial dysfunction has its origins in childhood and plays a fundamental role in the development of the atherosclerotic disease process. However little is known about the factors which modify endothelial function in children. The present study therefore aimed to examine the relationships between change in artery health and its predictors in children.

Methods This was an observational cohort study. We studied 116 nine-eleven year old children (70 female, 46 male). Flow mediated dilation (FMD), an index of vascular health, was assessed in the brachial artery and normalised for differences in its eliciting shear rate stimulus (FMD/SRAUC). Body composition was assessed by dual energy X-ray absorptiometry (DXA) and peak VO2 determined on a treadmill ergometer. Physical activity (PA) was assessed over 5 second epochs using uniaxial accelerometry across a 7 day period. All measurements were taken at baseline and repeated 16 weeks later, in order to assess whether changes in the above variables impacted upon FMD. Change scores were calculated, correlations performed and stepwise backwards linear regression used to identify predictors of change in FMD.

Results No sex differences existed so data was pooled. Change in FMD/SRAUC was correlated with change in high intensity PA (r=0.3, p=0.002), change in average counts per minute (r=0.25, p=0.009) and change daily steps (p=0.202, r=0.034). Regression analysis revealed that change in high intensity PA was the only predictor of change FMD/SRAUC (r2=0.126, p=0.001).

Conclusions FMD was not significantly related to changes in body composition, cardiorespiratory fitness levels or low to moderate intensity PA. The significant association between change in FMD and change in high intensity physical activity suggests that future interventions should focus on encouraging this form of behaviour.

AEROBIC INTERVAL TRAINING VERSUS STRENGTH TRAINING AS A TREATMENT FOR THE METABOLIC SYNDROME

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Background: Physical inactivity and overweight is strongly associated with an increased risk for developing metabolic syndrome. The syndrome is characterized by a clustering of risk factors related to cardiovascular disease and mortality such as increased blood pressure, impaired glycemic control, excess of abdominal fat and dyslipidemia. Regular physical activity followed by increased fitness can improve the metabolic profile and reduce the risk of developing cardiovascular diseases, however the optimal training regime for reversing metabolic syndrome and its associated cardiovascular abnormalities remain undefined.

Methods: Forty subjects were randomized (stratified by gender and age) to either aerobic interval training (AIT, n=11), strength training (ST, n=10), combination of aerobic interval training and strength training (COM, n=9), or a control group (n=10). Training was performed 3 times per week for 12 weeks, and risk factors comprising the metabolic syndrome were measured before and after the intervention in all four groups.

Results: AIT and COM significantly increased VO2peak (34.2 ± 9.8 to 38.6 ± 11.3 ml•kg-1•min-1 for AIT and 28.4 ± 6.3 to 31.5 ± 10.2 ml•kg-1•min-1 for COM). Maximal strength was significantly increased after COM (EMM 1.8 kg•lbm-0.67, 95% CI, 0.935-2.626) ST (EMM 3.1 kg•lbm-0.67, 95% CI, 2.456-3.765) as well as in the control group (EMM 0.7 kg•lbm-0.67, 95% CI, -0.08-1.431). AIT significantly reduced triglyceride levels (from 2.27 ± 0.97 to 1.83 ± 0.76 mmol/l) systolic blood pressure (from 140 ± 14.6 134.2 ± 12 mmHg) and diastolic blood pressure (from 89 ± 8.1 to 85 ± 5.5 mmHg). Only ST reduced waist circumference significantly (from 111.5 ± 10.8 to 110 ± 11 cm). Endothelial function measured as flow mediated dilatation (FMD) was significantly improved in all three training groups (AIT 7.1 ± 2 to 8.8 ± 2.8, COM 7.2 ± 2 to 9.1 ± 2.4 and ST 8.1 ± 3.1 to 11 ± 4.7). No change occurred in weight, fasting plasma glucose, high density lipoprotein or insulin C-peptide in either group.

Conclusion: Although all three training regimes improved abnormalities associated with the metabolic syndrome, 12 weeks of AIT was superior to both strength training and a combination of interval and strength training for improving risk factors related to the metabolic syndrome. Three out of the six risk factors identifying the metabolic syndrome were significantly improved after 12 weeks of aerobic interval training.

EFFECTS OF DIFFERENT WARM UP INTENSITIES ON LACTATE DISTRIBUTION IN DIFFERENT BLOOD COMPARTMENTS AND POWER OUTPUT

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Introduction: An improved lactate transport across the red blood cell membrane might be an advantage during high intensity exercise by increasing the muscle-to-plasma [La] gradient and therefore allowing more lactate/H+ to leave the muscle. It is hypothised that the bioavailability of MCT (Monocarboxylattransporter) may be altered by translocation from cytoplasm to the membrane of RBC when it is needed. Therefore we investigated if lactate transport across RBC membrane can functionally be influenced after maximal exercise by previous different warming up protocols (WU).

Methods: At three subsequent visits to the laboratory, subjects performed 30 s lasting maximal sprint tests on a cycle ergometer with different prior warm up intensities: 1. without prior warming up (W), 2. extensive warm up (E): 12 min cycling at 60% of VO2 peak, 3. intensive warm up (I): 12 min cycling at 60% of VO2 peak including three 10 s lasting peaks at 200% of VO2 peak. After warming up, subjects stayed in a sedentary position for 5 min followed by the maximal sprint test. Blood samples were taken under resting conditions, after warming up, before sprint exercise (pre M) and in minute intervals during recovery (0 min-15 min) to determine lactate concentrations in whole blood, plasma and RBC.

Results: The initial increments (pre M-0') in plasma & RBC [La] showed significant differences between W/E and I. The RBC/plasma [La] ratio of the increments (pre M-0') was significantly lower for I (0.23 ± 0.06) compared to W & E (W: 0.28 ± 0.04 & E: 0.27 ± 0.04). These

differences were due to lower increments in RBC [La] (-16% W vs. I & -10% E vs. I). No significant differences were found for the increments of plasma, RBC & ratio in the following time intervals.

The peak power (PP) output as well as the mean power (MP) output for the sprint test was significantly lower for W (MP: 680 ± 181 Watt) compared to E & I (MP: 738 ± 192 Watt; E) (MP: 740 ± 191 Watt; I).

Discussion: Several possible effects of WU are discussed in literature which might have an effect on performance. In the present study we tested if different warming up intensities influence the lactate flux across the RBC membrane. A recent study from our group has shown that MCT in RBC might be translocated from cytoplasm to the membrane in response to exercise, which might effect La flux. In the present study the WU had no influence on La flux across the RBC membrane. The increase in plasma [La] was significantly lower in the first time interval for "I". Therefore one would expect a similar or even higher increase in RBC [La] (and not a lower) because of a less stressed transport system. But may be it must be considered, that the pre-loading of RBC with lactate and therefore the [La] gradient is different between the conditions. It can be speculated, that the time (of warming up) was too short to induce a translocation of MCT. Further molecular investigations are needed to identify possible mechanisms for translocation of MCT.

THE EFFECTS OF 15-WEEKS HOCKEY SPECIFIC TRAINING ON SKELETAL HEALTH AND BODY COMPOSITION IN ACTIVE WOMEN

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Introduction: The importance of sport and exercise for optimizing body composition and bone health in women is well documented (Drinkwater et al., 1995). Although evidence from former athletes suggests that any training-induced anabolic skeletal effect achieved, disappears after the cessation of an athletic career (Karlsson et al., 2000 and 1996). There is a lack of information about bone health in relation to seasonal changes in training and the overall long-term health benefits in active women. The aim of this investigative study was to establish whether 15 weeks of hockey-specific training and match-play had a beneficial effect on bone mineral density and body composition in active pre-menopausal women.

Method: Body composition (total mass, fat mass, lean mass, and percent body fat) and whole-body, proximal femur and lumbar spine bone mineral density (BMD), of 12 female club-level hockey players (32.8 ± 7.8 years; 58.7 ± 5.0 kg; 1.64 ± 0.04 m) and 13 normo-active controls (32.9 ± 7.1 years; 59.3 ±6.6 kg; 1.63 ± 0.05 m), were measured using dual-energy X-ray absorptiometry (DXA). Measures were taken pre-season and before the mid-season break, 15-weeks apart. Training consisted of 2.5 hours of hockey-specific fitness work, plyometrics, drills and practices and a 70-minute match each week, in addition to their normal physical activity. Data were analysed using SPSS v14, by means of a 2-way mixed model design ANOVA.

Results: The hockey players had significantly greater ($P < 0.05$) proximal femur BMD (trochanter and inter-trochanter) at baseline compared to the controls; all other body composition variables were not significantly different. After 15 weeks of training the hockey players had a significantly lower percent body fat ($P < 0.05$) and significantly greater lumbar spine BMD (L1, L2, L3 and L4) and proximal femur BMD (neck, trocahanter and intertrochanter) than the normo-active control group. The hockey players exercise duration, also significantly increased during season (from 3.6 ± 2.3 pre-season to 6.2 ± 2.2 hours/week mid-season; $P < 0.05$).

Discussion: Long-term participation in hockey can improve body composition and enhance BMD at the lumbar spine and proximal femur, by means of increasing bone mass accrual. The hockey players had 18.3 ± 8.4 years playing experience, during which sport specific skeletal adaptions should have occurred. However, some skeletal regions (i.e. lumbar spine) still increased in BMD during the season, demonstrating that these sites may be susceptible to transient changes in BMD due to the seasonal nature of the sport. Therefore off-season exercise needs to be promoted, to help maintain long-term bone health in team sports.

References

Drinkwater BL, Grimston SK, Raab-Cullen DM, Snow-Harter C. (1995). Med Sci Sports Exerc, 27, i-vii.

Karlsson MK, Linden O, Karlsson C, Johnell O, Obrant K, Seeman E. (2000). Lancet, 355, 469-470.

Karlsson MK, Hasserius R, Obrant K. (1996). Calcif Tissue Int, 59, 245-248.

15:15 - 16:45

Oral presentations

OP-BM03 Biomechanics 3

THE EFFECT OF INCREASED VOLUNTARY EFFORT ON NEUROMUSCULAR CONTROL IN HIGH IMPACT LANDING

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UNIVERSITY OF JYVÄSKYLÄ

The effect of increased voluntary effort on neuromuscular control in high impact landing

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Leg extensor muscles have been shown to be activated well before the onset of ground contact during natural movements like running, jumping, landing etc. In landing tasks the motor system has to adjust pre-landing activity based on the predicted impact peak in order to achieve a safe and smooth landing (Santello 2005). Furthermore, it has been shown that in the case of very high impact loads the post-impact response is crucial as it modifies body acceleration (Melvill Jones and Watt 1971). However, the exact mechanism that modulates electromyographic (EMG) activity in the early post-impact phase is unclear. Both pre-programmed (Melvill Jones and Watt 1971) and reflex (Santello and McDonagh 1998) origins have been suggested. Therefore, the purpose of the present experiment was to study the contribution of spinal and supraspinal mechanisms during extreme landing conditions, where pre-contact activities of the leg extensor muscles could be voluntarily varied.

Eight healthy young male subjects participated in the experiment. They performed ten drop jumps on a sledge ergometer with free pre-activity (FREE) and ten with pre-activity corresponding to 60% of isometric maximal voluntary contraction (60%MVC). For this purpose a special ankle support was designed and used, where subjects could induce different levels of isometric contractions during the landing. Dropping height corresponded to 200% of the maximal squat jumping height. Transcranial magnetic stimulation (TMS) over the motor cortex and peripheral nerve stimulation over the tibialis nerve were induced during the early post-impact phase (on average 17ms after the impact). Motor evoked (MEP) and H-reflex responses were recorded from the soleus muscle. Stability of the TMS coil was verified with three dimensional motion analyses.

Interestingly, our data suggest that the increased pre-contact activity of the plantar flexor muscles prior to ground contact does not modify the neural strategy during the early post-impact phase. There were no differences in MEP and H-reflex peak-to-peak amplitudes or in their ratios between the FREE (approx. 20%MVC) and 60%MVC conditions. It would be logical to suggest that the increased voluntary activity was not able to counteract the inhibitory effects probably originating from Golgi tendon organs. However, high and unaffected SLR reflex amplitudes invalidate this suggestion. Since there were similarities in the EMG patterns towards the impact, it could be suggested that increased voluntary effort was not able to bypass the effect of the pre-programmed landing strategy.

Melvill Jones G, Watt DGD. (1971) J Physiol 219:729-737.

Santello M. (2005) Gait and Posture 21: 85-94.

Santello M, McDonagh MJN. (1998) Exp Physiol 83: 857-874.

PROLONGED WALKING INCREASES COMPLIANCE IN THE HUMAN SOLEUS MUSCLE-TENDON UNIT: IMPLICATIONS FOR THE SHORT LATENCY STRETCH REFLEX

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After repeated passive stretching, tendinous tissue compliance increases in the human soleus muscle-tendon unit (1,2). If present in dynamic conditions, this would influence force transfer between muscle fibres, tendons and bones, and could decrease the stretch stimulus to the spindles, thus influencing stretch reflex responses. The existence of such changes in locomotion is yet to be investigated.

Eleven healthy subjects walked on a treadmill at a gradient of 3% for approximately 60 minutes with the left leg attached to a robotic actuator capable of rapidly dorsiflexing the ankle joint (3). Ultrasound was used to measure soleus fascicle lengths and surface EMG activity was recorded. Stretch reflexes were elicited by applying 6° (250°/s) stretches at three time intervals; Pre (immediately before the walking intervention), Mid (after approximately 30 minutes of walking) and Post (immediately after the intervention). If the intervention did cause an increase in tendinous tissue compliance, it was anticipated that stretch reflex amplitudes would be lower at the end of the protocol. As muscle spindle Ia afferents are velocity sensitive, an additional series of faster stretches (approximately 270°/s) were performed at the Post interval.

Between the Pre and Post intervals, the amplitude and velocity of fascicle stretch decreased (by 46% and 59%, respectively) in response to a constant external stretch, as did stretch reflex amplitudes (33%). A faster stretch elicited at the end of the protocol resulted in a recovery of fascicle stretch velocities and reflex amplitudes to approximately the pre-exercise values. These findings, in addition to a lack of change in electrically evoked muscle twitch properties, support the theory that repeated stretching and shortening of a muscle-tendon unit can induce structural changes in the tendinous tissues (1), and provide evidence for the existence of this phenomenon during low intensity human locomotion. As muscle spindles are mostly velocity- and length-sensitive receptors, any reduction in fascicle stretch velocity and amplitude due to changes in tendinous tissue compliance could reduce muscle spindle afferent feedback, and thus decrease the amplitude of the resulting stretch reflex response. The increase in tendinous tissue compliance may also compromise the efficacy of storage and reutilization of elastic energy in the tendinous tissues.

1 Avela, J., Finni, T., Liikavainio, T., Niemela, E. & Komi, PV. (2004). Neural and mechanical
responses of the triceps surae muscle group after 1h of repeated fast passive stretches. J Appl Physiol. 96; 6; 2325-2332.

2 Avela, J., Kyrolainen, H. & Komi, PV. (1999). Altered reflex sensitivity after repeated and
prolonged passive muscle stretching. J Apply Physiol. 86; 4; 1283-1291.

3 Andersen, JB. & Sinkjaer, T. (2003). Mobile ankle and knee perturbator. IEEE Trans Biomed Eng.
50; 10; 1208-1211.

SHORT-TERM PRESSURE INDUCED SUPPRESSION OF THE SHORT LATENCY RESPONSE – A NEW METHODOLOGY FOR INVESTIGATING FUNCTIONAL STRETCH REFLEXES

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Peripheral afferent feedback during movement is used not only for controlling the actual performance but also to drive the α-motoneurons and thereby enhance the motor output. Especially stretch-shortening cycle contractions provide an experimental model in which afferent feedback is used as the latter: the short-latency response (SLR) of the spinal stretch reflex has been argued to enhance tendomuscular stiffness and thereby enable elastic energy to be stored during the eccentric phase of the contraction (Komi & Gollhofer, 1997). To investigate functional stretch reflexes, many studies applied an ischemic nerve block to annihilate the SLR (e.g. Grey et al., 2001). However, ischemia is accompanied with several methodological drawbacks, including the associated pain and therefore the restricted movement behaviour as well as the short time window allowed for investigation, which limit its application in highly functional tasks. Here, we present a new methodology to investigate functional stretch reflexes possessing none of the abovementioned limitations.

10 healthy subjects (age 27±2 years) participated in this study. A conventional blood pressure cuff was used to apply short-term pressure to the right calf muscles by inflating the cuff to 220 – 240 mmHg immediately (10 seconds) before the measurement started. EMG recordings were obtained from m. soleus of the right leg. Subjects were asked to perform hopping movements at a submaximal intensity. 40 hops were averaged with the cuff deflated and inflated in a randomized order.

Inflation of the pneumatic cuff decreased the size of the SLR in m. soleus during hopping in 7 out of 10 subjects (cuff deflated: 0.67±0.32 mV versus cuff inflated: 0.55±0.32 mV). The three remaining subjects showed no difference in the size of the SLR between deflated and inflated cuff.

The present study showed that short-term pneumatic pressure is able to reduce the SLR during hopping. Based on additional protocols not mentioned in this abstract it is argued that - with inflated cuff – the induced stretch is mechanically modulated. It is concluded that this mechanical modulation of the stretch is suitable to investigate functional stretch reflexes during highly dynamic tasks.

Grey, M. J., Ladouceur, M., Andersen, J. B., Nielsen, J. B., & Sinkjaer, T. (2001). J.Physiol 534, 925-933.
Komi, P. V. & Gollhofer, A. (1997). J Applied Biomechanics 13, 451-460.

MAXIMAL AMPLITUDE OF THE M-WAVE IN SOLEUS MUSCLE DURING STANDING IN WATER

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INTRODUCTION: The M-wave is compound muscle action potentials lead to stimulation of motor axons in peripheral nerves. Maximal amplitude of the M-wave (Mmax) indicates that all α-motor fibers were recruited. Amplitude of the M-wave is also used as the stationary of the electrical stimulus. Previously, it was considered that the M-wave did not influenced by the central nerves system. Recent study reported that Mmax in soleus muscle (SOL) changed with the ankle joint angle. This result suggests that amplitude of the M-wave may change with condition even though the stimulus intensity is constant. In water, human is affected by the physical characteristics of water and different physiological responses are showed relative to land. The electromyographic (EMG) activity in SOL during standing, walking and running in water differed from that on land. Therefore we speculated that Mmax in SOL during standing changes with somatosensory inputs for lower legs. The purpose of this study was to investigate the effects of decreasing the body weight induced by the buoyancy to Mmax in SOL during stationary standing. METHOD: Six healthy males participated in this study. Subjects stood on a waterproof force platform. Subjects were tested under two randomly administered conditions; (1) standing on land and (2) standing in water. The experiments in water were performed in a water tank. The depth of water inside the tank was adjusted on the gastrocnemius muscle belly of each subject. The temperature of water was kept constant at 34 ℃. M responses were elicited in SOL during standing each condition by electrical stimulation with single square pulse of 1ms duration to the tibial nerve in the popliteal fossa. Surface EMG was recorded from SOL using bipolar electrodes. The electrodes were covered with water resistant adhesive microfilms. Mmax was defined peak to peak amplitude of M-wave at the time of the disappearance of the H-wave associated with the increasing of stimulus intensity. RESULT AND DISCUSSION: The average of ground reaction force (GRF) during standing in water was significantly lower ($P<0.05$) than on land. The average Mmax during standing in water was significantly lower ($P<0.05$) than on land. It was considered that approximately 10 % decrease of the average GRF was caused by the buoyancy. Postural control of human performed to adjust the activity of the anti-gravity muscles reflexively and voluntarily by receiving from visual, vestibular and somatosensory systems. Motoneuron pool of the anti-gravity muscles is affected the somatosensory inputs from the skin, the joint, the muscle spindle and the tendon spindle. From these factors, it is suggested that the decreasing of Mmax is the appropriate response of body related to changes in somatosensory inputs. In conclusion, Mmax in SOL shows the gravitational information for body to vertical direction.

RELIABILITY AND GENERALIZABILITY OF CONSECUTIVE MAXIMUM CONTRACTIONS AS A TEST OF NEUROMUSCULAR FUNCTION

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Introduction: The standard strength tests (SST), based on sustained maximum isometric and isotonic contractions of relevant muscle groups, have been widely used to assess neuromuscular function. However, numerous functional movements are based on either short-lasting muscle actions or consecutive actions of antagonistic muscle groups (e.g., postural corrections, walking, running, throwing, kicking). Therefore, SST may not capture the neural activation typical for a number of important natural movement patterns. We recently conducted a preliminary evaluation of a novel test of neuromuscular function based on consecutive maximum contractions (CMC; Suzovic et al., 2008). The aim of this study was to evaluate the reliability of CMC as well as to generalize previous findings across different muscle groups.

Methods

Male physically active participants (N=12) performed three consecutive trials of SST of quadriceps muscle, as well as the paced isometric CMC (i.e., a series of consecutive maximum force exertions and relaxations). Following the initial session, two subsequent trials were performed after two days and six weeks, respectively. In addition, thirty six subjects performed the same two tests of four different muscles (i.e., knee flexor and extensor, and elbow flexor and extensor muscle). SST provided the maximum voluntary force and the rate of force development, while CMC (exerted at self-selected frequency) revealed the peak force, and the rates of force development and relaxation. Intraclass correlation coefficients (ICC) and coefficients of variations (%CV) were used to assess the reliability, while a principal component analysis was employed to assess the relationships among the dependent variables obtained from different muscle groups.

Results: The evaluated tests revealed both a high within-day (i.e., ICC, > 0.90; CV%, range 1.8-8.1%) and between-day reliability (i.e., ICC, > 0.80; CV%, range 4.1-12.3%). The principal component analyses performed separately on both tests revealed factor structures that suggest a high level of generalizability of the individual dependent variables across the tested muscle groups. Finally, despite being about 20% lower, the peak force obtained from CMC highly correlated with the maximum voluntary force of SST.

Discussion: The present data suggest that the variables derived from CMC could be as reliable as the variables obtained from SST. Moreover, in addition to presumably capturing muscular action typical for rapid and/or consecutive action of antagonistic muscle groups, the peak force could also assess the maximum voluntary force exerted during a sustained contractions. Although the external validity of CMC still remains to be explored, the present findings support development of CMC into a standard test of neuromuscular function.

References

Suzovic D, Nedeljkovic A, Jaric S. (2008). J Hum Kin, 20, 51-67.

THE RATE OF TORQUE DEVELOPMENT OF A BALLISTIC CONTRACTION PRECEDED BY A RAPID ANTAGONIST CONTRACTION: EFFECT OF THE CHARACTERISTICS OF THE ANTAGONIST CONTRACTION

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UNIVERSITÉ LIBRE DE BRUXELLES

The rate of isometric torque development is greater when a rapid (ballistic) contraction is preceded by a rapid contraction of the antagonist muscles compared with a ballistic contraction performed from a resting condition (Richartz et al., Comput Methods Biomech Biomed Engin,10 (S1):150-151, 2007). In the current study, we investigated the influence of the torque produced during the antagonist contraction on the rate of isometric torque development in the subsequent ballistic agonist contraction.

Eleven healthy subjects participated in this investigation. They seated on a chair with their right foot strapped to a footplate. The task consisted successively: (1) to sustain a submaximal force (20% MVC) with the dorsiflexors, (2) to perform a rapid contraction with the plantar-flexors (antagonists) and (3) to produce, without transition, a ballistic contraction with the ankle dorsiflexors. The experimental session was divided into three parts that were executed in a random order: agonist contractions of different torque levels (25%, 50% and 75% MVC) were preceded by an antagonist contraction of 25%, 50% and 75% MVC. We recorded the isometric torque produced by the plantar- and dorsiflexor muscles and the EMG activities of both agonist (tibialis anterior) and antagonist (soleus and gastrocnemii) muscles by means of two surface electrodes placed over each muscle.

The results show that the rate of agonist torque development was significantly enhanced with the increase in antagonist torque (ANCOVA, $P<0.001$). The agonist-antagonist coactivation ratio during the ballistic agonist contraction was measured at 4 different time points (25ms and 50ms after the onset of the agonist contraction, at peak velocity and at half of the integrated EMG) and was significantly enhanced only when the antagonist torque reached 75% MVC. The ratio at 50ms was 1,39 ± 0,07, 1,41± 0,08 and 1,64 ± 0,05 for 25%, 50% and 75% respectively. Furthermore, in almost 45% of these contractions, a time interval (TI) between the end of the antagonist contraction and the onset of the agonist contraction appeared during which none of the four investigated muscles presented any EMG activity. Interestingly, the contractions where TI was observed showed a significant increase in rate of agonist torque development (ANCOVA, $P<0.001$).

In conclusion, this study shows the presence of TI in all of the involved muscles in about half of the contractions when a ballistic action is preceded by a rapid submaximal contraction of their antagonist muscles. TI might contribute to increase the rate of torque development during a subsequent ballistic contraction. As both the rate of agonist torque development and coefficient of coactivation are significantly increased with the antagonist torque developed it is suggested that, even in isometric conditions, the stretch-shortening cycle may play a major role in the increased rate of torque development of a ballistic contraction.

17:15 - 18:45

Oral presentations

OP-NU03 Nutrition 3

INCREASED PROTEIN INTAKE REDUCES LEAN BODY MASS LOSS DURING WEIGHT LOSS IN ATHLETES

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Purpose:

To examine the influence of dietary protein on lean body mass loss and performance during hypoenergetic weight loss in athletes.

Methods: In a parallel design, 20 healthy, young, resistance trained athletes were examined for energy expenditure for one week and fed a fully controlled mixed diet (15% protein, 100% energy) in the second week, followed by a hypoenergetic diet (60% of the habitual energy intake), containing either 15% (~1.0 g∙kg-1) protein (control group, n=10) or 35% (~2.3 g∙kg-1) protein (high protein group, n=10) for two weeks. Subjects continued their habitual training throughout the study. Total, lean body and fat mass, performance (squat jump, maximal isometric leg extension, one repetition maximum bench press, muscle endurance bench press and 30 sec wingate test) and fasting blood samples (glucose, non esterified fatty acids (NEFA), glycerol, urea, cortisol, free testosterone, free IGF-1 and growth hormone) were examined at the end of each of the four weeks.

Results: Total (-3.0 ± 0.4 kg and -1.5 ± 0.3 kg for the control and high protein group, respectively, $p=0.036$) and lean body mass loss (-1.6 ± 0.3 kg and -0.3 ± 0.3 kg, $p=0.006$) were significantly larger in the control group compared to the high protein group. Fat loss, performance and most blood parameters were not influenced by the diet. Urea was higher in the high protein group and NEFA and urea showed a group*time interaction.

Conclusion: These results indicate that ~2.3 g∙kg-1 or ~35% protein was significantly superior to ~1.0 g∙kg-1 or ~15% energy protein for maintenance of lean body mass in healthy young athletes during hypoenergetic weight loss.

THE EFFECT OF WEIGHT REDUCTION RATE ON BODY COMPOSITION, THYROID HORMONES AND BASAL METABOLIC RATE IN ELITE ATHLETES

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Background: Optimal body composition and body weight (BW) are important performance factors in sports that emphasize aesthetics and high power to weight ratio. Weight reduction guidelines for athletes today suggest a weekly weight loss of 0.5-1.0kg which corresponds to 0.7% and 1.4% of BW in a 70-kg athlete (1). Weight reduction may lead to loss of lean body mass (LBM) and changed thyroid hormone profile and thereby reduced basal metabolic rate (BMR). Combining resistance training with energy restriction may reduce loss of LBM in overweight subjects (2). Purpose: To compare changes in body composition, thyroid hormones and BMR in two different weight-loss interventions promoting loss of 0.7% versus 1.4% of BW per week in elite athletes. Methods: 30 male and female elite athletes

were randomized in to slow weight reduction ["SLOW", n=14, 23.5± 3.3y, 72.1± 12.2kg] and fast weight reduction ["FAST", n=16, 22.3± 4.7y, 72.2±11.3kg]. Both interventions included energy restricted diets and resistance training regimen for 6-12 weeks. The duration was dependent on the desired weight loss and the random allocation to one of the interventions. Diets were recorded by a 4-day weighed food records which were used to design individual meal plans promoting weekly BW loss of 0.7% or 1.4%. Four weekly resistance training sessions were added to the usual training regimen to stimulate muscle hypertrophy. The following measurements were taken at the baseline and post intervention: BW, LBM, FM with dual energy x-ray absorptiometry (DEXA), s-THS and s-free T4 and BMR with indirect calorimeter. Results: There were no significant differences between the groups in any variables at the baseline. BW was reduced by (5.6± 3.0%, p<0.001) and (5.4± 2.3%, p<0.001) for SLOW- and FAST-group, respectively. The changes were not significantly different between the groups (p=0.8). LBM was significantly increased for SLOW (2.0± 1.3%, p<0.001) but not for FAST (1.1± 3.0%, p=0.3). There was a significant difference in change of FM between the groups SLOW (-31± 2.9%, p<0.001) and FAST (-23.4± 13.8%, p<0.001)(p=0.04). Free T4 reduction was significant in FAST (-11.2± 7.6% , p=0.001) but not in SLOW. These changes were significantly different between the groups (p<0.001). BMR reduced significantly for both SLOW (-12.3± 11.4%, p=0.036) and FAST (-9.8± 6.5%, p=0.018), but did not differ between the groups (p=0.9). Conclusion: For optimal body composition changes in athletes a moderate energy restriction combined with resistance training leading to a weekly weight loss of 0.7% seems preferable. Despite maintained or increased LBM, athletes experienced reductions in BMR.

1.O'Connor H, Caterson I.Weight loss and the athlete. In: Burke L, Deakin V. Clinical sports nutrition, 3rd edition. Australia, McGraw-Hill;2006;135-165.

2. Stiegler P, Cunliffe A. The role of diet and exercise for the maintenance of fat-free mass and resting metabolic rate during weight loss. Sports Med 2006;36(3):239-262.

THE EFFECT OF TWO DIFFERENT WEIGHT-GAIN INTERVENTIONS ON BODY COMPOSITION AND PERFORMANCE IN ELITE ATHLETES

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Because muscle mass is an important determinant of performance in sports dependent on high muscle strength or power (e.g. weight lifting, alpine skiing), there is a need for effective muscle mass gaining protocols. The most important factors promoting an increase in muscle mass is strength training combined with positive energy balance, and an increase in body mass of 0.25-0.5 kg per week may be possible depending on genetics and the resistance-training history of the athlete (1,2). For Elite athletes with heavy training loads, competitions and limited time for proper nutrition strategies, it can be a difficult task to increase lean body mass (LBM) or to maintain LBM during the competitive season. Thus, a significant number of these athletes are using excessive supplementation and diets high in saturated fat. Purpose: To evaluate the effect of nutritional guidance in a 10-12 weeks weight-gain period in elite athletes. Methods: 39 male and female elite athletes where randomized into two groups, "nutritional guidance group" (NG, n=21, 19.1±2.9 y, 70.9±8.9 kg) and "ad libitum group" (ALG, n=18, 19.6±2.7 y, 75.0±5.9kg). The Athletes in NG followed a strict meal plan based on a 4-day weighed food registration, providing a positive daily energy intake corresponding to 544±143 kcal whereas the athletes in the ALG had an ad libitum energy intake with no nutritional guidelines. All athletes continued their normal sport specific training (16.7±5.4h per week), and in addition all included four resistance-training sessions per week to emphasize muscle hypertrophy. Assessments done pre and post intervention were: body weight (BW), dual energy x-ray absorptiometry (DEXA), 1 RM tests (squat and bench press and bench pull). Results: The energy intake during the intervention period was significantly higher in the NG than in the ALG (3585±601 vs. 2964±884 kcal, respectively). BW increased with 3.9±0.6% in NG and 1.5±0.4% in ALG. Total LBM increased by 2.7±0.4% in the NG but was not significantly changed in the ALG (1.8±0.4%, p=0.6). There was larger increase in fat-mass in NG (14.7±3.7%) than in ALG (2.5±2.6%). Strength performance was improved in both the NG and ALG in 1 RM bench press (11.5±8.5% and 9.0±1.8%), in 1RM squat (9.1±1.4% and 11.5±2.0%) and in 1 RM bench pull (9.0±3.4% and 6.1±1.6%), respectively. Conclusion: In terms of reaching their weight-gain goals, the athletes in NG was significant more successful than the ALG. Due to long history of heavy strength-training, the athletes had limited possibilities to increase LBM and performance in these variables. For overall body composition goal, the excess energy intake in a weight-gain protocol should be considered carefully since greater rates of gain are likely to include increments in body fat storage in trained athletes.

1) Walberg Rankin J Weight loss and gain in athletes Curr Sports Med Rep 2002;4:208-213

2) Tipton KD, Wolfe RR Protein and amino acids for athletes J Sports Sci 2004;22:65-79

IMPACT OF LONG TERM HYPOCALORIC DIET ON EXERCISE-INDUCED SUBSTRATE UTILIZATION AND AEROBIC CAPACITY IN OBESE SUBJECTS

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FRANZ VOLHARD CLINICAL RESEARCH CENTER

Introduction: Obesity is often associated with reduced aerobic capacity (AC) and impaired exercise induced fat oxidation (Blaak, 2004). We aimed to investigate the effects of a prolonged hypocaloric low fat (LF) and low carbohydrate (LC) diet on substrate utilization and aerobic capacity in obese subjects.

Methods

We included overweight to obese (BMI: age: 33.8 ± 4.2) but otherwise healthy subjects who participated at a 6-month hypocaloric diet with either a low proportion of carbohydrate (LC: n=19) or fat (LF: n=17) to total energy intake. Subjects were advised to keep their current physical activity level during the dietary intervention. Substrate oxidation and aerobic capacity (expressed as maximum oxygen uptake) was determined using an incremental exercise test with indirect calorimetry. For each individual oxygen uptake (VO2), carbon dioxid production and respiratory quotient were averaged every 10s intervals throughout the exercise test. To assess whole body substrate oxidation we applied stoichiometric equations with appropriate energy equivalents (Frayn, 1983). Area under the curve was calculated for fat (AUCfat) and CHO (AUCcho) using the whole slope for FAT and CHO vs. workload.

Results: Absolute aerobic capacity (VO2max in l/min) did not change in either group. Related to body weight (relative AC) increases were observed in LC (22.7 ± 5.6 to 25.4 ± 4.5 ml/min/kg, p<0.05) and LF (23.2 ± 5.8 to 25.9 ± 6.9 ml/min/kg, p<0.05). Whole body fat oxidation was enhanced after 6 month of diet independent of macronutrient composition (LC: AUCfat + 22%; LF: AUCfat+ 20%; ns) whereas CHO oxidation only changed marginal. Accordingly the respiratory quotient was slightly lower throughout the exercise test in both groups.

Conclusion

Our data indicate that fat oxidation tended to increase after long term dietary intervention independent of the ratio between fat and carbohydrate to total daily energy intake whilst CHO oxidation seems not to be affected. The improvement in relative aerobic capacity was likely due to the reduced bodyweight considering that absolute aerobic capacity was unchanged. A 6 month hypocaloric diet without additional participation in physical activity does not influence aerobic capacity or substrate oxidation to a significant extent during exercise.

References

Blaak EE. (2004). Basic disturbances in skeletal muscle fatty acid metabolism in obesity and type 2 diabetes mellitus. Proc. Nutr. Soc. 63 323-330.

Frayn KN. (1983). Calculation of substrate oxidation rates in vivo from gaseous exchange. J. Appl. Physiol 55 628-634.

ACUTE EFFECT OF EXERCISE PERFORMED IN THE HEAT ON ENERGY INTAKE IN ACTIVE MALES

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THE UNIVERSITY OF WESTERN AUSTRALIA

Introduction: Maintenance of a healthy body weight is achieved when there is a balance between energy intake and energy expenditure. However, the effect of exercise itself on subsequent energy intake is not well understood. In particular, the environmental temperature in which exercise is performed may influence energy intake in the post-exercise meal. This study examined the effect of an acute bout of exercise performed in the heat on energy intake, macronutrient selection and preferences for solid food or drinks in the subsequent meal.

Methods: Eleven active males completed three experimental trials in a randomised counter-balanced design; exercise in the heat (36 C: HEAT), exercise in a neutral temperature (25 C: NEUT) and a resting control trial (25 C: CON). The exercise trials consisted of treadmill running for 40 min at 70% VO2 peak. Following exercise or rest (control), participants were presented with a buffet-style breakfast of precisely known quantity and nutrient composition from which participants could consume ad libitum. From this, total energy intake and consumption of each specific macronutrient was determined.

Results: There was no significant difference in total post-exercise energy intake between HEAT and NEUT. However, participants consumed significantly more energy during NEUT compared to CON ($p = 0.007$). When accounting for the excess energy expended during exercise, relative energy intake (REI) during HEAT was significantly lower than CON ($p = 0.001$), while there was no significant difference in REI between the two exercise trials or between NEUT and CON. The lower REI following HEAT compared to CON, but not NEUT could not be accounted for by significant differences in the circulating level of blood glucose or lactate between exercise trials ($p > 0.05$). In contrast, body temperature was significantly elevated following exercise in the HEAT until the breakfast meal, a factor which may inhibit post-exercise energy intake. With respect to macronutrient preferences, there were no significant differences in carbohydrate, fat or protein intake following the exercise trials, but there was a significantly greater intake of carbohydrate following NEUT compared to CON ($p = 0.007$). Also, a significantly greater proportion of kilojoules were consumed in the form of drinks during both exercise trials compared to CON.

Discussion: In summary, when accounting for the excess energy expended during exercise, energy intake is lower following exercise in the HEAT compared to rest in healthy males. Conversely, REI is similar following exercise in NEUT compared to rest. These findings suggest that exercise performed in a warmer environmental temperature may be favourable for achieving acute negative energy balance.

HYDRATION STATUS OF THE OFF-ROAD BIKERS IN THE OFFROAD FINNMARK 2008 TESTRACE

MIKKILÄ, S., WEYDAHL, A.

FINNMARK UNIVERSITY COLLEGE

Offroad Finnmark 2008, a testrace for the 700 km one-stage off-road biking race took place in Alta, northern Norway. The race had 11 checkpoints with 3 mandatory 2hours stops. An adequate hydration status can be challenging to maintain during this prolonged exercise. Dehydration reduces the exercise performance and may severely impair essential body functions(1). The purpose of the study was to describe the hydration status throughout this physically demanding race.

Five well-trained (VO2max 73.3+/-7.5 ml/minxkg) male amateur bikers participated in this study. Urine samples for osmolality (Uosm) and specific gravity (Usg) were collected a week before the race, during the race at 6 checkpoints and right after the race. The pre-exercise samples with restricted fluid intake were analyzed to confirm bikers' normal renal function. The other samples were analyzed to determine dehydration during the race. Uosm samples were analyzed with a freezing point osmometer and Usg samples with a hand-held refractometer. The fluid intake during the race was registered at the same 6 checkpoints as urine samples were collected and right after the race. The registration was based on the bikers' recitations. Dehydration was determined by using the cut-off values of Uosm =/>900 mosm/kg H2O and Usg=/> 1.020.

A total of 33 urine samples were collected. Three bikers completed the race giving each 8 samples. Two bikers quitted the race due to injuries. However, one of them gave 4 and the other 5 samples.

A biker completing the race showed dehydration with all checkpoint samples by using the Uosm criteria. By using the Usg criteria, this biker was dehydrated the entire race. Another biker completing the race showed mild dehydration at one checkpoint by using the Usg criteria. The biker who broke the race after giving 3 checkpoint samples, was dehydrated at 2 checkpoints by using the Uosm criteria and at 3 checkpoints by using the Usg criteria.

Fluid intake of the bikers during the race was 6113+/- 643 ml/24 hours. The biker, breaking the race and showing dehydration with 2 of the Uosm and 3 of the Usg samples had the lowest fluid intake. The biker, who finished the race and showed dehydration throughout the entire race with the Usg and at 6 checkpoints with the Uosm had the highest fluid intake. Most likely the bikers' recall of the fluid intake is not accurate as well as the fluid contents of the meals are not calculated.

The results show that maintaining an adequate hydration status was individually demanding.

However, the study shows that the dehydration was not a major problem during Offroad Finnmark 2008.

References

1. Barr S. Effects of dehydration on exercise performance. CANADIAN JOURNAL OF APPLIED PHYSIOLOGY-REVUE CANADIENNE DE PHYSIOLOGIE APPLIQUEE. 1999 APR 1999;24(2):164-72.

17:15 - 18:45

Oral presentations

OP-PS02 Psychology 2

WHAT MATTERS FOR WELL-BEING IN ELDERLY: PHYSICAL FUNCTION OR PERCEIVED PHYSICAL HEALTH? PRELIMINARY DATA FROM A RANDOMIZED CONTROLLED TRIAL

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NORWEGIAN SCHOOL OF SPORT SCIENCES

One important question in the exercise and well-being relationship concerns the role of physical fitness (McAuley & Rudolph, 1995). Several studies report exercise to result in significant physiological improvements, but such changes do not always lead to improved well-being (e.g., Blumenthal et al., 1989). According to Rejeski and Mihalko (2001), it may rather be changes in perceived physical health that facilitate well-being effects of exercise in the elderly. Thus, the aim of the present study was to explore the relationships between physical and psychological indices of health and well-being in a group of elderly.

The sample was drawn from community-dwelling elderly volunteers (N= 68, *M* = 74.3 yrs, 67.6% women). Measures included a) Functional tests: Stair climb, gait speed, chair raise, 6 min walk test, timed up and go and functional upper body; b) Psychological measures consisting of a) 5-item measure of Perceived physical health (PPH); b) Subjective well-being (SWB) comprised of the Positive and Negative Affect Schedule (PANAS), Satisfaction With Life Scale (SWLS) and Center for Epidemiological Studies Depression Scale (CES-D); c) Eudaimonic well-being was measured with the Subjective Vitality Scale (SVS). All psychological measures yielded acceptable reliability (α's from .75 to .87).

Perceived physical health was significantly correlated with four of the six functional tests (gait speed, chair raise, 6 min walk test, and timed up and go). Physical function (a sum score of these four tests) correlated significantly with perceived physical health ($r = .34$, $p<.01$), but none of the two well-being indices. Perceived physical health was significantly correlated with SWB ($r = .46$, $p<.001$) and subjective vitality ($r = .27$, $p<.05$). Bootstrapping procedures (Preacher & Hayes, 2008) revealed that perceived physical health mediated the relation between physical functioning and subjective well-being (SWB) in elderly. No mediation effect was observed using eudaimonic well-being as outcome.

Preliminary findings suggest that gains of exercise in terms of physical fitness may be insufficient to obtain better well-being in the elderly. Rather, changes in perceived physical health may serve as a mechanism by which exercise enhance well-being. We will pursue these issues further in future analyses from our RCT.

Reference List

Blumenthal, J. A., et, al. (1989). Cardiovascular and behavioral effects of aerobic exercise training in healthy older men and women. J.Gerontol., 44, M147-M157.

McAuley, E. & Rudolph, D. (1995). Physical-Activity, Aging, and Psychological Well-Being. Journal of Aging and Physical Activity, 3, 67-96.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behavior Research Methods, 40, 879-891.

Rejeski, W. J. & Mihalko, S. L. (2001). Physical activity and quality of life in older adults. J.Gerontol.A Biol.Sci.Med.Sci., 56 Spec No 2, 23-35.

THE EFFICACY OF PRIMING AS A MEANS OF PROMOTING FLUENT MOTOR BEHAVIOUR

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BRUNEL UNIVERSITY

Breakdown of skill execution under pressure (referred to as choking, see Baumeister, 1984) is a common occurrence in sport so development of methods that promote fluent, autonomous performance is warranted. Research out with the sport domain indicates that priming methods can be successfully employed to manipulate attitudes and behaviours (e.g., Bargh & Chartrand, 2000); however, the applicability of priming to skilled motor behaviour is unclear and the processes through which priming effects behavioural change are poorly understood. Preliminary investigations within a motor skill context demonstrated that priming can promote positive performance effects and alleviate skill failure under stress (Ashford & Jackson, under review). The aim of the present study was to replicate this finding and measure the attentional demands associated with performing under different prime conditions through use of a probe-reaction time (PRT) task. Twenty-four university level soccer players completed a dribbling task under three priming conditions (skill focus, neutral, fluency) and a control condition. Priming was conducted using different versions of a sentence scrambling task. While dribbling the ball, participants were required to respond verbally with the word 'low' or 'high' to a pseudo-randomly presented auditory tone of either 250 or 500 Hz respectively. Task completion time, ball displacement from the midline, and probe reaction time served as dependent variables. Repeated measures ANOVAs revealed a significant main effect of prime condition for both task completion time, $F(2, 41) = 22.02$, $p < .001$ and probe reaction times, $F(2, 46) = 5.46$, $p < .01$, but not for ball displacement. Consistent with our hypothesis, the fluency prime yielded significantly faster task completion times and probe reaction times (5262 ms and 66 ms respectively) than were observed in the skill focus prime condition (5810 ms and 81 ms respectively). The results suggest that priming can affect skilled motor performance and that the effects of fluency and skill-focus primes are mediated by the attentional states they promote. Further research into the modifying properties of priming and, in particular, its effectiveness in the alleviation of skill failure under stress, is warranted.

References

Ashford, K.J., & Jackson, R. (2008). Priming as a means of preventing skill failure under pressure. Manuscript submitted for publication.

Bargh, JA., & Chartrand, T.L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In H. Reis & C. Judd (eds.), Handbook of research methods in social and personality psychology (pp. 253-285). New York: Cambridge University Press.

Baumeister, R. F. (1984). Choking under pressure: Self-consciousness and paradoxical effects of incentives in skilful performance. Journal of Personality and Social Psychology, 46, 610-620.

IDENTIFYING SELF-REGULATORY BEHAVIOR IN YOUTH SOCCER PLAYERS: A QUALITATIVE INVESTIGATION

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Self-regulation refers to processes by which individuals control their thoughts, feelings, and actions (Baumeister & Vohs, 2004). In the learning and development context, it is described as the extent to which individuals are metacognitively, motivationally, and behaviorally proactive in their learning process (Zimmerman, 1986). Talented youth soccer players possess characteristics that facilitate learning, training, and competition (Williams & Reilly, 2000). One of these characteristics may be self-regulation, since self-regulation helps individuals to learn more effectively. Previously, we have measured metacognitive and motivational self-regulation with a questionnaire, and found that elite youth soccer players outscored non-elite players on reflection and effort (Toering et al, 2008). However, we have not yet measured behaviors. If we want to know what these scores mean, thus how much more elite players reflect and invest effort than non-elite players, we have to relate them to overt behaviors (e.g., Andersen et al., 2007; Young & Starkes, 2006).

The purpose of this study was to identify self-regulatory behaviors of youth soccer players. Seven expert soccer coaches working with youth soccer players in a talent development program of a Dutch premier league club were interviewed. The interviewer gave definitions of metacognitive and motivational self-regulation, and the coaches were asked to describe behaviors they recognized as self-regulative or non-regulative behaviors during soccer training. Qualitative analysis resulted in a list of self-regulative and non-regulative behaviors, that could be captured in the following themes: focus, time-management, interaction with coach, interaction with team members, resilience, initiative, discipline, and 100% determination to execute tasks. The coaches considered the interaction with coach and team members, discipline, and 100% determination to execute tasks as most important in the development of youth soccer players.

References.

Andersen, M.B., McCullagh, P., & Wilson, G.J. (2007). But what do the numbers really tell us? Arbitrary Metrics and Effect Size Reporting in Sport Psychology Research. J Spo & Ex Psych, 29, 664-672.

Baumeister, R.F. & Vohs, K.D. (2004). Handbook of self-regulation: Research, theory, and applications. New York: Guilford Press.

Toering, T., Elferink-Gemser, M., Jordet, G. & Visscher, C. (2008). Self-regulation and performance level in youth soccer players. In J. Cabri et al. (Eds.), Book of Abstracts of the 13th Annual Congress of the European College of Sport Science (pp.270). Estoril, Portugal.

Williams, A.M. & Reilly, T. (2000). Talent identification and development in soccer. J Spo Sc, 18, 657-667.

Young, B.W. & Starkes, J.L. (2006). Coaches' perceptions of non-regulated training behaviors in competitive swimmers. Int J Spo Sc & Coaching, 1, 53-68.

Zimmerman, B.J. (1986). Development of self-regulated learning: What are the key subprocesses? Cont Educ Psych, 16, 307-313.

THE ROLE OF SELF-REGULATORY SKILLS IN YOUNG TALENTED ATHLETES PLAYING TEAM SPORTS

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Both in sports and academics it has been found that at the higher levels one typically finds more athletes or students with superior self-regulatory skills (Cleary & Zimmerman, 2001; Zimmerman, 1986). Self-regulation reflects a combination of metacognitive attributes, i.e., planning, self-monitoring, evaluation, and self-reflection, and motivational attributes, i.e., effort and self-efficacy (Ertmer & Newby, 1996; Hong & O'Neill Jr., 2001). Unknown, however, is whether there is an association between these skills and: 1 sport competitive level and 2. level of education in highly talented athletes playing team sports.

In total 120 talented athletes playing baseball, basketball, handball, field hockey or volleyball filled in a questionnaire for self-regulatory skills (Herl et al., 1999; Hong & O'Neill Jr., 2001; Howard et al., 2000; Peltier et al., 2006). Of them, 33 competed at international sport competitive level (mean age: 14.9 years ± 1.09 years) and 87 competed at national level (mean age: 13.9 yrs ± 1.01). Data were analysed using MANCOVA with the self-regulatory skills as dependent variables, sport competitive level and level of education as factors, and age as covariate.

The results of the MANCOVA showed no significant differences ($p>.05$) on the six self-regulatory aspects for sport competitive level or level of education which may mean that at the 'highest' sport performance levels a general feature as self-regulation is not discriminative. Yet, the possession of above average levels of self-regulation is a necessity for talented athletes in order to juggle the demands of their academic career with their extensive investments in sports (Moon, 2003). Although not statistically different, the results showed that the athletes competing at international level had higher scores on evaluation and self-reflection with moderate effect sizes: $d=0.50$ on both attributes.

With regard to our findings, it appears prominent that sport specific characteristics make the difference between the international elites and those performing at national level within team sports. Further investigation is warranted with respect to individual sports in which self-regulation is closely related to sport specific psychological skills (Anshel, 1995).

Nonetheless, our findings have important implications for people involved with talented athletes playing team sports. It would, for instance, be interesting to investigate in a longitudinal design whether self-regulation will enable promising athletes to optimally profit from their self-regulatory skills in their sports and academics.

References.

Anshel MH (1995).Aus Psych 30: 78-83

Cleary TJ, Zimmerman BJ (2001).J Appl Sport Psych 13: 185-206

Ertmer PA, Newby TJ (1996).instr Sci 24: 1-24

Herl et al (1999).CSE Tech Rep.

Hong E, O'Neill Jr HF (2001).Int J Psych 36: 186-194

Howard et al (2000).Paper Am Edu Res Ass

Moon, SM (2003).HAS 14: 5-21

Peltier et al (2006).J Mark Edu 28: 5-16

Zimmerman, BJ (1986).Cont Edu Psych 11:307-313

RISKS FACTORS FOR BURNOUT AMONG ELITE ADOLESCENT HANDBALL PLAYERS

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UNIVERSITÉ CLAUDE BERNARD LYON 1

Introduction: The purpose of the study was to examine the impact of self-determined motivation, anxiety and self-confidence on athlete burnout (Raedeke, 1997) in young elite handball players. A theoretical model based on the Self Determination theory (Deci & Ryan, 2002) was proposed to analyse these relationships. This model postulates that the least self-determined forms of motivation might lead to serious negatives consequences, such as lower self-confidence, higher anxiety, lower vitality, higher burnout and higher intentions to dropout.

It was hypothesized that an athlete with lower self-determined motivation would have higher anxiety, lower self-confidence, lower vitality, higher intentions to dropout, and would report higher risks to burnout at season's end.

Method: A sample of 309 French handball players (152 males and 157 females) participated in this study. They trained an average of 11 hours a week (SD = 3.5). Their average age was 15.4 years (SD = .90) and the average playing experience in their sport was 6.8 years (SD = 2.4). 62.1% were playing at a national level.

These athletes completed a questionnaire twice during the season, measuring: (a) sport motivation (EMS; Brière, Vallerand, Blais & Pelletier, 1995), (b) anxiety and self-confidence (EEAC; Cury, Sarrazin, Pérès & Famose, 1999), (c) subjective vitality (SSV; Ryan & Frederick, 1997), (d) future sport intentions (Sarrazin, Vallerand & Guillet, 2002), and (e) athlete burnout (ABQ; Raedeke & Smith, 2001).

Results / Discussion: A structural equation model (χ²/df = 2.18, RMSEA = .06, CFI = .95, NFI = .90) revealed that self-determination has (1) a mediating and (2) direct influence on burnout. (1) A player with lower self-determined motivation, higher anxiety, lower self-confidence, lower vitality at the beginning of the season, expressed feeling a lack of accomplishment at season's end. A player with lower vitality, higher intentions to dropout at the beginning of the season, had higher tendencies to devalue handball at the season's end. These findings bring new elements to light in our understanding of the athlete burnout. (2) A player with lower self-determined motivation at the beginning of the season reported higher symptoms of burnout at the end of the season. These results confirm previous study findings in that lower self-determined motivation increases the risk of burnout in young elite athletes.

References

Raedeke, T. D. (1997). Is athlete burnout more than just stress? A sport commitment perspective. Journal of Sport and Exercise Psychology, 19, 396-417.

Raedeke, T. D., & Smith, A. L. (2001). Development and preliminary validation of an athlete burnout measure. Journal of Sport and Exercise Psychology, 23, 281-306.

DROPPING OUT OF ORGANIZED SPORT OR STAYING IN? A PROSPECTIVE STUDY ON THE INFLUENCE OF PSYCHOSOCIAL FACTORS

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: Participation in organized youth sport across childhood and adolescence increase the likelihood of being physically active in adulthood (Telama et al 2006). Hence, preventing young people from dropping out of organized sport may be seen as an important health promotion strategy.

Study purpose

To examine the influence of a theoretically informed set of environmental and personal factors on young athletes' dropout from organized sport.

Method: Prospective design including a sample of 698 athletes aged 12-16 years from different sports who provided T 1 (early season) data and responses regarding their participation status the following sport season (T 2). T 1 predictors comprised perceptions of the sport environment, cognitive mediators of motivation and persistence, regulation of motivation and affect.

Results: Direct logistic regression helped assess the impact of predictor variable set on the likelihood of next season dropout. The full model containing all predictors was statistically significant, X2 (13, N= 678) = 68,23, p<.001, indicating that the model was able to distinguish between athletes who reported and did not report having dropped out of organized sport. The model as a whole explained between 25% (Cox and Snell R square) and 36% (Nagelkerke R squared) of the variance in organized sport participation status, and correctly classified 84% of the cases.

Seven predictor variables made a unique statistically significant contribution to the dropout model. The strongest predictors - odds ratios of 2.13 and 1.82 - were a high performance climate and high perceived ability, respectively. Athletes, who early season perceived the climate as strongly performance oriented, were over 2 times more likely to report dropout than those who did not, controlling for all other factors in the model. Further, athletes high on perceived ability were 1.8 times more likely to report dropout than their counterparts. The odds ratios of perceived autonomy and relatedness were less than 1. Hence, for every additional level of agreement in terms of being socially integrated with peers in sport, athletes were .70 times less likely to report dropout, controlling for other factors in the model. Finally, boys were .60 times less likely to dropout of sport than were the girls, and younger athletes were .59 times less likely to dropout than older ones.

Discussion: Results reveal the importance of de-emphasizing social comparison and winning while simultaneously strengthening athletes' sense of autonomy and social bonds with their sport peers, and prevent negative affect. Findings also reveal that preventing dropout seem particularly important among girls and as athletes grow older. Findings also attest to the importance of challenging high ability athletes in accord with their sport abilities.

Reference

Telama,R et al (2006). Participation in Organized Youth Sport as a Predictor of Adult Physical Activity: A 21-Year Longitudinal Study, Pediatric Exerc Sci, 17, 76-88.

17:15 - 18:45

Oral presentations

OP-AP01 Adapted physical activity

THE EFFECT OF COOPERATIVE PHYSICAL ACTIVITIES ON THE GROUP STRUCTURE OF PUBESCENT, MOTOR-DISABLED CHILDREN

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Earlier studies in applied pedagogy (Newcomb, Bukowski, Pattee, 1993) have shown that one of the traits of practical cognitive aspect is that the development of an aptitude for thinking is the solution for most educational problems. In spite of the fact that the quality of social interactions has a major impact on performance. Physical skills and/or social qualities and abilities must be used as an educational tool to develop personality. Indeed, in a good group the students require the support of each other and benefit from the cooperative attitude as well as from their performance (N. Kollár, 1997).

In our earlier studies (Kovács, 2004, 2006) we found that in small groups (14-18 students), that 3-4 months of regular cooperative physical activity has a positive impact on group structure. The overall position of the girls in the experimental group shifted in a positive direction while in the control group the position of the students either deteriorated or did not change.

In this study we map changes to the group structure and sociometric status of motor disabled children marginalized by their peers under the influence of performance-oriented and competitive rowing practice three times a week.

We hypothesize that the necessity to work together during the physical exercise program would have a positive impact on group structure and reduce the degree by which students on the group periphery were marginalized by their peers.

The participants were 11-15 years old (N=15) motor disabled children, who traveled by bus to training. The students depended upon each other from the beginning of the bus trip until end of the training. Their success and enjoyment of each session required coordinated teamwork.

Sociometric status was measured with Shellenberger's Group-Evaluative Method (1990). We extended the matrix (Kovács, 2005) to the 'Y' axis, graphing the average score the student gave to each classmate regarding how willingly they would make a joint decision.

As successful cooperation depends on working together, the answers to the decision question will mirror social abilities.

The initial group structure was very similar to that observed in our earlier studies. The students favored two of their peers, and strongly marginalized 3- 4 of them.

In our presentation we graphically present the effect of 10 weeks' cooperative program on the group's structure, and the sociometric distance between students.

Reference:

Kovács K. és Kudar, K. (2004): The Effect of Cooperative School Games on Self-Concept and Position in Group Evaluative Method of 12-14 Year School Girls. Pre-Olympic Congress, Volume I. 496.p.

Kovács K. (2006): The Effect of Cooperative School Games on Pubescent Girls' Decision and Study Aspect of Sociometric Status. 11th annual Congress of the European College of Sport Sciences, Lausanne, Switzerland, Volume p.: 169.

Newcomb, A., Bukowski, W., Pattee, L. (1993): Children's peer realitons. Pscycholgy, Bull. 113. p.99-128

Schellenberger, H. (1990): Psychology of Team Sports. Sport Books Publisher, Toronto

RECRUITING PEOPLE WITH DISABILTIES TO NORWEGIAN SPORT

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Introduction: This paper presents some results from a study documenting the current state of equality within Norwegian sports and fitness activities, especially with regard to gender. The project was initiated in 2007 by The Norwegian Equality and Anti-Discrimination Ombud, and carried through by a research group at the Norwegian School of Sport Sciences. The Norwegian Sports for the Disabled Association was dissolved on 1. September 2007, after the national sporting associations passed a resolution that they would commit to taking responsibility for organising sports for the disabled.

The results discussed in this paper answered this question: To what extent is work being done at the various organisational levels to facilitate and recruit people with disabilities?

Methods: Representatives from 24 individual sport associations, 6 regional confederations and 43 clubs were interviewed. In addition, the researchers reviewed their annual reports, strategy documents and action plans.

Results: A great deal of work is done in order to accommodate and recruit people with disabilities. This is related to the fact that, however, that there are large variations with regard to how much work has been invested in this endeavour, even if there is a high degree of awareness with regard to the articulated goal of integration.

Several associations refer to the fact that recruitment among people with disabilities represents a big challenge, and point to difficulty in making contact with people with disabilities and reaching them with information. Some associations also pointed out that it was a big challenge to get the clubs to take responsibility for the integration of disabled people.

Many of the teams mentioned challenges connected to the involvement as a limiting factor. It appears that many of the disabled people that are active in teams are children, while the accommodation

and inclusion of disabled adults is perceived to be a great deal more difficult. There appear to be few disabled people who are active as board members, coaches and officials.

Discussion: One challenge regarding recruiting people with disabilities seem to be their dependence on help and facilitation for doing sports and to become board members. Therefore the results are discussed on the background on Norwegian social politics with refer-

ence to full integration and equality and the impact it may have on Norwegian sports organisations. Theories on empowerment and empowerment language and how these theories are used to facilitate activities are used as theoretical fundaments in the discussion.

References

Fasting, K. , Sand, T.S, Sisjord, M.K., Thoresen, T. & Broch, B.T. (2008)- Report on Equality and Variety in Norwegian Sport

UPPER LIMBS LEAN MASS AND STRENGTH IN CHILDREN WITH DOWN SYNDROME

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Introduction: It is known that people with Down syndrome (DS) are hypotonic (Pueschel, 1990; Sakadamis et al., 2002) and they have "soft" muscles. This hypotonicity could be the cause of the lack of strength in this population.

Material and methods: 30 children (17 male) with DS, mean age 14.7±3 yr. were compared with 30 healthy and without mental retardation (MR) children, matched in age and sex. The upper limbs lean mass of the subjects was measured using dual energy X-ray absorptiometry (DXA). Forearm strength was assessed with a maximal handgrip dynamometry in both hands. Dividing the kilograms of strength the performed in the dynamometry by the kilograms of upper limbs lean mass, we obtained an index of relative strength (IRS) that indicates the amount of kilograms of strength by one kilogram of lean mass in the upper limbs. Differences in the IRS between groups established using Student's unpaired t test and analysis of covariance was performed to test the differences in the upper limbs lean mass adjusting by height and Tanner maturational status.

Results: children with DS had, statistically, increased lean mass in the upper limbs compared with control children; however the IRS was 46% lower in the children with DS (both $p<0.05$).

Discussion: adjusting by height and Tanner stage, children with DS have more lean mass in the upper limbs than the children without MR; however they cannot produce too much kilograms of strength by kilogram of lean mass. Physiological impairments could explain these results. Further studies are needed on this topic, testing different muscular groups, i.e. lower limbs.

References:

Pueschel, S. M. (1990) Am J Med Genet Suppl, 7, 52-6.

Sakadamis, A., Angelopoulou, N., Matziari, C., Papameletiou, V. and Souftas, V. (2002) Eur J Obstet Gynecol Reprod Biol, 100, 208-12.

EFFECTS OF PHYSICAL EXERCISE ON FITNESS IN ADULTS WITH MENTAL RETARDATION: INFLUENCE OF SPORT SPECIALIZATION

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Introduction: Exercise and physical fitness are considered important for health and well-being for individuals with mental retardation (MR) (Van de Vliet et al., 2006; Frey et al., 2008). The modern literature is poor in relation to sport specialization in athletes with MR. The aims of this study were to assess the physical fitness profile in athletes with MR in comparison with individuals who were included in recreational and leisure activity programs (non-athletic people); the contribution of sport specialization on athletes' fitness; and to analyse the correlation of each fitness component with subjects' MR levels.

Methods: A sample of sixty-four subjects aged 18-45 years (MR: Mild 38%, Moderate 22%, Severe 38%, and Profound 3%) composed by 22 track and field athletes, 19 basketball athletes, and 23 non-athletic people participated in this study. All participants were assessed before and after a 6-months period through fitness tests adapted to individuals with MR, including anthropometric measurements (height, weight, body mass index, and % body fat), Sit and reach test assessing the flexibility (FLEX), Hand grip test assessing the arm muscular strength (HG), Sit-ups and Push-ups tests assessing the muscular strength and endurance (SUT and PUS), Standing long jump test assessing the explosive leg power (ExLP), Step test assessing the cardiovascular endurance (VO2max), Flamingo test assessing general balance (BAL), and finally Timed up and go test assessing the motor coordination (MCoord).

Results: The results showed that participants' weight, body mass index and BAL were significantly affected by time ($p<0.01$); the ExLP was significantly affected by activity ($p<0.01$); and VO2max, HG, PUS, SUT, and Mcoord were significantly affected by interaction time and activity ($p<0.01$). Only track and field athletes increased significantly the VO2max ($p<0.05$). All athletes improved significantly in HG, PUS and SUT (track and field: $p<0.05$, $p<0.01$, and $p<0.05$ respectively; basketball: $p<0.01$, $p<0.05$, and $p<0.01$ respectively), instead non-athletic people decreased significantly in SUT ($p<0.01$). MCoord improved significantly in track and field athletes ($p<0.05$), and decreased significantly in no-athletic people ($p<0.05$). MR level was positively correlated to MCoord (p≤0.01, r=0.403).

Discussion: The findings of this study showed that physical activity improved fitness in adult individuals with MR, decreasing health risks. Moreover, these improvements were related to sport specialization. Finally, athletes with lower MR obtained higher performance scores in motor coordination test.

References

Van de Vliet P, Rintala P, Fröjd K, Verellen J, Van Houtte S, Daly DJ, Vanlandewijck YC (2006). Scand J Med Sci Sports, 16, 417-425.

Frey GC, Stanish HI, Temple VA (2008). Adapted Physical Activity Quarterly, 25, 95-117.

LATERALITY AND FRAGILE X SYNDROME

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Introduction: Fragile X Syndrome (FXS) is a hereditary intellectual disability linked to X chromosome. Individuals with intellectual disability could be left-handed or ambidextrous (Carlier et col., 2006; Gérard-Desplanches et col., 2006). In the works of Cornish, Pigram & Shaw (1997), the FXS presents preferably left-handedness in comparison to Down syndrome and control groups. In the works of McManus & Cornish (1997), the persons FXS are right-handed and resemble the control group without handicap.

Methods: The experimental group is composed by 19 boys, aged between seven and thirty seven years old, studying in special schools, in ordinary schools or working in special workshops or ordinary businesses. The control group is composed by 19 individuals without

handicap studying in secondary schools. The method is the test of handedness preference by Annett (1970) that we have adapted for our study. We have included three test for measuring footedness, two for eyedness and one for eardness.

Results: The first results confirm the preference of right-handedness in persons FXS and provide new data regarding footedness, sensorial laterality. The persons FXS presents inconsistent footedness and ocular cross laterality.

Discussion: Our results are in the same way than the works of McManus & Cornish (1997). We know problems that the children FXS have with the sensorial integration. A cross laterality and a difficult sensorial integration can give the same problems for learning and for social-affective life. We cannot explain, nowadays, what influence more about education regarding control group submit also a high frequency of cross laterality.

References

Annett, M. (1985). Left, right, hand and brain: the right shift theory. London: Lawrence Erlbaum Associates.

Carlier, M., Stefanini, S., Deruelle, C., Volterra, V., Doyen, A.-L., Lamard, C., et al. (2006). Laterality in persons with intellectual disability : I- Do patients with trisomy 21 and Williams-Beuren syndrome differ from typically developing persons ? Retrieved 06/06/06, 2006, from: http://www.up.univ-pc/pagesperso/Carlier/behavior%20genetics.pdf

Cornish, K. M., Pigram, J., & Shaw, K. (1997). Do anomalies of handedness exist in children with fragil-x syndrome? Laterality, 2, 91-101.

Dailly, R., & Moscato, M. (1984). Latéralisation et latéralité chez le jeune enfant. Bruxelles: Mardaga.

Fagard, J. (2004). Droitiers/gauchers. Des asymétries dans tous les sens. Marseille: Solal.

Gerard-Desplanches, A., Deruelle, C., Stefanini, S., Ayoun, C., Volterra, V., Vicari, S., et al. (2006). Laterality in persons with disability II. Hand, foot, ear, and eye laterality in persons with trisomy 21 and Williams-Beuren syndrome. Developmental Psychobiology, 48, 482-491.

Glóver-López, G., & Guillén-Navarro, E. (2006). Síndrome X frágil. Revista de Neurología, 42, S51-S54.

McManus, I. C., & Cornish, K. M. (1997). Fractionating Handedness in Mental Retardation: what is the Role of the Cerebellum? Laterality, 2, 81-89.

CORRELATION BETWEEN COURSE NAVETTE AND HANDGRIP AS A PREDICTOR OF THE LEVEL OF PHYSICAL CONDITION IN INTELLECTUAL DISABILITY

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Introduction: The purpose of the study was to describe the relationship between the results obtained in a multistage run field test "Course Navette" to evaluate the aerobic capacity in relation to the right Handgrip results to measure strength in population with Intellectual Disability (ID).

Methods: 8 individuals with Down Syndrome (DS), 13 individuals with Intellectual Disability but without Down Syndrome (ID-non-DS) volunteered for this study. They were 29±7,3 years of age, and they presented a mild or moderate level of ID. An initial familiarization session was performed before the study, and an informed consent was obtained. All of them performed a Course Navette test and a right Handgrip test at 30°, twice separated by one week.

Results: individuals ID-non-DS presented better absolute values in Course Navette (3,61±2,65min) than the ones obtained in population with DS (1,8±0,7 min). The same occurred as expected with strength (ID-non-DS=46,7kgW vs. SD=35,6kgW). The relationship in all individuals in both tests presented a significative correlation of 0,649

Discussion: 1) Field testing is easier to perform, and useful for exercise prescription. 2) ID-non-DS perform better, both, Course Navette and handgrip. 3) There is a significant correlation between both tests in population with ID that may allow the prediction of aerobic capacity through handgrip. 4) More research is needed increasing the sample to verify these results with laboratory testing.

References:

Guerra-Balic, M. et al (2000). Physical Fitness Levels of Physically Active and Sedentary Adults With Down Syndrome. APAQ, 16 pp. 310-321.

Jódar Montoro, R. (2003). Revisión de artículos sobre la validez de la prueba de Course navette para determinar de manera indirecta el VO2 max. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte, vol. 3 (11) pp. 173-181. (En línea). http://cdeporte.rediris.es/revista/revista11/revision.htm

Pitetti,K.H. et al. (1993). Physical fitness and adults with mental retardation. An overview of current research and future directions. Sports Medicine, 16,(1), 23-56.

Project partly funded by Spanish Education and Science Ministry DEP2005-00202-C04-01

17:15 - 18:45

Oral presentations

OP-PT01 Physiotherapy

THE EFFECTS OF TAPING ON UPPER TREPEZIUS ELECTROMYOGRAPHIC ACTIVITY AMONGST PATIENTS WITH SUSPECTED SUBACROMIAL IMPINGEMENT AND ANTERIOR GLENOHUMERAL SUBLUXATION. A PILOT STUDY

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Purpose

Of the most commonly encountered clinical sign in shoulder patients is loss of muscular control around scapula. One of the muscles which is subject to electromyographic (EMG) alterations is trapezius. Especially its upper fibres are found to be overactivated leading to limited upward scapular rotation (Ludewig et al. 2004). Scapular taping is suggested as a method of improving both, muscular control

and scapular position (Selkowitz et al. 2007, Hsu et al. 2009). The aim of this study is to explore the electromyographic activity of upper trapezius following the application of tape in patients with suspected subacromial impingement and anterior glenohumeral subluxation.

Methods: 9 women (mean age:34,7) with suspected subacromial impingement, 4 of which had co-existent anterior subluxation, and 7 healthy females (mean age:22) who served as controls, volunteered to participate in this pilot. Subjects were requested to perform abduction in the scapular plane with and without the application of tape. Abduction was performed without a weight and with a 1,5 kg weight on the affected hand. Two taping techniques were utilised, 'relocation of head of humerus' and 'inhibition of the upper trapezius muscle' (McConnell, 1994). Bipolar surface electrodes (Ag/AgCl, 4-cm diameter, 25-mm interelectrode distance) were applied over upper trapezius. Changes in frequency (F) and root mean square (RMS) of the power spectrum were calculated using the Viking-Quest equipment (Nicolet Inc.). F (frequency domain) and RMS (time domain) are the considered parameters describing motor unit activation patterns. Total time of the effort during EMG measurement was also analyzed. 5 measurements were provided for each test. Changes within groups were examined by utilising paired t tests for parametric and Wilcoxon signed rank tests for nonparametric data.

Results: For abduction mean RMS was highly statistically significant (p=0.01). Lower values were found with the tape application (115.3±35.3) than without tape (212.7±30.4). Results for abduction with the weight also yielded statistically significant results (p=0.02) with again, lower values with (177.5±35.3) compared to without the tape (297.3±37.4). In the control group, no significant decrease in the activation of motor units was yielded following the tape. The results suggest that in our patients upper trapezius, when taped, significantly decreased its activation.

Conclusions

These preliminary findings provide some evidence that taping facilitates the inhibition of potentially overactive upper trapezius muscle in patients with subacromial impingement and anterior glenohumeral subluxation.

References

Hsu YH, Chen WY, Lin HC, Wang WTJ, Shih YF. (2009). J Electromyogr Kinesiol, in press.

Ludewig PM, Hoff MS, Osowski EE, Meschke SA, Rundquist PJ. (2004). Am J Sports Med, 32, 484-493.

McConnell J. (1994). Course notes, McConnell Institute.

Selkowitz DM, Chaney C, Stuckey SJ, Vlad G (2007). J Orthop Sports Phys Ther, 37(11), 694-702.

SCAPULATHORACIC MUSCLE ACTIVITY DURING PUSH UP EXERCISE ON AN UNSTABLE VIBRATING SUPPORT SURFACE

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Introduction: The Redcord 'Neurac' approach is frequently used by clinicians for treatment of neck/shoulder pain. It is hypothesized that application of high frequency vibration to the slings improves the success rate in treating neck/shoulder patients by facilitating activation of pain inhibited muscles. At present, it is not clear whether vibration applied to the slings acts to increase activation of scapulathoracic muscles. The aim of this study was to determine whether push-up exercises performed in slings (with and without vibration) induce elevated surface electromyographic (sEMG) activity of scapulathoracic muscles compared to push up exercise performed on a stable surface.

Methods: Eight subjects (7 males, 1 female; mean age 28 yrs, SD 7 yrs) were recruited from a convenience sample of university students and faculty. Bilateral sEMG was recorded (Myomonitor III, Delsys, US) from upper, transverse, and lower trapezius, serratus anterior, infraspinatus, pectoralis major and anterior deltoid while maintaining a regular push up position and a push up plus position with: 1) hands placed on a bench, 2) hands placed in slings, and 3) hands placed in slings with a 25 Hz vibration applied to the sling ropes. All exercise positions were maintained for ~20 sec (i.e., isometric contraction) while keeping the elbow joint in an extended position. Subjects rested 2 min between each exercise. All sEMG measurements was normalized by the highest root-mean-square detected sEMG response (EMGmax) obtained during maximal voluntary contractions. Median sEMG level (%EMGmax) was used to quantify sEMG activity.

Results: Pectoralis major was the only muscle displaying significantly higher sEMG activity during sling exercise compared to bench exercise (median sEMG level ~20-30% vs. 5-15% EMGmax). Overall there was no difference in sEMG activity between exercises performed with sling vibration compared to exercise performed without vibration. Push-up plus induced significantly higher sEMG activity during all exercise conditions compared to regular push-up for all muscles except anterior deltoid.

Discussion: Additional vibration to the slings did not increase scapulathoracic muscle activity under isometric, sub-maximal contraction conditions. Moreover, all muscles except pectoralis major showed similar sEMG level during sling exercise versus exercise on a stable surface. Our findings are consistent with previous studies showing no difference in scapulathoracic muscle activity when performing push-up exercises on stable versus unstable surface (e.g. Lehman et al 2008). Further studies are needed to elucidate why vibration applied to the slings seems clinically effective in reducing symptoms among neck/shoulder patients.

References

Lehman GJ, Gilas D, Patel U (2008). Man Ther, 13, 500-506.

INFRARED THERMOGRAPHY AS A METHOD FOR MONITORING AND PREVENTING INJURIES IN SOCCER

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Introduction: Infrared thermography is considered as a valid and non-invasive diagnostic method [1] of different pathologies [2], including some musculo-skeletal problems as the lumbar pain [3]. Modern equipments make possible very accurate and objective recording of the body surface with a single picture. Recently, thermography has been purposed as a method not only for diagnosing but also for monitoring rehabilitation processes [4].

Methods: We recorded the body temperature of 23 professional players of the C.D. Toledo S.A.D. (Age= 24,9; SD= ± 3,5) on 24 days of its 2-months precompetitive period. Two thermographic pictures for each player (frontal and dorsal, of the trunk and lower limbs) were taken with a ThermaCAM TM SC640 (FLIR SYSTEMS, Portland) before starting the training season. Mean temperature of the muscular groups: abdominal (AB), quadriceps (Q,R&L), adductors (AB,R&L), anterior leg (AL,R&L), lumbar (L), hamstrings (H,R&L) and calves (C,R&L) and the joints: anterior knees (AK,R&L), posterior knees (PK,R&L), and ankles (A,R&L) were calculated from the pictures by the software 'ThermaCAM Reporter'. Additionally, the level of nuisance of those areas was assessed every day by the player from 1 (no pain) to 10 (injured). Temperatures were compared with the declared level of nuisance considering three groups (1 = No pain; 2 - 3 = Low pain; > 4 =

High pain). Areas affected by physiotherapeutic treatments were excluded from the sample. Rough reports and pictures from each player were daily reported to the physiotherapist of the team.

Results: ANOVA results point out a direct relationship between the declared level of nuisance of the area and its temperature both in ankles (F[AR] = 9.20; $p < 0.05$ and F[AL] = 3.99; $p < 0.05$) and knees (F[PKR] = 5.34; $p < 0.05$ and F[PKL] = 9.14; $p < 0.05$). There were also found significant differences for temperatures (aprox. 0.5 degrees) between the painful and non-painful limb on the knee (F[AK] = 14.36; $p < 0.05$) and hamstrings (F[H] = 3.9; $p < 0.05$) results. None serious injury has been produced among the players during the 2-months of the study.

Discussion: We concluded that infrared thermography is a valid, fast and convenient method of preventing soccer injuries. We suggest that this technique could also be applied to monitor and diagnose injuries and to quantify training loads in sports

References

1. Barnes, R.B. (1967). Determination of body temperature by infrared emission. J. Appl. Physiol. 22:1143-1146.

2. Garagiola, U. & Giani, E. (1990). Use of telethermography in the management of sports injuries. Sports Medicine. 10(4): 267-272.

3. Pichot, C. (2001). Use of thermography in chronic lumbar pain. Rev. Soc. Esp. Dolor. 8: 43-47.

4. Lee, M., y Cohen, J. (2005). Rehabilitation Medicine and Thermography. United States: Impress Publications (available in http://www.lulu.com/content/1690479).

CARDIAC ADAPTATIONS WITH 6 WEEKS OF EITHER SPRINT INTERVAL OR ENDURANCE EXERCISE TRAINING IN HEALTHY YOUNG HUMANS

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Introduction: A recent study showed improved peripheral vascular adaptations to sprint interval training (SIT) that are similar to those of traditional endurance training (ET) (Rakobowchuk et al., 2008). However, central artery stiffness was not improved with either training paradigm, suggesting limited central vascular or cardiac adaptations. The current study evaluated whether 6-weeks of SIT alters left ventricular (LV) morphology compared with traditional ET.

Methods: Twenty healthy untrained subjects were randomly assigned to a SIT (n=10, 24 ± 1.0 yrs [mean ± SE]) or ET group (n=10, 23 ± 0.7 yrs). The SIT group completed 4-6 x 30s "all-out" efforts (repeated Wingate Tests) separated by 4 minutes of recovery, 3 times/wk. The ET group completed 40-60 minutes of cycling at 65% of their maximal oxygen uptake, 5 d/wk. B-mode echocardiography (GE System FiVe, 2.5 MHz probe) was used to quantify LV morphology, using established guidelines, in all participants on 2 separate days before training and at 48 after the completion of training.

Results: Training improved maximal oxygen uptake to a similar extent in both groups (ET PRE: 40.5±6.6 ml/kg/min, POST: 42.4±6.6 ml/kg/min; SIT PRE: 40.7±6.1 ml/kg/min, POST: 45.0±5.2 ml/kg/min, $p<0.05$). The 2 modes of training resulted in different changes in LV dimensions during supine rest. The ET group showed significant reductions in LV diameter at end systole and a non-significant increase in the interventricular septum at end systole resulting in increased percent fractional shortening (pctFS) (PRE: 31.9 0.58%, POST: 34.2 1.3%, $p=0.015$) and a greater LV ejection fraction (EF) (PRE: 0.68 0.01, POST: 0.71 0.02, $p=0.05$). In contrast, SIT did not alter individual cardiac diameters; but was associated with a small but significant reduction of EF (PRE: 0.70 0.01, POST: 0.67 0.02, $p=0.047$). There was a trend ($p=0.056$) for a group x training interaction in LVmass with mass increasing in the SIT group (PRE:139.2 13.5, POST:151.7 15.1g) and no change in the ET group (PRE:173.7 14.3, POST:171.9 16.0g).

Discussion: Overall, these results suggest unique adaptations of the LV that vary with each training method. Past research has noted small increases in LVmass in sprint trained individuals and following sprint based training (Ricci et al., 1982), however this is the first study to observe this effect when participants were not partaking in additional training (resistance) that may evoke concentric hypertrophy. We also show improved EF and pctFS in the ET group, which may be a functional and not a morphological adaptation due to reduced HR and adaptive hypervolemia.

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References

Rakobowchuk et al. (2008) Am J Physiol 295:R236-242.

Ricci et al. (1982) Medicine and Science in Sports and Exercise 14:344-347.

EXERCISING WITH RESERVE: EXERCISE REGULATION BY PERCEIVED EXERTION IN RELATION TO DURATION OF EXERCISE AND KNOWLEDGE OF ENDPOINT.

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Introduction: Noakes and colleagues [1] have proposed that the rising RPE produced during exhaustive exercise acts as a protective mechanism during exercise, overriding the conscious desire to increase the exercise intensity if such an increase could threaten homeostasis, either at that moment or sometime in the future. Accordingly, athletes maintain a reserve capacity, presumably to prevent any catastrophic failure of homeostasis.

Methods: We examined the rate of RPE increase during repetitive maximal effort time trials as well as after an intervention which aimed to decrease certainty about the remaining distance of the exercise bout. In addition, we examined the rate of RPE increase during bouts of markedly different duration. Part 1: 12 well-trained, competitive level cyclists completed five 40km time trials. During the final time trial all feedback was withheld until the final kilometre. In addition, to cause confusion about the remaining distance, they were asked to report their RPE at random intervals from 18km to 38km. Part 2: 6 well-trained, recreation level cyclists randomly completed a 5km, 10km, 40km and 100km time trial.

Results: Part 1: Mean ratings of perceived exertion increased during the first 4 trials and decreased during the final trial. The rate of RPE progression increased in linearity during the first four trials and became more conservative in the final trial. These changes were directly related to performance. Part 2: Mean ratings of perceived exertion for longer duration trials (40km, 100km) were lower during the first half of trial duration but matched those of shorter trials in the final 20%.

Conclusions: We showed that the rate of increase in perceived exertion during exercise is not always repeatable, but changes in relation to certainty about the endpoint of exercise as well as the set exercise duration. When subjects were initially unfamiliar with the exercise bout, they chose a perceived exertion strategy that maintained a larger metabolic reserve which was then accessed near the end of the

bout. With increased familiarity with the required exercise task, the RPE strategy became more aggressive, linear and with less metabolic and cardiorespiratory reserve. This was associated with increased performance. Similarly, during exercise bouts of longer duration, subjects started exercise bouts with lower RPE scores and maintained these lower RPE values until the final 20-30% of the exercise bout, after which they increased the RPE to values similar to those recorded during the shorter exercise trials. Subjects therefore maintained a greater metabolic and cardiorespiratory reserve during longer trials.

1 Noakes TD, St Clair GA, Lambert EV. From catastrophe to complexity: a novel model of integrative central neural regulation of effort and fatigue during exercise in humans: summary and conclusions. Br J Sports Med 2005;39:120-4.

MUSCLE ACTIVATION PATTERNS IN SHOULDER IMPINGEMENT PATIENTS

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Introduction: Shoulder impingement is one of the most common presentations of shoulder joint problems 1. It appears to be caused by a reduction in the sub-acromial space as the humerus abducts between 60o -120o – the 'painful arc'. Structures between the humeral head and the acromion are thus pinched causing pain and further pathology 2. Shoulder muscle activity can influence this joint space but it is unclear whether this is a cause or effect in impingement patients. This study aimed to observe muscle activation patterns in normal and impingement shoulder patients and determine if there were any significant differences.

Method: 19 adult subjects were asked to perform shoulder abduction in their symptomatic arm and non-symptomatic. 10 of these subjects (age 47.9 ± 11.2) were screened for shoulder impingement, and 9 subjects (age 38.9 ± 14.3) had no history of shoulder pathology. Surface EMG was used to collect data for 6 shoulder muscles (Upper, middle and lower trapezius, serratus anterior, infraspinatus, middle deltoids) which was then filtered and fully rectified. Subjects performed 3 smooth unilateral abduction movements at a cadence of 16 beats of a metronome set at 60bpm, and the mean of their results was recorded. T-tests were used to indicate any statistical significance in the data sets. Significance was set at $P<0.05$.

Results: There was a significant difference in muscle activation with serratus anterior in particular showing a very low level of activation throughout the range when compared to normal shoulder activation patterns (<30%). Middle deltoid recruitment was significantly reduced between 60-90o in the impingement group (30:58%).Trends were noted in other muscles with upper trapezius and infraspinatus activating more rapidly and erratically (63:25%; 60:27% respectively), and lower trapezius with less recruitment (13:30%) in the patient group, although these did not quite reach significance.

Conclusion: There appears to be some interesting alterations in muscle recruitment patterns in impingement shoulder patients when compared against their own unaffected shoulders and the control group. In particular changes in scapula control (serratus anterior and trapezius) and lateral rotation (infraspinatus), which have direct influence on the sub-acromial space, should be noted. It is still not clear whether these alterations are causative or reactionary, but this finding gives a clear indication to the importance of addressing muscle re-education as part of a rehabilitation programme in shoulder impingement patients.

References:

1. Ludwig P and Cook T (2000), 'Alterations in shoulder kinematics and associated muscle activity in people with symptoms of shoulder impingement' Physical Therapy, 80(3), p276-91

2. Michener L, McClure P and Karduna A (2003), 'Anatomical and biomechanical mechanisms of sub-acromial impingement syndrome', Clinical Biomechanics 18, p369-79

17:15 - 18:45

Invited symposia

IS-SS05 Sport and cultural identity

SPORT AND THE IDEA OF NORTHERN IRELAND

BAIRNER, A.

LOUGHBOROUGH UNIVERSITY

Since the early 1980s, the socio-cultural significance of sport in Northern Ireland has attracted considerable interest from sociologists, historians and anthropologists. Much of the relevant work focused on the ways in which sport not only reflected but also contributed to the construction and reproduction of competing political identities. Additional published output examined the extent to which sport can be used to help transcend those divisions. Implicit in much of this research was an understanding of the contested nature of Northern Ireland as a political entity which as a consequence of agreement by the Democratic Unionist Party and Sinn Féin to share power is arguably more secure than at any time since the formation of the Northern Ireland state in 1921. This altered political context offers an ideal opportunity to assess in greater depth than ever before the meaning of Northern Ireland in relation to the identity formation of those who live there. This paper examines the ways in which various sports, but in particular association football, have contributed in the past to the idea of Northern Ireland and assesses the potential of sport help consolidate the current constitutional arrangements.

A QUESTION OF REARING TO COMPETITION, DEMOCRACY OR CARE IN EQUESTRIAN SPORTS

HEDENBORG, S.

SPORTS STUDIES

The purpose of this paper is to analyze the rearing of children and young people within equestrian sports in Sweden during the second half of the 20th century. In contemporary times the Swedish Sport Movement, together with schools, is the most important rearing environment for children. However, the actual goal of the rearing, except of course learning a specific sport activity, is more unclear. The question is important as children's sports receive significant financial support from the government. In the contemporary debate on this issue, children's experiences as well as emotions like happiness and sorrow; fellowship and marginalization are presented as outcomes

of children's sports activities. In recent times especially the competitative rearing ambitions have been criticized whereas goals like participation for all have been emphasized as the primer aim. Other questions have been the role of parents and children's inclination and discomfort in connection to sports.

Previous research on football for children and young people has demonstrated that political intentions emphasizing sports for all and a rearing focused on democratic values has justified governmental financial support to children's and young people's sports activities. Despite this, children within the football associations are often raised with values connected to competition and marginalization (Peterson 1993). Furthermore, children's sports environment is very authoritarian (Redelius 2002). Rearing within the sports movement is also a question of gender. Generally sports has been connected to men and masculine values (Olofsson 1989; Hjelm 2004; Larsson 2005; Hedenborg 2008). A study of rearing activities within football has demonstrated that quite young boys are met by a masculinity constructed in opposition to homosexuality and femininity (Fundberg 2003). Whether the same values can be, and have been, seen in equestrian sports is questioned in this paper. Furthermore it is argued that the target of rearing can be connected to gender. A question raised is whether the target of rearing can explain the feminizing process within equestrian sports.

Annual reports from one of the equestrian organizations (Ridfrämjandet), interviews with two persons who have been working with education within this organization and letters from children sent to a children's magazine are used as source material. The latter is of specific interest as this source material will reflect children's own experiences and view of the rearing aims.

NO SENSE OF PLACE? TRANSNATIONALITY AND IDENTITY IN FOOTBALL

HOGNESTAD, H.

TELEMARK UNIVERSITY COLLEGE

This paper discusses globalization and perceptions of cultural differences in football. The consumption of football and the experience of the game's social and physical places (stadiums, streets, pubs) will be scrutinized with examples drawn from studies in Northern Europe.

Debates around globalization in football is further highlighted through moral and political calls for the protection of "our" (national) talents and restrictions on the number of "foreign" footballers. These issues are particularly evident in debates which seeks to promote the interests of national team football against an increasingly commodified international club football.

In this paper I shall particularly discuss the ways in which football supporters apply notions of 'who we are' and 'who we are not' within the cultural complexity of contemporary football. The paper also seeks to delve into the issue of how these orientations can be linked to more general social, racial and cultural issues.

17:15 - 18:45

Invited symposia

IS-BC04 Genomics and Exercise: Signals and Mechanisms of Training Adaptation, a Systems Biology Approach (ACSM Exchange Symposium)

A SYSTEMS BIOLOGY APPROACH TO DECIPHERING THE MOLECULAR BASIS FOR AEROBIC ADAPTATION IN HUMANS

TIMMONS, J.A.

RVC, UNIVERSITY OF LONDON

Complex organisms have evolved to incorporate the benefits of the steep thermodynamic gradient afforded by atmospheric oxygen and to deal with the obligatory reactive nature of oxygen chemistry. This implies that the link between aerobic capacity and disease may reflect gene-environment interactions that have evolved to regulate the safe transport or consumption of molecular oxygen for the purpose of energy transfer. This may also explain why low aerobic capacity (2max) is one of the strongest risk factors for development of cardiovascular disease and premature death in mammals. Exercise, the sole strategy for increasing aerobic capacity in humans, is ineffective in a significant number of people(1). The molecular governors of a low or high propensity for aerobic capacity adaptation are unknown, and population genetics alone has not easily resolved the genetic variants that quantitatively contribute to cardiorespiratory adaptation. We previously produced the first protein coding genome-wide analysis of human muscle adapting to aerobic training(2). From this we identified that molecular approaches (e.g. KO mice) involving single-gene in vivo manipulations demonstrate little genuine connection with the complex physiological process we noted in humans. To further explore our observations we developed a new strategy; combining the power of natural biological variation, across four independent human studies, with gene-chip profiling (n=120) to facilitate molecular predictor analysis. A 29 gene transcript signature, established at baseline in young sedentary subjects, was able to blindly predict the magnitude of aerobic adaptation in young active subjects, and in middle-aged subjects with metabolic syndrome and this led to the identification of genetic variation in 6 genes in the HERITAGE study population which associated with gains in aerobic capacity. We verified that a pro-angiogenic network activation associated with the magnitude of aerobic adaptation in humans (and in rats artificially selected for a low or high response to aerobic training). Parallel protein coding RNA and microRNA (miRNA) analysis with independent bioinformatics identified transcription factors that coordinate muscle adaptation, while conservation of gene-network activation across physiological states and species underscores the robustness of our analysis. The utility of expression profiling to focus genome-wide association studies is thus exemplified by our study, while the ability to predict aerobic adaptation in humans, has promise for facilitating personalized medicine and defining therapeutic targets for enhancing aerobic capacity.

1. C. Bouchard, M. R. Boulay, J. A. Simoneau, G. Lortie, L. Perusse, Sports Med 5, 69 (Feb, 1988).

2. J. A. Timmons et al., Faseb J 19, 750 (May, 2005).

EXERCISE GENOMICS: RESULTS FROM THE HERITAGE FAMILY STUDY

BOUCHARD, C.

PENNINGTON BIOMEDICAL RESEARCH CENTER

The focus of this presentation will be on the complex network of genes and DNA sequence differences that contribute to human variation in cardiorespiratory fitness as assessed by maximal oxygen uptake (VO2 max) and in the changes brought about by exercise training in VO2 max and risk factors for diabetes and cardiovascular disease. Results of the HERITAGE Family Study indicate that, among sedentary adults, VO2 max adjusted for age, sex, ethnicity, body mass and body composition is characterized by an heritable component of the order of 50%. The response of VO2 max to training, adjusted for baseline level, age, sex and ethnicity, is influenced by a genetic component of the same magnitude. However, there is no correlation between the sedentary level of VO2 max and its trainability, suggesting that different gene networks and sequence variants regulate them. The heterogeneity of responses to training is considerable, with a range from about fourfold to tenfold when comparing the lowest to the highest responders. Four approaches have been used to identify the genes that are contributing to human variation in sedentary VO2 max, its trainability and training-induced changes in risk factors: candidate genes, gene expression arrays, genome scans with microsatellite markers, and genome-wide association studies with panels of single nucleotide polymorphisms (SNPs). Responsiveness to exercise-training among HERITAGE subjects has been associated with multiple genes including TTN, KIF5B, CREB1, SLC4A5 and FHL1. DNA SNPs in these 5 genes have been associated with differences in training-induced changes in hemodynamic and metabolic endophenotypes. The broader network of exercise responsiveness genes as revealed by HERITAGE will be defined. The role of FHL1 genotypes on the changes brought about by regular exercise in insulin and glucose metabolism will be highlighted. The usefulness of exercise genomics for applications in public health and physical performance domains will be discussed.

17:15 - 18:45

Oral presentations

OP-ST07 Sports 7

PREDICTION OF CROSS-COUNTRY SKI SEASON PERFORMANCE BASED ON A LINEAR REGRESSION MODEL OF LABORATORY ROLLER SKI CAPACITY AND VO2MAX TEST

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SWISS FEDERAL INSTITUTE OF SPORTS, MAGGLINGEN, SWITZERLAND

Introduction: Cross-country (XC) ski-specific testing is used to support elite athletes regarding their training control as well as to predict performance of competitive ski season (Alsobrook & Heil, 2009, Staib et al., 2000). The purpose of this study was to investigate the relationship between the results of two different laboratory preseason roller ski tests and the XC ski performance of the following season as well as its predictability with a linear regression model.

Methods: In October 2008, 14 male XC skiers of the Swiss National U20 (n=5), U23 (n=2) and Elite (n=7) Distance Ski Team completed two laboratory roller ski tests on a large motor-driven treadmill. Athletes performed a maximal diagonal stride test to measure VO2max. 24 hours later they carried out a maximal double poling capacity test with self selected speed during three stages of eight minutes (5 min at 3° inclination and 3 min at 5° inclination) to establish maximal possible distance. XC ski season performance was ranked by the 4th XC ski distance International Ski Federation (FIS) points list 2008/2009. Spearmen correlation analyses and multiple linear regression models were applied.

Results: Athletes achieved a mean total distance of 5299.3 ± 460.5m, a VO2max of 77.4 ± 4.6 ml/min/kg and mean FIS Points of 59.7 ± 44.1 (range = 1.2 - 130.5). There was a negative correlation between distance and FIS points as well as VO2max and FIS points ($r = -0.832$; $p < 0.001$ and $r = -0.510$; $p = 0.062$, respectively). Age was significantly correlated to FIS points ($r2 = -0.638$; $p = 0.014$). The best linear regression model to predict FIS points was: FIS points = - 0.069 * distance [m] - 2.897 * VO2max [ml/min/kg] + 650.95 with a mean residual of 15.6 ± 9.2 points. Correlation between XC ski performance and the linear regression model was significantly ($r2 = 0.790$, $p < 0.001$).

Discussion and Conclusion

These findings suggest that distance achieved during the capacity test and VO2max are important determinants of the following XC ski season performance. Our linear regression model based on a ski-specific laboratory test is highly correlated with seasonal performance (FIS). We suggest that this model is a useful tool to predict XC ski performance of the following winter season, in spite of the long time frame and possible confounding factors (health problems, ski preparation, race tactic, etc).

References

Alsobrook NG, Heil DP (2009). Eur J Appl Physiol, 105, 633-941.

FIS point rules: http://www.fis-ski.com/data/document/pktrl0809e.pdf

Staib JL, Im J, Caldwell J, Rundell KW (2000). J Strength Cond Res, 14(3), 282-288.

THE RELATIONSHIP BETWEEN OXYGEN EXTRACTION IN THE ARMS AND LEGS TO FORCE AND EXERCISE INTENSITY IN DIAGONAL SKIING

BJÖRKLUND, G., STÖGGL, T., CARLSSON, L., DOVRÉN, L., HOLMBERG, H.C.

MID-SWEDEN UNIVERSITY

Introduction:

Diagonal skiing (DIA) is the main classical cross-country technique used when skiing uphill. Two interesting findings when examining this technique at submaximal workloads have been that 1) O2 extraction was lower in the arms than the legs (Calbet et al., 2005) and 2) lactate oxidation mainly occurred in the leg muscles simultaneously with a high lactate production in the arms (Van Hall et al., 2003). At

present no data have described how these findings may be associated with force generation and the muscle activity measured by electromyography (EMG). Thus, the aims of this study were to examine i) the interaction between physiological and biomechanical variables and ii) the effect of changes in submaximal exercise intensities in diagonal skiing.

Methods:

Eleven elite XC skiers (age 22±3yr; VO2max 69±3 mL/kg/min, obtained during DIA on a treadmill) performed a protocol of 3 min at 90% followed by 6 min at 70% of VO2max DIA. Cardiorespiratory data were collected continuously, along with determination of blood gases and metabolites from a. femoralis, v. femoralis and v. subclavia. Pole and foot forces (Pedar, Mobile 100Hz) and EMG data from six lower and upper body muscles (Noraxon, 3000 Hz) were collected. Changes to variables between 90% and 70% of VO2max were analyzed using paired sample t-tests. Pearson correlations were used to evaluate the relationships between variables. α was set to 0.05.

Results:

The O2 extraction was higher for legs than arms at both exercise intensities ($p<0.05$). The arms O2 extraction decreased more than that of the legs when intensity decreased ($p<0.01$). Leg and pole peak forces and muscle activity increased with intensity ($p<0.01$), whereas the impulses of forces and the ratio between the arm and leg force remained constant. O2 extraction was negatively associated with iEMG activity in % of MVC at both intensities ($r=-0.56$ to -0.91, $p<0.05$ to $p<0.001$). The lactate a-v difference in the arms was associated with the leg impulses at both intensities ($r=-0.53$ and -0.57, $p<0.05$) and with a cycle rate at 70 % of VO2max ($r=0.77$, $p<0.01$).

Discussion:

A decreased relative use of the arms and legs' MVC at a given % of VO2max decreases O2 extraction. The difference in O2 extraction between the arms and legs increased at decreased exercise intensities, mainly due to decreased arm O2 extraction despite similar changes in muscle activity. A high leg impulse decreases lactate occurrence in the arms, regardless of exercise intensity, whereas a low cycle rate is important only during medium intensity DIA.

References:

Calbet, JA, Holmberg HC, Rosdahl H, van Hall G, Jensen-Urstad M, Saltin B. (2005). Why do arms extract less oxygen than legs during exercise? Am J Physiol Regul Integr Comp Physiol, 289, R1448-1458.

Van Hall G, Jensen-Urstad M, Rosdahl H, Holmberg HC, Saltin B, Calbet JA. (2003). Leg and arm lactate and substrate kinetics during exercise. Am J Physiol Endocrinol Metab, 284, E193-205.

ENDURANCE TRAINING AND SPRINT PERFORMANCE IN ELITE JUNIOR CROSS-COUNTRY SKIERS

SANDBAKK, Ø., WELDE, B., HOLMBERG, H.C.

NORTH-TROENDELAG UNIVERSITY COLLEGE, DEP. OF SPORT AND PHYSICAL EDUCATION, ROESTAD, N-7600 LEVANGER, NORWAY

Introduction: Sprint races in modern cross-country (XC) skiing have a shorter racing time, as well as a relatively flat terrain profile, when compared to traditional races. Several studies have thus suggested that maximal speed is the most important performance predictor (e.g. Stöggl et al., 2007). However, the energy release for comparable racing times in other sports is reported to be 70-85% aerobic (Gastin, 2001). The present study therefore investigated the importance of aerobic capacity in sprint performance. The effects of a major change in training stimuli, due to increased emphasis on high-speed moderate intensive endurance training upon sprint performance, maximal O2-uptake (VO2max) and O2-uptake at the ventilatory threshold (VO2VT) were also examined. Methods: Fifteen (10 males and 5 females) elite junior XC skiers (age 17.4±0.5 yr, VO2max 68±6 ml kg-1 min-1) participated in this study. After an eight week baseline training period, all subjects performed a freestyle 1.5 km sprint time-trial on roller skis. In addition, VO2max and VO2VT were measured in the laboratory. Thereafter, an eight week intervention training period was performed. Subjects were split into a control group (CG, n=8) and an intervention group (IG, n=7). The IG increased their training at intensities near the ventilatory threshold, emphasizing level and mixed terrain in order to induce more high-speed training, while the CG continued their traditional polarized training model with 70-80% slow distance training and the remainder as high-intensity interval training. After the intervention training period the sprint race and tests on VO2max and VO2VT, were rerun. Results: Close relationships were found between VO2max ($r = -0.79$, $p<0.01$) and VO2VT ($r = -0.67$, $p<0.01$) and sprint performance. The mean sprint time in all athletes was 3:36±0:19 min in the pre-test. The IG improved sprint performance by 4.5±2.9% ($p<0.01$), VO2max by 3.9±1.9% ($p<0.01$) and VO2VT by 9.9±3.1% ($p<0.01$) from pre- to post-test. No significant changes were found in the CG. Discussion: Our findings suggest an association between sprint performance and aerobic capacity. The improvements in the IG are potentially related to the major change in training stimuli and demonstrate the effects of training at these moderate intensities, as well as the importance of training periodization. Additionally, some of the improvements might have been induced by the high speed rather than the effects of the exercise intensity.

References:

Gastin, P. Energy system interaction and relative contribution during maximal exercise. Sports Med, 31 (10):725-741, 2001.

Stöggl T, Lindinger S, Müller E. Analysis of a simulated sprint competition in classical cross-country skiing. Scand J Med Sci Sports 27:362-372, 2007.

ANTHROPOMETRY AS A PREDICTOR OF SPRINT SKIING PERFORMANCE

ENQVIST, J., HOLMBERG, H.C., STÖGGL, T.,3

1. SWEDISH WINTER SPORTS RESEARCH CENTRE, 2. DEPARTMENT OF SPORT SCIENCE AND KINESIOLOGY,UNIVERSITY OF SALZBURG,SALZBURG,AUSTRIA,3.CHRISTIAN DOPPLER LABORATORY"BIOMECHANICS IN SKIING",SALZBURG,AUSTRIA

Introduction: Anthropometric measurements have been used in sports for finding performance limiting factors (Reilly et al. 2000; Drinkwater et al. 2008). Studies concerning relationships between anthropometric characteristics and performance in XC skiing are limited (Bergh 1987; Larsson and Henriksson-Larsen 2008). The aims of the present study were to examine possible relationships between anthropometric values and sprint skiing performance. Methods: Fourteen elite sprint skiers (mean age 26.4±4.8 yrs; body weight 76.7±5.4kg; body height 180.4±4.6cm; VO2max 5.2±0.5 l•min-1, volunteered to participate in the study. Subjects were examined with DXA to determine body composition and body dimensions (Lunar iDXA, General Electric Company, Madison, USA) and performed two incremental maximal sprint tests using the double poling (DP) and the V2 skating techniques, both performed with roller skis on a treadmill. Results: BMIlean displayed the highest positive relationships towards DP maximal speed ($r=0.80$, $p<0.001$) of all the measured variables. Body weight, total lean mass and total trunk mass were all positively correlated to DP performance ($r=0.57$; $p<0.05$; $r=0.69$, $p<0.01$; $r=0.53$, $p<0.05$). Absolute and relative (%trunk mass) lean mass of the trunk was positively related to DP maximal speed (abs. value $r=0.75$; $p<0.01$; rel. value $r=0.550$, $p<0.05$). The ratio between trunk mass to trunk length and the ratio between trunk mass and the mass of the head and

the neck were positively related to DP maximal speed (r=0.58, p<0.05; r=0.69, p<0.01). None of the measured anthropometrical variables were significantly associated with V2 skating maximal speed. Discussion: The findings in this study agree with Bergh (1987), suggesting that heavier skiers are favoured over all parts of a racing course except for steep uphills. However, this aspect was only valid in the current study in DP. Based on the results, we suggest that skiers should aim to achieve an optimal body composition that has a high percentage of lean mass and low fat mass, with a particular focus on high trunk mass in order to have the proper body composition for DP sprint performance. No anthropometrical predictors of performance were found for the V2 skating technique, suggesting that high maximal speed in that technique is not associated with body morphology. The results suggest that maximal speed in DP and V2 skating is not determined by genetic body dimensions but, particularly for DP, by trainable factors such as total mass, muscle mass and body fat.

Bergh, U. (1987). 'The influence of body mass in cross-country skiing.' Med Sci Sports Exerc 19(4): 324-31.

Drinkwater, E. J., D. B. Pyne, et al. (2008). 'Design and interpretation of anthropometric and fitness testing of basketball players.' Sports Med 38(7): 565-78.

Larsson, P. and K. Henriksson-Larsen (2008). 'Body composition and performance in cross-country skiing.' Int J Sports Med 29(12): 971-5.

Reilly, T., J. Bangsbo, et al. (2000). 'Anthropometric and physiological predispositions for elite soccer.' J Sports Sci 18(9): 669-83.

QUALITY OF GRIP WAXING AND THE FORCE PRODUCTION IN CLASSICAL SKIING

LINNAMO, V., PIIRAINEN, J., VÄHÄSÖYRINKI, P., KOMI, P.

UNIVERSITY OF JYVÄSKYLÄ, VUOKATTI SPORTS INSTITUTE

Introduction: Horizontal force during the kick phase in classical skiing is depending on the GRIP waxing quality of the ski (Komi 1987). The effect of waxing is likely to be even more substantial in uphill skiing with shorter gliding phase. The purpose of the present study was to examine the effects of waxing on the force production and skiing speed in steep uphill classical skiing. In addition it was examined if the waxing properties affect the force production and gliding properties when measured using a novel ski tester.

Methods

7 experienced male skiers (age 21.7 + 5.1 years) skied 11˚ uphill with maximal speed with three different waxing conditions (slippery, medium grip and good grip). Vertical and horizontal forces of both skis and poles were measured with a 12m long force plate system. After the subject had skied over the force plates the ski was attached to a ski tester (Linnamo et al. 2008). The pressure against the force plates was adjusted to be 60% of the body weight (BW) for each subject. In addition, gliding phase was measured with 150% BW. All the measurements took place in indoor Ski Tunnel in Vuokatti Sports Institute.

Results: No major differences were observed in maximal pole forces or in maximal vertical ski forces while the maximal horizontal force during kick phase increased significantly (P<.01) as a result of better grip (slippery 154 + 27 N, medium grip 168 + 53 N, good grip 279 + 66 N). This led to a significant (P<.01) increase in skiing speed (slippery 3.5 + 0.4 m/s, medium grip 4.1 + 0.3 m/s, good grip 4.5 + m/s). Ski tester with 60% BW showed no significant differences in maximal vertical force but maximal horizontal force was significantly higher (P<.05) in good grip condition than in slippery. Horizontal force in the gliding phase was similar in 60% BW between different waxing conditions but with 150% BW it increased significantly (P<.01) from slippery to good grip.

Discussion: This study showed that in a steep uphill (11˚) the horizontal ski forces and skiing speed are remarkably improved with better grip wax conditions. While the skiing speed decreased with slippery waxing the pole forces remained similar in all conditions. This suggests that the horizontal ski force loss cannot be compensated with pole forces when skiing with maximal speed. As expected the maximal skiing speed in the present study (4.5 m/s) was lower than earlier observed (5.6 m/s) in 2.5˚ uphill skiing (Vähäsöyrinki et al 2008). Due to steep uphill the gliding phase was almost non existent thus slowing down the speed. On the other hand even better grip did not affect the gliding properties as was the case with 150% BW in ski simulator. During kicking phase the ski simulator was able to differentiate the horizontal forces between waxing conditions even with only 60% BW.

References

1. Komi P.V. Int J Sport Biomech. 3, 370-381, 1987

2. Linnamo V. et al. Science and Skiing IV, 615-620, 2008

3. Vähäsöyrinki P. et al. Med. Sci. Sports Exerc. 40(6), 1111–1116, 2008

AUTONOMIC RECOVERY DURING HIGH TRAINING LOADS IN FEMALE WORLD-CLASS BIATHLON ATHLETES

EMANUELSEN, E., SANDBAKK, Ø., WELDE, B., MORK, P.J.

NORTH-TROENDELAG UNIVERSITY COLLEGE, NORWAY

INTRODUCTION: World class endurance athletes endure extremely high training loads (frequency, duration and intensity) to achieve a maximal adaptive effect. Incomplete recovery can, however, lead to stress-related side-effects indicated by autonomic imbalance. Heart rate variability (HRV) is an established, noninvasive tool to investigate autonomic balance. At present, there is a lack of information regarding autonomic recovery during hard training periods in elite female endurance athletes. The aim of this present study was to investigate the relation between HRV, training load, and self reported form and fatigue during 3-week of competitive training in world-class female biathlon skiers. METHODS: Seven female world class biathlon skiers (25.6 +- 3.2 yr, 172.3 +- 3.4 cm, 62.5 +- 7.3 kg, 63.8 +- 2.6 ml•min-1•kg-1), all members of the Norwegian biathlon team, including World Cup and World Championship medal winners, participated in the study. HRV, training load, and self reported form and fatigue were recorded on a daily basis during a 3-week competitive training period. HRV was recorded with a Polar Heart Rate Monitor (Polar RS800) each morning for 5 minutes in the supine position. Low intensity (LIT), moderate intensity (MIT), and high intensity (HIT) endurance training were quantified by HR recordings during each training session. Overall training load (TRIMP) was calculated by multiplying the accumulated duration spent in each intensity zone by 1, 2, and 3 for the LIT, MIT and HIT, respectively. Self reported fatigue was scored on a 1 to 6 point scale (1 = no fatigue; 6 = maximal fatigued), and self reported form from a 4 to -4 point scale (4 = extremely good form/light feeling; -4 = extreme bad form/heavy feeling), after every training session. RESULTS: Preliminary analysis revealed no general relation between HRV, TRIMP, and self-reported fatigue and form; however, the –inter-individual variation was substantial. For some athletes, self reports of fatigue and form showed a time lag (1-4 days) to indices autonomic recovery, e.g., indices of improved or reduced form was preceded by reduced or increased HRV. However, variation in form and fatigue was small and the overall impression was that most athletes obtained autonomic recovery even after two succeeding days with competition. DISCUSSION: In general, world-class female biathlon athletes' shows fast autonomic recovery during a hard training and competition period, despite extremely high training loads. An overnight rest seems to be sufficient to recover from two train-

ing sessions and 2-4 hrs daily training. However, the inter-individual variation is substantial and recordings of HRV may be a useful tool for some athletes to monitor autonomic recovery during periods with high training loads.

17:15 - 18:45

Oral presentations

OP-TT02 Training & Testing 2

ACUTE EFFECTS OF A LOW-STRETCHING STATIC PROTOCOL IN THE UPPER BODY FORCE PRODUCTION

PEZARAT-CORREIA, P., LEONE, D., VALAMATOS, M.J., FERNANDES, O.

FACULTY OF HUMAN KINETICS, TECHNICAL UNIVERSITY OF LISBON

Introduction: Previous research has shown that static stretching in the warm-up can decrease several muscular performance variables. For example, Kokkonen et al. (1998) showed that 1 repetition maximum (1RM) of knee flexion and extension was decreased by previous static stretching in some muscle groups of the lower limbs. Fowles et al. (2000) found that maximal voluntary isometric contraction (MVC) and neuromuscular activity of the triceps surae muscle were impaired immediately after repeated static stretching. However, the vast majority of studies have examined only the effects of this stretching routine on lower-body performance. The purpose of this study was to investigate the acute effects of a low-stretching static protocol on maximal isometric force, time to maximal isometric force, rate of force development, and EMG amplitude of main agonist muscles acting on the bench press exercise.

Methods: Twenty participants were randomly allocated into two equivalent groups: no stretch (NS) and static stretch (SS). The MVC on the bench press exercise was measured before and after (immediately, 10 min, 20 min, and 30 min) the static stretching, and nonstretching. The average amplitude of the surface EMG (AvgEMG) of the pectoralis major, long and lateral heads of the triceps brachii was measured during MVC.

Results: There was a significant decrease (p=0.001) in the maximal isometric force from the pre to the post-stretching in the SS group. This decrease was nearly 6%, with an initial average value of 895.7 ± 232.1N and achieving 839.9 ± 213.8N immediately after stretching. In this group, there were no significant differences in the time to maximal isometric force and rate of force development of the three investigated muscles between the pre to the post-stretching. Significant decreases in the AvgEMG of the three muscles were found (p<.05) from the pre to the post-stretching in the SS group. No significant differences were found in the control group (NS) in the force or in the EMG parameters between the pre and the post-stretching. Force did not remain significantly decreased for 30 min in both groups.

Discussion: It appears that an acute bout of static stretching impaired the force output in the pectoralis major and in the long and lateral heads of the triceps brachii. The results suggest an association between stretch-induced changes in muscular activation and maximal isometric force in an earlier phase.

References

Fowles, J., Sale, D., & MacDougall, J. (2000). J Appl Physiol, 89(3), 1179-1188.

Kokkonen, J., Nelson, A.G., & Cornwell, A. (1998). Res Q Exerc Sport, 69(4), 411-415.

EFFECTS OF HEART RATE BASED RECOVERY PERIOD ON HORMONAL AND NEUROMUSCULAR RESPONSES DURING STRENGTH TRAINING

PIIRAINEN, J., NISSILÄ, J., TANSKANEN, M., LINNAMO, V.

UNIVERSITY OF JYVÄSKYLÄ

INTRODUCTION: One of the main objectives in strength training is to increase the amount of muscle mass. To obtain this, anabolic hormones such as testosterone and growth hormone play a key role by increasing protein synthesis (1) and thus causing hypertrophic responses in muscles. Shorter recovery time between sets may cause higher anabolic hormone response (2), but it is unclear what would be the optimal recovery time. Purpose of this study was to evaluate the effect of heart rate based recovery time in hormonal and strength responses among men and woman.

METHODS: Totally 35 male and female subject (male n=21, 31±9 years; female n=14, 32±10 years) participated in this study. Subjects were divided four different groups (FT80M; male study group, controlM; male control, FT80F; female study group, controlF; female control group). Subjects trained three times per week during a seven week training period. The recovery time between the sets in the FT80 group was based on to the heart rate monitor calculation (Polar FT80) while the control group used constant two minute recovery after each set. Basal concentrations of serum total testosterone, growth hormone and cortisol were measured in the beginning (0 week) and after the training session (7 weeks). MVC was measured during 1RM concentric knee extension using knee extensor dynamometer and 10RM loads were measured in gym in the beginning and at the end of the study period.

RESULTS: Recovery times of 50-55 seconds in FT80 group were significantly lower (p<.001) compared to the control group (120 seconds) during the entire period. Testosterone levels increased significantly after the training both in FT80M (22.8±15.3%, p<.001) and FT80F (52.6±23.4%, p<.05), while no significant changes were observed in controls. No significant changes were observed in cortisol levels. Training induced increment in 10RM among FT80M (63.3±33.6%, p<.001) was higher (p<.05) than in controlM (32.7±21.3%, p<.001), while in women the increment was the same between groups (n.s.).

DISCUSSION: These results suggest that individual heart rate based recovery time between the sets may be more optimal in hypertrophy type strength training than standard recovery time. In addition, the results confirm that high intensity strength training increase the anabolic hormone levels (2). Unchanged cortisol levels could suggest that the training did not cause overtraining state and therefore the training intensity was not too strenuous. Also higher 10RM increment among FT80M supports the conclusion about the more optimal training intensity based on the heart rate dependent recovery time.

REFERENCES

1. Kraemer & Mazzetti, 2003, In: Strength and power in sport,2.ed., p.74

2. Bottaro et.al., 2009, J Sci Med Sport, 12(1) 73-78.

BRIEF FORCE PULSES: THE RELATIONSHIP BETWEEN THE PEAK FORCE AND RATE OF FORCE DEVELOPMENT

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Introduction: While the standard strength tests assess the ability to exert high force of sustained maximum isometric and isotonic contractions, a number of important functional movements are based on brief 'force pulses' exerted in either discrete (e.g., postural corrections, pointing) or repetitive movements (walking, running, cycling). Therefore, in addition of requiring high forces that may be either painful or inappropriate for some populations, the standard strength tests may not capture the activation pattern of brief muscular actions. The aim of this study was to evaluate the relationships between the peak force and the rate of force development and relaxation of the brief force pulses (BFP) as candidate for a novel test of neuromuscular function.

Methods

Within the first experiment, 12 participants performed consecutive series of 12 isometric BFP (i.e., a rapid exertion of force to a prescribed level followed by rapid relaxation) targeting 30%, 50% and 70% of MVC both within-day and across days. Individual BFP provided the peak force (PF) and the rates of force development (RFD) and relaxation (RFR). The data from each series were, thereafter, presented on RFD-PF and RFR-PF graphs and the linear regression was assessed. These data were used for the assessment of the within-day and between-day reliability through the intra-class correlation coefficients (ICC) and coefficients of variation (CV%). Within the second experiment, additional 36 participants performed the same test of the knee flexors and extensors, and elbow flexors and extensors. These data served for the general assessment of the RFD-PF and RFR-PF relationship, as well as for a comparison of the variables obtained from different muscle groups.

Results: The first experiment revealed moderate to high within-day reliability (i.e., ICC, range 0.71-0.98; CV%, range 1.8-141.5) as well as moderate to high between-day reliability (i.e., ICC, range 0.58-0.92; CV%, range 4.1-205.8) of the slopes and intercepts of the PF-RFD and PF-RFR relationship. The second experiment revealed similar slopes across the tested groups, while the intercepts were either a relatively low or close to zero. PF-RFD and PF-RFR slopes also moderately correlated. When the data of different muscle groups were related, the slopes moderately correlated, but not the intercepts. Of utmost importance, however, could be exceptionally high correlations.

Discussion: In general, the obtained results suggest both invariant and subject specific force-time profiles of BFP across a range of exerted forces. Of particular importance for future BFP consideration could be an apparent functional importance of the obtained slopes (e.g., discerning 'strong individuals' from 'quick ones'), simplicity (single variable could be the outcome), generalizability across muscle groups, and low level of exerted forces. Therefore, although the external validity remains to be examined, BFP could be a test complementary to the standard strength tests.

INTERSESSION RELIABILITY OF VERTICAL JUMP HEIGHT

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Introduction: The usefulness of measurements in research depends on the extent to which the researcher can rely on data as accurate and meaningful indicators of a behavior. In short, the measurements have to be reliable and valid (Portney and Watkins, 2008).

The vertical countermovement jump (CMJ) is often used as a physical performance test. Researchers routinely seek to enhance the reliability of the CMJ height measurement by having subjects perform a number of jumps, typically 3 or 5, and then using either the best or the average for further analyses. However, studies show that there does not exist a consistent protocol for either the number of jumps or whether to use best of or average (e.g. Bazett-Jones et al., 2008, Vanezis and Lees, 2005, Hamilton, 2008). The purpose of this study is to investigate how the number of jumps and the use of best of or average affect the reliability of the CMJ measurements.

Methods: Twenty-two males (25.2 +/- 1.95 years; 1.81 +/- 0.06 meters; 75.9 +/- 6.38 kg [mean +/- SD]) went through the same programme twice (test and retest) with one week in between. The programme started with five minutes warm-up on a cycle ergometer followed immediately by 10 maximal CMJs on a force plate with one minute rest before each jump. From the data, 4 series of 10 test-retest intraclass correlation coefficients (ICC) were calculated. In two series, A and B, jump height was calculated from the vertical impulse, while jump height in the other two series (C+D) was calculated from flight time. The first ICC in each series (A-D) was calculated from the first jump in test and retest. The second ICC in series A+C was calculated from the average of the two first jumps in test and retest, and in series B+D from the best of the two first jumps in test and retest. The same procedure was used for the third ICC and so on until the tenth ICC where all the 10 jumps from test and retest were used in the ICC calculations.

Results: The series A, which was calculated from the vertical impulse and using the average, gave the following ICCs: 1 jump = 0.74; 2 jumps = 0.82; 3 jumps = 0.86; 10 jumps = 0.91. The series B, C and D had lower ICCs and in that order.

Discussion: The results showed three things: (1) It is more reliable to use vertical impulse than flight time, (2) it is more reliable to use average than best of, and (3) ICC increased steeply through the first three jumps and then just slightly. Therefore, when using the CMJ as a physical performance test, one should use vertical impulse and average of at least 3 jumps.

References

Portney, L, Watkins, M. (2008). Foundation of Clinical Research. Application to Clinical Practice, p. 77, Pearson Prentice Hall, New Jersey.

Bazett-Jones DM, Gibson MH, McBride JM. (2008). J Strength Cond Res, 22(1), p. 25-31.

Vanezis A, Lees AD. (2005). Ergonomics, 48, p. 1594-1603.

Hamilton RT, Shultz SJ, Schmitz RJ, Perrin DH. (2008). J Athl Train, 43(2), p. 144-151.

A COMPARISON OF SUCCESSFUL AND UNSUCCESSFUL ATTEMPTS IN 1 RM BENCH PRESS.

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Introduction: One of the most popular exercises in strength training for the upper body is bench press. The movement consists of different periods. The sticking period is probably the weakest link in the upward movement and is probably the period at which an attempt will be successful or not. In maximal lifting, understanding of the causes of this sticking period and its effects could help to enhance the training methods. Therefore the purpose of this study was to compare the differences in EMG and kinematics between successful and unsuccessful attempts in bench press at 1RM in recreational weight-training athletes with special attention to the sticking period.

Methods: Eleven male subjects (age 21.9 ± 1.8 yr, mass 80.0 ± 11.2 kg, height 1.79 ± 0.08 m.) with at least one year of bench press training experience participated in this study. The subjects performed attempts at 1RM and 1RM + 2.5kg in bench-press where the kinematics: acceleration, velocity, vertical and horizontal height of the bar, and joint angles were measured and calculated using a 3D motion capture system. EMG was measured for the triceps brachii, the anterior deltoid, the sternal portion of the pectoralis major and the biceps brachii and averaged in 3 periods (pre-sticking, sticking and post sticking period). One successful attempt and one unsuccessful attempt were used for analysis.

Results: The subjects lifted at 1RM 97.73 kg ± 16.3 kg, and unsuccessful attempts were on average at 100.23 kg ± 15.8 kg. Significant differences ($p<0.05$) were found between successful and unsuccessful attempts for the following variables: peak acceleration (2.84 vs. 2.41 m/s2); peak velocity in the upward movement (0.24 vs. 0.19 m/s); vertical barbell height (12 vs. 8 cm); moment arm about the elbow joint and joint angles during at the occurrence of minimal velocity. Both attempts showed the same sticking period, but only in 4 of the 11 subjects failure occurred during that period. The main differences in the kinematics occurred during the sticking period, which was caused by the increased mass. The muscle activity showed the same pattern in both attempts and only differed during the start of the upward movement of the lift.

Discussion: The findings of the current study were in line with Elliott et al. (1989). The difference in success or failure in bench press is not related to a specific time period in which velocity reduces (sticking period). Only a few subjects stopped their attempt during the sticking period. The period started (0.2s) and ended (1.0s) at the same time in both attempts. Total failure often happens after new acceleration, i.e., after the sticking period. This indicates that the sticking period is not related to the mechanism that determines if an attempt will be successful or not. Failure occurs in a sticking region, a poor mechanical force region as indicated by the different external moment arm on the elbow.

References

Elliott B, Wilson G, Kerr G. (1989).Med Sci Sports Exerc 21, 450-462.

NEURAL ADAPTATIONS TO ECCENTRIC STRENGTH TRAINING

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Introduction: The ability to voluntarily activate muscles varies between muscle groups with plantar flexors and knee extensors typically showing sub-optimal activation levels despite maximal voluntary effort. While eccentric strength training has been shown to enhance neural activation of these muscle groups, the neural mechanisms are still unknown. For isometric muscle actions improvements in neural activation have been suggested to occur via e.g. increased central motor drive, elevated motoneurone excitability and reduced presynaptic inhibition of Ia-afferents (Aagard et al., 2002). Since dynamic and isometric actions receive different afferent inputs, the adaptive mechanisms with strength training might also differ. The aim of this study was to investigate if, and via what mechanisms, eccentric strength training of the plantar flexor muscles would affect neural activation during maximal voluntary eccentric and concentric muscle actions.

Methods: Eighteen healthy subjects were randomized into an eccentric strength training group (N = 8) or a passive control group (N = 10). Training consisted of 15 sessions of eccentric plantar flexor exercise over a 5-week period. During pre- and post-training testing, subjects were lying prone with knees extended and their right foot attached to a foot plate controlled by an isokinetic torque motor. Dynamic plantar flexor strength was measured and neural activation was calculated using the twitch interpolation technique. The Soleus H-reflex was used to assess presynaptic inhibition and the Soleus V-wave to test for both changes in presynaptic inhibition and changes in supraspinal inputs to the motoneurone pool. H-reflexes, V-waves, M-waves and twitches were evoked as the foot was moved through an angle of 90◦ during passive ankle rotations (Hmax and Mmax) and during maximal voluntary concentric and eccentric plantar flexion (Hsup, V-wave, and Msup).

Results: Training induced significant improvements in plantar flexor strength and tendencies ($p=0.058$) towards an increase in neural activation during both concentric and eccentric maximal voluntary actions. SOL Hmax/Mmax and Hsup/Msup ratios remained unchanged after training, whereas the Soleus V/Msup ratio was increased during both concentric and eccentric contractions after training. No change was seen in the control group for any of the parameters.

Discussion: The enhanced voluntary strength could be attributed partly to an increase in voluntary activation induced by eccentric training. Since the Hmax /Mmax and Hsup/Msup ratios remained unchanged, the increase in activation cannot be ascribed to decreased presynaptic inhibition. The increased V/Msup ratio for both action types indicate, however, that increased voluntary drive from supraspinal centers and modulation in afferents other than Ia:s, may have contributed to such an increase in voluntary activation.

References

Aagard P, Simonsen EB, Andersen JL Magnusson P, Dyhre-Poulsen P. (2002) J Appl Physiol. 92, 2309-18.

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Oral presentations

OP-PH16 Physiology 16

HUMAN SKELETAL MUSCLE INTRAMYOFIBRILLAR GLYCOGEN IS DECREASED AFTER 14 DAYS OF IMMOBILISATION IN YOUNG AND OLD MEN

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Introduction: The high magnification of transmission electron microscope (TEM) allows for a visualisation of skeletal muscle subcellular arrangement of structures and inclusions. This has revealed at least three populations of glycogen in humans (Marchand et al. 2002): (1) a major population located in the intermyofibrillar space surrounding the myofibrils in close proximity to sarcoplasmic reticulum and mitochondria (75-85% of total glycogen). (2) A minor population in the intramyofibrillar space, where glycogen particles are located be-

tween the contractile filaments often in the I-band (10-20% of total glycogen). And (3) also a minor population is located in the subsarcolemmal space just beneath the sarcolemma together with e.g. nuclei, mitochondria, golgi complex and lysosomes (5-20% of total glycogen). Their individual roles in muscle function remain today elusive.

Method

In this study 11 young (24 ± 0.5 years) and 9 old (67 ± 1 years) men had their quadriceps muscle immobilised for 14 days by casting from hip to ankle of one of their legs chosen by random. Muscle biopsies were obtained from vastus lateralis before and after the immobilisation period and muscle specimens were prepared for TEM contrasting in favour of glycogen as described by Marchand et al. (2002). From each of the young and old men 5 were randomly selected for the TEM analysis, which was carried out on images of x40 000 magnifications photographed on systematically randomised locations. All fibres were fibre typed based on mitochondria volume and z-line width. Values are presented as means ± SEM.

Results: There was a strong interaction of immobilisation and subcellular glycogen population ($p < 0.0001$), post hoc analysis showed that immobilisation induced a decrement of intramyofibrillar glycogen by 44 ± 5 % ($p < 0.001$), which was independent of fibre type and age group. In contrast, immobilisation did not change the glycogen content localised in the intermyofibrillar or subsarcolemmal spaces. Thus, immobilisation lowered the intra- to intermyofibrillar glycogen ratio from 0.15 ± 0.01 to 0.07 ± 0.005.

Discussion: This study showed a novel regulation of subcellular glycogen content in human skeletal muscle: a halving in one population and no change in two other populations due to 14 days of immobilisation. This can be interpreted as follows. Firstly, a translocation mechanism of glycogen from the relatively minor store in the intramyofibrillar space to the major intermyofibrillar store exists and is active during immobilisation. Secondly, during the 14 days of immobilisation a degradation of intramyofibrillar glycogen is incompletely replenished suggesting suboptimal glucose uptake signalling.

References

Marchand I, Chorneyko K, Tarnopolsky M, Hamilton S, Shearer J, Potvin J and Graham T. E. (2002). J Appl Physiol, 93, 1598-1607

ELECTROMYOGRAPHIC ACTIVITY DURING WHOLE BODY VIBRATION: MOTION ARTIFACTS OR STRETCH REFLEX RESPONSES?

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Introduction: The validity of electromyographic (EMG) data recorded during whole body vibration (WBV) is discussed controversially. Some authors have suggested filtering because of vibration-induced motion artifacts (Abercromby et al., 2007; Fratini et al., 2008) while others have interpreted the EMG signals as muscular activity caused at least partly by stretch reflexes (Mesters et al., 2002; Rittweger et al., 2003; Kvorning et al., 2006). The aim of this study was to investigate the origin of the EMG signal during WBV using several independent approaches.

Methods: The EMG activity of four leg muscles was determined in ten healthy subjects during WBV. Additionally, to test whether the movement of the cables and electrodes during WBV caused motion artifacts in the EMG signal, special dummy electrodes were developed, thus providing a signal only influenced by motion artifacts, without interference from muscle signals. The three following protocols had the same goal, but used a physiological approach and in addition they were designed to verify whether the characteristics of the EMG signal were consistent with the characteristics of a stretch reflex response. For that purpose, frequency spectra and latencies of mechanically evoked stretch reflexes and of the EMG signal during WBV were evaluated and compared. Moreover, pressure application via a blood pressure cuff served to reduce the amplitude of the short latency component of the stretch reflex, thus allowing an estimation of the stretch reflex contribution to the EMG signal.

Results: The dummy electrodes, designed to monitor motion artifacts, showed almost no activity during WBV. The frequency analyses showed no evidence of motion artifacts. The latencies of the stretch reflex responses evoked by the dorsiflexions in an ankle ergometer were almost identical to the supposed stretch reflex responses during vibration (differences of less than one millisecond). Pressure application significantly reduced the amplitude of both the supposed stretch reflexes during vibration (by 61±17 %, $p<0.001$) and the stretch reflexes in the ankle ergometer (by 56±13 %, $p<0.01$).

Discussion: The present results support the hypothesis of WBV-induced stretch reflexes. Contribution of motion artifacts to the overall EMG activity seems – at least with accurate recording conditions – insignificant. Therefore, we recommend not to filter the EMG signal on account of motion artifacts, due to probable distortion of the information content.

References

Abercromby AF, Amonette WE, Layne CS, McFarlin BK, Hinman MR and Paloski WH. (2007). Med Sci Sports Exerc, 39, 1642-1650.

Fratini A, Cesarelli M, Bifulco P and Romano M. (2008). J Electromyogr Kinesiol.

Kvorning T, Bagger M, Caserotti P and Madsen K. (2006). Eur J Appl Physiol, 96, 615-625.

Mester J, Spitzenpfeil P and Yue Z. (2002). Strength and Power in Sport, 488-501. Blackwell, Oxford.

Rittweger J, Mutschelknauss M and Felsenberg D. (2003). Clin Physiol Funct Imaging, 23, 81-86.

CHANGES IN SINGLE MUSCLE FIBRE SPECIFIC FORCE, MAXIMAL ISOMETRIC QUADRICEPS STRENGTH AND MUSCLE SIZE AFTER 2 WEEKS OF IMMOBILIZATION IN YOUNG AND OLD MEN

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Introduction: Immobilization reduces whole muscle strength, which, apart from changes in the neural and tendinous systems, is mainly caused by changes in the muscular system. This becomes apparent both at, the whole muscle and single muscle fibre level, respectively [1]. However, it is unknown whether immobilization-induced changes at the whole muscle and single fibre level, differs between young and old individuals. In a health perspective, such knowledge is important for designing strategies to counteract the deleterious effects of immobilization, especially in elderly which are frequently exposed to periods of disuse (e.g. due to hospitalization and disease) [2]. Our purpose was to evaluate the effects of lower limb immobilization on whole muscle strength and size, as well as on single muscle fibre specific force in young and old men.

Methods: 11 young (Y: 23.6±0.5 yrs) and 9 old (O: 66.7±1.3 yrs) healthy men with similar activity level underwent 2 wks of randomized unilateral whole-leg casting, with tests prior to and after immobilization. Measurements at the whole muscle level included max isometric knee extensor torque (MVC) and quadriceps anatomical cross-sectional area (QCSA) at the mid femur [3]. Measurements at the single

muscle fibre level (290 fibres in total, biopsies obtained from vastus lateralis) included cross-sectional area (CSA) and max Ca2+-activated force (P0) used to estimate single muscle fibre specific force (SF = P0/CSA) [4]. Subsequently single fibre MHC analysis was performed.

Results: Prior to immobilization: O had lower MVC, QCSA, and MHC IIA SF compared to Y (41.8%, 10.2%, and 15.9%, respectively; p<0.05). After immobilization: MVC decreased to a similar extent in Y (15.4%: 3.04±0.16 to 2.56±0.14 Nm/kg, p<0.05) and O (15.5%: 1.77±0.14 to 1.50±0.15 Nm/kg, p<0.05), QCSA decreased more (p<0.05) in Y (7.2%: 71.97±2.57 to 66.56±1.76 cm2, p<0.05) than O (4.8%: 64.60±1.69 to 61.46±1.33 cm2, p<0.05), SF for MHC I and IIA fibres decreased similarly in Y (21.5%: 66.6±4.5 to 52.3±4.2 kN/m2 and 27.6%: 120.6±5.7 to 87.4±5.4 kN/m2, respectively, p<0.001) and O (14.7%: 60.4±3.0 to 51.6±3.7 kN/m2 and 33.0%: 101.4±7.8 to 67.9±6.3 kN/m2, respectively, p<0.001).

Conclusion

The present data demonstrate that, 2 wks of lower limb immobilization leads to a similar magnitude of muscle strength decrease (~15%) in young and old individuals. The mechanisms by which this occur seem to be age-dependent, as indicated by a larger decrease in quadriceps cross-sectional area in young compared to old subjects. However, as both MHC type I and IIA single muscle fibre specific force decreased to an almost parallel extent in young and old, other changes within the muscular, tendinous and/or neural systems must have contributed to the observed decrease in whole muscle strength.

[1] Trappe et al, J Physiol 557:501-13,2004

[2] Suetta et al, J Appl Physiol 102:942-48,2007

[3] Aagaard et al, J Physiol 534: 613-23,2001

[4] Ørtenblad et al, J Physiol 548: 139-45,2003

LOWER LIMB STRENGTH AND POWER IN RELATION TO MUSCLE CROSS-SECTIONAL AREA IN YOUNG FEMALE BALLET DANCERS AND NON DANCERS

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Female ballet dancers belong to a group of athletes who need to balance aesthetic and performance requirements. In particular, high levels of strength and power are needed to perform effectively, but within the aesthetic constraints of a low body mass and lean physique. To date, however, these seemingly paradoxical requirements have not been examined in ballet dancers. With approval from the University of Strathclyde ethics committee, six female ballet dancers (mean, s) age18.3 years, s = 0.8, body mass 53.5kg, s = 4.7, height 163.8cm, s = 3.6 and seven weight matched physically active female non-dancers age 20.1years, s = 0.9, body mass 55.6kg, s = 6.3, height 163.4cm, s = 6.2, participated in the study. Isokinetic peak torque of the knee extensors at four velocities (60°.s-1, 120°.s-1, 180°.s-1, 360°.s-1) and maximal voluntary isometric contraction (MVC) of the knee extensors and flexors were measured using an isokinetic dynamometer. Surface electromyography (sEMG) signals were obtained during all strength trials from the vastus lateralis (VL) and the biceps femoris (BF) muscles using a 4 electrode linear array. The cross-sectional area (CSA) of the knee extensor muscle group was calculated from ultrasound measurements. Maximal muscle power was estimated from three types of vertical jumps, squat jump (SJ), countermovement jump (CMJ) and a single leg jump, using a force platform. The two tailed unpaired t-test was employed to test for differences between dancers and non-dancers. The criterion for significance was set at p ≤ 0.05. Results show that while both subject groups had similar knee extensor CSA (dancers = 84.5 cm3, s = 6.1, non-dancers = 78.0 cm3, s = 4.9), the dancers produced a 28.7% greater MVC (dancers = 150.4 Nm, s = 23.4, non-dancers = 116.9 Nm, s = 16.2; p≤ 0.01). Similarly, torque values were greater in the dancers compared to non-dancers at all isokinetic velocities, ranging from 19% greater at 60°.s-1 to 4.6% at 360°.s-1 although no results reached significance. Vertical jump data show that dancers produced a greater power output of 27.4% in the SJ (p≤ 0.05) and 15% in the single leg jump (p≤0.05) compared with non-dancers. The root mean square (RMS) and median frequency (MDF) of the sEMG were similar for both groups (RMS: 0.28mV, s = 0.15 and 0.23mV, s = 0.13; MDF: 75.6Hz, s = 4.6 and 71.7Hz, s = 21.6, for dancers and non-dancers respectively), as was antagonist co-activation (dancers = 21.8%, non-dancers = 25.7%). These results suggest that female ballet dancers, in comparison with non dancing controls, are capable of producing high contractile forces from a relatively normal leg muscle mass, thereby maintaining the aesthetic appearance essential for professional level dance. This difference was not however explained by differences in the muscle activation recorded from the sEMG or through differences in antagonistic co-activation.

HIGHER EXERCISE INTENSITY IS LINKED TO CHANGES IN FRONTAL LOBE ACTIVITY

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Introduction: The relationship between physical exercise and the human brain is going to develop as one of the key areas of sports medicine and science. To date the display of neural processes within the brain did require extreme complex and costly methods such as PET and fMRI. While both seem therefore only applicable to a small number of approaches, low resolution brain electromagnetic tomography (LORETA) enables the spatial identification and analysis of brain cortical activity via traditional EEG recordings. This study aimed to identify cortical regions that are affected by physical exercise.

Methods: EEG was recorded before and after running at 50% and 80% V02peak on 18 healthy subjects aged 20-45 years. LORETA analysis of alpha-, beta- and gamma-activity served to statistically identify and display cortical regions that were affected by exercise. While alpha activity generally reflects normal brain function, beta indicates excitatory CNS activity.

Results: After 80% exercise intensity data revealed a temporary increase of alpha-activity (8-12Hz) in the frontal lobe combined with a decrease of beta-activity (12-35) and gamma-activity (35-48Hz) in the occipital and temporal lobes immediately post exercise. Fifteen minutes post exercise the alpha increase vanished whereas beta and gamma changes remained stable. No significant changes were found after exercise intensity at 50% V02peak.

Conclusion: A decrease of brain cortical activity, especially in the higher frequency areas has been postulated before and was interpreted as a decrease of cortical excitability. The fact that this now can be localised in specific regions might enhance the discussion about effects of exercise on brain performance and efficiency.

THE POSSIBLE ROLE OF SEROTONINE, DOPAMINE AND NORADRENALINE IN CENTRAL FATIGUE

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Introduction: The central fatigue hypothesis is based on the assumption that during prolonged exercise the synthesis and metabolism of central monoamines, in particular serotonin (5-HT), dopamine (DA) and noradrenaline (NA), are influenced (Meeusen,2006). It is not known however which neurotransmitter system is responsible for accelerating or delaying the onset of fatigue during prolonged exercise. The influence of ambient temperature on fatigue is well studied, but there are little available data on the combined effects of pharmacological manipulations and environmental heat stress on performance. Therefore, the effects of acute administration of individual 5-HT, DA and NA reuptake inhibitors (5-HTRI, DARI, NARI) on performance and thermoregulation were examined in normal and high ambient temperature.

Methods: In three separate studies, between 8 and 11 healthy trained male cyclists completed four experimental trials (two in 18°C, two in 30°C) in a double blind-randomized crossover design. Subjects ingested either a placebo or drug (Citalopram – 5-HTRI, Reboxetine - NARI, Ritalin - DARI) on the morning of the trial. Subjects cycled for 60 min at 55%Wmax, immediately followed by a time trial to measure performance. Tcore, skin temperature, heart rate, blood pressure, sweat loss, RPE, thermal stress, blood lactate and hormonal data were recorded. The significance level was set at $p<.05$.

Results: 5-HTRI did not induce any significant change in performance in 18 and 30°C ($p=0.518$; $p=0.112$; Roelands,2009). DARI improved performance in high ambient temperature with more than 7min ($p=0.049$; Roelands, 2008a). Core temperatures rose significantly higher compared to placebo ($p=0.05$) while no changes in RPE and thermal stress were found. NARI decreased performance by 3min in 18°C and 8min in 30°C ($p=0.018$;$p=0.007$; Roelands,2008b).

Discussion/Conclusion

5HTRI did not cause a change in exercise capacity, thereby confirming other studies (Meeusen,2001; Strachan,2004;2005) and indicating that the role of 5-HT in the onset of fatigue during prolonged exercise is limited in humans. It appears that DA neurotransmission is capable of increasing motivation and drive to continue exercising, even at very high core temperatures, without changing the subjects' perception of effort and internal temperature. Manipulation of NA neurotransmission, in contrast, has negative effects on performance. In conclusion, most probably central fatigue is caused by a complex interplay between the different neurotransmitters systems, with the most important role for the catecholamines DA and NA on either side of the performance spectrum.

17:15 - 18:45

Oral presentations

OP-PH04 Physiology 4

DIFFERENCES IN INFLAMMATORY PLASMA CYTOKINE RESPONSE FOLLOWING TWO ELITE FEMALE SOCCER GAMES SEPARATED BY 72 H RECOVERY

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SCHOOL OF HEALTH AND MEDICAL SCIENCES

Introduction: Because of the combination of high systemic and local muscular stress in soccer games, a substantial inflammatory response may be expected. The inflammation response leads to the secretion of cytokines by inflammatory cells (Ostrowski et al., 1999). A thorough evaluation of the inflammatory response during female soccer games would provide new insights into physiological alterations occurring during games and the recovery following games. Thus, the aim of the study was to investigate changes in a large battery of pro- and anti-inflammatory cytokines in elite female soccer players following two 90-min games separated by 72 h active or passive recovery.

Methods: Blood samples were taken from 13 players (23±4 yrs 167±6 cm, 64±6 kg, 54±3 ml•kg-1•min-1) before, immediately, 21 h, 45 h, 69 h after the first game and immediately after the second game. Leukocyte count was analyzed together with several plasma pro- and anti-inflammatory cytokines using sandwich immunoassay based protein array system.

Results: Immediately after the first and second game, total leukocytes and neutrophils significantly increased. Increases ($P<0.05$) in pro-inflammatory (IL-12, TNF-a, INF-γ, IL-17), chemokines (MCP-1, IL-8 and MIG), anti-inflammatory (IL-2R, IL-4, IL-5, IL-7, IL-10, IL-13, INF-a) and the mixed cytokine IL-6 occurred immediately after the first game. Leukocyte and cytokine levels were normalized within 21 h. Active recovery (low intensity exercises) did not affect the cytokine response. A dampened cytokine response was observed after the second game as only IL-12, IL-6, MCP-1, IL-8 and MIG increased ($P<0.05$).

Conclusion

An elite female soccer game leads to an immediate mobilization of immune cells and a robust, but transient, increase in plasma concentration of both pro- and anti-inflammatory cytokines. Moreover, IL-12, IL-6, IL-8, MCP-1 and MIG seem to be important immunoregulatory cytokines following soccer games and may play important roles in the recovery processes following soccer games. Active recovery training on the days between the games does not seem to affect the cytokine response. Interestingly, when a second game is played 72 h after the first game a dampened cytokine response occurs. Further investigations should aim to understand the mechanisms behind the dampened cytokine response when two games are separated by 72 h. The finding that one elite female soccer game induces a well-orchestrated pro- and anti-inflammatory cytokine response does not support the use of anti-inflammatory drugs before or after one game in well-trained soccer players. However, the dampening of the cytokine response observed after a second game played 72 hours after the first one might have negative effects, especially during female soccer tournaments where several games are played within few days.

References

Ostrowski K, Rohde T, Asp S, Schjerling P, and Pedersen BK. (1999). J Appl Physiol, 515, 1, 287-291.

BRONCHIAL EPITHELIAL DAMAGE INDUCED BY INTENSE EXERCISE IN RUNNERS

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UNIVERSITY OF PALERMO

Introduction: We previously reported increased neutrophils (PMN) in induced sputum (IS) of nonasthmatic runners at rest and after a Marathon (M) race (Bonsignore et al, 2001) and training-induced mild epithelial damage in a mice model (Chimenti et al, 2007). To further characterize airway cell composition, IS samples were analyzed in experienced endurance runners at rest (R) and after Half Marathon (HM) races.

Methods

IS samples (NaCl 5%) were collected in 9 runners (mean age±SD: 40±4 yr, training volume: 85±26 km/week) at rest (3 days pre-race) and shortly after HM races

held in October, May and November.

Results: Differently from the results in M runners, PMN were unchanged or decreased after HM, while bronchial epithelial cell (BEC) differential counts increased after all HM races (% BEC: October, 0.9±1.2 at R, 27.7±21.5* after HM; May, 1.7±2.6 at R, 33.3±21.8* after HM; November, 1.5±2.6 at R, 22.6±26.9* after HM; *p<0.05 vs R). BEC apoptosis also occurred after all HM races (% apoptotic BEC:October, 0±0 at R, 25.0±7.5* after HM; May, 0±0 at R, 14.7±8.2* after HM; November, 0±0 at R, 11.8±12.6* after HM;*p<0.05 vs R).

Discussion: These data suggest a complex time course of airway cells during endurance exercise, with BEC counts increasing early during exercise, and PMN influx into the airways predominating during prolonged exercise (i.e Marathon). This interpretation is in line with previous data obtained in a mice model (Chimenti et al, 2007), and suggest that PMN influx may be secondary to mild bronchial epithelial damage caused by intense exercise.

References

Bonsignore MR, Morici G, Riccobono L, Insalaco G, Bonanno A, Profita M, Paterno' A, Mirabella A, Vassalle C, Vignola AM. (2001). Am J Physiol: Lung, Cell Mol Physiol, 281, L668-L676.

Chimenti L, Morici G, Paterno A, Bonanno A, Siena L, Licciardi A, Veca M, Guccione W, Macaluso F, Bonsignore G, Bonsignore MR. (2007). Am J Respir Crit Care Med, 175, 442-449.

MUSCLE MORPHOLOGY IN HUMAN NECK AND LEG MUSCLES

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UNIVERSITY OF OSLO

Introduction. It is well established that neck pain can lead to reduced neck function and altered motor control of neck muscles in humans. Even though knowledge of muscle morphology is important to understand muscle function, human neck muscles have been scarcely studied morphologically. In this study we examine a neck flexor muscle (sternocleidomastoideus), a lateral flexor (scalenus medius), an extensor muscle (splenius) and two reference muscles ñ one located in close proximity to the neck muscles (trapezius) and one remotely located (vastus lateralis).This knowledge will help interpreting the functional impact of motor control patterns.

Methods. Muscle autopsies are taken from the sternocleidomastoideus, trapezius, splenius capitis, scalenus medius and the vastus lateralis muscle of so far 8 human subjects 1-3 days post mortem. Subjects were between 18 - 65 years at the time of death. Muscle autopsies are frozen in melting isopentane and serial transverse sectioned in 10µm samples using a cryostat. Fiber type composition and vascularisation are assessed by immunohistochemistry. The fiber type composition is based on the staining patterns of four monoclonal antibodies (BA-D5, SC-71, BF-35 and 6H1) against myosin heavy chain (MyHC)1, MyHC2A and MyHC 2X. Anti-CD-31 (JC70, DAKO) is used for measurement of vascularisation and anti-laminin (Sigma) for visualisation of the basal lamina for measurement of muscle cell cross-sectional areas. MyHC and laminin presence are visualized using immunofluoresence - and CD31 by immunoperoxidase staining. Cell nuclei are stained using haematoxylin.

Analysis. Muscle samples are divided into four quadrants using the laminin staining section and 400 cells in two random quadrants are numbered giving a total of 800 cells blinded for MyHC staining. The fiber identities of these cells are then determined on basis of the four MyHC staining patterns. After inspection of cell integrity the cross sectional area of 80 cells of each fiber type are measured planimetrically using the laminin staining images in the ImageJ software. The microvessel density in muscle samples are assessed by several procedures. First, the number of vessels per area (mm2) and the vessel to fiber ratio in the same area are measured. Also, the number of vessel around single fibers and the number of vessels relative to fiber area are calculated. The data of fiber type composition, fiber cross-sectional area and microvessel density from the different muscles will be compared. Also, separate between- subject analysis will be completed.

Results. Preliminary results of the fiber type composition of the vastus lateralis muscle show that subjects have 33 +/- 10 % type 1, 35 +/- 8 % 2A and 13 +/- 8 % 2X fibers. A large number of hybrid 2A/X fibers were found (18 +/- 9 %) while hybrid fibers containg both MyHC 1 and 2A were scarce (0.8 +/- 0.9 %). Complete results will be presented at the ECCS congress.

COMPARISON OF A TASK-RELATED TEST VERSUS NATIONAL LABOUR INSPECTION AUTHORITY ENDURANCE AND STRENGTH TESTS FOR FIREFIGHTERS AND APPLICANTS

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NORTH TRONDELAG UNIVERSITY COLLEGE

Introduction: Firefighting is physically very demanding (Heimburg et al., 2006). Consequently, the Norwegian Labour Inspection Authority (NLIA) has set minimum requirements to firefighters' physical ability by approving laboratory endurance and strength tests. Other tests with similar physical requirements, f. ex. task-related tests (TR), may be used as substitute. This study therefore compares performance on a TR-test, proposed to be an alternative, with the NLIA-tests.

Methods: Firefighters (24 seniors, 19 young) and 20 young applicants (12 males, 8 females) were dressed up for smoke diving (wearing 23 kg), carried out all tests while scores were recorded.

The TR-test includes following tasks: carrying four cans of 23 kg each 11 m, crawling thru a 2 m long and 60 cm wide tunnel, balancing on a 4 m long and 10 cm wide beam, connecting and disconnecting ten firefighting hoses, twice pulling a fire-hose weighing 32 kg a distance of 58 m including stair climbing, physical work in a heat chamber (>120 °C; moving 20 concrete blocks of 18 kg each alternately up and down a stair). Performance is time to conclusion.

The NLIA endurance test of 8 min of standardised treadmill walking was modified by extending exercise by stepwise increases in intensity to volitional exhaustion, obtaining time to exhaustion and peak VO2 as continuous outcome variables. NLIA strength tests based on number of repetitions were squat-and-raise, push-ups, and horizontal pull-chest-to-bar-test.

Results: VO2 rose linearly by duration of the extended NLIA treadmill-test. Young men walked longer than senior firefighters and female applicants did. Time spent on the TR-test was closely related to performance on the extended NLIA-test, suggesting that VO2-max is important for the performance. A firefighter completing the TR-test in less than 21 min meets requirements of the NLIA treadmill-test. Performance on the TR-test was not closely related to muscle strength beyond a minimum. Male firefighters and applicants performed as well on the TR-test as on the NLIA-tests, but females performed relatively poorer on the TR-test.

Discussion: The close relationship between performance on the TR-test and the NLIA treadmill-test suggests that the TR-test distinguishes well between physically fit and less fit firefighters and applicants; it may thus be a substitute for the NLIA treadmill-test. The relative poorer performance of females on the TR-test may be caused by their lower body mass and muscular strength that may be a disadvantage for performing firefighting-like activities but not for laboratory tests. As long as the NLIA-approved test is the norm, the TR-test may discriminate against females. The TR-test does not seem to challenge muscle strength.

Reference

Heimburg E von, Rasmussen AKR, Medbo JI. (2006). Ergonomics, 49(2), 111–126.

PHYSICAL FITNESS AND PHYSICAL ACTIVITY IN NORWEGIAN HOME GUARD SOLDIERS

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Soldiers' physical fitness is considered to be an important factor in military operations. A desired level of fitness can be developed from sufficient exercise training. Regular Home Guard soldiers (HGS) only undergo military repetition training for about 3-5 days a year. Since HGS primarily live a civilian life, no obligatory military physical training is completed, and the fitness level is not monitored, as opposed to i.e. professional soldiers and recruits. Hence, the aim of this study was to measure fitness and activity level in regular HGS, and identify whether these soldiers were sufficiently fit for military work.

A total of 710 male HGS (age 32.8 ± 4.6 yrs) from five districts have participated in the study. Physical measures were conducted during regular military repetition service, while physical activity has been measured during and after the repetition service. The 20 m Shuttle Run Test (Leger et al., 1988) was conducted to estimate maximal oxygen uptake (VO2max). Percent body fat was estimated from bioimpedance measurements (Quantum II, RJL Systems, USA). Other anthropometric measures were height, weight and waist circumference. Physical activity was measured for 9 consecutive days with SenseWear Pro2 Armband (Bodymedia, USA).

Estimated VO2max was 49.0 ± 6.5 ml/(kg∙min) in the Norwegian HGS. Mean height and weight were 180.1 ± 6.7 cm and 85.0 ± 13.3 kg, and mean BMI was 26.2 ± 3.7. Thirteen percent of the soldiers were obese (BMI ≥ 30). Mean waist circumference were 94.5 ± 10.1 cm, and 20 % of the soldiers had an waist circumference of ≥ 102 cm. Mean percent body fat was 19,4 ± 5,8. Physical activity estimated with the Armband monitor during regular weekdays showed a mean energy consumption of 3479 ± 787 kcal/day. The HGS walked 10.202 ± 4336 steps/day, and had a mean METS value of 1.77 ± 0.40. Physical activity level during weekends was slightly lower than during weekdays, while the activity level during repetition service was generally similar to regular weekdays.

Norwegian HGS had lower aerobic fitness compared to Norwegian male cadets, recruits and soldiers in Special Forces. This finding was expected since i.e. the HGS are somewhat older than other groups of Norwegian soldiers, and the fact that no fitness demands exist for regular HGS. However, for military personnel, police, firefighters etc a minimum acceptable aerobic fitness level has been claimed to be 43 ml/(kg∙min) (Shephard, 1991). If this criterion is taken into account, 80 % of the HGS met the minimum acceptable level. About 13 % of the HGS were overweight in terms of BMI, while 20 % had a high waist circumference. Hence, several HGS had an increased risk of i.e. cardio-vascular diseases. Most HGS met the recommendation of a minimum of 30 minutes/day of moderate intensity physical activity. However, more physical activity with high intensity could be recommended.

Leger LA et al. J Sports Sci. 6(2): 93 – 101, 1988

Shephard RJ. Sports Med. 12(2): 94 – 109, 1991

"VO2 SLOW COMPONENT" ABOLISHED AFTER WARM UP WITH APNEAS

SCHAGATAY, E., BJÖRKLUND, G.,3, RYDH, F.

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Introduction: The cause of the "VO2 slow component" (SC), i.e. a slow further rise in VO2 during continued intense exercise after the fast rise during the initial 2-3 min, has not been settled, but suggested candidates are alterations in fibre recruitment, muscle acidosis, and muscle temperature. Spleen contraction during exercise (Laub et al.,1993) or apnea (Schagatay et al., 2001) is known to inject a stored supply of red blood cells into circulation. Our aim was to study if the SC could be related to an increase in hemogloin concentration (Hb) caused by spleen contraction, a factor never studied in this context before. The elevated Hb could facilitate oxygen delivery to the active muscles and increase buffering.

Methods

Eight male cyclists with mean (SD) age 26(4) years, height 183 (7) cm and weight 76(9) kg performed two identical protocols separated by two days, consisting of 3 high intensive periods on a cycle ergometer at 90% for 3 min, spaced by 6 min periods of 70% of VO2max. Series were preceded by 10 min warmup at 50% of VO2max. After warmup one series contained 3 maximal effort apneas preceeded by 1 min of hyperventilation to maximize duration. In the test without apneas, subjects rested sitting after warm-up. Respiratory parameters (AMIS 2001) and heart rate (Polar S610) were recorded continuously. Spleen diameter (ultrasonic imaging), venous Hb (Hemocue) and Lactate (Biosen 5140) were measured before and after warmup, after apneas or rest, and after the exercise.

Results: Mean (SD) duration increased across apnea 1 - 3 from 109(17) s to 142(17) s ($P<0.01$). This increase is typical of repeated apneas and considered to reflect spleen contraction (Schagatay et al 2001). After the protocol with apneas the spleen volume was smaller and venous Hb higher than after rest without apneas (both $p<0.05$). At this point before exercise lactate was also higher after apneas (1.42 versus 0.96 mmol *L-1; $P<0.01$). In the series without apneas, VO2 increased by 50 ml/min between the high intensity period 1 and 2 ($P<0.05$), and by 60 ml/min between period 1 and 3 ($P< 0.01$), but no change was observed in the exercise test preceded by apneas.

Conclusions

We concluded that in the maximal work test preceded by apneas, the spleen contraction and resulting Hb elevation abolished the slow component. Thus VO2 max will not be reached before the blood-boosting spleen contraction is induced, which takes several minutes during work alone, but is pre-triggered when work is preceded by apneas. Also lactate or other effects of apnea and/or hyperventilation may affect the peak VO2, which calls for further study.

References

Laub M, Hvid-Jacobsen K,.Hovind P, Kanstrup IL, Christensen NJ and Nielsen SL. (1993). Spleen emptying and venous hematocrit in humans during exercise. J Appl Physiol, 74, 1024-1026.

Schagatay E, Andersson JPA, Hallén M and Pålsson B. (2001). Selected contribution; Role of spleen emptying in prolonging apneas in humans. J Appl Physiol, 90, 1623-1629.

Friday, June 26th, 2009

08:30 - 10:00

Invited symposia

IS-BM05 Complex systems in sport

COMPLEX SYSTEMS AND PHYSIOLOGICAL TESTING

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Introduction: The complex systems approach to physiological testing in sport science is offering a chance to cope with the holistic nature of the organism, giving information about the synergies of the main systems interacting during the exercise and their fractal characteristics (Goldberger, 1997). The aim of this study is to introduce the basis of the complex approach to physiological testing and summarize the main results obtained by the application of the Kaunas Load system in the evaluation of overtraining and exercise induced fatigue and failure.

Methods: A formalized model and its software, involving the main holistic systems -muscles and bones (periphery system), cardiovascular (supplying system), and regulatory system, has been used for the evaluation of trained individuals (Vainoras, 1997). A system of parameters has been elaborated to reveal the behaviour and dynamics of the organism during the application of cycle ergometer workloads and during the recovery period. The parameters are based on the synchronous registration of standard 12 lead ECG, arterial blood pleasure and developed power. In the model some new and a set of nonlinear parameters –evaluation of sample entropy and evaluations with the help of Hankel matrix are determined. The sensitivity to the model and its parameters to special features as overtraining, fatigue and failure induced by exercise have been checked and will be discussed.

Results: The system and some evaluated parameters (Ad) have shown its sensitivity to special features as overtraining effects on the organism. The evaluation of sample entropy and Hankel matrix analysis, as measures of organism complexity, revealed its sensitivity in the study of the fatigue and failure during cycle ergometer endurance exercise. Both indicators decrease with the development of load, returning to their initial values during the recovery period. A special hallmark is the increase in complexity observed before the failure point is reached.

Discussion: The model and its software have been proven as being useful in the investigation of the human organism complexity during exercise and have shown its sensitivity to some syndromes of complex nature as overtraining and fatigue and failure induced by exercise. The computerized system is used for research purposes and is being applied to Lithuanian sportsman -from early ages up to the Olympic team members. The main advantages of the system are related with the fast diagnostic and early detection of abnormal reactions to workload exposures that are not possible through the more classical physiological testing Methods: References

Goldberger A. (1996). Non-linear dynamics for clinicians: chaos theory, fractals and complexity at the bedside. Lancet. 11,347(9011),1312-1314.

Vainoras A., Gargasas L., Ruseckas R. et al..Computerized exercise electrocardiogram analysis system "Kaunas-Load". (1997) In "Electrocardiology'97" Bratislava, Slovak R., 253-256.

MANIPULATION OF TASK CONSTRAINTS AND REPLICA SYMMETRY BREAKING. AN ANALYSIS OF NOVEL PATTERN FORMATION

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UNIVERSITY SS ¨CYRIL AND METHODIUS¨

Introduction: According to Sternberg & Lubart (1999) creativity is defined as an activity of generating novel and appropriate (i.e. satisfying goal constraints) products. Within the constraints –led framework on action formation a generative system can be defined as a set of task, personal and environmental constraints coupled to the action degrees of freedom of the performer. Using the tools of glassy state physics which is a paradigm of complexity it may be shown how it can be used for capturing the most prominent features of creative behavior in sport movements, that is, the generation of novel appropriate patterns.

Methods: An experiment of hitting actions was conducted. 6 participants unfamiliar with the task of hitting were asked to strike a frontally positioned heavy bag from various positions and under varying energy of hand-target impact demands. The hand trajectories of performers were analyzed by calculating the static and dynamic overlaps of the upper limb configurations and the probability distribution function of the overlaps as well as by constructing a hierarchy of movement configuration states. In line with the glassy physics the hierarchical states were interpreted as order parameters.

Results: Manipulation of task constraints brought about emergence of novel and appropriate behaviors of performers. Initially rare, nucleating movement variations grew, stabilized and dissolute as the task constraints were varied. The probability distribution function of the overlaps showed effects of replica symmetry breaking by showing peaks other than that of a zero overlap values. The hierarchical structure also changed as a function of the task constraints. The dynamic overlaps showed an ergodicity breaking behavior and divergence of the relaxation time. The relative entropy exhibited non-analytic behavior at the points of emergence of novel configurations.

Discussion: The investigation showed how the manipulation of task constraints leads to formation of novel and appropriate movement configurations which is a hallmark of creative behavior. The results generalized the previous findings (Hristovski, Davids & Araújo, 2006). By making task constraints more released or stringent movement configurations evolved from boxing to karate and dance-like patterns. The glassy state modeling seems an appropriate mathematical model of a generative system of sport movements.

References

Hristovski, R., Davids, K., & Araújo, D. (2006). Affordance – controlled bifurcations of action patterns in martial arts. Nonlinear Dynamics, Psychology and Life Sciences, 4, 409- 440.

Sternberg, R.J.& Lubart,T.I. (1999). The Concept of Creativity: Prospects and paradigms. In: R. Sternberg (Ed.). Handbook of Creativity. Cambridge University Press, 3-16.

A COMPLEX SYSTEMS APPROACH TO THE STUDY OF SPORT GAMES

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This talk will address ball games in sport based on the evidence that in such complex systems multiple causes produce multiple effects. Following this perspective, for the study of a match, more than analysing it by decomposing the game in multiple variables, it may be beneficial the search for a synthesis of it, by identifying the collective variables that describe and explain the game, in a way simpler than the game itself. Therefore, the search for patterns, as well as transitions among them, the identification of attractors and repellors that change over time, as well as the identification of patterns of collective interactions, may suit this endeavour. We will illustrate these ideas using studies conducted in team ball sports such as rugby and football, showing the same dynamical proprieties both at an individual and at a collective level.

08:30 - 10:00

Oral presentations

OP-PS03 Psychology 3

THE EFFECT OF THE COACHES' PROFESSIONAL EXPERIENCE ON ATTITUDES AND ACHIEVEMNT GOALS IN YOUTH SPORT

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Coaches are believed to have an important role in shaping the quality of the youhg athletes experiences. Scholars suggest that the climate fostered by the coach can influence the athletes' achievement orientations and moral attitudes. The purpose of this study is to examine the effects of the soccer youth coaches' professional experience on (a) the style of communication in competition, analysed through the Coach Behaviour Assessment System (CBAS); (b) the sport attitudes (Sports Attitudes Questionnaire/SAQ), and achievement goals (Task and Ego Orientations in Sport Questionnaire/TEOSQ), (c) the perceptions of coaches' behaviour (CBAS perception questionnaire), as expressed by the athletes.

Methods: Six soccer coaches were observed. Three of the coaches were experient, the other three were in their first coaching season. Eighteen games were vídeo recorded, three for each coach. The recordings were analysed and registered in the CBAS sheet. The athletes of the observed teams (n=106, 55 playing for an experient coach and 51 playing for an unexperient one; mean age 14,8 years, SD±0.95), fullfilled the portuguese versions of SAQ, TEOSQ and CBAS. To analyze the effects of professional experience

on dependent variables t-test and ANOVA were performed.

Results and Discussion: All the observed coaches stressed positive reinforcement, technical instruction, and general communication, although with major individual differences which don't discriminate the coaches by level of professional experience. In TEOSQ no effect from professional experience on dimensions task and ego was found. In SAQ significant effects were found on convention and commitment, the athletes from experient coaches showing higher scores, but no effects were found on cheating and gamesmanship. In CBAS the athletes from experient coaches'teams perceive better tactical instructions but less afective support and encouragement than their peers playing for unexperient coaches.

Conclusions: The level of professional experience of the coach seems to have no effect on the type of communication in competition, on achievement goals, and on negative sport attitudes. These effects are identified on positive sport attitudes and in the CBAS itens related to support, reinforcement and tactical instruction. The lack of a pattern of results discriminating experient from unexperient soccer coaches suggests that future programs to foster sportpersonship among coaches must be individualized.

References: Chi, L., & Duda, J. (1995). Multi-sample confirmatory factor analysis of the Task and Ego Orientation

in Sport Questionnaire. Research Quart., 66, 2, 91-98.

Lee, M.J. (1996). Young people, sport and ethics: an examination of fairplay in youth sport.

Unpublished report submitted to the Sports Council Research Unit, London.

Smith, R., Smoll, F., & Hunt, E. (1977). A system for the behavioral assessment of athletic coaches.

Research Quart., 48, 401-407.

STABILITY OF GOAL ORIENTATIONS IN DUTCH TALENTED ADOLESCENT FIELD HOCKEY PLAYERS

ELFERINK-GEMSER, M.T., STARKES, J., MEDIC, N., VISSCHER, C.

UNIVERSITY OF GRONINGEN, UMCG; MCMASTER UNIVERSITY, CANADA; THE UNIVERSITY OF WESTERN AUSTRALIA, AUSTRALIA

Introduction: The adolescent period is characterized by extreme changes in virtually every aspect of an athlete's performance. To ultimately meet international performance standards later on, athletes have to develop their physical, physiological, and technical performance characteristics fairly quickly (Elferink-Gemser et al., 2006; 2007). However, is this also the case for psychological variables such as motivation? With the importance of goal orientations in understanding achievement motivation in sport and exercise being widely recognized by researchers (e.g., Duda, 1992), the purpose of this study was to examine how stable task and ego orientation are for talented adolescent athletes.

Methods

Participants were 41 (20 male and 21 female; mean age 14.0, sd 1.1 at the first measurement) talented field hockey players who filled in the Task and Ego Orientation in Sport Questionnaire (TEOSQ; Duda and Nicholls, 1992) four times over a 4-year period.

Results: Intra-class coefficients, the percentage of participants with differences that were within ±1 range of the mean test scores (proportion of agreement test), repeated measures MANOVA, and paired sample t-test scores showed that players' goal orientations changed marginally from year-to-year and across a period of 4 years ($p>.05$).

Discussion: In order to persevere in a highly competitive environment, talented athletes require high levels of both task and ego orientation (Van Yperen and Duda, 1999). The results in the present study confirm relatively high scores on task as well as ego orientation for both male and female talented field hockey players, with task orientation scores comparable to other studies and ego orientation scores higher (Duda and Whitehead, 1998). The results also show that motivational orientations appear to be highly stable over a 4-year period and independent of one's relative skill or physical maturity. An implication of these findings is that one measure of an athlete's goal orientations during adolescence appears to be sufficient. Whether these results are specific for Dutch field hockey players or whether they can be generalized to other populations of adolescent talented athletes has to be investigated. The results are unique because this is one of the first studies to apply a longitudinal design examining the stability of talented adolescent athletes' goal orientations over a period of four years.

Duda JL (1992). Motivation in sport and exercise, 57-91. Champaign, IL: Human Kinetics.

Duda JL, Nicholls JG (1992). Journal of Educational Psychology, 84, 1-10.

Duda JL, Whitehead J (1998). Advances in sport and exercise psychology measurement, 21-48. Morgantown, WV: Fitness Information Technology.

Elferink-Gemser MT et al (2007). Journal of Sports Sciences, 25, 481-489.

Elferink-Gemser, MT et al. (2006). British Journal of Sports Medicine 40, 340-345.

Van Yperen NW, Duda JL (1999). Scandinavian Journal of Medicine and Science in Sports, 9, 358-364.

MOTIVATION AND GOALKEEPING: COPING WITH MEDIA REPORTING OF SAVES AND FAILURES

KRISTIANSEN, E., ROBERTS, G.C.

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Introduction: As a part of a larger study investigating media reporting as a stressor for elite athletes, this study investigated the experience of professional football goalkeepers when coping with media reports on their performance. The sport media typically presents sporting images by exaggerating the spectacular, inventing and focusing on rivalries, and manufacturing reasons why we should pay attention to different sports events. The media tells the story the way those who benefit from cultural commitments to competition, productivity, and material success. One popular theme is the success theme, but lurking behind every success story is someone else's failure. Within the football environment, goalkeeping failures often become the media reason why one team wins and another loses. The media does not cover learning, progress, or enjoyment (mastery motivation), rather they cover winning, great individual performance, and success and failure. In motivational terms, the media is attracted to ego involving criteria, where players are compared and lionised if successful, or demonised if they fail. From research, we know that to keep people motivated and performing optimally, we need to be mastery involved and concentrate on one's own performance and successes (e.g., Roberts, 2001). However, the media only looks ego involving criteria of what is success and failure. How do the goalkeepers relate to these conflicting views of what is success and failure in their role as an elite athlete?

Methods: We used qualitative, in-depth, semi-structured interviews conducted in 2008. Participants were 3 goalkeepers in the Norwegian elite division. The goalkeepers were all asked about the goalkeeper's importance on the team and the framing of goalkeepers in the news media. The interviews were transcribed verbatim and coded with main categories and associated sub-categories before analysis.

Results and Discussion: The goalkeepers considered the news media to overestimate the importance football players should place on the game, and disagreed with the framing of matches in the media. As a result, they used many different coping strategies to cope with what they considered to be the interfering media attention. Avoidance of the media representatives and of reading what was written was a coping strategy frequently mentioned. All three goalkeepers claimed that they did not have the faintest idea what the media wrote about them. In addition, they had also instructed family and friends not to tell them, especially before games. Instead, they tried to focus on their tasks in the game and rely on their own/or the coach's evaluation of it later (mastery motivation involvement with vigilance coping). The goalkeepers understood why the media was interested in them, but they disagreed with the framing of their performances in order to sell newspapers.

References

Roberts, G.C. (2001). Advances in motivation in sport and exercise. Champaign, IL: Human Kinetics.

GOAL ORIENTATION, MOTIVATIONAL CLIMATE, BASIC PSYCHOLOGICAL NEEDS AND PERCEIVED COMPETENCE AMONG YOUNG ELITE CROSS-COUNTRY SKIERS: A LONGITUDINAL STUDY

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In recent years, a major framework for understanding motivation in sport and physical activity contexts stems from achievement goal theory (Nicholls, 1989) and self- determination theory (Deci & Ryan, 1985). This research has found a relationship between motivational climate and goal orientation and basic psychological needs and self- determined motivation. This research has also confirmed the relationship between perceived self referenced competence and task orientation and self- determined motivation. Even though it has been a widely support for these relationships is it more unclear how perceived normative competence will influence both ego orientation and self- determined motivation in a sport context. Since the major part of the research has included samples where different kind of groups has been measured (e.g. team sports), and very few demonstrates the changes over time with a longitudinal design, is it also unclear how motivation variables will change over time for competitors in individual sports.

The aim of this study was to examine the relationship between perceived motivational climate, achievement goal orientations, basic psychological needs and perceived competence in a longitudinal study. The participants were 38 young elite cross-country skiers between 17 and 23 years old. Inclusion criteria were that all had to compete at a high level, and they had to represent the same sport, cross-country skiing. The participants were asked to respond on a two-part questionnaire. The first part requested demographic information including gender, age, sport specific age, perceived sport level and totally numbers of training hours present season. The second part were formed to measure motivational variables such as goal orientation (POSQ), motivational climate (PMCSQ), situational motivation (SIMS), basic psychological needs (BPNES) and perceived competence (PCS). Data were collected five times; pre- season, three times

during the competitive season, and after the main goal for the season (e.g. the World Championship). Preliminary analyses revealed that there were fluctuations in motivation during the season while perception of competence remained relatively stable. Results and conclusion will be discussed and suggestions regarding motivational issues will be presented.

References:

- Deci EL & Ryan RM (1985). Intrinsic motivation and self-determination in human behaviour. New York: Plenum Press.
- Nicholls JG (1989). The competitive ethos and democratic education. Cambridge, MA: Harvard University Press.

ARE ATHLETES BURNING OUT WITH PASSION?

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Introduction: Feeling passionate about sport may help athletes cope with the demands of excessive training needed for a number of years to become successful at the elite level. Passion is thereby seen as a strong motivational force towards an attractive activity, possibly to the extent that it becomes an integral part of the athlete's identity (Vallerand et al., 2003). The concept of passion has been divided into two forms: harmonious and obsessive. Although feeling passionate about sport seems important from a motivational perspective, it may increase the risk for burnout, which is a negative consequence blamed partly on too much training and inadequate recovery (Gustafsson et al., 2008). The question voiced in this study is whether the risk for burnout is equally between harmoniously and obsessively passionate athletes.

Methods: Participants were 94 female and 164 male competitive athletes from 21 sports. Passion was measured with the Passion scale (Vallerand et al. 2003) and burnout with the Athlete Burnout Questionnaire (Raedeke & Smith, 2001). A one-way MANOVA was performed to investigate potential differences between athletes categorized according to type of passion (i.e., Harmonious vs. Obsessive) in the level of burnout.

Results: A significant main multivariate effect was found: $F(7, 250) = 4.85$, $p < .0001$. Follow-up analyses, using a Bonferroni adjusted alpha level of .007, showed significantly higher burnout scores in the Obsessive passion group than in the Harmonious group: Emotional/physical exhaustion, $F(1, 256) = 9.90$, $p = .002$; Reduced sense of accomplishment, $F(1, 256) = 18.39$, $p < .001$; and Devaluation of sport participation, $F(1, 256) = 14.12$, $p < .001$.

Discussion: These findings strengthen the assumption that even though passion may indeed be a vital part of elite sport; athletes scoring high on obsessive passion may be at greater risk for developing burnout than more harmoniously passionate athletes. One possible explanation is that obsessive passion induces a more rigid form of persistence (Vallerand et al., 2003). Interpreted positively, persistence may increase the athletes' chance of reaching their full potential during the competitive season, but rigid persistence can increase the risk for negative outcomes such as the overtraining syndrome and burnout.

References

Gustafsson H, Hassmén P, Kenttä G, & Johansson M. (2008). A qualitative analysis of burnout in elite Swedish athletes. Psychology of Sport & Exercise, 9, 800-816.

Raedeke TD, & Smith A L (2001). Development and preliminary validation of an athlete burnout measure. Journal of Sport and Exercise Psychology, 23, 281-306.

Vallerand RJ, Blanchard M, Mageau GA, Koestner R, Ratelle C, Léonard M, Gagné M, & Marsolais J. (2003). Les passions de l'âme: On the obsessive and harmonious passion. Journal of Personality and Social Psychology, 85, 756-767.

CAN TEENAGE FEMALE ATHLETES LIGHT UP IN A HIGH COMPETITIVE SPORT CONTEXT WITHOUT BURNING OUT?

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UNIVERSITÉ CLAUDE BERNARD LYON 1

Introduction: Female athletes have reported higher levels of competitive state anxiety and train anxiety (Mellalieu, Hanton & Fletcher, 2006) and it has been suggested that they are more susceptible to burnout than their male counterparts (Abrahamson, 1997). Gender differences seem an important psychological parameter as they are likely to influence the quality of the sport experience of high level athletes. The purpose of the current study was to examine whether differences in the anxiety and self-confidence of female and male athletes influence the quality of their sport experience. Based on previous research findings it was hypothesized that female athletes would report higher anxiety and lower self-confidence than male athletes and consequently would also experience lower vitality and higher burnout symptoms.

Method: A sample of 790 French handball players (418 males and 372 females) participated in this study. They trained an average of 11.29 hours a week (SD = 3.6). Their average age was 15.82 years (SD = .97). These athletes completed a questionnaire in April 2007 (T1), November 2007 (T2) and April 2008 (T3), during which we measured: (a) anxiety and self-confidence (EEAC; Cury, Sarrazin, Pérès & Famose, 1999), (b) subjective vitality (SSV; Ryan & Frederick, 1997), and (c) athlete burnout (ABQ; Raedeke & Smith, 2001).

Results: One-way MANOVAs and post hoc tests Newman Keuls were conducted to examine the differences between boys and girls on (1) anxiety, self-confidence, and vitality; and (2) on the three dimensions of burnout. Findings indicated that (1) females had higher scores of cognitive anxiety and lower scores of self confidence and vitality at T1 (Wilks' λ = .90, $F(4, 451) = 11.71$, $p < .001$), at T2 (Wilks' λ = .87, $F(4, 460) = 17.41$, $p < .001$) and at T3 (Wilks' λ = .85, $F(4, 361) = 15.01$, $p < .001$). Females also had higher scores of somatic anxiety at T1 (Wilks' λ = .90, $F(4, 451) = 11.71$, $p < .001$). (2) Males had higher scores of exhaustion at T1 (Wilks' λ = .98, $F(3, 451) = 3.71$, $p < .05$). Females had higher scores of reduced accomplishment at T2 (Wilks' λ = .96, $F(3, 460) = 6.76$, $p < .001$) and at T3 (Wilks' λ = .94, $F(3, 361) = 7.27$, $p < .001$).

Discussion: Based on the current findings, young elite female handball players felt more anxious and reported lower accomplishment, while males were more self-confident. However, male athletes reported higher physical and emotional exhaustion in April 2007. Current findings can't allow us to affirm that females experience higher levels of burnout in a high competitive context. Further investigations are needed.

References

Mellalieu, S. D., Hanton, S., & Fletcher, D. (2006). A competitive anxiety review: recent directions in sport psychology research. In S. Hanton & S. D. Mellalieu (Eds). Litterature reviews in sport psychology. Nova science.

Raedeke, T. D. (1997). Is athlete burnout more than just stress? A sport commitment perspective. Journal of Sport and Exercise Psychology, 19, 396-417.

08:30 - 10:00

Oral presentations

OP-CO01 Coaching

DROPOUT RATE AND DROPOUT REASONS IN TALENTED TRACK AND FIELD ATHLETES, A 25 YEAR STUDY

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Introduction: Research explains the early dropout of young talents in sport as a combination of different inner and outer conditions such as individual talent and personal development, athletic progress, motivation, priorities of interest and influence from the social environment (Ames, 1992; Molinero et al., 2006). The aim of the present study was to identify the total dropout rate and dropout reasons in a group of talented track and field athletes from 1975 - 2000. Methods: 202 males and 98 females aged 16 ±2 years took part in this study. The questionnaires designed in 1975 were sent together with informed consent and local ethics committee approval in September 1975 to 320 participants. The questionnaires designed for the 1983 study and the 1989 study were administered in November 1983, and October 1989. All questionnaires were administrated in written form. The participants who did not respond to the first request were sent a new questionnaire two months after, and those who did not answer the second questionnaire were sent a new and last questionnaire after two months from the second questionnaire. Those who did not answer after the third trial were considered as dropped out. In 1989, 10 athletes were chosen for interviews. In 2000, 24 athletes who had continued their athletic career after 1989 were interviewed. The interviews were conducted in the period between September 1989 and October 1989 for the 1989 study, and from February 2000 to November 2000 for the 2000 study. The interviews varied in time from 60 - 120 minutes. Combining the analysis of the quantitative data and qualitative data was to bring forward more refined and valid information about the variables involved in the processes of dropping out from competitive sport at an early age. A chi-square test was administrated to test the difference between males and females dropping out and to test the most significant reasons influencing the athletes' decision to drop out from competing in track and field. Results: The dropout rate was highest when the athletes were 17 years old. Females were clearly dropping out more than males ($p < 0.05$). Injuries, school demands, and lack of motivation were highly notable reasons to why relatively many athletes dropped out at an early age. Various dropout reasons were important over the life of the study, and differed at the different stages. Conclusion: Today elite sport requires increasingly harder training, tough competitions and constant expectancies of good results. Young talented athletes who fail to meet these requirements may chose to drop out of competitive sport at an early age.

References:

Ames, C. Achievement goals, motivational climate, and motivational processes. In: Roberts, G. C. (ed). Motivation in Sport and Exercise. Champaign, IL: Human Kinetics, 1992: 161-176.

Cervello, E. M., Eduardo, M., Esearti, A., Guzman, J. F. Youth sport dropout from the achievement goal theory. Psicothema 2007: 19 (1): 65-71.

WHAT PEDAGOGICAL/DIDACTICAL COMPETENCE DO SPORTS COACHES HAVE?

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HEALTH AND SOCIETY

Introduction: It is said that "good leaders are not made, they are born." Attempts to study the truth of this in sports have been made in different studies by e.g. Jones et al (1). In one study they adopted a life-story approach to the coaches´ construction of their knowledge.

The aim of this study is to examine the pedagogical/didactic competence of sports coaches in the planning, execution and evaluation of their training.

Methods: The sample in the study consists of 14 coaches in different sports areas. Their disciples can all be classified as elite, from international to regional level. The coaches´ education levels range from "auto didactical" to academic studies.

The methods used are Stimulated Record (SR) and in-depth interviews. All 14 were observed and interviewed using SR and four coaches were interviewed 1-2 months after the SR study. Lyle (2) claims that "…SR is a valuable tool for investigating cognitive processes, although care has to be taken with research designs."

The didactic competence of the coaches was determined using a three-level model and compared with their experiences in coaching, their experiences as athletes and their education levels.

Results: The results show that there is little correlation between the coaches' experience and didactic skill; that experience as athletes is negative for didactic competence; and that the level of the coached athletes is irrelevant. Four of the coaches reached level three in the model. These four were the only ones to have an academic pedagogical education. This is so far the only positive correlation found between coaching competence and education, coaching experience or skill as an athlete. It seems that tradition, social context and former experiences as athletes have more impact on the coaches´ competence than education within sports.

Discussion: The results will be discussed from an educational point of view. Suggestions to enhance the didactic competence of coaches will be made.

References

(1) Jones, R. L. (2003). Sport, Education and Society, Vol. 8, No. 2, pp. 213-229.

(2) Lyle, J. (2003). British Educational Journal, Vol. 29. No, pp. 861-878.

THE NORMALIZATION OF EMOTIONAL ABUSE IN SPORT: AN ECOLOGICAL GROOMING MODEL

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One of the greatest risks to emotional abuse in sport is the inability of the victim to recognize the abuse as problematic (Stirling & Kerr, 2007). The term grooming is used to refer to the normalizing or legitimizing of actions or conditions with the victim and/or within the

broader social community, that enable the offender to abuse a victim with minimal resistance and/or repercussion (van Dam, 2001). Relative to abuse prevention, an understanding of the various grooming factors is particularly important because these factors can bring about the appearance of co-operation from the victim, making acts of abuse seem to be consensual (Fasting & Brackenridge, 2005). To-date, different types of grooming have been examined relative to the coercion of individuals to sexual abuse or sexual molestation (Leberg, 1997). Exploration of the grooming of other maltreatments remains to be examined. The purpose of this study, therefore, was to determine what factors contribute to the grooming of athletes to emotional abuse. Data for the present study were gleaned from a series of previous interviews on athletes' experiences of emotional abuse. Interview transcriptions were included in the present study if the athlete had reported experiences of emotional abuse in the coach-athlete relationship, expressed some degree of present or past acquiescence to his/her emotionally abusive experiences, and was able to articulate various sources of influence perceived to affect his/her acquiescence. As such, data used in the present study included the interviews of 30 elite athletes (male, n= 8; female, n=22) between the ages from 18-25 years. All athletes competed at the national/international level, and a variety of sports were represented. Collective analysis of the data was conducted using open, axial, and selective coding techniques. Interview data were interpreted to suggest that athletes are embedded in and affected by a social context that is comprised of a range of micro to macro spheres of influence. Athletes reflected on influences that were perceived to affect the normalization of their emotionally abusive experiences, including intra-relational, inter-relational, community, organisational, and cultural grooming factors. Based on the study findings an ecological grooming model is proposed. Comparisons are made with the sexual abuse literature, and recommendations are posed for prevention and future research.

Brackenridge, C. & Fasting, K. (2005). The grooming process in sport: Narratives of sexual harassment and abuse. Auto/Biography, 13, 33-52.

Leberg, E. (1997). Understanding Child Molesters: Taking Charge. CA: Sage Publications.

Stirling, A. & Kerr, G. (2007). Elite female swimmers' experiences of emotional abuse across time. Journal of Emotional Abuse, 7, 4, 89-113.

van Dam, C. (2001). Identifying Child Molesters: Preventing Child Sexual Abuse by Recognizing the Patterns of the Offender. NY: The Hawthorn Press.

THE CONSTRUCTION AND EFFECTIVENESS OF OFFENSIVE PLAYS IN BASKETBALL BY USING SYSTEMATIC OBSERVATION

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INEFC, LLLEIDA.

Introduction: In the field of sports research there is a growing need for the rigorous collection of data that provide empirical evidence about the complex reality they refer to. Key aspects in this regard include the presence of regularities that are not detectable through visual inference or traditional methods of data analysis, the lack of standard observation instruments and the priority need to develop powerful, computerized coding systems, all of which must form part of an approach that is suitable for natural and habitual contexts (Morris & Burwitz, 1989).

Method: The observational methodology used had the rigor and flexibility needed to study the episodes and different configurations of play just as they occurred. Ten ACB basketball games (First Spanish Division) were recorded and the instrument used was the Match Vision Studio software (Perea, Alday & Castellano, 2004), which has enabled us to set up code and category of the situation space of the players in the two previous moves to the basket. The approach here concerns the way in which temporal patterns are able to reveal those aspects of social interaction that are not immediately observable, and considers that every interactive flow is governed by behavioural structures of varying stability that can be visualized by detecting hidden temporal patterns such as T-patterns. These temporal patterns can be detected by means of the powerful algorithm of the THEME software, developed by Magnusson (1996).

Results: A total of 3478 T-patterns were detected in the subset of games won. Given the temporal patterns detected and the results obtained in the lag sequential analysis we then turned our attention to those co-occurrences in which there was a disparity according to game performance.

Discussion: The results show that it is possible to identify stable spatial structures that provide information about areas and positions of players more effective in launching basket and an imbalance that provide more effective for completion and the type of termination of attack that can be applied for the improvement of sports training and initiation. The selection of the data has been grouped into different criteria.

Key words: T- Patterns, microanalysis, team sports, observation device, systematic observation.

References

Magnusson, M.S. (1996). Hidden real-time patterns in intra- and inter-individual behavior. European Journal of Psychological Assessment, 12 (2), 112-123.

Morris, A ; Burwitz,L (1989), Anticipation and movement strategies in elite soccer goalkeepers at penalty kicks (Anticipation et strategies de mouvement chez des gardiens de but de football d' elite lors des penalties). L, Journal of Sports Sciences 1989: Vol. e Issue 1. p. 79-80

Perea, A., Alday, L., & Castellano, J. (2004). Software para la observación deportiva Match Vision Studio. III Congreso Vasco del Deporte. Socialización y Deporte / Kirolaren III Euskal Biltzarra. Sozializazioa era Virola. Vitoria.

COMPETENCIES OF FLEMISH JUDOCOACHES A AND B

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Introduction: The European parliament has been approving the European Qualification Structure (EQS). This structure consists of competencies of all jobs, classified in numbered levels (OECD, 2005). A job, described in a qualification profile, will give visible expectations and can be objectively evaluated. This study aims to determine the competencies of the judocoach and create a framework in which he/she works.

Method: The Delphi method was used to personally interview Flemish qualified judo experts (in different rounds) to ensure that all coaching views/opinions were recorded and that finally a consensus could be reached (Linstone and Turoff, 2002).

In the first round the core tasks were determined with their associated "knowledge", "skills" and "attitudes". In the second round, all listed items were located by the experts in a particular (Flemish) trainer level. From their, in the final round, the competencies (combination of

knowledge, skills and attitudes) were composed (using COMET, 2003) and proposed to the experts for confirmation in a consensus meeting.

Results: There were eight competencies formed, namely: communication, tracking changes, feedback, individualization, working pedagogic and didactic, set up plans, working in team and technical and tactical instructions. These competencies are further developed as the coach reached a higher level. The competencies are completed differently depending on the context (main task) in which the coach works. The judocoach B has six main tasks including competitive training, recreational training, coaching, mentor/supporting, information gathering and talent detection. The judocoach A has seven main tasks including competitive training, recreational training, coaching, mentor/supporting, information gathering, talent detection and sports leadership.

During the study it became apparent that the experts lacked a (higher) coachlevel to put 5 specific tasks in: competitive targeted training, coaching, supporting, information gathering and sports leadership.

Discussion/conclusion: A framework was formed combining age and level of judokas with the level of the coach (with their respective determined tasks and competencies): the young talented judoka should grow and develop on the national level with a judocoach B, whilst a judocoach A has to lead him to a high international competitive level and finally the judocoach of higher level will guide the international top athlete (World Championships, Olympics)

References:

COMET, the competency modeling toolkit, Copyright, Open University Holland, Onderwijs-technologisch Expertisecentrum, 2003 (http://www.open.ou.nlast/comet_eindversie/index.htm)

OECD, The definition and selection of key competencies, 27 may 2005 (http://www.oecd.org/edu/statistics/deseco)

Linstone, H., Turoff, M., (2002), Introduction, The Delphi method: techniques and applications, pp 3 – 12, (http://wwwis.njit.edu/pubs/delphibook)

PARENTAL INVOLVEMENT IN YOUTH SPORT.

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Introduction: Parent engagement in youth sport settings has important implications for their children's experiences. Parents often assume the role of motivator, facilitator, even coach in their children's participation and success in sport. In these roles parents can provide economical, emotional, and physical support. Parents can also create stress for the young athlete in the interest of excellence and success. The purpose of this study was to examine young athletes' perceived parental involvement in Finland and Austria.

Methods

The Parental Involvement in Sport Questionnaire (PISQ) (Hinic, 2004; Wuerth & al., 2002) was administrated to 116 Finnish and to 133 Austrian young athletes ages ranging from nine to eleven years old. The instrument measured athletes' perceptions of their parents' behavior utilizing four sub-scales: Active Involvement (AI), Praise and Understanding (PU), Directive Behavior (DB) and Pressure (P).

Results: The young athletes perceived higher pressure (P) from their fathers than from their mothers. Similarly, boys perceived higher pressure (P) from their fathers and mothers than girls. Young athletes from Finland perceived higher parental active involvement (AI) and pressure (P) than athletes from Austria. On the other hand, athletes from Austria perceived higher praise and understanding (PU) than Finnish athletes.

Discussion: Parental involvment, seen as parental support and parental pressure are interesting forces in children's sport participation. This study demonstrated both gender and cultural differences for parental involvement, which need to be recognized and utilized in coach education. In addition, these findings should be disseminated to parents to initiate a discussion with parents.

References

Wuerth, S., Lee, M. J., Alfremann, D. (2002). Parental involvement and athletes´career in youth sport. Psychology of Sport and Exercise 5, 21–33.

Hinic, H. (2004). Psykologiska, sociala och motivationsfaktorer inom ungdomsfotbollen. Stockholms universitet: psykologiska institutionen.

08:30 - 10:00

Oral presentations

OP-HF02 Health and Fitness 2

IS VIGOROUS PHYSICAL ACTIVITY A RISK FACTOR FOR PELVIC ORGAN PROLAPSE?

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Objective: The aim of the present study was to investigate former and current physical activity as risk factors for pelvic organ prolapse (POP).

Background: It has been estimated that half of women who have given birth lose pelvic floor support, resulting in some degree of POP, and of these 10-20% will seek medical attention. To date there is scant knowledge about the impact of vigorous physical activity and the presence of POP. However high intensity training is believed to be a risk factor (1), due to its similarity to heavy physical work. Searches on PubMed revealed two studies presenting data on physical activity, and they not reveal any association between physical activity and POP.

Methods: Forty-nine women with POP were age and parity matched one-to-one with 49 controls. Questionnaire and interview covered current and former physical activity (exercise type, frequency, duration and intensity), socioeconomic status, heavy work, medical history and family history. Current and former exercise volume was estimated by multiplying exercise duration with frequency. Intensive exercise was defined as physical activity implying sweating or heavy breathing, and current exercise was classified as either high or low intensity.

Continuous data were analysed with Wilcoxon paired test, and McNemars test was used for categorical data. A special cox regression model was used to fit a conditional logistic regression procedure for one – to- one matched case-control studies

Results: Differences between cases and controls were found in former and current exercise volume of high intensity, family history of pelvic floor disorders, socioeconomic status, heavy work and body mass index (BMI) ($p<0.05$). However, the positive association with present high intensity and former exercise volume as well as family history of pelvic floor disorders found in the unadjusted analyses disappeared after adjustment for socioeconomic status and BMI. Low intensity exercise was not found to be associated with POP. When combining being a current high intensity exerciser and former exerciser, the test of trend was borderline significant ($p=0.06$). Women who never had been active compared to women who always had been exercisers had an odds ratio of 5.4 (95% CI 1.4-20.9) for POP.

Discussion: The present study revealed significantly higher former exercise volume among women with POP than age and parity matched controls. Hence, being a former exerciser is not associated with POP, and the result of this study does not support the hypothesis that vigorous physical activity is a risk factor for POP (1). The lower exercise volume of high intensity activities among women with POP compared to the controls may be due to the fact that POP is bothersome doing these kinds of activities.

Conclusion: Being a former exerciser is not associated with POP

Reference List

(1) DeLancey JO, Low LK, Miller JM, Patel DA, Tumbarello JA. Graphic integration of causal factors of pelvic floor disorders: an integrated life span model. Am.J.Obstet.Gynecol. 2008.

IDENTIFYING PHYSICALLY INACTIVE YOUNG ADULTS IN FINLAND

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Introduction: There is a large part of the Finnish population that does not exercise enough to maintain their health. The reasons for the insignificant (amount of) physical activity have not been specified in detail in the previous studies. The inability to involve physically inactive people, making decisions and planning exercise programs without knowing the needs and behaviours of physically inactive people, have created limitations in previous research, physical activity politics, and sport organisations. The factors that have been recognised at the whole population level do not necessarily apply to smaller inactive groups. The purpose of this study is to examine what types of inactive adult groups can be recognised based on the health behaviour research data (AVTK) of Social Institution of Finland (KELA).

Methods

The data is based on the responses to the health behaviour survey of Social Institution of Finland in 2007. There were 3245 respondents of 15-64-year-old Finns. Approximately 37% (1163) of the respondents were classified as physically inactive. Through explorative factor analysis, nine factors were created: smoking, mental health problems, illnesses, alcohol, health advancement, working time, age, education, and eating habits. Cluster analysis was used to create 14 groups of physically inactive people who differ from each other based on their way of life and health. A group of young men (n=104/9,0%) and a group of young women (n=138/11,9%) were selected as subjects in this study.

Results: The average age in the young men's (n=104/9,0%) group was 22,5 years, the majority were unmarried, studying or working, and free from illnesses or disabilities that would affect their job or exercise ability. They drank more coffee, ate more sweats and fast food, and used more alcohol than average. They were not very interested in enhancing their health.

The average age in the young women's group (n=138/11,9%) was 33,4 years. The majority were married or lived together with their partner, most of these were students, and free from illnesses or disabilities that would affect their job or exercise ability. The members of the group took care of their health by eating healthy foods, not smoking, and using less alcohol than average. They often show willingness to change their lifestyle habits and are interested in enhancing their health.

Discussion: In the present study novel groups of physically inactive people were recognised. In these groups of young men and young women physical inactivity was not linked with socioeconomic status but with the lifestyle as a whole. Physical inactivity is already part of the adolescents' culture in Finland. Recognising the specific characters of the groups enables better exercise intervention planning for physically inactive people.

GROWTH AND BONE STRENGTH IN OVERWEIGHT AND OBESE PERI-PUBERTAL BOYS AND GIRLS

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Introduction: A high body mass index (BMI) has been associated with a high skeletal dimension and mass in children, adolescents and young adults, and with a low rate of bone loss during aging. A previous study with overweight/obese pre-pubertal children observed, however, an insufficient femoral neck strength adaptation to an advanced general skeletal growth and development [1]. The purpose of the present investigation was, also, to analyze the influence of overweight and obesity in growth and strength of the skeleton, but in peripubertal boys and girls.

Methods: Participants were 263 adolescents, 141girls (11.1±0.1 yrs) and 122 boys (11.7±0.2 yrs), of which 235 with normal body mass index (17.0±2.1 kg/m2), and 28 overweight or obese (22.5±2.2 kg/m2) in accordance with Cole et al. (2000) criteria. The anthropometric measures obtained were: height and weight, biepicondylar humerus and biepicondylar femur breadths, and skinfolds. Fat mass percentage was estimated using the mean value of the Slaughter et al. (1988) and Lohman (1986) equations. Evaluation of radius and tibia bone speed of sound was conducted with quantitative ultrasound (Sunlight Omnisense) and physical activity (PA) with the Actigraph accelerometer (GT1M) over seven days. The outcome PA variables were the number of minutes the child engaged in activity of different intensities. Cut points of 100 and 1952 counts/min represent sedentary, light, and moderate plus vigorous PA. Pubertal maturation was assessed according secondary sex characteristics (Tanner, 1962). Bone age was determined by the Tanner-Whitehouse III Method. Energy and calcium intake were calculated from a semi-quantitative Food Frequency Questionnaire assessing regular intake of a wide set of typical Portuguese foods. ANOVA was used to analyze the main and interaction effects of BMI (with vs. without overweight/obesity) and gender (male vs. female) on the variables described.

Results: It was observed a BMI main effect with overweight/obese participants demonstrating a higher skeletal dimension in lower limbs, namely, in bi epicondylar femur breadth (9.1±0.5 vs. 8.5±0.6 cm), but a lower bone speed of sound at the tibia (3612±102 vs. 3666±113 m/s), than children without overweight/obesity. It was not observed any BMI effect in upper limbs region or in any other variable. It was also not observed any interaction between BMI and gender (boys vs. girls).

Conclusion: Overweight/obesity during peri-pubertal years appears to promote wide bones at the lower limbs region but not with adequate bone density, elasticity and internal architecture expressed by the tibia speed of sound.

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1. Baptista, F., et al.. Bone Growth and Development in Over Weighted and Obese Pre-pubertal Children. Medicine & Science in Sports & Exercise, 2008: 40, 5, S241.

EFFECTS OF MENSTRUAL CYCLE PHASE ON CARDIOPULMONARY RESPONSES IN HEALTHY ACTIVE AND INACTIVE FEMALES

MOHSENZADEH, M.

UNIVERSITY

INTRODUCTION: The effects of menstrual cycle hormones on exercise performance have been studied previously however, the results remain controversial.Particularly,the respiratory responses to progressive intensity exercise have shown inconsistent results.It is thought that the higher levels of circulating estrogen and progesterone are the stimuli for altered ventilatory responses during the luteal phase of the cycle(Sheel et al.,2004).Our purpose is to compare the cardiorespiraory responses to progressive intensity exercise during the early follicular and luteal phases of the menstrual cycle.

METHODS: Twenty healthy active and inactive Females volunteered to participate in the study.Recruitment will be limited to young(19-25 yrs)healthy female subjects with no known history of cardiopulmonary,metabolic or musculoskeletal disease who willingly volunteer to participate in this study.Furthermore, the subjects provided a blood sample for the determination of luteal phase.Progesterone and Gnadotropic concentrations were measured with commercially available double-antibody radioimmunoassay kits.An incremental graded exercise test(Hopkins et al.,2000)was conducted on a cycle ergometer in the early follicular and luteal of menstrual phase.Pulmonary function and expired gas analysis will be determined with the aid of an automated gas analyzer(model k4b2).All testing was conducted in accordance with the guidelines of the American College of Sports Medicine(2000)in the measurement center of Olympic committee.

RESULT: A repeated measures ANOVA was used to determine differences in minute ventilation,maximal heart rate, oxygen pulse,maximal oxygen uptake,respiratory exchange ratio during the follicular and luteal phases.

There are no differences in maximal exercise test variables between the follicular and luteal phases of the menstrual cycle of active and inactive females.

DISCUSSION: There were no significant differences in gas exchange variables during a maximal graded exercise test between the follicular and luteal phases of the menstrual cycle in active and inactive females. It is thought that the higher levels of circulating estrogen and progesterone are the stimuli for altered ventilatory responses during the luteal phase of the cycle(William et al.,1997).These results provide additional data suggesting that the timing of the menstrual cycle phase may not be as critical as once thought when designing future exercise ventilation studies.

REFERENCES

Williams & Wilkins.(2000).Guidelines of Exercise Testing and Prescription,4,57-90.

Beidleman,Beth A.,Paul B.Rock,Stephen R.Muza,Charles S.Fulco,Vincent A.Forte,Jr.,and Allen Cymerman. (1999).J Appl Physiol.86(5):1519–1526.

Hopkins, Susan R.,Rebecca C.Barker,Tom D.Brutsaert,Timothy P. Gavin, Pauline Entin, Ivan M. Olfert, Susan Veisel, and Peter D. Wagner.(2000).J Appl Physiol 89:721–730.

William, T.J. & Krahenbuhl, G.S.(1997).Medicine Science Sports Exercise, 29:1609-1618.

Sheel et al.(2004) Sports Med.34:567-579.

HEALTH RISK BEHAVIOURS AMONG ADOLESCENT GIRLS: A QUESTIONNAIRE VS AN INTERVIEW

AFRICA, E.

STELLENBOSCH UNIVERSITY

HEALTH RISK BEHAVIOURS AMONG ADOLESCENT GIRLS: A QUESTIONNAIRE VS AN INTERVIEW

Eileen K Africa

Department of Sport Science, Stellenbosch University, Stellenbosch, South Africa

ABSTRACT

Adolescent girls grapple with life's complexities and there is considerable evidence supporting the idea that health risk behaviours amongst adolescents is mounting. These risk behaviours include violence, cigarette smoking, alcohol and drug use and abuse, irresponsible sexual behaviours, unhealthy eating behaviours and physical inactivity. The study population consisted of adolescent girls in Grade 12 (N=37) who was selected from a previously disadvantaged high school in the Worcester region, South Africa. The main aim of this article was to investigate whether the respondents were honest in completing a questionnaire based on the Youth Risk Behaviour Survey (YRBS). The reliability and validity of the YRBS has been proven by many researchers. A Kappa statistic was computed for each item of the questionnaire. Kappas ranged from 23.6% to 90.5% with a mean of 60%. For the reason that adolescents tend to purposefully under- or over report health risk behaviours because of the sensitivity of the questions, the need existed to determine if the results of a timeline follow-back (TLFB) procedure through interviews correspond with the results of the questionnaire that the participants completed. The TLFB was based on the alcohol timeline follow-back assessment method by Sobell and Sobell (1992). A TLFB procedure was used as an alternative method to determine if the respondents answered the YRBS in all honesty. In most cases the results show that the respondents were honest in answering the questionnaires and no statistical differences were detected. Seeing that there are no significant differences, the TLFB procedure can be useful in the understanding of youth risk behaviour.

KEYWORDS: Health Risk Behaviours, Adolescent Girls, Timeline Follow-Back Procedure, Youth Risk Behaviour Survey

Sobell, L.C., and Sobell, M.B. Timeline Follow-back: A technique for assessing self-reported alcohol consumption (1992). In: Litten, R.Z., and Allen, J.P., eds. Measuring Alcohol Consumption: Psychosocial and Biological Methods. Totowa, NJ: Humana Press, 1992. pp. 41–72.

FOLLOW UP OF AN ACTIVE WALKING PROGRAM ON SEDENTARY AND MODERATELY OBESE POSTMENOPAUSAL WOMEN

GARNIER, S., GAUBERT, I., AUNEAU, G., MAURIEGE, P.

UNIVERSITÉ PAUL SABATIER

Introduction: Participation to an active walking program help postmenopausal women to feel better (Lean and Lara, 2002) and improve their metabolic risk profile (Roussel et al 2009). However, these beneficial effects at long term have not been fully investigated. Aims of the present study were to examine the impact of an active walking program on cardiorespiratory fitness (CRF), body composition, two years after the intervention and to compare women who continued to walk and those who did not.

Methods: 181 initially sedentary and moderately obese (mean body mass index, BMI = 30 +- 4 kg/m2) postmenopausal women (60 +- 5 yrs-old) were subjected to a 4-month endurance-training program consisting in 3 sessions/week of 45 min-walking, at 60 % of their heart rate reserve.

During this period, women were asked to maintain their usual dietary habits.

Following measurements were performed before and and after the 4-month aerobic exercise program as well as two years later, on 95 women:

- height, weight (body mass index, BMI, calculated) and waist circumference were measured using standardized procedures,
- fat mass and fat-free mass were determined by electrical bioimpedance (Bodystat 1500),
- CRF was assessed by the 2-km walking test (Laukkanen et al., 1993) and estimated VO2max was then calculated,

41 women completed a short follow up questionnaire by phone (QP) and 45 gave up.

Results: Although 91/136 women at least continued to walk after the 4-month aerobic exercise program, this ratio was lower in the QP than in the other group (72/95 vs 19/41; p <.001). The mean weakly frequency declared was 2 and the mean subjected intensity reported was considered as «very moderate». Two years later, the decrease in body weight (p=.0001), BMI (p<.05), fat mass (p<.0001) and fitness (p<.0001) was maintained in the 95 women who completed the whole. However, the decrease in the waist circumference was not maintained (NS). Among the 95 women, those who continued to walk maintained their body weight (p=.003), BMI (p<.01), fat mass (p <.0001) and fitness (p<.0001) but not their girth waist (P=.07). These improvements did not persist on the women who stopped walking (NS) except for the level of fitness (p<.0001).

Discussion: This program let the wide majority of the initially sedentary women engage themselves on the long term in this type of physical activity and maintain benefits on health. On the opposite the women who stopped walking could not maintain all these ameliorations.

References

Laukkanen RMT, Kukkonen-Harjula TK, Oja P, Pasanen ME, Vuori IM. Scand J Med Sci Sports, 1993, 3: 267-272.

Lean MEJ and Lara J. In: Progress in Obesity Research, Medeiros-Nito G, Halpern A & Bouchard C eds, vol 9, 2003, p 859-865

Roussel M., Garnier S., Lemoine S., Gaubert I., Bessodès L., Auneau G. and Mauriège P. Menopause, 2008 dec, in press.

08:30 - 10:00

Invited symposia

IS-SS09 Friluftsliv - the impact of outdoor education on environmental concerns

OUT-OF-DOORS AND ENCOUNTERS WITH NATURE FOR SUSTAINABLE DEVELOPMENT?

SANDELL, K.

KARLSTAD UNIVERSITY

There are various reasons for being out-of-doors and outdoor recreation as a pedagogical tool could be used for a number of aims. A recurrent theme never the less is to use outdoor education for the need of environmental concerns and try to develop environmental engagement also involving behaviour and life style issues in line with the strive for sustainable development. It is here reasonable to believe that what type of outdoor recreation activity and what pedagogical perspectives and motives that are used will be linked to different effects with regard to environmental engagement. In this presentation a mind map over outdoor recreation and environmental concerns and their interlinkages will be proposed. A division of three different types of outdoor recreation with regard to landscape relations (different 'outdoor recreation styles') and a division of two main types of motives (as a means for different purposes, and as an intrinsic value) is made. Also a division with regard to the depth of environmental concerns in terms of: nature protection, nature conservation, environmental control and sustainable development are put forward. A special focus in the presentation is the role of encounters with nature in outdoor education for sustainable development. Here six aspects of encounters with nature that describe the potential of outdoor education in a pluralistic environmental and sustainable education will be presented: I An experience-based meaning of nature; II A relational ethical perspective; III Adding a fourth perspective to sustainable development; IV Human ecology in practice; V Sensing the quality of a simple life; and VI Democracy, identity and dwelling. These six aspects have been established partly with the aid of three case practices carried out in a multidisciplinary research program in Sweden: i.e. outdoor education with roots in traditional biology excursions, outdoor activities as a means for children's development, and outdoor education connected to the radical outdoor movement.

FRILUFTSLIV AND OUTDOOR EDUCATION - THE DEEP ECOLOGICAL APPROACH

BREIVIK, G.

NORWEGIAN SCHOOL OF SPORT SCIENCES

The purpose of the paper is to present and discuss the idea of "friluftsliv" or outdoor life by focusing on Arne Næss, his ideas about deep ecology and the consequences these ideas have for outdoor education. The Norwegian word "friluftsliv" was coined by among others, Henrik Ibsen, and means literally "life in the open air". But the word is connected to certain deeper ideas and ideals (Reed & Rothenberg, 1993). Friluftsliv involves certain values, a certain ideology of being outdoors with simple means, being free and close to nature and with a

deep respect for the wilderness. Nature is thus considered a central part of the Norwegian national identity (Breivik, 1989; Reed & Rothenberg, 1993).

In the beginning of the 20th century and up towards the 1960s sport and friluftsliv seemed to flourish side by side. But old tensions surfaced in the 1960s and 1970s when elite sport developed into professional show sport. Leading friluftsliv ideologists, like Faarlund and Kvaløy Sætereng, felt that friluftsliv and sport had to split completely and that friluftsliv was the only acceptable physical culture from an ecological point of view (Faarlund, 1993; Kvaløy Sætereng, 1993).

In the 1960s and 1970s study programs in friluftsliv were developed at various university colleges in Norway. The theoretical foundation for the new area of study was sought in the new ecological disciplines and especially "deep ecology". It was Arne Næss (1912-2009) who in 1973 coined the term "deep ecology" (Næss, 1973). Later he developed his own systematic philosophical version of deep ecology called "ecosophy T" (Næss, 1990) From an ecophilosophical platform he sketched how friluftsliv should be experienced and practiced (Næss, 1994).

The paper will be divided into five sections. The first section gives a short presentation of Arne Næss, his life and philosophy. The second section examines relevant aspects of ecosophy T, especially the ideas of "self-realization" and of "increasing identification with all beings". In the third section Arne Næss' thoughts on outdoor life are presented and discussed, especially the ideas of "hilaritas" and "many-sidedness". The last section will give examples of Arne Næss' own practice and discuss implications of his philosophy for outdoor education.

References

Breivik, G. (1989) "F.Nansen and the Norwegian outdoor life tradition." Scand. J. Sports Sci. 11(1):9-14

Faarlund,N. (1993) "A Way Home". In: Reed & Rothenberg (1993:157-169)

Kvaløy Sætereng, S.(1993) "Complexity and Time: Breaking the Pyramid's Reign". In Reed & Rothenberg (1993:116-146)

Næss, A. (1973) "The shallow and the deep, long-range ecology movements" Inquiry 16, 95-100

Næss, A. (1990) Ecology, Community and Lifestyle. Cambridge University Press, Cambridge.

Næss, A. (1994) "Notes on the Philosophy of Sport". Manuscript.

Reed, P. & Rothenberg, D.(eds.) (1993) Wisdom in the Open Air. University of Minnesota Press. Minneapolis.

NARRATIVES ON NATURE, NURTURE AND CULTURE

GURHOLT, K.P.

NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: Autobiographies of prominent environmentalists show that their early lives have been rich in personal experiences of nature (Milton, 2002). Notably, the early childhood experiences of philosopher and climber Arne Næss (1912-2009) inspired the development of the philosophy of deep ecology, which influenced the emergence of friluftsliv as environmental pedagogy in the 1970's. As a subject friluftsliv was underpinned by the principle of identification with nature and consequently intended to induce people to act protectively towards nature, not because 'they think they ought to but because they feel inclined to'. This paper contributes to the understanding of complex, empathetic relationships to nature by analysing the significance of nature and friluftsliv in the life-worlds of young Norwegians.

Methods: In 2001 and 2006 nearly 200 youths aged from 15 to 19, living in the sub-Arctic, a suburb of Oslo, and a southern seaside holiday site, wrote essays on their experiences of nature. The question was an open one but stimulated a biographical approach (Gurholt, 2005; Vigane, 2007).

Results: The youth emphasise intimate experiences of nature from early childhood. These experiences are connected to playing freely in neighbourhoods and hiking with family and friends. They express a love for the native "natural world". Despite the fact that "nature means a lot", the relations to nature have at the time of writing become distanced. When looking into the future, they often dream of living close to nature, which is not seen antagonistic to urban lifestyles. If they have children, they want them to grow up with the same freedom to play outside as they themselves enjoyed in their own childhood. The youth are concerned about litter and reflect on "nature's life giving significance", often expressed abstractly as something "we must of course take care of" because "nature is the biggest reason why we humans are able to live on this planet." However, the ways in which the youth are acting towards nature, e.g. activities performed and technology used, represent broad diversity.

Discussion: Processes of self-formation nurtured by close contact with nature are discussed as embodied experiences, which in part are informed by stories on how nature is perceived and should be treated and nurtured. Recent theories on the ecological self do not take social relations into account (Milton, 2002: Sutton, 2004). This study indicates that it is the interweave of natural/ecological processes, transforming selves and socio-cultural relations that underpin young people's diverse feelings and actions towards nature, friluftsliv and environmental issues.

References

Milton, K. (2002). Loving Nature. Routledge, London.

Gurholt, K. (2005) Nature Narratives. In Humberstone, B, Nicol, R. Old Traditions–New Trends. Brathay Hall, Ambleside.

Vigane, Å. (2007). Kysten er jo alt for meg! Norges idrettshøgskole, Oslo.

Sutton, P.H. (2004). Nature, Environment and Society. Palgrave, New York.

08:30 - 10:00

Invited symposia

IS-SM03 Evidence Based Sports Physiotherapy: the difficulty of the research paradigms

THE DIFFICULTY OF THE RESEARCH PARADIGMS IN SPORTSPHYSIOTHERAPY

CABRI, J., BAEYENS, J., VIROUX, P.

FACULDADE DE MOTRICIDADE HUMANA - UTL

The application of evidence based practice is nowadays an accepted way to treat patients more effectively. Results of the latest scientific research are communicated to the health care providers, who may have to change their daily practice accordingly. However, in physiotherapy in general and in sports physiotherapy more particularly, some difficulties may arise when considering the research paradigms. Indeed, some of the assumptions researchers use (e.g. independency of observer, therapist and patient) may interact and therefore lead to research bias. Blinding, for example, may be in some cases impossible because of the interaction between the therapist-researcher and the patient. Furthermore, especially in RCT's, there is much debate about the 'standard' or 'control' therapy, because of the inexistence of the latter. Additionally, much controversy still exists with respect to the terminology used when considering joint kinematics. The invited symposium is aimed at the reflection of the aforementioned problems and exemplified by the research going on in shoulder injuries of athletes and its consequences for the practice.

FINE TUNING THE THROWING SHOULDER: BALANCING IN THE MOBILITY/STABILITY PARADOX

BAEYENS, J.P.

VRIJE UNIVERSITEIT BRUSSEL

Throwing athletes require a delicate balance of shoulder mobility and stability in order to meet the functionally high demanding loads of their throwing skills. There is evidence that shows altered mobility patterns in the throwing shoulder. In their dominant shoulder, throwers display increased external rotation and limited internal rotation, the latter hypothesized to be related to posterior shoulder tightness. The external rotation gain has been thought to be advantageous in terms of ball velocity upon release. However, the altered shoulder ROM can evolve into overuse manifestations such as subacromial impingement, internal impingement and SLAP lesions. In throwers with borderline internal impingent, glenohumeral external rotation at 90° abduction is increased as compared to asymptomatic throwers. Throwers with internal impingement also have significantly more internal rotation deficit compared with asymptomatic throwers.These rotations are coupled with obligate intra articular translatons. No significant differences in anterior translation but increased anterior stiffness in 90° external rotation at 90° abduction have been found between the throwing and non throwing shoulders in asymptomatic professional baseball pitchers. F.i. external rotation at late cocking results in posterior humeral head translation. Throwers with minimal anterior instability do not present this posterior translation. Enhanced superior translation and diminished posterior translation have been demonstrated to relate to subacromial impingement.

Scapular kinematics has been a increased area of investigation in recent years. Throwers present with augmented scapular upwards rotation, internal rotation and retraction. Increased scapular posterior tilt and upwards rotation of the scapula has been shown in throwers with internal impingement compared to non symptomatic shoulders. In subacromial impingement, decreased upwards rotation and posterior tilt have been shown. In subacromial impingement, a strengthening program accentuating on the scapular muscles proved to be efficient for upwards and internal rotation, but nor for posterior tilt.

This presentation will assess an update of the scapulothoracic arthrokinematics and the intra articular kinematics of the glenohumeral joint in context of the throwing shoulder with and without shouder problems.

FINE TUNING THE SHOULDER DURING THE PRE-SEASON CONDITIONING OF ELITE TENNIS PLAYERS; A QUESTION OF MOBILITY OR STABILITY ?

VIROUX, P.

ATHLETES CARE - SPORT MEDICAL ADVICE CENTER

When it comes to pre-season screening in function of the conditioning program to prepare elite tennis players for their tennis-season, evaluation must be done thoroughly and within the right context. Performance is the most important aspect for tennis coaches and conditioning trainers. But optimal performance can only be achieved when the athlete is injury free. As a sports physical therapist integration of a preventive strategy in this conditioning program is my main goal for my elite tennis players.

In a sport with a great biomechanical aspect like tennis, my practical work method is based upon the 'kinetic chain theory'. Basic screening of a players 'posture and movement' in relation to the players specific 'movement patterns' is the first step.

The combination of those results and the knowledge about the kinetic chain principles in tennis make it possible to integrate a preventive strategy in this pre-season conditioning program.

Evidence based principles of injury prevention let us know that evaluation of previous injuries and sport specific adaptations in relation to the known mechanisms of tennis injuries are not only important but even essential.

The very specific role of the shoulder in the kinetic chain of tennis players and the fact that shoulder injuries are still very common in elite tennis players emphasize the importance of such a very specific evaluation method. Fine tuning the shoulder can only be done if the balance between mobility and stability is reached.

This sport specific evaluation of the shoulder will be presented as well as the ' fine tuning' strategy of this link within the kinetic chain of the sport of tennis.

08:30 - 10:00

Invited symposia

IS-PH04 The Physiology of East and North African Runners (EFSMA Exchange Symposium)

AFRICAN RUNNERS: NATURE OR NURTURE?

DICKHUTH, H.

UNIVERSITY HOSPITAL FREIBURG

In 1985, 50% of the best runners came from Europe, 21% from Africa and about 15% from North-America. 25 years later the situation had changed completely.

We see a dramatic change in the countries of origin from which the best middle- and long-distance runners have come. Today 69% of the best runners come from Africa and 47% of these from Kenya.

The East-African countries of Ethiopia and Eritrea, as well as Morocco, are also represented in middle distance running. It is noteworthy, that in these countries we find no excellent sprinters.

On the other hand it is interesting that in 2008, the top sprinters essentially had their genetic roots in West-Africa, including those sprinters from the Caribbean and the USA. It is interesting, that it is not possible to find excellent middle- and long-distance runners in those countries.

Most of the sports medicine scientists believe that the differences in endurance and sprint performance have a genetic background. The genetic type and the phenotype of East-Africans differ considerably from those of West-Africans. An explanation for this could be a selective pressure caused by the dryness and high altitude conditions in North- and East-Africa. That would fit with the fact that the genetic exchange between East- and West-Africa was prevented by the East-African rift and by the desert (Sahara).

In conclusion, a small genetic shift might be a small genetic shift (pressure) which is responsible for the different phenotype observed of West-Africa and East-Africa.

But what are the physiological differences which allow East-African, especially Kenyan runners, to be top runners world-wide?

Literature:

Billat V, Lepretre PM, Heugas AM, Laurence MH, Salim D, Koralsztein JP: Training and bioenergetic characteristics in elite male and female Kenyan runners. Med Sci Sports Exerc. 2003 Feb;35(2):297-304;

Larsen HB:Kenyan dominance in distance running. Comp Biochem Physiol A Mol Integr Physiol. 2003 Sep;136(1):161-70. Review.

Scott RA, Pitsiladis YP Genotypes and distance running : clues from Africa. Sports Med. 2007;37 (4-5):424-7.

Scott RA, Fuku N, Onywera VO, Boit M, Wilson RH, Tanaka M, H Goodwin W, Pitsiladis YP. Mitochondrial haplogroups associated with elite Kenyan athlete status. Med Sci Sports Exerc. 2009 Jan; 41(1):123-8

PHYSIOLOGICAL APPROACH OF KENYAN TRAINING

BILLAT, V.

UNIVERSITE D'EVRY VAL D'ESSONNE

Introduction: The purpose of this study was to test the hypothesis that there was no significant difference between the aerobic and anaerobic component of performance with the critical speed model and that training is responsible for two different physiological phenotypes in two groups of Kenyan runners belonging to the same ethnic group and village (Kissi).

Methods: In order to compare the aerobic and anaerobic component of the Kenyan vs. non Kenyan best performers (from 800 to 10,000m) we compared their critical velocity and anaerobic distance capacity using the critical power model with 2 components (1). VO2 was measured breath by breath using a portable gas analyser (K4b2, Cosmed) during an incremental exhaustive running test performed on a running track.

The subjects were 20 elite Kenyan runners: 13 men (10-km performance time: 10-km performance time of 28 min, 36 s ±18 s) and 7 women (32 min, 32 s ±65 s). The male runners were separated into high-speed training runners (HST: N = 6) and low-speed training runners (LST: N =7) depending on whether they train at speeds equal or higher than those associated with the maximal oxygen uptake (vVO2max). All but one woman were high-speed training runners (female HST: N =6). Subjects performed an incremental test on a 400-m track to determine VO2max, vVO2max, and the velocity at the lactate threshold (vLT).

Results: There was no significant difference of critical speed or anaerobic distance capacity between Kenyan or non Kenyan runners (21.3±0.6 vs. 22.1±0.6 km.h-1, p = 0.07) for CV and (213±68 vs. 185±69 m, p = 0.45) for ADC. Within each gender among the HST group, 10-km performance time was inversely correlated with vVO2max (rho =0.86, P =0.05, and rho =0.95, P =0.03, for men and women, respectively). HST male runners had a higher VO2max, a lower (but not significantly) fraction of vVO2max (FvVO2max) at the lactate threshold, and a higher energy cost of running (ECR). Among men, the weekly training distance at vVO2max explained 59% of the variance of vVO2max, and vVO2max explained 52% of the variance of 10-km performance time. Kenyan women had a high VO2max and FVO2max at vLT that was lower than their male HST counterparts. ECR was not significantly different between genders.

Conclusion

The critical speed, vVO2max and ADC of the Kenyan or non Kenyan top 20 best performer middle and long distance runners were not significantly different. However, ADC is only an indirect marker of anaerobic capacity which must be explored with oxygen deficit. Caucasian non Kenyan runners have a non significant higher vVO2max extrapolated from 3000m performance considering the time limit at VO2max reported in literature (7 min). Kenyan have polarized training even inside one training session and practice skills that could contribute positively to this ability for speed variation that allows for energetic optimisation (1).

References

1°) Billat LV, Koralsztein JP, Morton RH. Time in human endurance models. From empirical models to physiological models. Sports Med 27:359-379, 1999.

KENYAN DOMINANCE IN DISTANCE RUNNING

LARSEN, H.B.

COPENHAGEN MUSCLE RESEARCH CENTRE

Abstract. During the past three decades, the international scene of middle- and long-distance running for men has been dominated by Kenyans. Critical physiological factors for performance in running are maximal oxygen consumption (VO2max), fractional Vo2max utilization and running economy. While Kenyan and Caucasian elite runners are able to reach very high, but similar maximal oxygen uptake levels, the VO2max of black South African elite runners seems to be slightly lower. Moreover, the studies of black and white South African runners indicate that the former are able to sustain the highest fraction of VO2max during long distance running. Results on adolescent Kenyan and Caucasian boys show that these boys are running at a similar percentage of VO2max during competition. A lower energy cost of running has been demonstrated in Kenyan elite runners and in untrained adolescent Kenyan boys compared to their Caucasian counterparts. In agreement with this are the results from studies of black South African elite runners who have shown similar low energy costs during running as the Kenyan elite runners. The good running economy cannot be explained by differences in muscle fibre type as they are the same in Kenyan and Caucasian runners. The same is true when comparing untrained adolescent Kenyan boys with their Caucasian counterparts. A difference exists in BMI and body shape, and the Kenyans long, slender legs could be advantageous when running as the oxygen cost when running is a function of leg mass. Studies comparing the response to training of Kenyans and Caucasians have shown similar trainability with respect to VO2max, running economy and oxidative enzymes. Taken all these data together it appears that having a good running economy may be the primary factor favouring the good performance of Kenyan endurance athletes rather than them having a higher VO2max than other elite runners. In addition, the slim body shape and low mass of the lower leg are likely contributing to the superior running economy of the Kenyan runners.

THE OXYGEN TRANSPORT SYSTEM IN KENYAN RUNNERS

SCHMIDT, W., PROMMER, N., THOMA, S., NIESS, A.

UNIVERSITY OF BAYREUTH

It is assumed that the performance dominance of East African runners is primarily due to their high VO2max, high fractional utilization of VO2max, and high running economy. Their lifelong exposure to altitude has been intensively discussed as one important reason, since haemoglobin concentration and haematocrit are slightly elevated. To explain the underlying physiological reasons previous research focused on oxygen consumption while profound data concerning the oxygen transport are, however, still missing.

We therefore investigated the essential structures of O2-transport, i.e. total haemoglobin mass (tHb-mass), blood volume (BV) and heart size, in elite Kenyan runners in a combined cross sectional and longitudinal study in order to detect de-adaptation processes of these parameters during a sojourn at near sea-level.

Ten Kenyan runners (group K; competing between 1.500m and marathon) living and training at moderate altitude (~2100m) performed a 6 week training camp at 350m in Germany. Training (volume ~210km/week) was similar to that normally performed in Kenya. tHb-mass and BV were determined using the optimized CO-rebreathing method on the first day after arrival to Germany and weekly during their whole stay at low altitude. In addition BV and haemoglobin concentration ([Hb]) were also examined before departure at altitude. VO2max was determined in three field tests and running economy in a laboratory test on a treadmill. 11 German elite runners served as a control group (group G).

The Kenyan runners had a significantly lower body mass (K 57.2 ±7.0kg; G 66.5 ±6.3kg) and BMI (K 18.5 ±0.9; G 20.4 ±0.9). Relative VO2max did not differ between the groups (K 71.5 ±5.0 ml/kg/min; G 70.7 ±3.7 ml/kg/min) and absolute VO2max did not change during the 6 weeks at low altitude. Relative tHb-mass (K 14.2 ±1.0g/kg; G 14.0 ±0.7g/kg) and BV (K 101.9 ±4.5ml/kg; G 99.6 ±5.8ml/kg) were similar in both groups but continuously decreased in K during the stay at near sea level (absolute tHb-mass from 813 ±90g to 767 ±90g, $p<0.001$; BV from 5828 ±703ml to 5513 ±708ml, $p<0.01$). [Hb] tended to decrease (-0.7 ±0.7g/dl) when commuting altitude but did not differ at near sea level between the groups (K 15.4 ±1.0g/dl, G 15.5 ±1.2g/dl). The relative heart volume was slightly lower in the Kenyan group (K 14.0 ±1.5ml/kg; G 15.2 ±2.0ml/kg) and did not change at low altitude. Running economy was higher ($p<0.05$) in K at speeds of 18km/h and above and can partly be attributed to the smaller calve circumference ($p<0.001$) and lower BMI ($p<0.001$).

In conclusion, we state that the excellent performance of Kenyan runners is not simply due to an improved oxygen transport system when compared to European runners. Although Kenyans benefit from altitude effects a lower demand of oxygen at higher speeds seems to be the essential reason for their excellent performance.

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LIMITING FACTORS OF ENDURANCE PERFORMANCE

ROECKER, K.

UNIVERSITY OF FREIBURG, CENTER OF INTERNAL MEDICINE

There is recent discussion about which specific innate or acquired factors are potentially responsible for the east African dominance in long distance running - or whether social and geographical factors must be taken more into account for that predominance. Prior to any experiment, a distinct evaluation of the performance determining system is needed to answer that question from a physiologist's view.

This review describes the various domains of endurance performance determination in long distance running: Some of these domains are clearly genetically determined and fixed, others are even though genetically affected but subject to adaptive transformation via training. Structural anthropometrical or biomechanical aspects belong to the first group. All characteristics of the oxygen transport chain, metabolic aspects as glycogen storage or energy turnover pathways are in the second group. Factors of motorical efficiency and coordination are further important members of this cluster.

Thereby it is totally uncertain which factorial composition may yield maximal success in long distance running. The only evidence is that not one individual factor is relevant but many. Apart from that, we also need information about the specific responsivity of these factors to training and specific stimulation. The challenge is to identify the physiological basis for a 'talent' in such a multifactorially determined ability as long distance running. A system analysis is prerequisite for any interpretation of further physiological experiments in this field.

08:30 - 10:00

Oral presentations

OP-ST09 Sports 9

MUSCLES OF BODY BUILDERS ARE INTRINSICALLY STRONGER THAN THOSE OF ACTIVE UNTRAINED CONTROLS

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The massive muscle hypertrophy displayed by body builders (BB) is expected to be matched by a proportionate increase in muscle force. However, a higher specific tension of type 2A and type 2X single fibres of the vastus lateralis muscle of professional BB, compared to non-training controls (CTRL), has been found (1). The present study investigated whether the greater single fibre intrinsic force was reflected by a higher force per cross-sectional (F/CSA) of the whole muscle, once accounting for differences in neural activation, muscle architecture and moment arms. Eight professional male BB (aged 29.4±5.5 years, height 177.9±4.1 cm, body mass 91.7±13.4 kg), recruited by the Lithuanian Academy of Physical Education, were compared to 12 untrained, male CTRL (aged 20.8±2.5 years, height 177.4±4.6 cm, body mass 74.8±5.6 kg). Maximum isometric torque of the knee extensors (KE) was measured by isokinetic dynamometry at 60, 70, 80, 90 deg of knee extension. Quadriceps tendon (QT) moment arm (ma) was estimated by anthropometry (2) and KE volume (Vol) was estimated from a regression between anthropometric thigh muscle plus bone Vol and MRI KE Vol (3). Fascicle length (Lf) and pennation angle of the vasti lateralis (VL), medialis (VM), intermedius (VI) and rectus femoris (RF) were measured by ultrasound at rest and at the optimum angle of KE maximum torque. KE maximum force (F) was calculated as: KE torque at the optimum angle/QTma. Physiological cross-sectional area (PCSA) of VL, VI, VM and RF was calculated as the ratio of Vol/Lf, enabling KE F/PCSA to be estimated. BB KE force, Vol and PCSA were respectively, 52.3% ($P<0.01$), 13% ($P<0.01$) and 15.5% ($P<0.01$) greater than of CTRL. After accounting for differences in agonist and antagonist muscle activation and in ma, the F/PCSA of the BB was 22.1% higher ($P<0.01$) than of CTRL. Thus skeletal muscles of professional BB seem to be intrinsically stronger than those of untrained, controls. This effect, partly explained by a greater fibre specific tension, accounts for about half of the difference in KE maximum force between BB and CTRL. Thus other factors, besides single fibre specific tension, must account for this discrepancy and amongst these, a more efficient force transmission via the extracellular matrix could play a role.

References

1) D'Antona G et al. R. J Physiol 570:2006.

2) Visser JJ et al. Eur J Appl Physiol Occup Physiol 61:1990.

3) Narici MV & Roi GS. Pflügers Archiv 420:36P, 992

VIBRATION INDUCED SUPPRESSION OF IA AFFERENT PATHWAYS AFFECT MAXIMUM FORCE BUT NOT RATE OF FORCE DEVELOPMENT

GRUBER, M., FISCHER, C., TAUBE, W., MELNYK, M., GOLLHOFER, A.

UNIVERSITY POTSDAM AND UNIVERSITY FREIBURG

Exitatory inputs from Ia afferent pathways can contribute to homonymous muscle activity during human movement. A functional role of Ia afferent inputs during the beginning of a voluntary isometric contraction was assumed based on the fact that decreased presynaptic inhibition of Ia afferent pathways was observed prior to voluntary contractions (Hultborn et al. 1987; Meunier and Pierrot-Deseilligny 1989). In the present study we hypothesized that vibration induced suppression of Ia afferent pathways projecting to triceps surae muscles result in decreased rate of force development for maximal isometric plantarflexions.

22 male sport students participated in the present study. They performed 6 maximal isometric plantarflexions in an ankle ergometer equipped with moment transducers. For each contraction participants were instructed to contract as fast and powerful as possible. Maximal rate of force development (RFDmax) and maximum force (MVC) were calculated from the torque curves. Additionally, surface elektromyogramms (EMG) of M. soleus (SOL) M. gastrocnemius medialis (GM) and M. tibialis anterior (TA) were recorded. EMG was rectified and integrated in four time intervals of 50ms for the first 200ms of each contraction and for a time interval of 200ms around MVC. Prior to three contractions the triceps surae (SOL and GM) was vibrated for 40s with a muscle vibration device (Neurostim®) at 32 Hz. To control effects of muscle vibration on Ia afferent pathways, H-reflexes with peak to peak amplitudes of approx. 20% of the maximal M-wave were evoked throughout the experiment. Muscle vibration resulted in a massive reduction of the H-reflex (23 ± 3 % versus 2 ± 2 % Mmax; $p < 0.001$, Students paired t-test). This indicated suppression of the Ia afferent pathways projecting to SOL and GM. With muscle vibration, MVC was significantly reduced by 3 ± 6 % ($p < 0.05$, Students paired t-test) but no significant changes were observed for RFDmax or for any of the EMG parameters. We could not observe any effect of vibration induced suppression of Ia afferent pathways on the rate of force development during maximal isometric plantarflexions. Therefore, we assume a minor role of the Ia afferent pathways during the early phase of maximal voluntary muscle contractions. Interestingly, MVC was reduced indicating that the Ia afferent input to the cord might be important during later parts of maximal contractions.

1. Hultborn H, Meunier S, Pierrot-Deseilligny E and Shindo M. Changes in presynaptic inhibition of Ia fibres at the onset of voluntary contraction in man. J Physiol 389: 757-772, 1987.

2. Meunier S and Pierrot-Deseilligny E. Gating of the afferent volley of the monosynaptic stretch reflex during movement in man. J Physiol 419: 753-763, 1989.

EFFECT OF CREATINE SUPPLEMENTATION ON INTRAMYOCELLULAR LIPID CONTENT DURING LEG IMMOBILISATION AND REHABILITATION TRAINING

VAISY, M.

RESEARCH CENTRE FOR EXERCISE AND HEALTH

Introduction: Elevated intramyocellular lipid (IMCL) content has been associated with the incidence of insulin resistance in obesity and type 2 diabetes (1, 2). Creatine intake has been found to lower the insulinogenic index in rat (3) as well as to negate abnormal glucose tolerance in a transgenic mouse model of Huntington disease (4).In the current study we investigated the effect of oral creatine on IMCL content during an episode of leg immobilisation and subsequent rehabilitation training.

Methods

A double-blind placebo-controlled trail was performed in young healthy volunteers. The right leg of each subject was first immobilised for 2 weeks using a cast, where after they participated in knee-extension resistance training program for 6 weeks. Half of the subjects (CR; n=11) received creatine monohydrate supplements throughout the study, whereas the others ingested placebo (PL). Needle biopsy samples were obtained from m. vastus lateralis of the right leg before and after training and rehabilitation, as well as from the contralateral leg, for determination of fibre-specific IMCL content using ORO-staining. Succinate dehydrogenase activity (SDH) and FAT/CD36 content were assayed on muscle samples.

Results: In PL but not in CR, IMCL content in type I fibres increased by ~20% during immobilisation ($P<0.05$). At the end of the rehabilitation period IMCL content had returned to baseline in PL, yet was ~35% lower in CR ($p<0.05$). In type IIa fibres the immobilisation increased IMCL content, whilst retraining decreased IMCL content ($p<0.05$), but values were similar between groups at any time. IMCL content significantly changed in the contralateral leg during the study in neither CR nor in PL. Muscle SDH activity and FAT/CD36 protein content significantly changed ($p<0.05$) due to immobilisation and rehabilitation, but values were similar between groups at any time.

Discussion: Our current study shows that a short period of muscle inactivity due to immobilisation is accompanied by an increase in IMCL content in type I fibres, and that this increase is negated by 6 weeks of rehabilitation training. Interestingly, however, we found oral creatine supplementation to prevent the increase in type I fiber IMCL content due to immobilisation, and even to reduce IMCL content to markedly below baseline levels during rehabilitation training. These effect were explained neither by altered oxidative capacity as estimated from SDH activity, nor by altered FAT/CD36 protein content. The physiological mechanims by which oral creatine supplementation impact on IMCL content in type I fibres during an episode of muscle inactivity and subsequent reconditioning, remain to be elucidated.

References

1- Van Loon, LJ, et al. Am J Physiol Endocrinol Metab 287:E558-E565, 2004

2- Goodpaster BH, et al. J Clin Endocrinol Metab 86:5755-5761, 2001

3- Op't Eijnde, EB, et al. Int J Mol Med 17:1077-1084, 2006

4- Ferrante, RJ, et al. J Neurosci 20:4389-4397, 2000

EFFECT OF HEAVY STRENGTH TRAINING ON CLASSICAL INDICATORS OF ENDURANCE CYCLING PERFORMANCE

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LILLEHAMMER UNIVERSITY COLLEGE

Training is the first and most obvious way to improve cycling performance (2). Incorporation of strength training in cyclists' preparation has previously received some attention (1), and it has been shown that strength training may improve lactate threshold and cycling performance in untrained subjects (3). However, the effect of adding heavy strength training to usual endurance training in well-trained cyclists on endurance cycling performance indicators has not been thoroughly studied. Thus, the aim was to test the hypothesis that heavy strength training improves classical indicators of endurance cycling performance.

Twenty well-trained cyclists were assigned to either usual endurance training combined with heavy strength training (E+S; n=11 (♂=11), 27±2 years, 75±3 kg, VO2max 66.8±1.6 ml∙kg-1∙min-1) or to usual endurance training only (E; n=9 (♂=7, ♀=2), 30±2 years, 74±3 kg, VO2max 65.9± 2.0 ml∙kg-1∙min-1). The strength training consisted of four lower body exercises (half squat, leg press with one foot at a time, one-legged hip flexion, and toe raise, 3x4-10RM), which were performed twice a week for 12 weeks. Pre- and post-tests determined the cyclists' thigh muscle cross-sectional area (CSA), maximal voluntary contraction force (MVC) in isometric half squat, peak power output during a 30 s Wingate test, power output at 2 mmol blood lactate concentration during an incremental cycling test, VO2max, and mean power output during a 40-min all out cycling trial. Data are presented as mean±SE.

At baseline, the groups were similar. After the intervention period, E+S increased CSA of thigh muscles (4.5±0.6%), MVC (21.2±4.9%), peak power output in the 30 s Wingate test (9.5±2.9%), and power output at 2 mmol blood lactate concentration (4.1±1.5%). These variables were not changed in E. There was a significant difference between groups in relative improvement in MVC half squat, CSA of the thigh muscles, and peak power output. Both E+S and E increased their VO2max (3±1% and 6±2%, respectively) with no statistical difference between groups. E+S increased their mean power output during 40-min all out cycling while there was a tendency for a similar finding in E ($p=0.054$).

The overall finding was that adding heavy strength training to usual endurance cycling training results in favourable adaptations in classical performance indicators without compromising the development of VO2max. In contrast, adding explosive strength training to trained cyclists has been reported not to affect cycling performance and cycling economy (1). It is possible that the discrepancy is due to the difference between strength training regimens. In conclusion, adding heavy strength training to usual endurance training improves classical indicators that routinely are used to evaluate and predict endurance cycling performance.

REFERENCES

1. Bastiaans et. al., EJAP. 2001;86:79-84.

2. Jeukendrup & Martin, Sports Med. 2001;31:559-69.

3. Marcinik et.al., MSSE. 1991;23:739-43.

RESPONSES TO FOUR ECCENTRIC EXERCISE BOUTS OF THE ELBOW FLEXORS PERFORMED EVERY FOUR WEEKS

NOSAKA, K., CHEN, T.C., CHEN, H.L., LIN, M.R., WU, C.J.

EDITH COWAN UNIVERSITY

INTRODUCTION: An initial eccentric exercise confers protective adaptation to a subsequent bout of the same or more demanding eccentric exercise, which is known as the repeated bout effect. Although many studies exist concerning the repeated bout effect, most of them investigated the effect based on two bouts of eccentric exercise. Only two previous studies (1,2) examined the repeated bout effect of more than three eccentric exercise bouts, but the repeated bouts were performed before full recovery from the initial bout. It is not clear what happens if the same exercise is repeated more than three times after a full recovery. This study compared responses to four bouts of maximal eccentric exercise performed every 4 weeks to examine if additional protective adaptation is induced by the additional bouts.

METHODS: Fifteen untrained men (21.8 ± 1.9 yrs) performed four bouts of 30 maximal isokinetic (90°/s) eccentric contractions of the elbow flexors for the range of 90° by the non-dominant arm every 4 weeks. Measurements of maximal isometric and concentric isokinetic strength, optimum angle (OA), range of motion (ROM), upper arm circumference, plasma creatine kinase and lactate dehydrogenase activities, myoglobin concentration, muscle soreness, and B-mode ultrasound images were taken before, immediately after and for 5 days following each bout. Changes in the variables over time were compared amongst the four exercise bouts by a two-way (bouts x time) repeated measures ANOVA with a Scheffé's post-hoc test. A significant level was set at $P<0.05$.

RESULTS: No significant differences existed among the bouts for the pre-exercise values of any variables. Changes in all variables except for OA following the second to fourth bouts were significantly smaller than those after the first bout. No significant differences across the exercise bouts for changes in OA, although increases in OA were evident after each bout. The magnitude of decrease in muscle strength and ROM immediately after the fourth bout was significantly smaller than that of the other bouts.

DISCUSSION: The protective effect was conferred by the initial bout, and the additional bouts did not produce as significant protective effect as the initial bout. However, the magnitude of decrease in muscle strength and ROM immediately after the fourth bout was significantly smaller than that after the other bouts. This type of adaptation has been shown for resistance-trained subjects when they performed a similar eccentric exercise to that performed in the present study (3). A shift of OA does not appear to involve in the repeated bout effect. It is concluded that the first bout confers the greatest adaptation, but further adaptation is induced when the exercise is repeated more than 3 times.

REFERENCES

1) Newham DJ, Jones DA, Clarkson PM (1987) J Appl Physiol, 63, 1381-1386

2) Nosaka K, Newton M (2002) Med Sci Sports Exerc, 34, 63-69

3) Newton MJ, Morgan GT, Sacco P et al (2008) J Strength Cond Res, 22, 597-607

EVALUATION OF A NOVEL MUSCLE STRENGTH TEST FOR ATHLETES WITH ACL INJURY

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Introduction: The anterior cruciate ligament (ACL) injuries represent one of the most serious disabling injuries in associated with athletic activity. Despite the applied treatment methods (i.e., either conservative or operative), a lengthy rehabilitation procedure has to be not only performed, but also closely monitored. Various methods for the assessment of neuromuscular function have been applied and their potential advantages and disadvantages still remain to be explored. The aim of this study was to preliminary evaluate application of the consecutive maximum contraction test (CMC; Suzovic et al, 2008) for the assessment of muscle function in patients that have been undergoing rehabilitation following the ACL injury.

Methods: Ten competitive athletes with recent (3 to 12 months following the surgery) ACL reconstruction participated in the study. The concentric knee flexor and knee extensor strength of both legs was assessed by means of both an isokinetic dynamometer and CMC test (i.e., consecutive isometric force exertion and relaxation by self-selected frequency. Following a familiarization, the tests were performed within two consecutive sessions. The variables derived from two isokinetic tests were isokinetic knee flexor and extensor peak torques exerted at 60°/s and 120°/s of the injured and non-injured leg. These variables were compared with the peak torques and the rate of torque developments of the knee flexor and extensor muscle derived from the force-time curves recorded in CMC.

Results: The isokinetic tests revealed no differences in torque between the knee flexors, while the knee extension torque of the injured leg was significantly lower than in the non-injured one only under the 60 °/s condition. CMC test, however, not only revealed a lower peak torque of knee extensors, but also lower rate of torque development of both muscle groups of the injured leg, as compared with the non-injured one. Finally, note that the peak force of CMC significantly correlated with peak torques of the isokinetic tests (correlation coefficients being r=0.81-0.91).

Discussion and Conclusions

The variables derived from CMC could be more sensitive in capturing the differences in the neuromuscular output between the injured and non-injured leg than the variables obtained from the standard isokinetic test. The peak force obtained from CMC could also assess muscles' ability to exert maximum sustained contraction despite being both transient and relatively low. Therefore, the results obtained suggest that CMC could be developed into standard assessment tool for neuromuscular function in athletes rehabilitating after ACL reconstruction.

References

Suzovic D, Nedeljkovic A, Jaric S. (2008). J Hum Kin, 20, 51-67.

08:30 - 10:00

Oral presentations

OP-PH08 Physiology 8

EFFECT OF DIFFERENT LOCAL COOLING APPLICATIONS ON THE ENDURANCE CAPACITY DURING CYCLING

HOHENAUER, E., CLIJSEN, R., CABRI, J., CLARYS, P.

UNIVERSITY COLLEGE PHYSIOTHERAPY

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1: University College TVDL (Landquart, Switzerland), 2: FMH-UTL (Lisbon, Portugal), 3: VUB (Brussel, Belgium)

INTRODUCTION: The production of heat during intense exercise causes an increase of muscle temperature and core temperature, which can amount up to 40°C. In order to avoid losing endurance capacity, the body adjusts by rapidly reducing temperature. Evaporation is the primary mechanism by which muscle heat is released during exercise (Nybo et al., 2007).

AIM: The aim of this study was to investigate the effects of local upper arms cooling, upper body cooling and combined cooling of the upper arms and upper body on the endurance capacity during cycling.

METHODS: Seven male young healthy subjects (n=7) volunteered in this study. A random, cross-over design was used. The subjects were tested under four different conditions: A= without cooling; B= Energicer cooling bands; C= Energicer cooling vest; D= Energicer cooling bands and vest. The cooling bands (7.5 x 5 x 0.5 cm) were placed on the left and right upper arm. Both vest and bands were saturated (bands 25ml each, vest 225ml) with a menthol-alcohol liquid (Liquid Ice Cosmedicals GmbH, Unterägeri, Switzerland). We conducted a standardized incremental bike ergometer test following the Swiss Olympic Guidelines. Time to exhaustion was determined and used as the independent variable for endurance capacity. At the end of each incremental step following variables were measured: blood lactate, heart rate, body temperature and perceived exhaustion (BORG scale).The 4 experiments were accomplished within one week to decrease the chance of adaptation. Environmental temperature (35°C) and relative humidity (44%) of the lab were kept constant.

RESULTS: Mean age and BMI of the subjects were 39,11 y and

28,2 kg.m-2 respectively. Mean time to exhaustion didn't differ between the four conditions (p>0,05). We observed no significant differences at blood lactate, heart rate and body temperature during examination between the four conditions.

DISCUSSION: Our results are in line with Duffield et al. (2003). However all participants mentioned to feel more comfortable when wearing the cooling vest under the used environmental conditions. This effect might aggravate with the airflow when cycling under outdoor conditions which may lead to psychological advantages for the athlete. We didn't observe any significant changes in body temperature, and endurance capacity if cooling bands and/or cooling vests were used.

CONCLUSION: Under hot and humid environmental conditions local cooling of the upper arms and/or upper body by Energicer bands and/or vests don't enhance endurance capacity during cycling. Further studies are needed to analyse the effects of Energicer bands and vests when simulating the airflow in hot and humid environmental conditions and the effects on the skin temperature.

REFERENCES: Duffield R, Dawson B, Bishop D, Fitzsimons M, Lawrence S. (2003). Br J Sports Med, 37:164-169.

Nybo L. (2007). J App. Physiol, 104:871-878.

THE EFFECT OF REPETITIVE COOLING ON PRECOOLING EFFICIENCY AND EXERCISE PERFORMANCE: A PILOT STUDY

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EMPA, SWISS FEDERAL LABORATORIES FOR MATERIALS TESTING AND RESEARCH

Introduction: It is known that repetitive cold exposure improves thermal sensation and, decreases skin and body core temperatures (1, 2). Such responses could potentially improve precooling efficiency, defined as the ease with which body heat storage is reduced. Up to now, no studies have been published on the effect of repetitive cooling on precooling efficiency and, subsequent exercise performance. Therefore, we aimed at investigating: i) if repetitive cooling increases the efficiency of precooling and, ii) how such response affects various thermophysiological parameters during exercise in hot and humid ambient.

Methods: Four physically fit men with an average (SD) VO2peak of 65.4 (4.1) ml/min/kg participated in this study. They reported to the laboratory for 10 consecutive days. Each time, the subjects were submitted to 1 hour of cooling with an ice vest (Arctic Heat, Burleigh Heads, QLD, Australia) while sitting at an ambient temperature (Ta) of 20.2 (0.2) °C. On the 1st and the 10th day, this was followed by 25 min of cycling exercise at 60% subject's VO2peak in Ta of 30.2 (0.1) °C and relative humidity of 71.4 (0.8)%. On the 1st and the 10th day, during cooling and exercise, body core temperature (Tc) and skin temperatures on eight body locations (Tsk), were registered every 10 s. In addition, during the first and the last 5 min of cooling, skin blood flow (SkBF) was measured on forearm. While, rating of thermal perception (TP) was noted each 15 min.

Results: On the 10th, compared with the 1st cooling day, SkBF increased for 80 (49) %. Where, such response indicates a decrease in vasoconstrictor response. Cooling decreased Tsk on both occasions to a similar extend (1st day: 27.62 (1.30) °C; 10th day: 27.72 (1.11) °C). However, on the 10th day the time to reach this value halved. Despite, Tc was before the start of cooling slightly higher on the 10th day, at end of cooling, a similar Tc was reached. This was observed due to enhanced decrease of Tc on the 10th day. On average, TP improved from -2.3 (1.3) on the 1st day, to -1.3 (1.0) on the 10th day. Finally, during subsequent exercise there were no apparent differences between the 1st and the 10th cooling day in any of the variables investigated.

Conclusion

It is suggested that 10 days of consecutive cooling, when using an ice vest, can improve the efficiency of precooling. In particular, this is ascribed to reduced vasoconstrictor response. Repetitive cooling does not affect any of the investigated thermophysiological parameters during subsequent exercise performance in warm and humid ambient.

1. Leppaluoto J, Korhonen I, and Hassi J. Habituation of thermal sensations, skin temperatures, and norepinephrine in men exposed to cold air. J Appl Physiol 90: 1211-1218, 2001.

2. O'Brien C, Young AJ, Lee DT, Shitzer A, Sawka MN, and Pandolf KB. Role of core temperature as a stimulus for cold acclimation during repeated immersion in 20 degrees C water. J Appl Physiol 89: 242-250, 2000.

THE EFFECTS OF PRE-COOLING ON PERFORMANCE, PACING STRATEGY AND CONTRACTILE FUNCTION DURING ENDURANCE CYCLING IN THE HEAT.

DUFFIELD, R., GREEN, R., CASTLE, P., MAXWELL, N.

CHARELS STURT UNIVERSITY

Introduction: The reduction in exercise performance noted when performing prolonged exercise in the heat is well documented (Gonzalez-Alonso et al., 1999). Further, the ergogenic benefits of pre-cooling prior to exercising in hot conditions are also well established (Marino 2002). However, to date the mechanisms underlying the improved performances following pre-cooling in the heat remain equivocal. Accordingly, this study investigated the effects of pre-cooling on performance and pacing during free-paced endurance cycling in the heat, and further, the effects of pre-cooling on contractile function as a mechanism for performance improvement.

Methods: Following familiarisation, eight male cyclists performed two randomised 40-min time trials on a cycle ergometer (SRM power cranks) in 33oC. Prior to the time trials, participants underwent either a 20-min lower-body cold-water immersion procedure (14oC) or no cooling intervention. Prior to and following the respective intervention and time trial, 10 x 5 s isometric voluntary force (MVC) and evoked twitch force (Pf), muscle temperature and anaerobic blood metabolites were measured. Further, before, during and following the intervention and time trial, measures of core (rectal) and skin temperature and heart rate were recorded.

Results: Results indicated that performance was improved with pre-cooling, with a greater distance covered (19.3±1.3 v 18.0±1.4 km) and a higher mean power output maintained (198±25 v 178±26 W) for pre-cooling and control, respectively (P=0.05). While core, muscle, skin and mean body temperatures were lower in the cooling condition until the 20th min (P<0.05), performance did not differ until the latter parts of the time trial (29th min), by which time no differences in physiological measures were present. Further, while MVC was reduced post-exercise in both conditions, neither MVC nor Pf were different between conditions pre- or post-exercise.

Discussion: A 20-min lower-body pre-cooling intervention improved free-paced endurance exercise; however, the improvements in performance became evident after physiological differences induced by pre-cooling had dissipated. Further, rather than pre-cooling increasing power output per se, it seems pre-cooling prevented the reduction in self-selected exercise intensity noted in the final 10-min during exercise without cooling. Moreover, the lack of difference between conditions in MVC or the change in Pf indicates improvements in performance did not result from the prevention of interference of voluntary or evoked contractile function, suggesting cooling induced improvements may result from mechanisms related to muscle recruitment and/or activation.

References

Gonzalez-Alonso J., et al. (1999) J Appl Physiol, 86, 1032-1038.

Marino F. (2002) British J Sports Med, 36, 89-94.

THE EFFECTS OF PRE-EXERCISE SODIUM LOADING AND DRINK TEMPERATURE ON EXERCISE CAPACITY IN A WARM ENVIRONMENT

TRUELOVE, J.

UNIVERSITY OF EXETER

Performance benefits from acute plasma volume (PVol) expansion and reduced core body temperature are well documented, but the majority of strategies are impractical in a sporting environment. The effects of pre-exercise sodium (Na+) loading and pre-cooling by cold fluid ingestion on cardiovascular and thermoregulatory responses and endurance capacity were measured in 18 moderately-trained male cyclists (VO2peak: 55 ± 5 ml.kg-1.min-1; age: 26 ± 9 yr) during rest and exercise in a warm environment (32oC, 50 % RH). Participants completed two of four tests in a randomly-controlled incomplete block design consisting of ingesting 10 ml.kg-1 of either: warm-low Na+ (26oC, 10 mmol Na+.L-1); cold-low Na+ (4oC, 10 mmol Na+.L-1); warm-high Na+ (26oC, 164 mmol Na+.L-1); or cold-high Na+ (4oC, 164 mmol Na+.L-1) fluid over 45 min of pre-exercise conditioning. Participants then exercised for 45 min at 10 % ∆ (difference between Gas Exchange Threshold and VO2peak), followed by exercising to exhaustion at 60 % ∆. Heart rate (HR) and rectal temperature (Trec) were measured throughout conditioning and exercise. Blood was sampled before and after conditioning, and at exhaustion. A two-way ANOVA was used to analyse main effects for sodium concentration and drink temperature. Na+ loading elevated plasma volume (PVol) by 4.7 ± 0.3 % (P < 0.001), reduced mean HR by 12 ± 9 b.min-1 (P < 0.001) and increased time to exhaustion (TTE) by 51 ± 5 % (P < 0.001). Pre-cooling lowered Trec by 0.4 ± 0.04oC (P < 0.001), reduced mean HR by 12 ± 7 b.min-1 (P < 0.001), and increased TTE by 49 ± 4 % (P < 0.001). TTE demonstrated a strong positive association with elevated PVol (R2 = .41, P < 0.001) and reduced Trec (R2 = .38, P < 0.001), at the start of exercise. There were no interactive effects of pre-cooling and Na+ loading. Pre-cooling and Na+ loading are highly practical methods of improving exercise performance in the heat. Pre-cooling lowered Trec, Na+ loading elevated PVol, and both interventions maintained a reduced heart rate response and a resultant increase in exercise capacity.

TRANSIENT SWEAT RESPONSE OF THE HUMAN HEAD DURING CYCLING.

DE BRUYNE, G., AERTS, J.M., VANDER SLOTEN, J., GOFFIN, J., VERPOEST, I., BERCKMANS, D.

KATHOLIEKE UNIVERSITEIT LEUVEN

Introduction: This research aims at quantifying transient spatial gradients in sweat production on a human head while cycling, whereas previous studies only reported constant steady state sweat production (Machado-Moreira et al. 2008 and De Bruyne et al. 2008). This could be used to enhance physiological insight of the sweating process. Furthermore, it can also help in designing sweating thermal manikins that show more realistic sweating behaviour. Knowledge of the dynamics of sweat production might also be valuable for designing active controlled headgear since the controller should take the transient behaviour of sweat rate into account.

Methods: Six test persons were studied. Each test lasted 30 minutes while a change in work rate was applied after the first 5 minutes (80 to 150 Watt for males and 50 to 125 Watt for females). Two conditions were analyzed in this research: warm (28.3+/-0.1°C, 38+/-0.6% RH and 0.1+/-0.1 m/s air velocity) and standard (16.1°+/-0.2°C, 45%+/-0.6 RH and 2.4+/-0.2 m/s air velocity). Sweat production of the head was measured as a function of time on the right temple, left temple and forehead. This allowed modelling the dynamic characteristics of the sweat production response such as the time delay [s] between a change in work rate and the onset of sweating, the time constant [s]

describing how fast the sweat rate changes and the steady state gain [mg/(min.cm2.W)] describing how much sweat [mg/(min.cm2)] is produced per unit change of work rate [W].

Results: Time constants of sweat production were significantly smaller (P<0.05) in the warm condition compared to the standard condition. Mean and SEM time constant of sweat production varied from 561+/-144s (frontal region) to 1117+/-230s (left temple) and 1080+/-232s (right temple) in the warm condition. In the standard condition, the time constant of sweat production varied from 873+/-121s at the frontal region to 1431+/-195s at the left temple and 1727+/-196s at the right temple. Additionally, also constant steady state sweat production was 0.4 to 0.7 mg.min-1.cm-2 higher in the warm compared to the standard condition (P<0.05). However, no differences (P>0.05) were observed for steady state gain and time delay of sweat production between the standard and warm condition. The results showed that the sweat production response was predominantly affected by the applied work rate in the given thermal conditions, a non-thermal factor.

Conclusions: Local sweat production on the human head was mainly affected by the applied work rate, while the environmental condition affected the time constant of sweat production, but not its time delay or steady state gain.

References

De Bruyne et al (2008) Spatial differences in sensible and latent heat losses under a bicycle helmet, EJAP 104: 719–726.

Machado-Moreira et al (2008) Local differences in sweat secretion from the head during rest and exercise in the heat. EJAP 104(2): 257-264

SCALP HAIR ABSENCE DOES NOT ALTER SELF-PACED 10 KM RUNNING PERFORMANCE

PRADO, L., MARTINI, A.R., FERREIRA JR, J.B., BORBA, D.A., RODRIGUES, L.O.C.

FEDERAL UNIVERSITY OF MINAS GERAIS

Objective: Aim of the present investigation was to test the hypothesis that human scalp hair may act as a natural protection against sun radiation which would allow subjects to better perform during prolonged running bouts under the sun.

Methods: Participated in this investigation 12 male healthy subjects (29.5 ± 3.7 years old; 174.9 ± 4.3 cm; 72.7 ± 3.2 kg and 44.6 ± 3.4 ml.kg-1.min-1 VO2max). They presented at least 6 cm of stretched scalp hair at the beginning of the study. There were 4 exercise situations. On the first day, after anthropometric characterization, a field test for estimating aerobic capacity was carried out. Two days later, one familiarization run was carried out, followed by two experimental situations: scalp hair presence (HAIR) and shaved scalp hair (NOHAIR), in this order. In each exercise situation subjects performed a 10km self-paced run at maximal subjective intensity in an external environment, under the sun. HAIR and NOHAIR were carried out at least one week apart. All experimental situations took place on a 200m flat grassy circuit. Environmental heat stress was measured by the Wet Bulb Globe Temperature index (WBGT). Running velocity, heart rate, rectal temperature, physiological stress index and rate of heat storage were measured.

Results: There was no difference on WBTG between experimental situations (24.0 ± 1.4 e 23.2 ± 1.5 °C, for HAIR and NOHAIR, respectively). Running velocity (ANOVA, F=0.0066, p=0.94), heart rate (ANOVA, F=2.45, p=0.145), rectal temperature (ANOVA, F=0.27, p=0.6), physiological stress index (ANOVA, F=0.0176, p=0.89) and rate of heat storage (ANOVA, F=2.4, p=0.15) were not significantly different between HAIR and NOHAIR.

Conclusion: For the present experimental situations, the absence of scalp hair did not alter 10 km self-paced, maximal running velocity under the sun.

KUSHLAN, J.A. The vestiary hypothesis of human hair reduction. J Hum Evol. 14:29-32, 1985.

LAMBERT, E. V., St CLAIR GIBSON, A., NOAKES, T.D. Complex systems model of fatigue: integrative homoeostatic control of peripheral physiological during exercise in humans. Br J Sports Med. 39: 52-62, 2005.

08:30 - 10:00

Oral presentations

OP-BM02 Biomechanics 2

ARCHITECTURAL FEATURES OF HUMAN TIBIALIS ANTERIOR DURING PASSIVE ANKLE ANGLE CHANGES MEASURED BY 3D-ULTRASONOGRAPHY

IKEGAWA, S., KURIHARA, T., IWANUMA, S., AKAGI, R., SAKAGUCHI, M., KANEHISA, H., FUKUNAGA, T., KAWAKAMI, Y.

JUMONJIGAKUEN WOMEN'S UNIVERSITY

In pennate muscles, fascicles are arranged obliquely with respect to the tendon or aponeurosis. The fascicle length and the pennation angle change by joint angle. Detailed information on these changes is important for modeling of muscle. In the Tibialis anterior (a bipennate muscle), the informations of changes in fascicle length and pennation angle with joint angle are limited. The aim of the present study is to clarify the characteristics of fascicle length and pennation angle of the tibialis anterior muscle during passive ankle angle changing.

METHODS: Eight healthy men participated as subjects in the experiment. The ankle joint was set at 20 deg plantar flexion(P20) and it is changed to 20deg dorsi flexion(D20) with the knee joint positioned at 0 deg (full extension). In the present study, we employed 3D-ultrasonogram. The fascicle length and pennation angle were measured in the longitudinal images which most clear view of fascicle oriented from central aponeurosis to superficial aponeurosis and to Tibia or interoseous membrane. These measurements were performed the proximal, central and distal sites. A three-way ANOVA with repeated measures was to analyze fascicle lengths and pennation angles (2 × 2 × 3, ankle angles (P20, D20), muscle depth (superficial or deep), measurement site (proximal, central or distal).

RESULTS AND DISCUSSION: The fascicle lengths of superficial proximal site at P20 indicated 60.0 (9.4) mm. It decreased to 47.5 (6.4) mm at D20 and it is 23.1% decrements. The fascicle lengths of superficial central and distal sites were 22.0% and 23.8% decrements, respectively. In the deep, the fascicle lengths of proximal, central and distal sites were 18.0%, 20.0% and 25.3% decrement, respectively. The pennation angles of superficial indicated 33.1% to 47.2% increments at three sites with ankle angle changing. In the deep, pennation

angle increased 37.1% to 41.4% at three sites with ankle angle changing . The fascicle lengths and pennation angles were affected by ankle angles and muscle depths. The fascicle length was affected by three measurement sites but pennation angle was not. Maganaris and Valzopoulas, (1999) reported no difference was found the fascicle length and the pennation angle between either the unipennate parts of tibialis anterior or the different scanned site along the muscle at a given ankle angle. However, Hiblar et al(2003) reported the pennation angle decreased along the length of the muscle(central to distal) using 3D ultrasongraphy. Our result is in line with Hiblar et al(2003) and have important implication for construction of 3D muscle model.

REFFERENCES

Hiblar T, et al(2003) In: Molecular and Cellular Aspects of Muscle Contraction, edited by Sugi H. New York, NY: Springer, 635-645.
Maganaris and Valzopulas (1999) Eur.J.Appl.Physiol. 79: 294-297

APONEUROSIS BEHAVIOR IN HUMAN TIBIALIS ANTERIOR DURING SUBMAXIMAL AND MAXIMAL ISOMETRIC CONTRACTIONS

TILP, M., STEIB, S., HERZOG, W.

UNIVERSITY OF CALGARY

Introduction: The aponeurosis within a muscle transfers force developed by the muscle fibres via the tendon to the bone. In classical muscle models the aponeurosis is modeled as a passive elastic element in series to the contractile elements. However, there have been different reports regarding the aponeurosis behavior during muscle contractions. While some authors (e.g. Arampatzis et al, 2005) reported lengthening of the aponeurosis with increasing activation (force) others found e.g. shorter aponeurosis lengths in activated compared to the passive state at the same muscle lengths (Zuurbier et al, 1994) which would contradict the purely passive behavior of an elastic element in series. Therefore, the aim of the study was to determine the length changes of the human tibialis anterior (TA) during submaximal and maximal isometric contractions so as to decide whether the aponeurosis can be considered a purely passive element in series.

Methods: To measure the length changes of the TA aponeurosis in vivo, nine healthy subjects (7 males, 2 females, 27 +/- 5 years, 179 +/- 9 cm, 73 +/- 9 kg) were asked to perform isometric dorsiflexions with 20, 40 and 100 % of maximal voluntary effort (MVE). An isokinetic dynamometer (Biodex®, System 3) was used to control ankle joint movement and to measure torque. Two ultrasound systems (Phillips Envisor, 49 Hz) were used to observe the movements of the proximal and distal ends of the TA aponeurosis simultaneously. Surface electromyograms (EMGs) were obtained from the TA and the medial gastrocnemius (MG) muscles (Biovision® system). Torque and EMG were collected using WinDaq Data Acquisition software (DataQ Instruments®) at 1000 Hz and were synchronized with the ultrasound images using a synchronization signal produced by a function generator.

Results: Mean aponeurosis lengths increased slightly by 0.02 cm (+/- 0.2), 0.07 cm (+/-0.2), and 0.20 cm (+/- 0.23) with increasing torques at 20, 40 and 100% of MVE, respectively. Not all subject demonstrated a lengthening of aponeurosis. Especially at low activation levels (20% of MVE) three out of the nine subjects showed a decrease in aponeurosis lengths due to activation.

Discussion: Aponeurosis lengths only increase slightly with increasing forces indicating that either the aponeuroses are very stiff and do not contribute much to the expected passive length changes in muscles with increasing force, or aponeuroses are inherently soft but they are not arranged in series with the muscle fibres. Therefore, we conclude that aponeuroses in human TA play no appreciable functional role in series elasticity storage or return.

References

Zuurbier CJ, Everard AJ, van der Wees P, Huijing PA. (1994). J Biomech, 27(4), 445-53
Arampatzis A, Stafilidis S, DeMonte G, Karamanidis K, Morey-Klapsing G, Brüggemann GP. (2005). J Biomech, 38(4), 833-41

LATERAL FORCE TRANSMISSION BETWEEN LOWER LEG MUSCLES

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BISPEBJERG HOSPITAL, UNIVERSITY OF COPENHAGEN, NORWEGIAN SCHOOL OF SPORTS SCIENCES, UNIVERSITY OF JYVASKYLA, TURKU PET CENTRE

The mechanisms that underlie tendon injury are elusive, however, suboptimal muscle activation patterns and non-uniform force transmission from muscle to bone may be candidates for injury mechanisms. Musculotendinous force transmission may occur in a more complex manner than previously appreciated, and for example, it has been shown in animals that lateral force transmission occurs between synergist and even between agonist and antagonist muscles.

Purpose: To determine if lateral force transmission occurs within and between superficial and deep plantarflexor muscles in humans in vivo.

Methods: Seven subjects performed 5 types of either active contractile plantar flexions or passive joint manipulations: 1) voluntary plantarflexion, 2) voluntary hallux flexion, 3) passive hallux extension 4) passive knee extension, and 5) selective percutaneous stimulation of the medial gastrocnemius (MG). The corresponding muscle displacement during manipulations was determined by ultrasonography obtained at a proximal and at a distal site for 2 superficial plantarflexor muscles (MG (proximal site), soleus (SOL) (proximal and distal site), and 1 deep plantarflexor (flexor hallucis longus (FHL)) at the distal site. Neural activation of muscles was assessed by EMG.

Results: During passive hallux extension the FHL muscle tissue underwent 5±1 mm (mean±sem) displacement in the distal direction without any movement in the adjacent SOL muscle. The FHL moved 4±1 mm in the proximal direction during selective FHL contraction with no concurring SOL movement. During voluntary plantar flexion SOL and MG displacement in the proximal direction was similar (~7±1 mm), while FHL displaced proximally on average 2±1 mm. However, 4 subjects displayed proximal FHL displacement while 3 subjects had distal displacement of the FHL during plantarflexion. Percutaneous stimulation of MG generated 3±1 mm of displacement of GM and 2±1mm in SOL in the proximal direction while FHL remained fixed. Passive knee extension induced similar displacement of both the GM and SOL (~4±1 mm).

Discussion: The present data indicate that the FHL, which is a fairly strong plantarflexor muscle, seems to be an independent actuator with respect to intermuscular force transfer, and further support the notion that the FHL activation displays large inter-individual variation. Moreover, the data suggest that lateral force transmission occurs between the superficial plantarflexor muscles (GM and SOL). Recent work has challenged the classic understanding of muscles as single actuators, and suggested that muscle function and force transfer in a limb where muscles and tendons lie in close proximity should be considered as one interdependent system where force is transferred laterally between structures to minimize stress concentrations. This notion is partly supported by the present data.

This work was supported by the Danish Medical Research Council

IN VIVO MECHANICAL PROPERTIES OF THE PATELLAR TENDON IN ADULTS AND PRE-PUBERTAL CHILDREN

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UNIVERSITY OF HULL, MANCHESTER METROPOLITAN UNIVERSITY, UNIVERSITY OF BIRMINGHAM

An increase in tendon stiffness in vitro with maturation has been reported in many species, with an associated increase in tensile strength. The risk of strain-induced injury to tendon is related to its mechanical properties and associated tensile strength. Therefore, an understanding of how the in vivo mechanical properties of tendon change as a result of maturation may be valuable in gaining insight into the risk of strain-induced tendon injury at different ages. The mechanical properties of the patellar tendon were measured in men, women, boys and girls (each group, n=10). Patellar tendon force (Fpt) was calculated from the measured joint moment during ramped knee extension maximum voluntary contractions. Antagonist co-activation was quantified from its electromyographical activity, and the patellar tendon moment arm was measured from magnetic resonance images. Tendon elongation was imaged using sagittal plane ultrasound scans throughout the contraction. Tendon cross-sectional area was measured at rest from ultrasound scans in the transverse plane. Maximal Fpt and tendon elongation were [mean (SE)] 5453 (307)N and 5 (0.5)mm for the men, 3877 (307)N and 4.9 (0.6)mm for the women, 2017 (170)N and 6.2 (0.5)mm for the boys and 2169 (182)N and 5.9 (0.7)mm for the girls, respectively. In all groups tendon stiffness and Young's modulus were examined at the level that corresponded to the maximal 30% of the weakest participant's Fpt (925-1321N) and stress (11.5-16.5MPa), respectively. In this force region stiffness was significantly greater in both adult groups than either child group ($p<0.01$), with no differences between men and women, or boys and girls [men 915 (74)N/mm; women 876 (119)N/mm; boys 472 (60)N/mm; girls 478 (49)N/mm]. Young's modulus was also significantly greater in both adult groups than in boys ($p<0.01$) or girls ($p<0.05$), and there were no differences between men and women, or boys and girls [men 444 (39)MPa; women 443 (60)MPa; boys 224 (38)MPa; girls 266 (27)MPa). As a result of the reduced Young's modulus, the patellar tendon in children experienced greater strains at maximum voluntary contractions compared to adults, despite being under a lower stress. These findings indicate that children may be at a greater risk of strain-induced tendon injury than adults. Tendon stiffness also impacts the degree of fascicle shortening during contraction. To investigate whether the different tendon stiffness of each group results in differences in fascicle shortening between groups ultrasound recordings were made from the mid-belly of the vastus lateralis at rest and maximum voluntary contraction in a subsample of each group (n=3). It was found that fascicle shortening was ~20% of resting length in all groups. This indicates that tendon stiffness will not contribute to differences in the moment-angle relationship between adults and children.

DISTRIBUTION OF MEDIO-LATERAL BONE DENSITY AT THE ACHILLES TENDON INSERTION OF THE HUMAN CALCANEUS

LERSCH, C., FIRNER, S., POTTHAST, W., BRÜGGEMANN, G.P.

GERMAN SPORT UNIVERSITY COLOGNE

Introduction: Asymmetrical load distribution within the human Achilles tendon (AT) is considered to be an important etiological factor for AT injuries (Arndt et al.) A previous cadaver study revealed that particularly the variation of frontal plane Calcaneus (CA) position has an influence on medio-lateral load distribution within the AT (Lersch et al.) Due to the adaption of bone to mechanical load it was hypothesized that tendon induced loading, that acts asymmetrically in a long term, results in an asymmetrical distribution of bone density in the region of the tendon insertion. Therefore it was the purpose of this study to determine the medio-lateral distribution of bone density in the region of the AT insertion to get further insight into long-term force transmission between AT and CA.

Methods: Ten CA were assessed by Peripheral Quantitative Computed Tomography (pQCT) in intact condition after determining the position of the AT insertion by ultrasound in the sagittal plane. Subsequently to taking a low resulution pQCT scan of the entire bone in the sagittal plane, three transverse sections of the AT insertion, additionally one distal and one proximal to the insertion were recorded (slice thickness 0.5mm; voxel size 0.5mm). Slices were divided into medial and lateral parts and the following parameters were analyzed: Total cross sectional bone area (CSA, mm2), total bone mineral density (BMD, mg/cm3), total bone mineral content (BMC, mg), cortical area (CortA, mm2), Cortical Bone Mineral Density (CortBMD, mg/cm3).

Results: First data indicated that bone parameters differ between the different pQCT-slices. For both, medial and lateral parts CortBMD and CortA increased from proximal to distal (759.1–837.2mg/cm3; 1.5-9.8mm2). CortBMD was found to be higher on the medial side in all slices. The same was found for CortA, which differed most at the distal part of the AT insertion from medial to lateral (16.8 vs. 3.3 mm2).

Discussion: First data of this study showed that bone parameters of CA are not homogeneously distributed in the region of AT insertion. Particularly the medial aspect of the insertion exhibited higher values in analyzed parameters. This can be related to the findings of a previous study which revealed that AT loading in neutral and eversion CA positions led to inversion moments around the CA. The results of the present study support the hypothesis that higher tensile forces are applied to the medial aspect of the AT insertion than to the lateral aspect. The findings of this study could lead to a better understanding of the etiology of AT pathologies.

References

Arndt A, Brüggemann GP, Koebke J, Segesser B (1999). Foot Ankle Int. Jul;20(7):444-9.

Lersch C, Potthast W, Segesser B, Koebke J, Brüggemann GP (2008). Proceedings of 13th ECSS congress.

THE ANTERIOR AND POSTERIOR HUMAN PATELLAR TENDON - MARKED BIOMECHANICAL, STRUCTURAL AND BIOCHEMICAL DIFFERENCES

HANSEN, P., HARALDSSON, B.T., KROGSGAARD, M., QVORTRUP, K., LARSEN, J.O., KJAER, M., AAGAARD, P., MAGNUSSON, S.P.

BISPEBJERG HOSPITAL AND FACULTY OF HEALTH SCIENCES, UNIVERSITY OF COPENHAGEN, DENMARK

Introduction: Patellar tendinopathy is common in sports with prevalences up to 30-50% among elite jumping athletes. Different magnitudes of tensile strain during knee flexion have been demonstrated between the anterior and posterior aspects of human patellar tendon, which may lead to corresponding intratendinous alterations. We hypothesize that region-dependant differences in mechanical properties exist between the anterior and posterior patellar tendon fascicles and that such differences are paralleled by alterations in collagen fibril morphology and the biochemical cross-link composition of the tendon. Materials and methods: Patellar tendon samples were obtained from healthy young men (mean±SD, 32±9 yrs, n=8) during anterior cruciate ligament reconstruction. Collagen fascicles

were dissected from the anterior and posterior tendon. Fascicle mechanical properties were measured micromechanically. Collagen fibril morphology was examined by transmission electron microscopy (TEM). Hydroxlysylpyridinoline (HP), lysylpyridinoline (LP) and pentosidine (PE) cross-link content was determined by HPLC. A Student´s T-test was used to detect differences between the anterior (AF) and posterior fascicles (PF) for all mentioned analyses. Regression analyses were performed to reveal associations between the measured parameters. Results (mean ± SD): Mechanical properties: Peak stress was greater for AF (56.6±14.5.6 vs. 39.3±23.5 MPa, p<0.05). Strain was greater for PF (14±4 % vs. 19±3 %, p<0.01), while Young´s modulus was greater for AF (618±201 vs. 360±153 MPa, p<0.001). Biochemical analyses: HP and LP content were significantly greater for the PF (HP: 0.859±0.197 vs. 1.416±0.250 pmol/pmol, p=0.001; LP: 0.023±0.006 vs. 0.035±0.006 pmol/pmol, p<0.01). No differences were found for PE (0.024±0.015 vs. 0.024±0.013; p=0.92). TEM: (n=5 AF vs. 5 PF): Fibril diameters (FD) tended to be less for PF (7848±2391 vs. 4826±1603 nm², p=0.103) while fibril density showed a strong trend to be greater for PF (71±23 vs. 101±14 #/µm², p=0.0535). Regression analyses: For both AF and PF there were no significant correlations between cross-link concentrations (HP, LP and PE, respectively) and mechanical properties (peak stress, tangent modulus and strain, respectively). Pentosidine concentration and subject age were positively related for both AF (r^2=0.9, p=0.01) and PF (r^2=0.9, p=0.01). Conclusion: PF were markedly weaker than AF while HP and LP content was greater. Neither cross-link content nor fibril morphology could explain the decreased mechanical properties of PF. Interestingly, the cross-link composition of PF resembles the composition reported for human ligaments. We speculate that differences in loading patterns for AF and PF may explain the observed differences, which are presumed closely related to the frequent occurrence of tendinopathy in the posterior patellar tendon.

10:15 - 11:45

Invited symposia

IS-BM01 Strength training A: Hypertrophy

MYOSTATIN IN ADULT SKELETAL MUSCLE

SCHJERLING, P.

BISPEBJERG HOSPITAL

Myostatin (growth differentiation factor 8) is a growth factor which belongs to the TGF-beta superfamily. Myostatin is an important negative factor for skeletal muscle size as hyper muscularity is seen in mice, domestic animal races and humans when the myostatin gene is defect. It is well established that myostatin is important in muscle development, whereas the exact importance of postnatal myostatin expression on the adult muscle is still under debate.

Myostatin is produced as a precursor peptide of 376 amino acids, which at some point is cleaved into a 110 amino acids mature myostatin peptide and the so-called latency-associated peptide (LAP). The LAP remains associated to the mature myostatin, inhibiting receptor binding, until the LAP is cleaved by extracellular peptidases. The mature myostatin is then able to signal via at least two different receptors, the activin type II receptor and a yet unknown receptor. When signaling through the activin type II receptor, the SMAD transcription factors are phosphorylated which allows them to enter the nuclei and activate transcription of different genes.

Although myostatin is mainly recognized for its effect on muscle cells, recent experiments suggest that myostatin may as well play a role for fibroblasts in the muscle (Li et al. 2008).

The role of myostatin in adult skeletal muscle will be discussed in this presentation.

Li ZB, Kollias HD, and Wagner KR. Myostatin directly regulates skeletal muscle fibrosis. J Biol Chem. (2008) 283:19371-8.

TESTOSTERONE AND MUSCLE HYPERTROPHY

KVORNING, T.

TEAM DANMARK

Muscle hypertrophy (MH) induced by strength training (ST) involves the orchestration of several anabolic mechanisms. One important factor in this process is testosterone (T) and thus the primary aim of this presentation is to highlight the importance of endogenous T in ST-induced MH.

T supplementation in humans induces MH (1). Conversely, suppression of T production by GnRH-analogues results in decreases in protein synthesis, strength, and fat oxidation (5). Inducing chronic changes in T concentrations by GnRH-analogues and T supplementation in five graded doses resulted in a positive relationship between T concentrations and lean mass, strength, and fat mass (2, 7). Also, MH was associated with an increase in satellite cells, which correlated with graded T concentrations (6).

To further elucidate the role of T in the adaptations to ST, 22 young men were treated with 3.6 mg goserelin (GnRH-analogue) every 4 wks or placebo, in a randomized design, for a period of 12 wks (3, 4). Attention was focused on the effect of T on lean mass, muscle strength, androgen receptors (AR), satellite cells and expression of signaling genes underlying MH (myoD, myogenin IGF-IEa, IGF-IEb, IGF-IEc and myostatin). The ST period of 8 wks started after 4 wks of treatment. Testing was performed before and after the ST period and acute measures were taken during the final ST session in the ST period.

Goserelin suppressed resting levels of T below 10% of normal, blocked the acute increase in T during ST, significantly attenuated the increase in lean mass, and abolished the increase in strength due to the ST period. Fat mass increased in the goserelin-treated group and decreased in placebo. The absence of the acute increase in T, however, had no influence on the acute mRNA expression of myoD, myogenin, myostatin, IGF-IEa, IGF-IEb, IGF-IEc, and AR during the final ST session. Similarly, the lower resting level of T had no effect on the resting mRNA expression before or after the ST period. Therefore, T does not seem to be involved in the transcriptional regulation of the genes expected to stimulate MH. Increases in the number of satellite cells after the ST period were observed around type II fibers, with no significant effect between the two groups.

It can be concluded that T is important for MH since suppression of T attenuates the increase in lean mass and strength induced by ST. However this happens in spite of similar mRNA response and satellite cell activity. This implies that T may regulate intracellular factors downstream from myoD, myogenin, myostatin, IGF-IEa, IGF-IEb, and IGF-IEc mRNA transcription, and indicate that satellite cells are only partially involved in MH.

1. Bhasin Engl J Med 335: 1996.
2. Bhasin Am J Physiol Endocrinol Metab 281: 2001.
3. Kvorning Am. J. Physiol. Endocrinol. Metab. 291: 2006
4. Kvorning J. Physiol. 578: 2007
5. Mauras J Clin Endocrinol Metab 83: 1998.
6. Sinha-Hikim Am J Physiol Endocrinol Metab 1: 2003
7. Storer J Clin Endocrinol Metab 88: 2003

ROLE OF IGF-I IN HYPERTROPHY

HARRIDGE, S.

KING'S COLLEGE LONDON

The growth hormone (GH) and insulin like growth factor -1 (IGF-I) axis is extremely important during growth and development. GH causes the synthesis of IGF-I in the liver and this is the major source of circulating IGF-I. In the circulation IGF-I binds to a number of different binding proteins which regulate its biological activity. However, in regard to the hypertrophy of adult muscle, circulating IGF-I seems to be of considerably less importance than IGF-I produced locally in muscle. This is evidenced by recombinant growth hormone administration induced increases in IGF-I not increasing muscle protein synthesis or causing hypertrophy. The IGF-I gene can be subject to a process of alternative splicing. The subsequent E-peptides that are cleaved during processing of the pro-hormone leaving the same "mature" IGF-I peptide, which is 70 amino acids long. Administration of this peptide into the muscles of mice in vivo, and to cells in culture, has been shown to cause hypertrophy. Furthermore, gene transfer (somatic and germ line) studies where IGF-I has been over expressed in muscle (and not the circulation) have confirmed the anabolic actions of this protein. How does IGF-I exert its actions? IGF-I stimulates muscle protein synthesis through activation of the P13/AKt signalling pathway. Activation of this pathway also causes AKT phosphorylation to inhibit the action of FOXO, a regulator of atrogene expression, which itself regulates muscle protein degradation. IGF-I is also unique in that is causes the proliferation and differentiation of satellite cells, whose activation is ultimately required for growth to occur. What of the E-peptides derived from alternative splicing? There are three of these, termed IGF-IEc, Eb and Ec. IGF-I Ec is also known as mechano growth factor (MGF). The expression of these splice variants has been limited to the measurement of mRNA as no good antibodies are commercially available. MGF is the only one of these peptides whose role has been investigated in any detail. Its mRNA expression levels are markedly lower levels than those of IGF-IEa, but MGF is more rapidly upregulated in response to exercise. It seems that this particular peptide may play a specific role in muscle adaptation by stimulating satellite cell proliferation.

10:15 - 11:45

Oral presentations

OP-PS04 Psychology 4

STAGES OF CHANGE AND PHYSICAL ACTIVITY: HOW DO THE STAGES MATCH SELF REPORTED PHYSICAL ACTIVITY, SELF-EFFICACY AND PHYSIOLOGICAL MEASURES

SØRENSEN, M.

THE NORWEGIAN SCHOOL OF SPORT SCIENCES

STAGES OF CHANGE AND PHYSICAL ACTIVITY: HOW DO THE STAGES MATCH SELF REPORTED PHYSICAL ACTIVITY, SELF EFFICACY AND PHYSIOLOGICAL MEASURES?

Marit Sørensen1 and Sidsel Graff-Iversen2

1The Norwegian School of Sport Sciences, Norway

2National Institute of Public Health, Norway

Introduction: The stages of change model, or The Transtheoretical Model (TTM) has been heavily critisised. Among the issues are: not being applicable to complex behaviours like physical activity, lack of validated staging algorithms, and over-simplification. The purpose of this presentation is therefore to examine the relationship between self reported stages of change of physical activity behaviour, 3 different self-reported physical activity measures, self regulatory self-efficacy of exercise, and physiological measures related to physical activity, namely waist-hip ratio, triglycerides in the blood, and pulse counts, in a population study.

Methods: Data were obtained from a population-based cohort study by the National institute of public health in two counties during the years 2000-2001 (Norwegian Institute of Public Health, 2003). Questionnaires were collected by health personnel in conjunction with a physical examination. The sample for this study consisted of those individuals who answered the questions about stages of change of physical activity (N= 9374, 55.3% females and 44.7% men).

Results: The largest group for both genders and in all age groups were the preparers (37%), people who describe themselves as physically active but not regularly. Nearly as many defined themselves at the maintenance stage (35%). There were very few in the action stage (4.4%). The stages correlated reasonably with the self reported physical activity measures for leisure time activity. Cross-tabulations demonstrated that the main pattern of responses for all three activity measures supported the staging algorithms. However, a varying percentage gave inconsistent responses (variation raged from 1,5% up to 36,4% in some categories). The mean scores of exercise self efficacy, waist-hip ratio, triglycerides and pulse counts changed in a linear fashion with the 5 stages from precontemplation to maintenance.

Conclusion.

The staging algorithms were supported by the physiological markers and exercise self-efficacy, and to some extent by simple self-reports of physical activity in leisure time.

THE COMPARISON OF EXERCISE AND DIETING BEHAVIORS AMONG STUDENTS

HEIN, V.

UNIVERSITY OF TARTU

Previous research of the motivational model, based on self-determination theory and theory of planned behaviour, has shown that relative autonomous motivation predicted intentions to exercise or diet via the mediation of attitudes and perceived behavioral control, and the latter two predicted actual level of exercise and dieting behaviour via the mediation of intentions (Hagger et al., 2006). The aims of the present study were: 1) to retest motivational models of exercise and dieting behaviour with Estonian students; and 2) to compare the components of motivational models for exercise and dieting behaviour among overweight students.

Participants were 251 students aged 18 to 23 years. The motivational model components were measured according to the method reported by Hagger et al (2006) A structural equation modeling procedures were used. The comparison of the models components was made by the Paired - Sample T - Test. According to self-reported data about height and weight (Davis, 1990), 32 participants had BMI over 25 and were viewed as overweight.

The fit indexes of the models were acceptable (NNFI = 0.95, CFI = 0.96 and RMSEA = 0,07; NNFI = 0.94, CFI = 0.95 and RMSEA = 0,08, respectively for motivational models of exercise and dieting behavior). The models explained 56 and 35 % of the variance in the dieting and exercise behavior respectively. The direct effect from autonomous motivation to intention was followed in the both motivational models. The testing the mediation effect of intention between autonomous motivation and actual behaviors showed the existence of the complete mediation in the motivational model for exercise behavior and partial mediation in dieting behavior.

The comparison of the model components showed that all participants evaluated all motivational types, expect amotivation, higher for exercise behavior than for dieting behavior. The similar trend was followed in respect of the attitude and perceived behavioral control. The analysis of the group with overweight indicated that they were more intrinsically motivated in respect of physical activity than in the following the diet. Also the attitude toward the physical exercise was high than for diet.

The results of this study confirmed that the motivational models can be replicated not only in both behavioral contexts but is also applicable in other cultural context. Students were more motivated in physical activity than in following the diet.

References

Hagger M., Chatzisarantis N., Harris, J. (2006) The Process by Which Relative Autonomous Motivation Affects Intentional Behavior: Comparing Effects Across Dieting and Exercise Behaviors. Motiv Emot. 30, 307–321

Davis, C. (1990) Body image and weight preoccupation: A comparison between exercising and non- exercising. Appetite, 15,13- 21.

IMPAIRMENTS IN COGNITIVE PERFORMANCE DURING LONG LASTING PHYSICAL ACTIVITY

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It is generally accepted, that short bouts of aerobic exercises are capable to improve cognitive performance (Audiffren et al. 2008), while on the other hand, very long lasting strenuous physical activity, possibly accompanied by dehydration or sleep deprivation, leads to a severe reduction in intellectual capabilities (Tomporowski, 2003, Lieberman et al., 2005). Although there are several studies addressing these in- or decreases in cognitive performance for exercise intervals up to three hours, there are almost no reports exceeding this time interval.

Three studies will be presented focusing on cognitive performance changes during foot races lasting 24 hours or longer. The first study is a single case report of a 24 hours race where the subject underwent EEG recordings and reaction time tests approximately every two hours. In the second study the results of two subjects participating in the Badwater Ultramarathon (216 km in the Death Valley, with ambient temperatures well above 50°C) are reported. Concentration (as a part of the working memory system) and sustained attention have been investigated at 6 points along the route. The third study, carried out again during the Badwater Race included 5 subjects that have been tested until km 130. Reaction times, working memory span, long term memory (encoding and retrieval) have been investigated.

In general we can conclude that cognitive performance is at least in part somewhat impaired after more than 24 hours of exercise, although most of these effects are small and show considerable interindividual variations. While the performance in simple reaction time tasks, or working memory span is almost unimpaired, the encoding into long term memory shows a dramatic decrease. The fact that ultra-race participants are unable to encode and retrieve information into and from long-term memory, is of relevance for the organization of those events.

Audiffren M, Tomporowski P, Zagrodnik J (2008). Acta Psychologica 129: 410-419

Doppelmayr M, Finkernagel H, Doppelmayr H (2005) Perceptual and Motor Skills 100: 473-487.

Lieberman H, Bathalon G, Falco C, Kramer F, Morgan Iii C, Niro P (2005) Biological Psychiatry 57: 422-429.

Tomporowski P (2003) Acta Psychologica 112: 297-324.

MODIFICATIONS OF BODY STATE IMAGE AFTER A PHYSICAL ACTIVITY SESSION

NART, A., SCARPA, S., CAENA, F., CAVALLO, A.

UNIVERSITY OF PADUA

Introduction: Body image (BI) can be considered as a multidimensional construction about perceptions and attitudes that individuals refer to their bodies and in particular to their appearance. Despite the fact that athletes are generally more satisfied with their bodies than others, physical activities seem to wield both negative and positive influences on BI. The aim of the study was to understand the role played by physical activity (PA) in BI modifications. In particular we wanted to observe if a single session of sport or PA in general could have some positive influences on BI state, meant as an episodical evaluative and affective perception of physical appearance.

Methods: 180 subjects (128 women, 71.1% and 52 men, 28,9%) aged from 15 to 78 (M= 37.42, SD=18.78) were involved in the study. The main research tools were the following: (a) the Body Image States Scale (BISS, Cronbach's alpha in neutral context .77); an Italian version was obtained by means of back-translation (Cronbach's alpha .74); (b) one hour session of PA or sport; (c) additional personal information (sex, age, body mass index, physical and sport activity type, reasons linked to their practice, intensity and enjoyment level of the practised activity). Written informed consent was obtained from all participants.

BISS is a six-item questionnaire with a 9-point response format for each item. The measure of BI is obtained by the composite mean of the six items. Higher scores reflect more positive BI states. Procedure foresaw three compilations of BISS: the first one hour before, the second at the beginning and the third at the end of a PA or sports session (duration of one hour).

Results: The composite mean of initial compilation of BISS was 5.49 (SD .91), the second one was 5.49 (SD .92) and the final one was 5.91 (SD 1.03, p = .000). Male BI state scores significantly higher than the female one (5.8 vs 5.3 at baseline, p = .002), but the trend was the same for both males and females with a positive fallout from PA sessions. Age, BMI, motivation and PA type did not seem to influence BI state modifications, while there was a positive effect on BI state of both PA enjoyment and intensity.

Discussion: Results showed that sport and PA had a positive influence on BI state and seemed to confirm the validity of the BI state construct, changing with time and in different contexts. Those findings could have significant implications in the field of BI disturbances and their prevention. At least two cornerstones should be considered in promoting programs of adapted physical activities: (a) activities should have an intensity range from moderate to high; (b) due consideration should be given to enjoyment as a factor that increases the positive effects of physical exercise over BI.

References

Cash TF, Fleming EC, Alindogan J, Steadman L, Whitehead A. (2002). Eating Disorders, 10, 103-113.

Cash TF, Pruzinsky T. (2004). Body Image, Guildford Press, New York.

THE EFFECT OF THE ECOLOGY OF PRACTICE ON ACHIEVEMENT ORIENTATIONS AND SPORTPERSONSHIP AMONG SOCCER PLAYERS UNDER-16 YEARS

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UNIVERSITY OF COIMBRA

Coaches are believed to have an important role in shaping the quality of the youhg athletes experiences. Scholars suggest that the climate fostered by the ecology of practice can influence the athletes' achievement orientations and moral attitudes. The purpose of this study is to examine the effects of practice context's climate on (a) achievement goals (Task and Ego Orientations in Sport Questionnaire/TEOSQ) ; (b) the sportpersonship attitudes (Sports Attitudes Questionnaire/SAQ).

Methods: Soccer players aged 13-16 years (n=132, 85 from an academy of a professional club and 47 from a local club) fullfilled the portuguese versions of TEOSQ and SAQ. To analyze the effects of ecological climate on dependent variables t-test and ANOVA were performed.

Results and Discussion: In TEOSQ players from the academy scored significantly higher than their peers both on task and ego items. In SAQ significant effects were found on commitment, and gamesmanship,the athletes from the academy showing higher scores. No effects were found on convention and cheating.

Conclusions: The competitive level seems to have effect on achievement goals, and on sport attitudes. The players with professional orientation show an high ego- and high task-orientation, simultaneously with a greater commitment in sport and a greater orientation toward winning. The findings suggest that sport organizations with different philosophies exert different effects on adolescents' motivational orientation and sportpersonship.

References

Chi, L., & Duda, J. (1995). Multi-sample confirmatory factor analysis of the Task and Ego Orientation in Sport Questionnaire. Research Quart., 66, 2, 91-98.

Lee, M.J., & Whitehead, J. (1999). The effects of values, achievement goals, and perceived ability on moral attitudes in youth sport. Report provided to the Economic and Social Research Council, Swindon, England.

A CROSS-CULTURAL STUDY OF SELF-PRESENTATIONAL CONCERN AMONG INTERCOLLEGIATE SOCCER PLAYERS

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This study examined evaluative fear and sport-specific self-presentational concerns among 179 intercollegiate soccer players in Canada, Germany, and Japan. Participants completed the brief Fear of Negative Evaluation (FNE) scale (Leary, 1983) and listed their sport-specific self-presentational concerns as well as the target people of those concerns. Independent samples t tests and post hoc Tukey tests were used to analyze the FNE scores and showed that the Japanese players had significantly higher evaluative fear than the Canadian and German cohorts. Content analysis then revealed 23 conceptual clusters denoting both general and performance-specific self-presentational concerns, 19 of which were team-oriented while four pertained to individual concerns. However, the highest scoring category in Canada and Germany was that players had no specific concerns about impressions. In contrast, not one such response was found in the Japanese sample, and only five clusters were endorsed by the participants in all three nations. With respect to the target people of players' self-presentational thinking, the four universal categories from the 18 clusters that emerged included general spectators, teammates in general, friends, and opposing players/teams. Overall, the results suggest that Canadian and German university players wish to look competent and competitive and are cognizant of the impressions left on a variety of different people, while Japanese players' concerns are largely team-oriented and directed toward peers or those associated with their in-groups. They also suggest that the notion of maintaining "face" in Japanese life extends to sport, presumably through a cultural sense of obligation and group responsibility and the corresponding pressure to win. Follow-up research should examine elite players in different nations plus the effects of psychological skills training on self-presentational concern and performance among Japanese athletes, as it is possible that evaluative fear serves an adaptive function for sports competitors in Japan. Such research is necessary before instructing coaches to apply intervention strategies that reduce self-presentational thinking.

Leary, M. R. (1983). A brief version of the fear of negative evaluation scale. Personality and Social Psychology Bulletin, 9, 371-375.

10:15 - 11:45

Oral presentations

OP-SP01 Sport Management

MOVING BEYOND A PRESIDENTIAL ELECTION: A NETWORK OF STAKEHOLDER INFLUENCES

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Introduction: The purpose of this paper is to explain the presidential election process of the Norwegian Olympic and Paralympic Committee and Confederation of Sports (NOC) in 2007. Stakeholder and network theory is used as the theoretical framework in order to understand the election process and explore the power play between the different stakeholders in sport in relation to have their candidate elected as president. The stakeholder picture is multifaceted and consists of several formal and informal stakeholders, of whom some are internal and some are external.The most influential stakeholders are the sport federations (55) and the regional sport associations (19), and each group has 75 votes. In addition comes the executive board of the NOC. Stakeholder theory is one important example of a theory that develops tools to assess the relative importance of different constituents and to find rational strategies for balancing the attention given to their demands (Mitchell, Agle, & Wood, 1997). Power as conceptualized by Mitchell et al. (1997) refers to abilities to influence the outcome according to the stakeholders' desires. Even within a stakeholder group not all members are homogeneous. Stakeholders lacking sufficient power to influence the organization demonstrated that it may still be able to influence through forming an alliance with another powerful stakeholder (Frooman, 1999).

Method: Qualitative case-study of observations at the GA for three days and field notes, analysis of news paper clippings, and seven semi-structured retrospective interviews with the key-actors (spokesperson for the districts, the sport federations, the leader of the nomination committee, two vice-presidents, the elected president, and the major opponent). The interviews were tape-recorded and written down and analysed according to power, urgency and salience.

Results: The Nomination Committee planted a seed for a female president. This started the chase by the big federations to find a "heavy" candidate to substitute her. They did not succeed because the downfall of the big federations' power was caused by not playing by the democratic rules, too many dirty stories about opponents, arrogance, and failure of organizing fraction meetings. A troika (president and two vice-presidents) united just before the finish line by negotiations on divisions of power and work areas as well as salary. The theoretical framework gave more in-depth knowledge of the election process and how the different stakeholders operated.

Frooman, J. (1999): Stakeholder influence strategies Academy of Management Review.24 (2): 191-205

Mitchell, R. K., Agle, B. R. & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. Academy of Management. The Academy of Management Review, 22, 853-886.

SCIENTIFIC SUPPORT FOR THE "COACH CAMPAIGN" IN GERMAN TOP LEVEL SPORTS

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INTRODUCTION: Despite their exceptional importance for the athletic and personal development of their athletes, systematic research on analysing the professional profile and working conditions of coaches working in German top level sport has not been done yet. In order to address the important role of top level coaches and to improve their working conditions, in 2006 the German Olympic Sport Federation has started a so-called "Coach Campaign". The Federal Institute of Sport Science supports this campaign by the initiation and funding of two research projects: (a) "coach profession profile" and (b) "coach information supply".

The project "coach profession profile" deals with the structural conditions of the coaches' profession and explores the following issues: What are the structural and working conditions of coaches in top level sports? What are the conditions for being employed as a coach? Which measures have to be taken to establish the coach profession as a durable, well honoured and dominant profession, which is characterized by well defined and structured job qualification levels and job profiles?

In order to reach top level performances, coaches depend upon a permanent information supply about the latest training and coaching methods as well as for being up to date for the high demands put upon them in their job as coaches. In the research project "coach information supply", the common information supplies used and asked for by coaches are investigated. The main purpose of this study is to identify information deficits and information needs in order to optimize the information supply for top level coaches.

METHODOLOGY: Both studies were realized by the Institute of Sport Science and the Institute of Media Science at the University of Tübingen, Germany. For both research projects, more than 1.500 top level coaches were asked to fill out extensive questionnaires. Moreover, an analysis of literature and documents related to the topics of the surveys took place, including the use of coach related internet sites, as well as additional half-standardized interviews with experts were carried out.

RESULTS/DISCUSSION: Both research projects were finished in autumn 2008. The overall response rate was rather high (study a: 47,1 %; study b: 27 %), especially in consideration of questionnaire size in both studies.

Selected findings of both studies are

- a high need and interest of coaches for improving professional and structural working conditions;
- high academic and coaching qualification levels of top level coaches, including many years of coaching experiences in top level sports and a former successful individual sport career;
- a preference for non-formal methods of information supply (particularly the interchange of information with other coaches, own observation, analysis and evaluation) and the use of coach training programs.

Additional studies are intended to carry on the improvement of professional profile and working conditions of coaches working in German top level sport.

A COMPARISON OF THE PERCEPTION OF SPORT MANAGEMENT STUDENTS ABOUT GENDER STEREOTYPING IN MANAGERIAL SKILLS

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Introduction and aim: In mid-level managerial jobs, some skills such as relationships and doing tasks are important. Knowing the degree of resemblance between women, men and managers in midlevel managerial skills can show the way to explain the gender stereotyping in sport management. Therefore, the purpose of this study was to examine and compare how perceptions of women, men, and successful mid-level sport managers fared with respect to relationship orientation, task orientation, and emotional stability dimensions that characterize a successful mid-level sport manager.

Methodology: 483 undergraduate sport management students were participated in this study (289 male and 194 female). Data were collected by using Turkish version of Schein Descriptive Index (Sümer, 2006) to define both the sex role stereotypes and the characteristics of successful mid-level sport managers. The instrument consists of 69 items with three subscales; relationship-orientation (23 items), task-orientation (31 items), and emotional-stability (15 items). Internal consistency reliabilities of the subscales were .81, .86, and .72 respectively. Participants filled out only one form of the index. A 2 x 3 (respondent's gender x target person's type) ANOVA was conducted to examine how perceptions of women, men, and successful midlevel sport managers positioned on relationship-orientation, task-orientation, and emotional stability.

Results: Results of the ANOVA on the relationship-orientation measure yielded a strong target person's type effect, $F(2,1187)=16.84$, $p<.001$, $n2=.03$, along with a significant respondent's gender X target person's type interaction effect, $F(2,1187)=4.80$, $p<.05$, $n2=.008$, and main effect of respondent's gender $F(1,1187)=7.95$, $p<.05$, $n2=.007$. The ANOVA results on the task-orientation variable resulted in a strong target person's type effect, $F(2,1187)=95.03$, $p<.001$, $n2=.14$, along with a significant respondent's gender X target person's type interaction effect, $F(2,1187)=27.16$, $p<.001$, $n2=.04$, and main effect of respondent's gender $F(1,1187)=20.71$, $p<.001$, $n2=.02$. Results of the ANOVA on the emotional stability measure yielded a strong target person's type effect, $F(2,1187)=17.25$, $p<.001$, $n2=.03$, along with a non significant respondent's gender X target person's type interaction effect, $F(2,1187)=.03$, $p>.05$, $n2=.00$, and main effect of respondent's gender $F(1,1187)=29.54$, $p<.001$, $n2=.02$.

Conclusion: The results revealed that successful mid-level sport managers were perceived by both female and male respondents to be relatively high on relationship-orientation and task-orientation, and low on emotional instability. It could be stated that generally relationship-orientation is a characteristics more commonly ascribed to successful mid-level sport mangers and women than men, and task-orientation and less neuroticism are characteristics more commonly ascribed to successful mid-level sport managers and men than women.

Reference: Sümer, H. C. (2006). Women in management: still waiting to be full members of the club. Sex Roles, 55(1-2), 63-72.

TEN YEARS AFTER THE ESTABLISHMENT OF WADA: TIME TO EVALUATE ROLES OF THE ACTORS?

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Introduction: Since the establishment of the World Anti-Doping Agency (WADA) in 1999 the number of actors involved in anti-doping activity has increased and the credibility of testing has improved. The aim of this paper is to (i) analyze how the different units have become increasingly interconnected, and (ii) present some suggestions to redistribute tasks between the actors. The role of international federations (IFs) will be emphasized.

Methods: The paper is a result of a four year study (PhD) and based on four case studies which approach the network of anti-doping activity from four perspectives; the global, international, national and athletes perspective. The qualitative case studies were based on interviews, document analysis and archival records.

Results: National and international sports organizations and anti-doping organizations are signatories of the World Anti-Doping Code and required to adopt and implement anti-doping policies and rules, while governments have ratified the International Convention against Doping in Sport. Many organizations are not compliant with the Code, which probably is due to variations in resources, including infrastructure, personnel and economy, as well as in political and socio-cultural differences. Further, the anti-doping activity is still characterized by a lack of trust. The fact that positive doping tests have consequences for an organization may result in a conscious strategy to avoid doping scandals by failing to provide high quality doping controls. To take IFs as one example, they do not have independent anti-doping organizations.

Discussion: It may be a matter of fact that leaders of IFs do not want their sport full of doping, but are they ready to pay the price to get rid of it? In many sports such a process will be a difficult one, which may involve doping scandals and negative publicity for the sport. As a consequence sponsors, TV right-holders and spectators may disappear. To avoid mistrust IFs should not be involved in doping controls of their own athletes. Instead they should be responsible for funding the controls carried out by effective and independent national anti-doping organizations and coordinated by WADA. The funding could, for Olympic sports, be organized by earmarking some part of the income at the Olympics which is distributed to the IFs (in the 2004 Olympics the 28 summer IFs received 253 million USD from television rights). This would give a more trustworthy anti-doping activity. The main task for IFs regarding anti-doping could be responsibility to administer (registered) testing pools in accordance to the WADA regulations and run education program for their own athletes.

HOW DO NORWEGIAN CROSS-COUNTRY SKIERS EVALUATE AND INTERPRET THE WHEREABOUTS INFORMATION SYSTEM?

HANSEN, P.

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Aim: The whereabouts information system is probably the most discussed topic in antidoping. All the athletes who are in the national or international registered testing pool (RTP) have to provide information about their whereabouts. The system enables no-advance notice testing. The two studies on the whereabouts information system which have been carried out (BACL, 2008; Hanstad & Loland, 2009) indicated that many athletes were dissatisfied with the system and especially the technical solutions. The paper will examine the athletes` attitudes towards the whereabouts information system in light of how they evaluate the legal and technical aspects. The harmonization of anti-doping, and their everyday routines connected with the reporting are also taken into account.

Method: The study was carried out as a case study with a qualitative approach. A total of 10 individual interviews were carried out (5 athletes and 5 employees (2 from Antidoping Norway (ADN), 3 from the Norwegian Ski Association). In addition a focus group was used (consisting of 3 athletes).

Results: The meanings of the athletes vary from those who think that the whereabouts information is stressful, to those who doesn't think it`s stressful. All agree that there must be an efficient out-of-competition testing program, but that the technical system creates difficulties for the athletes. The lack of harmonization is also something that worries the athletes.

Discussion: Many athletes are dissatisfied with the system because they find ADAMS too advanced. There are indications that the sensegiving process connected to ADAMS has been executed poorly. The lack of sensegiving affects the sensemaking process within the national team. Furthermore, there seem to be a gap between what the employees in ADN find plausible and what the athletes find plausible. How other athletes evaluate and interpret the system influences the athlete to some extent.

References:

BACL (2008): Anti Doping and Athlete whereabouts Questionnaire, unpublished study

Hanstad, D.V., & Loland, S. (2009): Elite athletes' duty to provide information on their whereabouts: Justifiable anti-doping work or an indefensible surveillance regime? European Journal of Sport Science, 9(1), 3-10

GAMBLING MOTIVATIONS AND FINANCIAL RISK TAKING ATTITUDES OF SPORT GAMBLING UNIVERSITY STUDENTS AND THEIR PERSONALITY DIFFERENCES FROM NON GAMBLERS

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Introduction and aim: Sport gambling is a developing market in sport industry and sport gamblers are the stakeholders of the market. Analyzing sport gamblers in the scope of consumer behavior would be beneficial for creating successful marketing decisions. Therefore, the purpose of this study was three-fold; to determine the personality and financial risk-taking attitude differences between sports gambling students and non-gambling students, to specify gambling motivations of the sport gambling students and to identify the relationship among personality traits, financial risk-taking attitude and gambling motivations of the students who gamble on sport events.

Method: The subject group was composed of 1109 (male 700, female 409) Middle East Technical University students who were participating in sport gambling activities (n=435) and who had never participated in sport gambling activities (n=674). Big Five Personality Inventory (John, Donahue, & Kentle, 1991), Investment Risk Attitude Scale (Nyhus, 1995) and Gambling Motivation Scales (Chantal, Vallerand and Vallieres, 1994) were used in the data collection. ANOVA, MANOVA and Hierarchical Multiple Regression were conducted in statistical analysis.

Results: Results indicated that sport gambling students and non-gambling students showed significant differences in personality, Pillai's Trace = .24, $F(5,1101) = 70.51$, $p<.01$. Also, results demonstrated that sport gambling students and non-gambling students showed significant differences in their financial risk-taking attitudes, $F(1, 1105) = 29.39$, $p<.01$. Personality ($R2=.03$, $F(5, 429)= 2.613$, $p<.05$), gambling motivations ($R2change =.10$, $F(3, 426)=15.95$, $p<.05$) and gender ($R2change =.04$, $F(1, 425)=21.18$, $p<.05$) accounted for a significant amount on the financial risk-taking attitude of sport gambling subjects. Sport gambling students showed no significant difference in their gambling motivations according to their gender, Pillai's = .013, $F(7,427) = 800$, $p>.01$. Sport gambling students were primarily motivated with intrinsic motivating factors of gambling.

Conclusion: Finally, this study pointed that university students who were more extraverted and more open were more prone to gambling on sport events and were more permissive towards financial risk-taking. Additionally, results revealed that enjoyment, amusement and learning were the primary motivating factors that lead university students towards sport gambling.

References

Chantal, Y., Vallerand, R.J. & Vallieres, E.F. (1994). Construction and validation of the "Motivation towards Gambling Scale". Loisir & Societe, 17, 189-212.

John, O.P., Donahue, E.M., & Kentle, R.L. (1991). The "Big Five" Inventory Versions 4a and 54. Berkley (University of California, Berkley, Institute of Personality and Social Research).

Nyhus, E. (1995). The VSB-CentER savings project. Data collection methods, sampling procedures and questionnaires. Unpublished manuscript, CentER, Tilburg University.

10:15 - 11:45

Oral presentations

OP-RE03 Rehabilitation 3

THE RELATIONSHIP BETWEEN ACL INJURIES AND PHYSICAL FITNESS IN JUNIOR AUSTRIAN ALPINE SKI RACERS - A 10 YEAR LONGITUDINAL STUDY

RASCHNER, C., PLATZER, H.P., PATTERSON, C., HILDEBRANDT, C., LEMBERT, S., MILDNER, E., HUBER, R.

UNIVERSITY INNSBRUCK

INTRODUCTION: The development of ski equipment as well as changing environmental factors such as aggressive artificial snow result in higher loads on knees of junior ski racing athletes. Knee injuries are the most common injuries in skiing and ski racing with a higher incidence of ACL ruptures in female athletes (Pujol et al. 2007).

Based on retrospectively registered data, the aim of this study was to identify the link between physical fitness and ACL injuries of junior alpine ski racers.

METHODS: 485 female and 549 male adolescent (14-19 years of age) ski racers of the Skigymnasium Stams underwent the same test battery three times annually from 1996 to 2006. The following tests were conducted: maximum isometric unilateral leg extension strength, maximum isometric core strength flexion/extension, counter movement jump (CMJ), ski specific CMJ, drop jump, jump coordi-

nation, strength endurance, anaerobic shuttle run and Cooper test. Based on these tests, norm profiles were established in all age groups. In case of an ACL injury the last test result before the injury was compared with the norm values. Over the 10 year period 39 female and 18 male athletes sustained an ALC injury. Z score transformations for all variables normalized the different age groups. T-tests were used to calculate performance differences between injured and non-injured athletes.

RESULTS: Injured female athletes had lower performance in strength endurance (p=0.031), maximum relative isometric core extension strength (p=0.030) and core/leg strength ratio (p=0.039). In injured male ski racers maximum absolute & relative core flexion strength (p=0.032/p=0.030), jump coordination (p=0.017) and drop jump height (p=0.042) were lower than in non-injured athletes. Injured males had longer drop jump contact time (p=0.005). The calculated parameter of core flexion to extension ratio was also lower (p=0.009) in injured males.

DISCUSSION: Core strength is fundamental in ski racing for body stabilisation and force generation. Leetun et al. (2004) have noted that decreased core stability contributes to lower extremity injuries. In this study core strength, core/leg strength ratio and core flexion/extension strength ratio seems to be a critical factor for ACL injuries. Knee injury prevention must improve strength capacity and neuromuscular patterns in leg and core muscles (Hewett et al. 1999). Enhanced incorporation of fatigue resistance training in female and specific plyometric training programs coupled with unanticipated event management in male athletes are recommended. The longitudinal examination of physical fitness provides ski coaches with helpful information to develop more effective injury prevention programs.

REFERENCES

Pujol et al., Am. J. Sports Med. 35(7): 1071-1074; 2007

Leetun et al., Med. Sci. Sports Exerc. 36(6), 926-934, 2004

Hewett et al., Am. J. Sports Med. 27(6), 699-706, 1999

RELIABILITY OF SINGLE-LEG AND DOUBLE-LEG BALANCE TESTS IN SUBJECTS WITH ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION AND CONTROLS

KOUVELIOTI, V., KELLIS, E.

ARISTOTLE UNIVERSITY OF THESSALONIKI

Balance assessment and training are important elements of rehabilitation following anterior cruciate ligament (ACL) reconstruction. Assessment of balance in double and single-limb stance involves recording of the movement of the centre of pressure (COP) using various platforms. It is important to ensure that the assessment tools we use in the clinical setting and in research have minimal measurement error (Ageberg 2007). Translating reliability coefficients into clinically meaningful representations of measurement error is a necessary and important step when the goal is to link clinical research to clinical practice. Therefore, the aim of this study was to assess the test-retest reliability of balance variables measured in both and single-limb stance in patients and controls. Fifteen healthy subjects and ten subjects with ACL reconstruction performed stability tests at two occasions, a week apart. The subjects were instructed to stand erect, barefoot with feet shoulder width apart with opened eyes for 30 sec. They then performed a single-limb balance test by standing on one foot with the other leg flexed at 90° at the hip and the knee joints with both arms hanging relaxed at the sides (Ageberg, 2005). The assessment for both tests, included 3 measurements, and 5-min rest was provided between successive trials. The best trial was further analyzed. All tests were performed on an EPS pressure platform (Loran Engineering S.r.l., Bologna – Italy). The COP was recorded at 30 Hz and it was used to estimate the total path of the COP, the COP standard deviation in the anteroposterior and mediolateral axis, the velocity of the COP in both axis, the sway area and the ellipse formulated by the COP trajectory paths over time. For the total COP path, the intraclass correlation coefficient (ICC) ranged from 0.71 to 0.83. For the COP standard deviation the ICCs ranged from 0.74 to 0.94. For the COP speed, the ICCs ranged from 0.65 to 0.79. The sway area and ellipse scores displayed ICCs values of 0.91 to 0.95 and 0.86 to 0.92, respectively. In general, the ICCs were higher for double leg tests compared with single-stance ones. The above results indicate that 30-s balance tests in double and single-leg stance are reliable tools to assess static balance. Consequently, the use of such tests to monitor rehabilitation programs following ACL reconstruction is recommended.

References

Ageberg E, Flenhagen J, Ljung J. (2007). BMC Musculoskelet Disord, 8:57.

Ageberg E, Roberts D, Holmstrom E, Friden T. (2005). Am J Sports Med 33(10):1527-1535.

CROSS ECCENTRIC EXERCISE IMPROVES ACCELERATION REACTION TIME AND SUBJECTIVE SCORES ON QUADRICEPS FOLLOWING ACL RECONSTRUCTION

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TECHNOLOGICAL EDUCATION INSTITUTE (TEI)

Purpose

Anterior cruciate ligament (ACL) reconstruction can cause knee impairments and disability. Knee impairments are related to quadriceps performance - accelerated reaction time (ART) - and disability to performance of daily living activities which is assessed by questionnaires (Lysholm knee score). The purposes of this study were to investigate the effect of cross exercise to the early rehabilitation phase of ACL reconstruction: a) on quadriceps ART at 450, 600 and 900 of knee flexion and, b) on the subjective scores of disability in ACL reconstructed patients.

Methods

42 patients who underwent ACL reconstruction were randomly divided into 3 groups, two experimental and one control. All groups followed the same rehabilitation program. The experimental groups followed 8 weeks of cross eccentric exercise (CEE) on the uninjured knee; 3d/w, and 5d/w respectively.

Quadriceps ART was measured at 450, 600 and 900 of knee flexion pre and nine weeks post-operatively using an isokinetic dynamometer. Patients completed pre and post operatively the Lysholm questionnaire whereby subjective scores were recorded.

Results: Two factor ANOVA showed significant differences in ART at 900 among the groups ($F=4.29$, $p=0.02$, $p<0.05$). Post hoc Tukey HSD analysis determined that the significant results arose from the first experimental group in comparison to the control ($D=-0.83$, $p=0.01$). No significant differences were revealed at 450 and 600.

Significant differences were found in the Lysholm score among the groups (F=4.75, p=0.01, p<0.05). These significant results arose from the first experimental group in comparison with the control (D=7.5, p<0.01) and from the second experimental in comparison with the control (D=3.78, p=0.03).

Conclusions: These findings provide some evidence that adding CEE as supplementary program at the early phase of ACL reconstruction improves quadriceps ART at 900 at a sequence of 3d/w and, the subjective scores of disability at a sequence of 3d/w and 5d/w respectively on ACL reconstructed patients.

References

Dienst M, Burks R, Greis P. (2002). Orth Clin of North Am, 33, 605-660.

Hortobagyi T, Scott K, Lambert J, Hamilton G, Tracy J. (1999). Motor Control, 3, 205-219.

Housh TJ, Housh DJ, Weir JP, Weir LL. (1996). Int J of Sports Med, 17, 145-148.

Risberg M, Holm I, Tjomsland O, Ljunggren E, Ekeland A. (1999). JOSPT, 29, 400-412.

Zhou S. (2000). Ex Sports Science Review, 4, 177-184.

Papandreou M, Papaioannou N. Antonogiannakis E, Zeeris H. (2007). Br J of Biometricity, 1, 123-137.

A SCREENING TEST FOR KNEE PAIN

LARSSON, H., TEGERN, M., HARMS-RINGDAHL, K.

DIVISION OF PHYSIOTHERAPY

Background

Research on military populations indicates that failing to complete the training is a significant problem for armed forces around the world 1). The loss of new recruits is costly, both in terms of military preparedness and economically. Musculoskeletal disorders, especially knee pain2) during the service have been reported as one important risk factor. Preventive interventions are important however the problems have to be identified. A screening test for identifying low-level disorders that an individual may not be aware of but potentially increases the risk of injury during military training was designed. The study evaluated the capacity of the test to detect current knee pain before military training. The study also aimed to examine the reproducibility of the tests.

Method: When starting their basic training, 859 conscripts from two different army units were tested in four simple physical test of the lower limb. They also rated pain intensity during the test. Conscripts from one unit were followed and retested at the end of their basic training. Those who were premature discharged were registered.

Results: One of the four tests identified 82% of the conscripts who had knee pain, including subjects who in a questionnaire did not report any complaints.

Those who tested positive were to a higher level discharged, 34% compared to those who tested negative 7% (p<0.001). The reproducibility of pain ratings in relation to the tests was 'good' to 'excellent'.

Conclusions

The set of four lower-limb loading tests is a reliable and valid tool in detecting knee pain in conscripts. The construction of the test implies that many subjects could effectively perform the test at the same time. The screening tests can also be used in evaluating knee pain in other physically demanding occupations, as well as for athletes.

1) Knapik JJ, Canham-Chervak M, Hauret K, Hoedebecke E, Laurin MJ, Cuthie J: Discharges during U.S. Army basic training: injury rates and risk factors. Mil Med 2001, 166:641-647.

2) Larsson H, Harms-Ringdahl K: A lower-limb functional capacity test for enlistment into Swedish Armed Forces ranger units. Mil Med 2006, 171: 1065-1070.

EFFECT OF HEAVY LOAD STRENGTH TRAINING ON RAPID FORCE CAPACITY OF CHRONICALLY PAINFUL MUSCLES

ANDERSEN, L.L., ANDERSEN, J.L., SUETTA, C., KJÆR, M., SØGAARD, K., SJØGAARD, G.

NATIONAL RESEARCH CENTRE FOR THE WORKING ENVIRONMENT

Background: Rapid force capacity of chronically painful muscles is inhibited markedly more than maximal force capacity, and is therefore relevant to assess in rehabilitation settings.

Aim: To investigate the effect of three contrasting interventions on rapid force capacity, as well as neural and muscular adaptations in women with chronic neck muscle pain.

Methods: A group of employed women (n=48) with a clinical diagnosis of trapezius myalgia participated in a 10-wk randomized controlled trial; specific strength training of the neck/shoulder muscles, general fitness training performed as leg-bicycling, or a reference intervention without physical activity. Maximal voluntary shoulder abductions were performed at static angles of 35° and 115° with simultaneous recording of electromyography (EMG) in the trapezius and deltoid. Maximal muscle strength and activation (peak torque and peak EMG) as well as rapid muscle strength and activation (rate of torque development and rate of EMG rise) were subsequently determined. Trapezius muscle fiber characteristics were determined with ATPase histochemistry.

Results: Significant changes were observed only in the specific strength training group. Whereas peak torque increased 18-29% (P<0.01-0.001), rate of torque development increased 61-115% (P<0.001). Peak EMG and rate of EMG rise increased correspondingly (P<0.05-0.001), and trapezius type II muscle fibers hypertrophied 20% (P<0.001).

Conclusion: Rapid force capacity of chronically painful muscles is highly responsive to rehabilitation with specific strength training. The underlying mechanisms were related to both pain reduction and general neuromuscular adaptations to strength training. Potentially, the present method can be a useful clinical screening tool of muscle function in rehabilitation settings.

CHANGES IN LOCOMOTION PERFORMANCE AFTER TOTAL KNEE ARTHROPLASTY

BRANDES, M., RINGLING, M., HILLMANN, A., ROSENBAUM, D.

UNIVERSITY BREMEN

In patients suffering from knee osteoarthritis (OA), functional outcome after total knee arthroplasty (TKA) is usually assessed with questionnaires which may cause subjective and cognitive limitations. Thus, little is known about how the patients' activity level develops after

total knee arthroplasty. Therefore, this study assesses the physical activity level of subjects undergoing TKA using two accelerometry-based devices.

51 subjects (33 females, 67 ± 7.5 years, BMI 30.5 ± 4.5), designated for primary knee replacement were recruited. All subjects received a mobile bearing knee implant (Innex CR, Zimmer Inc.).

Time spent in different activity categories (locomotion, standing, sitting and lying) of 1 day was measured with the DynaPort ADL-monitor (McRoberts B.V., The Netherlands). The Step-Activity-Monitor (OrthoCare Innovations, USA) collected the number of gait cycles for 7 consecutive days. American Knee Society Score (KSS) and Short Form 36 (SF-36) were applied to assess the functional outcome and quality of life. All procedures were applied before surgery and at 3 (n=49), 6 (n=39) and 12 (n=29) months follow up.

Percentage of locomotion increased from 9.3% before surgery to 11.4% at 12 months FU ($p<0.05$). Categories reflecting resting (sitting, lying) decreased without reaching statistical significance. The number of daily gait cycles increased from 4790 gait cycles at 3M FU to 5864 gait cycles at 12M FU ($p<0.05$) which extrapolates to more than 2.1 million gait cycles per year. KSS showed significant improvements at each follow-up period up to 92.7% at 12 months FU. The mean outcome of the SF-36 as well as the subcategories physical functioning and pain reached significant improvements.

KSS and SF-36 show that ~90% of the subjects improved to a similar degree as subjects in other clinical studies. The number of gait cycles compares to hip or knee OA patients of a different region in Germany [2]. The baseline until 3 months FU points out that the recovery process from TKA takes longer after surgery. Furthermore, the gait cycles measured at six and twelve months after surgery indicate that the process of recovering or making use of the enhanced possibilities takes at least six months. Afterwards, European values reported for healthy subjects (~6600 gait cycles/day) [2, 3] are reached only by few subjects.

The percentage of locomotion indicates that TKA enables the subjects to load the affected knee more than before surgery. Resting periods are apparently less frequent than before surgery.

For pre-clinical testing of prostheses, load cycles should exceed 2 million cycles in order to reflect the loading of one year.

In conclusion, most patients benefit from TKA with respect to an improvement in quality of life as well as locomotion performance but do not achieve an activity level comparable to healthy subjects.

[2] Brandes et al., 2008, Gait Posture 28/6, 74-79.

[3] Busse et al., 2004, J Neurol Neurosurg Psychatry, 75/6, 884-8

10:15 - 11:45

Invited symposia

IS-SS04 Preventing harassment and abuse in sport

ASSESSING THE NEED FOR HARASSMENT PREVENTION IN NORWEGIAN SPORT.

FASTING, K., SAND, T.S., SISJORD, M.K., THORESEN, T., BROCH, T.

NORWEGIAN UNIVERSITY OF SPORT

Introduction: This paper presents some results from a study documenting the current state of equality within Norwegian sports and fitness activities, especially with regard to gender. The project was initiated in 2007 by The Norwegian Equality and Anti-Discrimination Ombud, and carried through by a research group at the Norwegian School of Sport Sciences. The results discussed in this paper answered this question: To what degree is work being done at the various organisational levels for the prevention of harassment-- particularly sexual harassment, racism, homophobia and negative attitudes towards gays and lesbians.

Methods: Representatives from 24 individual sport associations, 6 regional confederations and 43 clubs were interviewed. In addition, the researchers reviewed their annual reports, strategy documents and action plans.

Results: Most national sport associations did not have specific guidelines and/ or procedures for handling complaints concerning gender and/or sexual harassment. Furthermore, the topic did not appear to be included in the education of coaches and managers. None of the clubs had clear guidelines or procedures for handling sexual harassment.

The question of preventing and counteracting homophobia seems in many ways to be regarded as a non-issue in the sporting community. The general picture that emerged was that there is little openness about homosexuality at any level of the organisation, although there are some exceptions. The attitude of waiting until a case arises before "taking action" seems to be prevalent both with regard to sexual harassment and homophobia.

As regards activity to counteract racism, there is a great deal of variation between the individual sporting associations. When racism is addressed, it is done within the context of discussion concerning attitudes and values in general, often in connection with expectations related to fair play. It is rarely dealt with as a separate topic in the education of coaches and managers. Among the clubs that were interviewed almost none reported any experience of racism, and almost none had any guidelines or routines in place for dealing with the problem should it arise.

All the national sport associations have ethical guidelines, written or unwritten, although these focus primarily on alcohol and doping. There have been some campaigns designed to promote tolerance and diversity, however, particularly at the team and club level. Examples of such campaigns organised by national associations are Shut up and Play (The Norwegian Basketball Association) and Colourful Football (The Norwegian Football Association).

Discussion: The initiation of this project can be looked upon as a follow up of IOC's recommendations concern the need for more research in this area. The results are discussed in relation to the consequences it may have and have had for the prevention of harassment to occur in Norwegian sport.

PREVENTING EMOTIONAL ABUSE IN CANADIAN SPORT

KERR, G.

UNIVERSITY OF TORONTO

Recent research has indicated that emotional abuse is a common, yet unrecognized problem in competitive sport (Gervis & Dunn, 2004; Kirby, Greaves, & Hankivsky, 2000; Stirling, 2007). Emotional abuse has been defined as a pattern of deliberate non-contact behaviours by a person within a critical relationship role that has the potential to be harmful (Glaser, 2002; Stirling & Kerr, 2008). Given the serious, negative developmental consequences for young athletes who have experienced emotional abuse (Stirling & Kerr, 2007), significant efforts are needed to protect children and prevent abuse in this environment. Effective preventative measures call for a multifaceted approach that involves research, education, policy development, and advocacy. This presentation will address and critique various initiatives that have been incorporated in Canadian sport in attempts to prevent the abuse of athletes. Although some progress has been made, effective prevention will not be achieved until policies and educational programmes are informed by empirical research, are uniformly implemented, and include accountability measures. Recommendations for achieving these outcomes and preventing emotional abuse of athletes are suggested.

References:

Gervis, M., & Dunn, N. (2004). The emotional abuse of elite child athletes by their coaches. Child Abuse Review, 13, 215-223.

Glaser, D. (2002). Emotional abuse and neglect (psychological maltreatment): A conceptual framework. Child Abuse and Neglect, 26, 697-714.

Kirby, S., Greaves, L., & Hankivsky, O. (2000). The dome of silence: Sexual harassment and abuse in sport. Halifax, N.S., Fernwood Publ.

Stirling, A. (2007). Elite female athletes' experiences of emotional abuse in the coach-athlete relationship. Unpublished Master's thesis. University of Toronto. Toronto, Canada.

Stirling, A., & Kerr, G. (2007). Elite female swimmers' experiences of emotional abuse across time. Journal of Emotional Abuse. 7(4), 89-113.

Stirling, A., & Kerr, G. (2008). Defining and categorizing emotional abuse in sport. European Journal of Sport Science, 8(4), 173-181.

SYMPOSIUM CONTRIBUTION: MEASURING THE EFFECTIVENESS OF A HARASSMENT PREVENTION PROJECT IN ENGLISH FOOTBALL

BRACKENRIDGE, C.

BRUNEL UNIVERSITY

Introduction: The English Football Association undertook a major national consultation three years ago that revealed significant concerns about poor behaviour by players and spectators and about the associated loss of referees from the game. This paper reports the findings of a two year study of the remedial action taken by the FA in the form of a set of interventions called 'Respect'. These are aimed at enhance the quality of relationships between referees, players and spectators and also reducing referee attrition.

Methods: A multi-method research study was conducted during a ten week pilot of Respect from January to March 2008. This was followed by qualitative and quantitative data collection between October 2008 and March 2009. Methods included on-line surveys, stakeholder interviews and analysis of disciplinary performance indicators (such as red and yellow cards issued).

Results and Discussion: The Pilot yielded very positive results which were repeated in the main study. The research design and headline findings from the main study will be presented.

1280 characters (including spaces)

10:15 - 11:45

Invited symposia

IS-SM07 How much physical activity for health benefits in women?

PHYSICAL ACTIVITY AND HEALTH IN WOMEN: UPDATING THE EVIDENCE

BROWN, W.

UNIVERSITY OF QUEENSLAND

Introduction: During the last ten years a wealth of new evidence on the health benefits of physical activity (PA) for women has come to light. This symposium will provide a critical review of research findings about (1) the benefits of PA for physical health, (2) the benefits of PA for mental health and (3) the health hazards for women who do too much exercise. Suggestions for using the research findings in prevention and health promotion practice will be made.

Methods and Results: The first paper will review the benefits of PA for women's physical health. This will include new information on the role of PA in the primary prevention of several chronic health problems including stroke, cancer, diabetes and osteoarthritis, as well as in the prevention of weight gain, which is a determinant of many chronic heath problems in mid- and older-age women. There is now strong evidence to demonstrate dose-response relationships between PA and health in women, with benefits from relatively low levels of PA for some health outcomes, and from higher levels of activity for others, including the prevention of weight gain. The evidence will be drawn from several large cohort studies, including the Australian Longitudinal Study of Women's Health, which has been tracking the health of young (18-23 years at baseline), mid-age (45-50) and older (70-75) women for the last 12 years.

Discussion: The evidence suggest that, for many health problems, unstructured activity like walking can be as effective as more vigorous activity in reducing risk, and that as little as one hour of brisk walking each week is associated with reduced risk of several major health problems. This is important for the many women around the world who juggle roles in caring, homemaking and the paid workforce, making it hard to find time for PA. There is also evidence to show that mid-age and older women who increase levels of PA in mid-age can improve their health outcomes – it is never too late to stat being more active.

BENEFITS OF PHYSICAL ACTIVITY FOR MENTAL HEALTH

DUNN, A.L.

KLEIN BUENDEL

Introduction: Mental disorders are major causes of morbidity and mortality in developed and developing countries. A World Health Organization (WHO) survey in 14 countries found prevalence estimates ranging from 4.3% in Shanghai to 26.4% in the U.S. For many of these disorders, especially the most common ones, two to three times more women are affected than men but reasons are unknown. There is a large unmet need for treatment of mental disorders and it is possible that physical activity could play a role in the prevention and treatment of several mental health diseases.

Methods and Results: This presentation will examine the benefits of physical activity for selected mental disorders. Physical activity and structured exercise have both been examined in epidemiological studies and randomized controlled trials (RCTs) to examine effects on depressive and anxiety symptoms. Although gender differences have been examined, they are inconclusive. For example, 28 prospective cohort studies from 11 nations found that individuals classified as being physically active have a 25 to 40% lower risk of developing depression disorders or depressive symptoms, compared to inactive peers. This appears to be equally true for men and women. Results are more equivocal for anxiety disorders because there are fewer studies. Collectively, RCTs demonstrate a 1.1 SD reduction in depression symptoms when exercise treatments are compared with no treatment controls, but many of the studies have scientific weaknesses that weaken enthusiasm for use of exercise by clinical counselors. The studies done exclusively in women have been confounded by other treatments, a lack of clarity of phase of treatment, and small sample sizes. One dose-response study comparing different amounts and frequencies of exercise controlled for many of the scientific weaknesses of previous studies. This study reported remission and response rates that were comparable to rates achieved in studies of standard treatments, such as antidepressant medications and cognitive behavioral therapy; gender differences were not significantly different. There are fewer studies in anxiety but the results are similar to those in studies of depression. Most studies of exercise would be termed acute phase studies (8 to 12 weeks in duration). There are few continuation or maintenance phase studies in individuals diagnosed with depression or anxiety.

Discussion: Recommendations will be made concerning how to overcome scientific weaknesses that use exercise as a monotherapy, and as augmentation or adjunct treatment with standard treatments for depression, anxiety, and schizophrenia. In addition, exercise can improve many chronic diseases such as diabetes and cardiovascular disease that are often co-morbid with diagnosed depression and severe mental illness. Finally recommendations will be made for how physical activity or exercise might be integrated into clinical treatment using tailored web-based approaches.

EXERCISE- IS IT POSSIBLE TO HAVE TOO MUCH OF A GOOD THING?

SUNDGOT-BORGEN, J.

NORWAY

Introduction: The health benefits of physical activity and exercise for women are well known. The aim of this presentation is to consider whether too much exercise may be detrimental to women's health.

Methods: This question will be examined by considering the prevalence of overuse injuries, overtraining, and components of the female athlete triad, across the lifespan. Possible prevention strategies will also be considered.

Results: Overuse is one of the most common etiologic factors leading to injuries in the pediatric and adolescent athlete. The combination of heavy training, inadequate recovery and limited social support networks for young athletes can result in overtraining in young and aspiring elite athletes. Higher incidence rates for overtraining in adolescents have been reported in individual sports (48%) than in team sports (30%) and less physically demanding sports (18%). Overtraining can lead to burnout, which may have a detrimental effect on children's lifelong participation in sport.

Negative energy balance and energy drain occur in women of all ages when energy intake is insufficient to cover the energy costs of daily living, exercise training and competition, building and repair of muscle tissue, menstrual function, and any additional energy costs related to life stressors, such as illness or psychological stress. Training associated with inadequate caloric intake, exposes the young female athlete to several health risks and hazards, including menstrual irregularities. As a consequence, bone demineralization may develop, with increased risk of skeletal fragility, fractures, and vertebral instability and curvature. The prevalence of these different triad components varies from 5-75%, depending on the definition used and population investigated.

No studies have examined the issue of too much exercise for older women. However, vigorous activity after age 70 has higher risk of injury and lower adherence.

Discussion: To prevent overuse injuries and overtraining in young women, we need more research to allow us to recognize the key signs and symptoms, and to identify the central determining factors. Furthermore, effort should be made to optimize nutrition for female athletes, and if not successful, to reduce the training load in order to prevent menstrual abnormalities and deleterious bone effects, particularly during the critical period of rapid bone growth.

10:15 - 11:45

Oral presentations

OP-ST08 Sports 8

UPHILL RUNNING ECONOMY AND MOUNTAIN RUNNING PERFORMANCE.

ROUSOPOULOS, E., ZACHAROGIANNIS, E., PARADISIS, G., SMIRNIOTI, A., SOULAS, D.

ATHENS UNIVERSITY

Introduction: The majority of previous research efforts aimed at determining the physiological characteristics that contribute to level distance running success with little attention on uphill mountain racing.

Purpose: The purpose of this study was to examine the power of uphill running economy parameters in predicting mountain running performance.

Methods: Nineteen trained endurance runners (mean±SD) (age, 38.8±6.1 years, VO2max, 50.16±6.9, ml.kgr-1.min-1) were tested using open circuit spirometry 7-14 days before participating a mountain race (12km 5% mean inclination). Uphill running economy (URE, ml.kgr-1.min-1) was determined during 6min run at 8 km.h-1 speed and 10% inclination. The speed decrements due to inclination (SDI, km.h-1.1%-1 inclination) was also estimated (SDI=[(level speed which corresponds at 10%, 8km.h-1 VO2)-8]/10).

Results: The subjects averaged 71.1±10minutes on the 12km mountain race, 0.62±0.1 km.h-1.1%-1 SDI, 46.2±3.2 ml.kgr-1.min-1 URE and 92.9±7.1 %VO2max at 10%, 8km.h-1. The relationship between URE and performance was r=-0.41 ($p>0.05$) and the relationship between SDI and %VO2max at 10%, 8km.h-1 with performance was r=0.644 and r=-0.647 ($p<0.01$) respectively. Applying stepwise multiple linear regression the multiple R increased significantly with the addition of %VO2max at 10%, 8km.h-1 together with SDI, the combination of those two parameters account for the greatest amount of total variance (87.3%).

Conclusions: These data suggest that among trained and experience runners the speed decrements due to inclination together with the percentage of VO2max which is been used by the runner on a standard speed and inclination, submaximal test, can account for a large portion of the variance in performance during continuous uphill mountain race.

MUSCLE METABOLISM AND PERFORMANCE IMPROVEMENT AFTER TWO TRAINING PROGRAMS OF SPRINT RUNNING DIFFERING IN REST INTERVAL DURATION

BOGDANIS, G.C., SARASLANIDIS, P., PETRIDOU, A., GALANIS, N., TSALIS, G., KELLIS, S., KAPETANOS, A.G., MOUGIOS, V.

UNIVERSITY OF ATHENS AND ARISTOTLE UNIVERSITY OF THESSALONIKI

Introduction: Recent studies have shown that high-intensity training with repeated bouts of sprint exercise has a significant effect on the metabolic response to exercise and results in enhanced fatigue resistance (Mohr et al., 2007; Iaia et al., 2009). However, the effect of the length of the recovery interval on metabolic and performance parameters has not been investigated. The present study examined the effects of two sprint training programs differing in rest interval duration on muscle metabolism and performance.

Methods: Fourteen young, moderately trained, males were randomly assigned to 2 groups (n = 7 in each group) and trained three times per week for eight weeks. Each training session included 2 sets (during the first 4 weeks) or 3 sets (during the remaining 4 weeks) of two 80 m sprints for both groups. Sets were separated by 20 min of passive recovery, while the rest interval between the two sprints was either 10 s (group A) or 1 min (group B). Pre- and post-training field tests included maximal sprints of 100, 200, and 300 m to assess changes in performance. Muscle biopsies were obtained from the vastus lateralis muscle after warm-up and after the first set of two 80 m sprints during the first and last training session. Muscle biopsies were snap frozen and later freeze-dried, homogenized and analysed by enzymic spectrophotometric assays for ATP, ADP, creatine phosphate (CP), creatine, glucose, glucose 1-phosphate, glucose 6-phosphate (G6P), fructose 6-phosphate (F6P), glycerol 3-phosphate, pyruvate and lactate.

Results: Both training programs improved sprint performance ($p < 0.05$), but the improvement was greater in group A compared to group B at the final 100 m of the 200 m run (0.98 ± 0.15 vs. 0.61 ± 0.09 s, $p = 0.049$) and at the final 100 m of the 300 m run (1.11 ± 0.16 vs. 0.36 ± 0.15 s, $p = 0.005$). Changes in muscle metabolites after the two 80 m sprints were not affected by training, except for a mitigation in the drop of ATP ($p = 0.002$). The drop in CP, the increase in G6P and F6P, as well as the calculated anaerobic carbohydrate breakdown were greater in group A to group B ($p = 0.096$, 0.027, 0.017 and 0.084, respectively).

Discussion: We conclude that, in moderately trained athletes, training with repeated sprints is more effective when performed with a very short (10 s) compared to a longer (1 min) rest interval. This may be due to the greater activation of glycolysis caused by the limited resynthesis of CP during the very short rest interval. It is suggested that this type of short interval training may be used by coaches for improving speed endurance in single 200 m or 300 m sprints.

References

Iaia FM, Hellsten Y, Nielsen JJ, Fernström M, Sahlin K, Bangsbo J. (2009). J Appl Physiol. 106(1):73-80

Mohr M, Krustrup P, Nielsen JJ, Nybo L, Rasmussen MK, Juel C, Bangsbo J. (2007). Am J Physiol Regul Integr 292(4), R1594-1602.

MUSCLE ACTIVATION LEVEL IN GENERIC AND SPECIFIC STRENGTH TRAINING EXERCISES FOR ORIENTEERS

JOHANSEN, E., GJERSET, A., NILSSON, J.

THE NORWEGIAN SCHOOL OF SPORT SCIENCES, OSLO, NORWAY AND THE SWEDISH SCHOOL OF SPORT AND HEALTH SCIENCES, STOCKHOLM SWEDEN

Introduction: To improve muscular strength a relative tension in the musculature of approximately 60-70 percent of one repetition maximum (1RM) is needed (McDonagh & Davies 1984). By means of electromyography (EMG) it is possible to determine the EMG activation level at different levels of 1RM in generic exercises such as squats and ankle extensions. It is also possible to determine the highest EMG activation level in different maximal voluntary dynamic actions (MVDA) such as vertical jump, squat and ankle extension. The relationship between activation level and relative muscle tension (% 1RM) allow specific strength training exercises among orienteers to be evaluated. The purpose of the present study was to compare the EMG activation level in specific strength training exercises commonly used by orienteers with the activation level in generic exercises in order to evaluate possible strength training potential in the specific exercises.

Methods: In total six male elite orienteers, mean (range) age, height and weight; 25 (19-32) years, 1.80 (1.74-1.88) m and 71(67-75) kg, participated in the study. EMG was recorded with surface electrodes on four muscles: m. gluteus maximus (GM), m. rectus femoris (RF), m. vastus lateralis (VL) and m. soleus (SOL) on the right leg. The participants performed the following generic strength exercises: 5RM squats and 5RM ankle extensions on the right leg. In addition MVDA in form of 5 maximal vertical jumps were performed on the right leg and with both legs. The participants performed the following specific exercises: leaping i.e. running with very long strides and maximal effort on a horizontal gravel stone road and uphill in forest terrain. The maximal level of EMG activity during the generic exercises and MVDA was set to 100%.

Results: The results show that both generic (squats and ankle extensions) and specific strength training exercises (leaping on the horizontal and uphill) reach higher mean levels of EMG activation than was suggested by McDonagh & Davies (1984) for adaptive responses in mammalian skeletal muscles to exercise. The results also show that the activation levels during the specific strength exercises are compatible with the 5RM generic exercises commonly used to increase muscular strength.

Discussion: From the results in the present investigation it can be concluded that the EMG activation level in specific strength exercises such as leaping on the horizontal and uphill are compatible with generic exercises and show high relative EMG activation levels, which

indicate a possible strength training potential. Information obtained in this study can be used to enable a development of specificity in strength training and also a larger degree of integration between trained capacities among orienteers.

Reference

McDonagh, M.J.N., & Davies, C. T.M. Adaptive responses of mammalian skeletal muscle to exercise with high 1oads. Eur. J. Appl. Physiol., 52, 139-155, 1984.

THE HIT & TURN TENNIS TEST - AN ACOUSTICALLY CONTROLLED ENDURANCE TEST FOR TENNIS PLAYERS

FERRAUTI, A., KINNER, V.

RUHR UNIVERSITY OF BOCHUM

Worldwide no unique tennis specific endurance test exists. The Test profile is mostly characterised by multistage linear running on a treadmill (TT) which seems to be insignificantly valid in respect to the tennis specific profile of demands. Tests using a tennis ball machine (BMT) had been shown to be more valid, but they are difficult to standardise. Based on these problems the "Multistage 20 m Shuttle Run for Aerobic Fitness" (MFT) was internationally established for game players and could be useful in tennis as well. On the other hand, tennis players have to run shorter distances by using a specific foot work. Thus we found, that an adapted MFT for tennis players should be developed and transferred on the dimensions of a tennis court. Our study consisted of three steps, including test construction (step 1), test validation (step 2), and the development of norm values (step 3).

Step 1: We developed the Hit & Turn Tennis Test (HTT) as an acoustically controlled and progressive fitness test for tennis players. The test can be easily carried out with a racket on a tennis court. The object of the test is to follow as long as possible the audible signals and to hold up the required footwork. The player has to run along the base line and to simulate a forehand or backhand shot in the respective corners just in time with the signals. The test consists of 20 levels (each 45 seconds) including an increasing number of forehand and backhand strokes. All levels are interrupted by a rest period of ten seconds. After level 4, 8, 12 and 16 a longer break of 20 seconds that can be used to take blood lactate samples.

Step 2: On five experimental days twelve regionally ranked male tennis players completed five endurance tests in a randomised counter-balanced order: 1. HTT carpet I, 2. HTT carpet II, 3. HTT clay, 4. TT, 5. BMT. We determined VO2max (Cortex Metamax II, Leipzig, Germany) and submaximum performance at 4 mmol/l blood lactate concentration (P4). VO2max and P4 correlated significantly between HTT carpet I and II (0.942** and 0.848**) and between HTT carpet and HTT clay (0.713** and 0.880**) pointing to a sufficient reliability. VO2max and P4 showed a closer correlation between HTT and BMT (0.961** and 0.756**) than between TT and BMT (0.619* and 0.617*) which underlines the HTT validity.

Step 3: We determined maximum test level (Lmax) and VO2max during the HTT in 70 nationally ranked female (under 14, under 16) and male junior tennis players (under 14, under 16, under 18) in different age groups. Lmax increased slightly in female (11.3 under 14, 11.6 under 16) and clearly in male players (13.2 under 14, 14.2 under 16, 15.3 under 18) with increasing age. VO2max showed no age related values in both, female (49.1 under 14, 48.6 under 16) and male players (58.0 under 14, 57.5 under 16, 59.5 under 18).

We conclude that the HTT is a valid and reliable procedure for endurance testing in tennis. Lmax seems to be a better performance predictor in young athletes than VO2max.

INFLUENCE OF PLANTARFLEXOR STRETCH TRAINING ON FASCICLE LENGTH AND STRAIN, H-REFLEX AMPLITUDE AND MUSCLE FORCE PRODUCTION

BLAZEVICH, A.J., MILLER, S., WAUGH, C., FATH, F., KAY, T., THORLUND, J.B., AAGAARD, P.

EDITH COWAN UNIVERSITY

Chronic stretching training is commonly performed by athletic and patient populations to improve joint range of motion (ROM), reduce injury risk and, possibly, enhance movement performance. In this study, we examined changes in resting gastrocnemius medialis (GM) fascicle length and fascicle strain during stretch (ultrasound imaging) and soleus H-reflex amplitude (stimulation of tibial nerve) after 3 weeks of twice-daily static stretches in 12 healthy men; 10 men acted as non-training controls. These changes were then related to changes in peak active joint moment, rate of torque development (RFD) and the moment-angle relation (MArel) of the plantarflexors.

In each stretch training session, four 30-s static stretches were performed to maximum stretch tolerance with the knee extended. Self-reported training adherence was 92%. All dependent variables except H-reflex were measured pre- and post-training at 5 joint angles: 20 deg (angle 1) and 10 deg (angle 2) of plantarflexion, and 3 further equidistant angles (angles 3-5) where angle 5 was defined as the angle where 80% of the peak passive moment was developed (~3-4 deg from maximum ROM). H-reflex was assessed at joint angles 2, 3 and 4.

There were no changes in any measure in the control group. Stretch training elicited a 20% (8.6 deg; $p<0.001$) increase in ankle ROM. This could not be explained by a change in resting GM fascicle length. However fascicle strain measured from angle 1-5 increased significantly (28.8% increase, $p<0.05$). This increased strain was associated with a significant post-training depression of the resting (2% MVC) H/M-wave ratio at joint angles 2 and 3, but not 4. Increases in fascicle compliance were related to ($p<0.05$) decreases in H/M ratio at angles 2 ($r=0.71$) and 3 ($r=0.54$), but not 4 ($r=0.18$). The decrease at angles 2 and 3 may partly explain the increased fascicle strain as a reduced reflex sensitivity, but the lack of change at angle 4 does not. These data are suggestive that the increased strain with stretch training resulted from decreased fascicle strain sensitivity, in which the observed decrease in spinal reflex input might have been influential. Despite these changes, there were no changes in RFD measured from contraction onset to 50, 100, 200 and 400 ms or from 200-400 ms at any joint angle and no shift occurred in MArel. These data are symptomatic of a lack of change in SEC compliance. There was also no change in peak active moment at any joint angle.

Chronic stretch of the plantarflexors is associated with an increased ROM due largely to an increased fascicle strain, which may be partly linked to increased parallel elastic, but not SEC, compliance. It may also be partly linked to a decreased spinal excitability. These changes did not affect peak active moment, RFD or alter the moment-angle relation. It is not yet clear whether dynamic force is affected, or whether performance changes might occur with longer periods of stretch training.

10:15 - 11:45

Invited symposia

IS-NU03 Nutritional interventions to increase fat oxidation

WHY IS A HIGH CAPACITY TO OXIDISE FAT IMPORTANT. CHAIR'S INTRODUCTION.

WAGENMAKERS, A.

THE UNIVERSITY OF BIRMINGHAM

Obesity is now regarded to be an epidemic in Westernized societies and is rapidly spreading at a global level. According to the WHO obesity is the consequence of a gradual reduction in physical activity in the last 20-30 years in combination with a calorie and/or high fat food intake that exceeds energy expenditure. With obesity comes a variety of adverse health outcomes. Endothelial and (micro)vascular dysfunction are now regarded as one of the earliest common metabolic defects, which subsequently lead to various forms of pathology to include insulin resistance, hypertension, metabolic syndrome, type 2 diabetes and cardiovascular disease.

Although initially viewed as an inert store for excess fats, it has more recently become clear that the adipose tissue stores play a crucial role in the buffering of plasma lipid levels, both in the period after meal ingestion and in the overnight fasted state. In addition to that excessive adipose tissue stores (especially visceral stores) become chronically inflamed (with macrophages contributing more than 20% of the cell content of adipose tissue) and are a constant source of inflammatory cytokine production. Chronic exposure to high systemic levels of lipid and inflammatory cytokines have both been implicated in the mechanisms that lead to endothelial dysfunction and insulin resistance of both the endothelial lining of the muscle microvasculature and the skeletal muscle fibres and also play a role in the mechanisms that lead to cardiovascular disease.

In this symposium the first two speakers will present an overview of exercise and nutrition interventions and nutritional supplements that might be useful in the prevention or treatment of obesity. The last speaker will present an overview of state-of-the-art immunofluorescent staining techniques methods that can be used 1) to investigate the molecular defects by which obesity leads to endothelial dysfunction, insulin resistance and related pathologies and 2) to investigate the therapeutic effects of exercise, modified nutrition and nutritional supplements.

References:

1. Wagenmakers AJM, van Riel NAW, Frenneaux MP, Stewart PM. Integration of the metabolic and cardiovascular effects of exercise. Essays Biochem 42: 193-2010, 2006.

2. Schenk S, Saberi M and Olefski JM. Insulin sensitivity: modulation by nutrients and inflammation. J Clin Invest 118: 2992-3002, 2008.

NUTRITION AND EXERCISE AS MEANS TO INCREASE FAT OXIDATION AND CONTROL OBESITY

VENABLES, M.

THE UNIVERSITY OF BIRMINGHAM

It is well known that exercise is a potent stimulator by which metabolism can be modulated and that both exercise duration and intensity are two important factors leading to the modulation of fat oxidation.

This symposia presentation will discuss exercise related factors that can affect fat oxidation, more specifically in this presentation exercise related factors that affect maximal rates of fat oxidation (MFO) and FATmax, that is the exercise intensity which elicits maximal rates of fat oxidation. It will introduce the concept of FATmax and present data indicating that mode of exercise and training status can affect MFO and also how gender, training status and weekly physical activity can affect MFO and FATmax. Furthermore, the use of FATmax as a training intensity in obese individuals will be discussed and how this appears to be a more effective exercise protocol than an interval training program when investigating health related parameters such as fat oxidation and insulin sensitivity.

A potential mechanism thought to link the increase in fat oxidation following a 4 wk period of endurance exercise training with improvements in insulin sensitivity will be discussed. Insulin receptor substrate-1 (IRS-1) is a key protein involved in the insulin signaling cascade as it has been shown that without it IRS-1 associated PI3-kinase remains quiescent. The action of IRS-1 can be modulated in a post-translational manner not only by tyrosine phosphorylation but also by serine-threonine phosphorylation, which, depending on the specific site of phosphorylation, can either facilitate or inhibit insulin signal transduction. Moreover, it has been shown that phosphorylation on a specific serine site, serine 307, of IRS-1 can block the phospho tyrosine binding domain functions of the IRS-1 protein thereby inhibiting the downstream signaling events such as PI3-kinase activation and ultimately glucose uptake. Data will be presented that provides evidence for this mechanism.

NUTRITIONAL SUPPLEMENTS TO INCREASE FAT OXIDATION

JEUKENDRUP, A.

UNIVERSITY OF BIRMINGHAM

There are many nutrition supplements on the market that claim to increase fat oxidation. These supplements include caffeine, carnitine, hydroxycitric acid (HCA), chromium, conjugated linoleic acid (CLA), guarana, citrus aurantium, asian ginseng, cayenne pepper, coleus forskholii, glucomannan, green tea, psyllium and pyruvate. With few exceptions, there is limited to no evidence that these supplements marketed as fat burners actually increase fat oxidation during exercise. One of the few exceptions may be green tea extracts. We recently found that green tea extracts increased fat oxidation during exercise by about 20%. The mechanisms are not well understood but it is likely that the active ingredient in green tea epigallocatechin gallate (EGCG), one of most powerful polyphenol with anti-oxidant properties, increased the activity of the enzyme responsible for the breakdown of catecholamines (adrenaline and noradrenaline). This in turn may result in higher concentrations of catecholamines and stimulation of lipolysis making more fatty acids available for oxidation. Caffeine is another substance with the potential to increase fat oxidation. This talk will discuss the evidence (or lack thereof) for a stimulation of fat metabolism of various supplements.

IMMUNOFLUORESCENCE MICROSCOPY TO INVESTIGATE THE LINK BETWEEN FAT METABOLISM AND INSULIN ACTION

SHAW, C.S.

UNIVERSITY OF BIRMINGHAM

Immunofluorescence microscopy has provided unique insights into skeletal muscle fat metabolism and its role in the development of insulin resistance in skeletal muscle. Once transported across the sarcolemma, fatty acids can either cross the mitochondrial membrane and undergo β-oxidation or enter intramuscular triglyceride (IMTG) synthesis. The IMTG content of type 1 muscle fibres is approximately two-fold greater than type 2 fibres which appears to be related to a higher content of the IMTG synthesizing enzymes, namely mitochondrial glycerol-3-phosphate acyltransferase (GPAT) and diacylglycerol acyltransferase (DGAT). IMTGs are stored within lipid droplets (LD) which are preferentially located next to the mitochondrial network in trained individuals which enables the efficient oxidation of fatty acids liberated during periods of elevated metabolic demand (endurance and resistance exercise). Recent advances in LD research has shown that LDs contain a number of structural, enzymatic and membrane trafficking proteins and the protein composition of LDs depends on the cell type and its lipolytic state.

The expanded adipose mass in obese individuals results in increased delivery of circulating fatty acids to skeletal muscle. When fatty acid delivery exceeds fatty acid utilisation (oxidation or storage) the resultant accumulation of fatty acid metabolites, such as long chain acyl-CoA and diacylgycerol, appears to inhibit insulin-stimulated GLUT4 translocation. The accumulation of IMTG in the skeletal muscle of obese individuals does not appear to inhibit insulin action directly however IMTG metabolism plays an important role in determining the concentration of intracellular fatty acid metabolites. Low rates of fatty acid oxidation in obese individuals, at least partially due to low mitochondrial content, are likely to contribute to the accumulation of fatty acid metabolites. In addition, inadequate or incomplete IMTG synthesis could also potentially explain why fatty acid metabolites accumulate in the skeletal muscle of obese individuals.

Over recent years the elevations in plasma fatty acids and inflammatory cytokines associated with obesity have been implicated in the development of insulin resistance in the microvascular endothelium. Insulin-mediated synthesis of nitric oxide stimulates dilation of arterioles and a redistribution of blood flow to skeletal muscle fibres prior to insulin stimulation of the muscle fibres. There is evidence that microvascular dysfunction, typified by reduced NO-mediated vasodilation, occurs before impairments in insulin-mediated GLUT4 translocation. Immunohistochemistry allows visualisation of microvascular endothelial cells and could potentially provide further insight into the mechanisms behind obesity-related insulin resistance.

10:15 - 11:45

Oral presentations

OP-PH01 Physiology 1

DOES HAEMOGLOBIN MASS INCREASE WITH SEVERAL YEARS OF ENDURANCE TRAINING? - A CROSS-SECTIONAL STUDY WITH U18, U23 AND ELITE NATIONAL TEAM CYCLISTS

WEHRLIN, J.P., CLÉNIN, G.E.

SECTION FOR ELITE SPORT

Introduction: It is unclear if haemoglobin mass (Hbmass) and red cell volume (RCV) increase with several years (ys) of training in endurance athletes (Sawka et al., 2000, Heinicke et al., 2001, Prommer et al., 2008). Especially, little is known about changes between junior and adult age. The aim of this study was to determine with a cross-sectional approach, whether national team endurance athletes in the age-related teams 'under 18' (U18), 'under 23' (U23) and 'elite' (>23 ys) are characterized by different Hbmass, RCV, plasma volume (PV) and blood volume (BV).

Methods: Blood volume parameters (CO-rebreathing method) and other blood, iron, performance and training parameters were measured in each a group of U18 (age = 16.9 ± 0.6ys; n = 15), U23 (age = 19.2 ± 1.2ys; n = 13) and elite (age = 27 ± 4.2ys; n = 14) male Swiss national team cyclists (road, cross-country and track).

Results: There were no differences in either body weight related Hbmass (U18 = 14.4 ± 1.2g/kg; U23 = 14.0 ± 1.3g/kg; elite = 14.6 ± 1.0g/kg), RCV (40.4 ± 3.4; 39.2 ± 3.9; 40.8 ± 3.2 ml/kg), PV (63.6 ± 7.1; 64.6 ± 7.1; 64.6 ± 8.1 ml/kg) and BV (104.1 ± 8.6; 103.8 ± 9.8; 105.4 ± 10.2 ml/kg) or absolute values. Absolute power at 4mmol/l blood lactate in the lactate threshold test was lower in the U18 than in the elite group (p = 0.043) whereas differences in maximal absolute power output did not reach statistical significance (p = 0.102). Training hours per week were lower (p = 0.032) in U18 than in the elite athletes.

Discussion: Our results indicate that several years of endurance training between the U18 and the elite age in national team cyclists do not increase Hbmass, RCV, PV and BV, but power at 4mmol/l blood lactate concentration. Interestingly, in another recent cross-sectional study with XC-skiers and triathletes (Steiner, Boutellier & Wehrlin, 2009), we found Hbmass to be lower at age 16 than at age 21 while it was similar at age 21 and 28. Perhaps, Hbmass can increase with endurance training in athletes younger than 17ys? However, when interpreting our results, one has to take into account, that although all our subjects where national team athletes, we used a cross-sectional design. This implies the risk of a possible selection bias. Studies with a longitudinal design are needed.

Conclusion: Hbmass can be similar in male U18, U23 and elite national team cyclists, what suggests, that Hbmass does not increase with several years of endurance training in athletes from the U18, to the U23 and the elite national team.

References

Heinicke K, Wolfarth B, Winchenbach P, Biermann B, Schmid A, Huber G, Friedmann B, Schmidt W. (2001). Int J Sports Med, 22, 504-512.

Prommer N, Sottas P-E, Schoch C, Schuhmacher Y-O, Schmidt W. (2008). Med Sci Sports Exerc, 40, 2112- 2118.

Sawka MN, Convertino VA, Eichner ER, Schnieder SM, Young AJ. (2000). Med Sci Sports Exerc, 32, 332-348.

Steiner T, Boutellier U, Wehrlin JP. (2009). Book of Abstracts, ECSS Oslo.

DOES HAEMOGLOBIN MASS INCREASE WITH SEVERAL YEARS OF ENDURANCE TRAINING? CONTROLLED CROSS-SECTIONAL STUDY WITH 16, 21 AND 28 YEARS OLD ELITE XC-SKIERS AND TRIATHLETES.

STEINER, T., BOUTELLIER, U., WEHRLIN, J.P.

1. SECTION FOR ELITE SPORTS, SWISS FEDERAL INSTITUTE OF SPORTS, MAGGLINGEN., 2. INSTITUTE OF HUMAN MOVEMENT SCIENCES AND SPORT, ETH AND INSTITUTE OF PHYSIOLOGY, UNIVERSITY, ZURICH

Introduction: Recent research results (Prommer et al. 2008) put into question, whether haemoglobin mass (HbM) - an important limiting factor of VO2max - unlike as guessed so far (Sawka et al. 2000) can be increased in endurance athletes with endurance training. Little is known about the effects of long lasting endurance training on HbM in adolescents. The aim of this controlled cross-sectional study was to evaluate if there are differences in HbM between endurance athletes at the age of 16 years, 20-23 years and older than 23 years.

Methods: In three endurance athlete groups at different age (AG16: 15.9±0.7 years, n=15, national top 15 ranking in XC-skiing and triathlon in 2008, no national team at this age; AG21: 21.3±0.9 years, n=14 and AG28: 27.5±3.0 years, n=16 from the national teams in XC-skiing and triathlon) as well as in three age matched control groups (< 2h endurance training per week; KG16: 15.9±0.3 years, n=16; KG21: 21.3±1.2 years, n=15; KG28: 28.1±4.0 years, n=16) we measured, among others, HbM (CO-rebreathing) and VO2max.

Results: In AG16 HbM (12.3 ±0.8 g/kg) as well as VO2max (66.1 ±3.6 ml/min/kg) was lower ($p<0.01$) than in AG21 (14.2 ±1.1 g/kg / 72.9 ±3.6 ml/min/kg) and AG28 (14.6 ±1.1 g/kg / 73.4±6.0 ml/min/kg), while there were no differences between AG21 and AG28 and among the control groups. Between AG16 and KG16 (12.0 ±1.0 g/kg / 58.9±5.0 ml/min/kg) only VO2max was different ($p<0.001$) but not HbM ($p=0.39$). In the AG21 and AG28 groups HbM and VO2max were higher ($p<0.001$) than in the matchable control groups (KG21: 12.5 ±1.0 g/kg / 57.5 ±6.6 ml/min/kg. KG28: 12.1 ±1.0 g/kg / 54.7 ±6.2 ml/min/kg).

Discussion: Our results indicate that HbM increases between the age of 16 and 21 in elite endurance athletes, but not between 21 and 28 years. Endurance training of adolescents seems to influence VO2max much more than HbM. That HbM doesn't change in older athletes we confirmed in another study (Wehrlin & Clénin, 2009), where we even didn't find a difference in HbM between U18, U23 and elite cyclists. Wherefore, HbM might have its biggest potential for development between the age of 16 and 18 in endurance athletes. When interpreting our data, we have to take into account that cross-sectional designs implicate always possible selection bias, although the selection guidelines for the athletes at the age of 16 have been clearly defined (top 15 ranking). However, data in adolescents from longitudinal studies are needed to verify our findings.

Conclusion: Our data suggest that with several years of endurance training HbM increases between the age of 16 to 21 years but not between the age of 21 to 28 years in endurance athletes.

References

Prommer N, Sottas P-E, Schoch C, Schuhmacher Y-O, Schmidt W (2008). Med. Sci. Sports Exerc., 40 (12), 2112-2118.

Sawka MN, Convertino VA, Eichner ER, Schnieder SM, Young AJ (2000). Med. Sci. Sports Exerc., 32 (2), 332-348.

Wehrlin JP, Clénin GE (2009). Book of Abstracts, ECSS Oslo.

A COMPARISON OF VΔ50 VS V 2MAX TRAINING INTENSITIES FOR OPTIMAL ENDURANCE RUNNING PERFORMANCE

LOUCAIDES, G., NIKOLAOU, K., MICHAELIDES, M., COCHRANE, T., PANAGIOTOU, G., THEOHAROUS, A.

1.CYPRUS SPORT ORGANIZATION

INTRODUCTION – AIM OF THE STUDY: Coaches, athletes and scientists debate as to which is the most efficient interval training intensity for optimizing the performance in endurance events. The purpose of this study was to compare the individualized training intensities termed as vΔ50 (the velocity at 50% of the difference between the velocity at lactate threshold and the velocity associated with maximal oxygen uptake) and v O2max (the minimum velocity that elicits maximal oxygen uptake) and to provide insight as to which of the two intensities leads to greater benefits in running performance in 1500m and 5000m TT (Time Trials), as well as to physiological parameters that are associated with success in endurance running events.

METHODS: 32 out of 45 male distance runners that gave a written consent for participation in the study completed the 9-month training intervention. The training included a 4-month aerobic base preparation period which was common for all participants. Then, after the runners were randomly assigned into one of two groups, differing only in the intensity of the interval training part of the training (vΔ50 for group Α and v O2max for group Β), completed another 3 months of training. Before and after the interval training intervention period, a 1-month testing period was imbedded where athletes performed 1500m and 5000 TT's on the track, as well as lab tests for the determination of vΔ50, v O2max, O2max, vLT4 (speed associated with a lactate concentration of 4 mmol/L) and ECR (Energy Cost of Running). The MANOVA statistical test was used for data analysis and the level of statistical significance was set at $p < 0.05$.

RESULTS: Group Α improved significantly in the 1500m TT (Test 1 = 309 ± 24s, Test 2 = 299 ± 21s), in the 5000m TT (Test 1 = 1163 ± 77s, Test 2 = 1139 ± 69s), as well as in the vLT4 and vΔ50 ($p < 0.05$). Group Β improved significantly in the 1500m TT (Test 1 = 312 ± 40s, Test 2 = 301 ± 36s) in the 5000m (Test 1 = 1191 ± 134s, Test 2 = 1162 ± 120s) as well as in the ECR, v O2max and vΔ50 ($p < 0.05$). No significant differences were observed were observed in the O2max in both Groups.

COCLUSIONS: Both vΔ50 and v O2max were equally effective in improving 1500m and 5000m TT performance, but each intensity seems to affect to a different degree the parameters that are associated with success in endurance running performance. Finally, it seems that v O2max affects marginally more positively most parameters related to endurance running performance (except for vLT4 and vΔ50).

EFFECTS OF FREQUENCY OF EXERCISE FOR IMPROVING AEROBIC CAPACITY: TRAINING AND DE-TRAINING

HATLE, H., STØBAKK, P.K., BRØNSTAD, E., STOLEN, T., TJØNNA, A.E., MØLMEN, H.E., INGUL, C.B., WISLØFF, U., ROGNMO, Ø.

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

BACKGROUND: Aerobic exercise performed as interval training is an effective way of improving maximal aerobic capacity (VO2max). We have previously shown that high-intensity exercise performed 2-3 times per week is superior to moderate exercise for improving VO2max when total exercise volume is equalized. This is valid both within highly trained individuals as well as in different patient groups. The aim of the present study was to investigate the rate of adaptation of VO2max in young, healthy individuals performing exercise at

either high frequency or moderate training frequency. We hypothesised that improvements of VO2max could be achieved to the same extent when exercising at high frequency compared to moderate frequency.

METHODS: Nineteen healthy students (23.5±2.0 yrs) carried out a total of 24 exercise sessions at either 3 times per week for 8 weeks, or 8 times per week for 3 weeks. All training was carried out as uphill treadmill running using heart rate monitors. VO2max was measured initially and after every 8th exercise session. During the de-training period, VO2max was measured 4, 14 and 24 day post exercise, and thereafter every second week over a total period of two months.

RESULTS: The moderate frequency group increased VO2max by 6.0±2.7 ml/kg/min ($p<0.001$) and the high frequency group by 4.1±3.1 ml/kg/min ($p=0.002$). Using the linear model with correction for baseline value, we found however no differences between the groups regarding the magnitude of elevating VO2max ($p=0.36$). Interestingly, while the moderate frequency group reached the highest measured VO2max-value 4 days post training, the high frequency group reached the peak value 14 days post training. This elevation was sustained 24 days post training in the high frequency group ($p=0.413$), while the moderate frequency group showed declined VO2max compared to peak level at this time point ($p<0.001$).

CONCLUSIONS: Improvements of VO2max after high-intensity aerobic interval training could be accomplished in reduced time with high frequency training compared to normal frequency training. VO2max may boost after ending a high-intensive, high frequency training programme, and this over-compensation may be sustained for over three weeks without training.

INSPIRATORY MUSCLE TRAINING AND LOADING ACCELERATES BLOOD LACTATE CLEARANCE.

SHARPE, G., BROWN, P., JOHNSON, M.

NOTTINGHAM TRENT UNIVERSITY

Introduction: Chiappa et al (2008) showed that pressure threshold inspiratory muscle loading during recovery from maximal exercise markedly reduced blood lactate concentration ([lac-]B). Using an identical protocol we examined whether 6 wks of inspiratory muscle training (IMT) would further accelerate blood lactate clearance

Methods: 18 subjects initially completed two maximal incremental cycling tests (20 W.min-1) followed by 20 min of static recovery with a constant inspiratory threshold load (15 cmH2O) or with purely passive recovery. The two protocols were separated by at least 48 hours. Throughout recovery acid-base balance was determined using the physicochemical approach by measuring the strong ion difference ([SID]) = [Na+] + [K+] - [Cl-] + [lac-]; the total concentration of weak acids [Atot-] and the partial pressure of carbon dioxide (PCO2). Individual [lac-]B decay curves were fitted to a bi-exponential time function using an iterative non-linear regression technique (Freund and Zouloumian 1981). Subjects were divided equally into either an IMT group that performed pressure threshold IMT at 50% maximal inspiratory mouth pressure (MIP) or a control group that experienced no intervention. After 6 weeks both protocols were repeated.

Results: Values are shown as mean (SD). MIP increased 34 (6) % ($p<0.001$) in the IMT group and remained unchanged in the control group. Peak [lac-]B after maximal exercise was reduced by 1.24 (1.32) mmol.L-1 ($P<0.05$) after IMT. Prior to the intervention addition of the inspiratory threshold load did not affect [lac-]B decay relative to passive recovery. However, following IMT, both the fast and slow velocity constants of [lac-]B decay were increased ($P<0.05$). At corresponding time points during the 20 min recovery period a mean reduction in [lac-]B of 0.66 (1.28) mmol.L-1 (trial × time interaction effect, $P<0.01$) was observed with the inspiratory threshold load relative to passive recovery. Relative to pre-IMT, inspiratory threshold loading reduced plasma [H+] which was accounted for by an IMT-mediated increase in [SID] due almost exclusively to a reduction in [lac-]B.

Conclusions: Whilst our findings contradict those of Chiappa et al (2008) we show that combining IMT with threshold inspiratory loading after maximal exercise accelerates [lac-]B decay relative to passive recovery. Our data support the notion that after training, the inspiratory muscles are capable of net lactate clearance which reduces plasma [H+]. These IMT-induced adaptations may improve tolerance of repeated spints and may also explain improvements in whole body performance following IMT.

References:

Chiappa GR, Roseguini BT, Alves CN, Ferlin EL, Neder JA, Ribeiro JP. (2008) Blood lactate during recovery from intense exercise: impact of inspiratory loading. Med Sci Sports Exerc 40; 111-116.

Freund H, Zouloumian P. (1981) Lactate after exercise in man.1. Evolution kinetics in arterial blood. Eur J Appl Physiol 46: 121-133

EFFECTS OF AGE-RELATED AEROBIC FITNESS ON HEART RATE VARIABILITY AT REST, DURING EXERCISE AND DURING RECOVERY

MARTINMÄKI, K., RUSKO, H.

UNIVERSITY OF JYVÄSKYLÄ

Introduction: High aerobic fitness is associated with improved function of the autonomic nervous system (ANS) at rest and in response to exercise (1). Aerobic fitness and ANS function decrease with age (2,4) but physically active lifestyle can maintain high age-related aerobic fitness and may delay the age-related impairment of ANS function (1). We evaluated the effects of age-related aerobic fitness on autonomic heart rate (HR) control at rest, during low and high intensity exercise and during subsequent recovery.

Methods: Sixteen men and 16 women (age 25-55 yrs) were classified into high or moderate fitness group using predicted aerobic fitness (3) and age-related aerobic fitness norms (4). The gender and age were counterbalanced between the groups. The subjects performed an incremental maximal exercise test on a bicycle ergometer to verify their aerobic fitness and two 10-min constant load exercise sessions, one at low intensity (LI, 29±6% of maximal power) and another at high intensity (HI, 90±1% of individual anaerobic threshold). Low (LFP, 0.04-0.15 Hz) and high frequency power (HFP, 0.15-1.2 Hz) of heart rate variability (HRV) at rest, at the end of exercise and at each minute during subsequent 5-min recovery were assessed using short-time Fourier transform.

Results: Maximal oxygen uptake was higher ($P<0.001$) in the high (50±7, range 40-66 ml/kg/min) than moderate (39±7, range 30-53 ml/kg/min) age-related fitness group despite the ranges widely overlapped. At rest, HR was lower (62±8 vs. 72±8 bpm, $P<0.01$) and HFP was higher [7.73±1.39 vs. 6.56±1.13 ln(ms2), $P<0.05$] in the high than moderate fitness group. During HI exercise, there was no difference in HR but LFP [1.07±0.46 vs. 1.96±0.88 ln(ms2), $P<0.01$] and HFP [1.84±0.49 vs. 2.30±0.54 ln(ms2), $P<0.05$] were unexpectedly lower in the high than moderate fitness group. During the 5-min recovery period after HI exercise, HR decreased more rapidly ($P<0.01$) and HFP was higher ($P<0.01$) in the high than moderate fitness group. For LI exercise, only recovery HR was lower ($P<0.05$) and recovery HFP tended to be higher ($P=0.054$) in the high than moderate fitness group.

Discussion: The present findings suggest that, in addition to high aerobic fitness, high age-related aerobic fitness is associated with enhanced vagal HR control at rest and immediately after exercise. Lower HRV during HI exercise in the high than moderate fitness group may be related to greater absolute metabolic demand of HI exercise in the subjects with high age-related aerobic fitness.

References

1. Aubert AE et al. (2003). Heart Rate Variability in Athletes. Sports Med 33:889-919

2. De Meersman RE & Stein PK (2007). Vagal Modulation and Aging. Biol Psychol 74:165-173.

3. Jackson AS et al. (1990). Prediction of Functional Aerobic Capacity without Exercise Testing. Med Sci Sports Exe 22:863-870.

4. Shvartz E & Reibold RC (1990). Aerobic Fitness Norms for Males and Females Aged 6 to 75 Years: A Review. Aviat Space Environ Med 61:3-11.

10:15 - 11:45

Oral presentations

OP-ST05 Sports 5

AN ANALYSIS OF THE DIFFERENCE BETWEEN A JUDO SPECIFIC AND A GENERAL TREADMILL TEST

LOPEZ DIAZ DE DURANA, A., GARCÍA GARCÍA, J.M., NACLERIO AYLLÓN, F.

TECHNICAL UNIVERSITY OF MADRID

Introduction: In judo, treadmill running tests are commonly used for the physiological quantification of aerobic fitness in elite athletes. It should be noted however that the muscle mass used in a typical judo exercise is greater than in treadmill running. Therefore the aim of this study was to show the difference in the V˙O2max and hrmax observed in a treadmill test (Heck, 1985) and a new judo specifc protocol (López Díaz de Durana, 2009) which is a modification of that of (Sterkowicz, 1995).

Methods: 17 university judokas aged from 20 to 25 years, with a minimum of 3 years of judo practice were tested. All participants signed an informed consent, conistent with university guidelines concerning the testing of human participants. The teadmill test was an incremental step test and followed the protocol of (Heck, 1985). The judo test protocol (López Díaz de Durana, 2009) was similar to that of the treadmill and consited of incremental steps of 2 minute duration with a metronometer controlling the number and frequency of the throws (ippon seoi nage) for each step. After each step the heart rate and V˙O2 were recorded in the 1 minute before the next step began.

Results: The population average for the judo and treadmill V˙O2max was 64.2+10 mLkg-1min-1 and 58.23+7 mLkg-1min-1respectively. Whilst for the hrmax this was 195+9 bpm and 195+9 bpm respectively. However the mean individual differences between the judo and treadmill V˙O2max and hrmax were 5+10 mLkg-1min-1 and -1+10 bpm respectively. This showed that for the V˙O2max there exist substantial difference between the judo and treadmill tests. Such differences were not so apparent for the hrmax.

Discussion: Significant differences exist for the V˙O2max obtained in the judo specific test and the treadmill test, with the V˙O2max being greater in the judo test. This was due to that the muscular mass used in the judo specific test being greater than that used in treadmill test. In the case of the maximum heart rate the two tests predicted similar values. We conclude that for the prediction of V˙O2max in judokas a judo specific test is required so as not to underestimate this value.

References

Heck, H., Mader, A.. (1985). Int J Sports Med, 6, 117-130.

Lopez Diaz de Durana, A. (2009) PhD thesis UCLM.

Sterkowicz, S. (1995). Antropomotoryka [in Polish], 12, 29-44.

EFFECT OF K1 FIGHT ON VERTICAL JUMP, REACTION TIME, AND LACTATE PRODUCTION.

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1. FACULTY OF SCIENZE MOTORIE; UNIVERSITY OF MILAN; ITALY, 2. UFR STAPS; UNIVERSITY OF DIJON, FRANCE.

Introduction: K1 is a combat sport with punches, kicks and knee blows. Two parameters may influence athletes' performance: injuries (e.g., Zazryn et al., 2003) and fatigue. Some studies were conducted to determine fighters physiological profile such as VO2max (Gosh et al., 1995; Guidetti et al., 2002). However, the effects of fatigue during official K1 fights remain unknown. Therefore, the aim of this study was to determine the effects of fatigue induced by an official K1 fight on vertical jump, simple visual reaction time, lactate accumulation and tactical behaviors.

Methods: Eight male volunteers were recruited during regional Italian K1-style amateur competition. Mean (± SD) age, height, weight and training experience were 24.3 ± 1.8 yrs, 173.8 ± 5.6 cm, 73.3 ± 9.4 kg, 5.6 ± 2.2 yrs, respectively. Subjects performed three rounds of 90 s with 60 s rest among rounds. Tests included counter movement jumps, simple visual reaction time (both were measured with an opto-jump system, Microgate, Italy) and blood lactate (Lactate PRO). They were performed before warm-up and after fights. Vertical jumps and simple visual reaction times were determined 8 minutes after the end of the third round due to judge's decision and prize giving. Blood lactate was collected 2 minutes after the end of the fight. A complete match-analysis was also made using a camcorder (blow numbers).

Results: Match-analysis showed 86 ± 23 total blows. No difference was found among rounds. However, punches (39 ± 16) and kicks (37 ± 16) number during fights was bigger ($p<0.001$) than knees (10 ± 10). While no difference among rounds was found for punches and kicks, knee blows were greater during the third round regarding with the first and second round (+4.8 ± 4.1, 2.8 ± 3.2, 2.4 ± 3.6, respectively, $p<0.05$). After the end of the fights, blood lactate was found to be on average 15.3 ± 1.6 mmol/L. Simple reaction times significant increased (+7.8 ± 5.6%; $p<0.01$) and no difference was found in vertical jump heights.

Discussion: Our data showed an altered number of blows among rounds. The increased knee blow number may be due to either or both tactical behaviors and technical economy. High values of blood lactate suggested a key role of anaerobic metabolism in K1 fights. Although high lactate values, vertical jump heights were surprisingly unchanged, this may be due to long rest duration between the end of the fights and post-tests. After the fight, simple visual reaction time was the only modified physiological parameter. It may be of interest during training to optimize cognitive process in fatigue conditions.

References
Ghosh, AK, Goswami, A, Ahuja, A. (1995). Indian Journal of Medical Research. 102:179-183.
Guidetti L, Musulin A, Baldari C. (2002). J Sports Med Phys Fitness. 42(3):309-14.
Zazryn TR, McCrory PR, Cameron PA. (2008). Neurol Clin. 26(1):257-70.

EFFECT OF KICKBOXING FIGHT ON VERTICAL JUMP, MUSCLE POWER, AND METABOLIC INDEXES.

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1. FACULTY OF SCIENZE MOTORIE; UNIVERSITY OF MILAN; ITALY, 2. UFR STAPS; UNIVERSITY OF DIJON, FRANCE.

Introduction: Combat sports alternate both anaerobic and aerobic efforts (Smith, 2006). Powerful and fast anaerobic actions are of paramount importance for explosive punch or kick attacks, feigns and defensive actions. Some authors examined the effects of fight on blood lactate production among different combat sports (Khanna et al., 2006). However, especially during kickboxing fights, the effects of fatigue on muscle power and metabolic indexes remain unknown. Therefore, the aim of this research was to determine the effects of fatigue induced by a kickboxing fight on vertical jump, bench press peak power, heart rate, and blood lactate accumulation.

Methods: Eleven athletes (5 females and 6 males) volunteered for the experiment. Females mean (± SD) age, height, weight and training experience were 29.6 ± 3.8 yrs, 164.8 ± 3.9 cm, 59.0 ± 2.4 kg, 6.4 ± 1.3 yrs, respectively. Males group was 26.5 ± 6.2 yrs, 178.3 ± 3.4 cm, 78.3 ± 10.5 kg, 8.0 ± 1.0 yrs, respectively. Subjects performed unofficial fights with three 120 s rounds with 60 s rest among rounds. Fights were conducted in accordance with kickboxing rules (low kick style). Athletes, referee, and coaches used their usual competition behavior. One day before fights, pre-tests were performed to determine bench press peak power using an accelerometer (Myotest, Switzerland), and vertical jump height during counter movement jumps (Optojump, Microgate, Italy). Just before fights and after warm-up, basal lactate (Lactate PRO, Japan) was collected. Heart rate (TMpro, Hosand Technologies, Italy) has been continuously recorded during fights. Finally, immediately after the end of the third round, bench press peak power, vertical jump height, and blood lactate values were evaluated for post-tests.

Results: At pre-test, a sex effect was found for both bench press peak power and vertical jump height, with males demonstrating greater values than females ($p<0.05$). During rounds, heart rate was on average 93 ± 1 % of the maximal heart rate. After fights, blood lactate concentration significantly increased until 13.6 ± 2.3 mmol/L ($p<0.001$). After fights no time effect was found for both bench press peak power and counter movement jump height.

Discussion: This study highlighted high heart rate and blood lactate values suggesting anaerobic metabolism plays a key role in kickboxing fights. However, aerobic power also plays an important role during recovery (e.g., lactate clearance). Neuromuscular indexes (vertical jump height and bench press peak power) were surprisingly unchanged although a fight-induced fatigue. These data could be explained by the non specific nature of these tests regarding with kickboxing skills.

References
Smith M.S. (2006). J Sports Sci & Med CSSI: 74-89.
Khanna L.G. and I. Manna. (2006). J Sports Sci & Med 5: 90-98.

NEUROMUSCULAR CONTROL DURING ROUNDHOUSE KICK WITH AND WITHOUT IMPACT IN TOP LEVEL KARATEKA

SBRICCOLI, P., CAMOMILLA, V., QUINZI, F., ALAIMO DI LORO, D., DI MARIO, A., FELICI, F.
UNIVERSITY OF ROME

Introduction: Karate practice requires a fine control of movement associated to a great ability to perform the main technical actions as fast as possible (Zehr et al., 1997; Sørensen et al., 1996; Mori et al., 2002). Because of its high speed and excellent accuracy, the roundhouse kick (RK) seems to be a good model to quantify the ability of a karateka to perform complex actions combining high movement velocities with high precision. This work was designed to characterize the neuromuscular activity pattern adopted by a top level karateka while performing the roundhouse kick (RK) using two different techniques: with impact (Impact RK) and without impact (No-impact RK).

Methods: Surface electromyographic (sEMG) signals have been recorded through a wi-fi transmission EMG amplifier (BTS Pocket EMG, Italy) from the Vastus Lateralis (VL), Rectus Femoris (RF), Biceps Femoris (BF), Gluteus Maximum (GM) and Gastrocnemious (GA) muscles of the kicking leg during the execution of Impact RK and No-impact RK. Six top level Karateka (K) and six graduated students practicing karate as amateurs (Controls, C) have been tested (25±1yrs; 1.78±0.03m; 73.8±4kg). Knee angular velocity has also been computed through magnetic field angular rate and gravity sensors (MTx, Xsens Motion Technologies, Enschede, The Netherlands) placed in correspondence with knee joint centre of rotation. Differences in knee angular velocity between C and K group during Impact and No-impact RK have been tested through an unpaired T-Test (level of significance: $p<0.05$).

Results: For K subjects, a typical EMG activity pattern was observed, consisting of by a biphasic and synergic activation of GM and VL muscles during both Impact and No-impact RK, the BF activation being shifted in time with respect to VL and GM muscles. A delayed activation of RF muscle was also observed. For C subjects, no typical EMG activation pattern was observed. Knee angular velocity obtained for both the Impact RK and No-impact RK was significantly higher in K group than in C group ($p<0.0001$) (Impact RK: 1948±67.2 °/s vs. 1295±74.87 °/s; No-impact RK: 1680±41.4 °/s vs. 922 87.4 °/s). For both K and C groups the peak knee angular velocity was higher for the Impact RK than for No-impact RK ($p<0.05$).

Discussion: The results obtained suggest the presence of a peculiar muscle activation strategy adopted by the Karateka with respect to amateurs during the execution of the RK. This was associated with a higher execution speed in K with respect to C subjects. Following our results, the different RK technique doesn't act as a confounding factor in terms of neuromuscular control as no relevant differences have been detected in the execution of Impact and No-impact RK.

References
Zehr EP, Sale DG, Dowling JJ. (1997). Med Sci Sports Exerc, 29(10), 1366-1373.
Sørensen H, Zacho M, Simonsen EB, Dyhre-Poulsen P, Klausen K. (1996). J Sports Sci, 14, 483-495.
Mori S, Ohtani Y, Imanaka K. (2002). Hum Mov Sci, 21, 213-230.

THE IMPACT OF DIFFERENT COOLING STRATEGIES ON THE PHYSIOLOGICAL STRAIN ASSOCIATED WITH FIREFIGHTING ACTIVITY IN THE HEAT

BARR, D., GREGSON, W., REILLY, T.

LIVERPOOL JOHN MOORES UNIVERSITY

Introduction: Performing firefighting activity in the heat imposes a high degree of physiological stress (Rossi, 2003). The provision of effective cooling methods is important for the health and safety of firefighters. Cooling via the application of ice vests combined with hand/forearm water immersion (~19oC) reduces the physiological strain incurred during firefighting activities (Barr et al., 2009). However, the relative contribution of these two cooling methods is unclear. The aim of this study was to compare the effectiveness of an ice vest relative to hand/forearm water immersion on the physiological responses during firefighting activity in the heat.

Methods

On four separate occasions under high ambient temperatures (49.1 ± 1.3 oC, RH 12 ± 1%), seven male firefighters (mean + s: age 40, s = 6 years, maximal oxygen uptake 50.6 s = 4.6 mlkgmin-1, % body fat 19, s = 4 %), completed two 20-min bouts of treadmill walking (5 kmh-1, 7.5% gradient) separated by a 15-min recovery period. During each exercise bout, firefighters wore standard protective clothing, including self-contained breathing apparatus (SCBA). During the recovery period, participants removed their helmets, tunics, anti-flash hoods, gloves and SCBA, consumed a controlled amount of water (temperature ~19oC) (5 mlkg-1 body mass) and were either cooled via an ice vest (VEST), hand/forearm immersion (W; ~19oC), ice vest combined with hand/forearm immersion (VEST+W) or remained seated without cooling (CON).

Results: During the first bout of exercise physiological variables were similar under all conditions. Core temperature was lower at the end of the 15-min recovery period in W (37.96 ± 0.19oC) and VEST+W (37.97 ± 0.23oC) compared to the VEST (38.21 ± 0.12oC) and CON (38.29 ± 0.25oC) and remained lower throughout the second bout of exercise ($p < 0.05$). Mean skin temperature was higher in CON compared to the three cooling conditions ($p<0.01$). At the end of the recovery period heart rate (HR) was lower in W and VEST+W compared to VEST and CON ($p<0.05$). During the second bout of exercise maximum HR was lower in the VEST+W and W conditions, compared to the VEST, and CON condition. Prior to bout 2, firefighters perceived themselves to be 'cool' in the three cooling conditions compared to 'warm' in the CON condition. Firefighters perceived bout 2 to be 'hot' in the VEST+W and W conditions compared to 'very hot' in the VEST and CON conditions.

Discussion: These findings demonstrate that hand/forearm immersion is more effective than ice vests in reducing the physiological stress during firefighting activity in the heat. Furthermore, combining ice vests with hand/forearm immersion provides no additional benefits compared to hand/forearm immersion alone.

References

Barr D, Gregson W, Sutton L, Reilly T, 2009. A practical cooling strategy for reducing the physiological strain associated with firefighting activity in the heat. Ergonomics, In Press. DOI: 10.1080/00140130802707675

Rossi R., 2003. Fire fighting and its influence on the body. Ergonomics, 46, 10, 1017-33

POST ACTIVATION POTENTIATION - CHANGES IN POWER DEVELOPMENT IN UPPER BODY PULLING, FOLLOWING MAXIMAL FORCE EXERCISE

OLSEN, R., SØRENSEN, H.

AARHUS UNIVERSITET

Introduction: The contractile response in skeletal muscle depends partly on the contractile history, which can have both a fatiguing and a potentiating effect. The balance between these decides whether the muscle's contractile response in the post phase is increased (post activation potentiation, PAP), decreased, or unchanged (Rassier & MacIntosh, 2000). Young et al (1998) and Gilbert & Lees (2005) have shown that PAP can comprise increase in rate of force development (RFD) and maximal power (Pmax). Various intervention protocols have been used to examine PAP in the lower body and in the upper body pushing muscles, i.e. shoulder flexors and elbow ectensors, with varying results. However, no one has so far investigated PAP in the upper body pulling muscles, i.e. shoulder extensors and elbow flexors.Thus, the purpose of this study was to examine RFD and Pmax in the upper body pulling muscles following a bench-pull intervention.

Methods: 8 elite (national medal takers) male sprint canoeing and sprint swimming athletes, whit 3-14 years of continued strength training experience, where chosen, all had employed the exercise used in the study as a main exercise in their strength training for at least 6 month prior to the study.

The participants visited the lab on two occasions separated by 1-4 days. On the first occasion the subjects´ 1RM bench-pull was determined. On the following test occasion, an intervention of 5x1RM was performed whit 5min rest in between.

Pre and at 1,7,13, and 19min post the intervention, the subjects performed 3 explosive bench-pulls with 1min rest in between with 40% 1RM. The Pre and post tests were high speed filmed and subsequently Pmax from each pull was calculated. The mean value from each set of 3 pulls were used for further analysis. A one way ANOVA with repeated measures was used to test for significant differences among pre and post intervention Pmax.

Results: None of the participants could complete all the lift successfully during the intervention protocol, only 2 of the participants could complete more than 1 lifts successfully. Results showed no significant difference in Pmax from pre to any of the post measurements.

Discussion: The results in this study conflict with the earlier results found in the lower body by Gilbert & Lees, but is similar to result found by (Farup & Sørensen,2008) in upper body, both using the exact same intervention. It could be speculated if it for elite athletes is possible to reproduce a true 1RM 5 times whit only 5min break in between. Or if different tolerance for maximum intensity levels in the upper body vs. the lower body could explain the conflicting results.

In conclusion, the results shows that an intervention of 1RM is not applicable, to elicit post activation potentiation

References

Rassier DE, MacIntosh BR. Braz J Med Biol Res 2000: 33: 499-508

Gilbert GP, Lees A. Ergonomics 2005:48:1576-1584

Young WB, Jenner A, Griffiths K.. J Strenght Cond Res 1998: 12: 82-84

Farup J, Sørensen H., ICST 2008

12:00 - 13:15

Plenary sessions

PS-PL03 Sport, Body and Mind: Towards a New Understanding?

EVIDENCE FROM RANDOMIZED TRIALS: EFFECTS ON MENTAL DISEASE OUTCOMES

DUNN, A.L.

KLEIN BUENDEL

Recent randomized clinical trials demonstrate the role of exercise and physical activity in the treament of a wide variety of mental pathologies. Using depression illness as a primary focus and severe mental illness as a secondary focus, this discussion will highlight how exercise could be used in the treatment of depression and severe mental disorders.

A number of randomized trials suggest that exercise could serve multiple functions in the treatment of depression disorders and severe mental illness. One randomized trial examining different doses of exercise to treat diagnosed Major Depressive Disorder (MDD) as a monotherapy found that an amount equivalent to public health guidelines for physical activity was effective in reducing symptoms, while a lower dose was not. Furthermore, several studies now show response and remission rates of exercise to treat depression disorders appear to be equivalent to standard therapies of antidepressant medication and cognitive behavioural therapy (CBT). Exercise could also be used to augment pharmacotherapy or CBT in patients who might not be achieving complete remission of symptoms, and there is some evidence to suggest the use of exercise to augment traditional treatments is similar to findings from multi-site trials. Finally, recent trials demonstrate that exercise could be used as adjunctive therapy with both depression and severe mental disorders to improve health outcomes related to co-morbid diseases, like cardiovascular disease and diabetes.

Most studies of exercise have had relatively small sample sizes in comparison to standard treatment studies of pharmacotherapy and CBT. There is a need to demonstrate the efficacy and effectiveness of exercise treatments in well controlled studies with larger sample sizes of diagnosed patients. Further, there is a need for better understanding of the potential mechanisms underlying treatment effects in both primary and secondary prevention studies. This includes understanding: 1) short-term treatment effects of acute bouts of exercise; 2) long term treatment effects to prevent relapse; 3) key factors that might influence response to treatment, e.g., why do some individuals respond to exercise treatment; 4) the role of exercise in preventing the onset of a wide variety of mental disorders; and, 5) development of programs that will enhance motivational factors for individuals with mental disorders to engage in regular exercise.

THE BRAIN : HOW DOES THE INTEGRATION OF SIGNALS OCCUR ?

MEEUSEN, R.

VRIJE UNIVERSITEIT BRUSSEL

Brain research is a rapidly developing field and new understandings emerge on the interaction between the brain, motor action, and even motivation and emotion.

Recently there has been more interest in the effects of exercise on brain processes. These new experiments arise mostly from animal studies where the basic knowledge on possible underlying physiological mechanisms are explored. Much progress has been made in identifying the various hormonal and neural mechanisms by which the brain informs itself about signals from the periphery, and, in turn, generates behavioural, autonomic, and endocrine output. Several brain nuclei play crucial roles in homeostatic functions such as food intake, and in processing prior experience with food, reward, exercise etc. From these animal studies it is known that exercise might be a 'natural' antidepressant, and that some neurotransmitters are influenced by regular exercise. Training will induce other neurochemical reactions, that might explain possible underlying neurophysiological arguments for the use of training in degenerative neurological diseases such as Parkinson's disease and Alzheimer disease.

Exercise can be a powerful tool in the treatment of neurological diseases. There have been a number of studies that examined the exercise effect on a wide variety of pathological situations, and it seems that exercise works, although there is a general need for controlled trials.

14:15 - 15:15

Poster presentations

PP-PH07 Physiology 7

EFFECT OF REST DURATION BETWEEN RESISTANCE TRAINING SETS ON MARKERS OF MUSCLE DAMAGE IN TRAINED MALES

GHADERI, M., RAHIMI, R., AGHA ALINEJAD, H.

AZAD UNIVERSITY OF MAHABAD

Abstract:

The purpose of the present study was to evaluate the effects of rest duration between resistance training sets on markers of muscle damage in trained men. Therefore, ten male athletes (Mean ± SD, age=20.37± 2.24 years, body mass= 65.5 ± 26.70 kg) voluntarily participated in four sessions with 48 h recovery time who were performing different resistance trainings. At the first session, one repetition maximum (1RM) of participants evaluated. The subjects from the second session up to the fourth, each session, performed four sets of squat and bench press to failure with 85 % of 1RM and one of rest intervals of 60s, 90s and 120s between the sets used randomly. Also, there were taken three blood samples from the subjects before, immediately after, and 30 min after the training, to determine serum

enzymes concentration (CK، CK-MB and LDH). For statistical analysis of data, one-way repeated measures and LSD post hoc were used. No significant differences were found in the increase of serum enzymes concentration (CK، CK-MB and LDH) between three groups. However, there were significant increase in serum enzymes concentration immediately after and 30 min after exercise in the three groups. It wasn't observed a significant difference among the three programs in lactate concentration. Although, the ability of keeping the repetition (training volume) by using 90s and 120s rest intervals has been more than that of 60s, but statistically it wasn't observed a significant difference in training volume. The results of the present study showed that 60, 90, and 120 sec rest duration between resistance training sets don't affect on markers of muscle damage such as CK، CK-MB and LDH and also don't affect on training volume.

EFFECTS OF CONCURRENT AND RESISTANCE TRAINING ON CALCITONIN GENE-RELATED PEPTIDE (CGRP) CONTENT IN SLOW AND FAST MUSCLES OF WISTAR RATS

PARNOW, A., GHARAKHANLOU, R., HEDAYATI, M., MAHDIAN, R., GORGIN, Z.

UNIVERSITY

Calcitonin Gene-Related Peptide (CGRP), a 37-amino acid peptide generated by alternative processing of primary transcripts from calcitonin gene, is broadly distributed in the peripheral and central nervous systems of vertebrate and invertebrate species. The purpose of the present study was to investigation the effects of Concurrent (Resistance and Endurance) and Resistance Training on the content of CGRP in Slow and Fast Muscles of Wistar Rats. A number of twenty -three male Wistar rats (10 mo of age, 220 ± 15 gr, Iran Pasteur Institute) randomly were divided to three groups (control (n=7), concurrent training (n=8), and resistance training (n=8)) and followed 12 weeks training according protocols. Animals of the resistance group were housed in metal cage with a wire-mesh tower, with two water bottles set at the top. Concurrent group did a combine of both resistance and endurance training (5 days a week, 60 min/day, 30 m/min speed). Forty-eight hours after last session of protocols, animals were anaesthetized with a mixture of KetamineTM and Xylazine. The right soleus (as slow muscle) and anterior tibialis (AT, as fast muscle) were removed under sterile condition via an incision on dorsolatral aspect of the hindlimb. After remove, tissues were quickly frizzed in liquid nitrogen and kept at -70 ° C for later useage. For CGRP assay, ELISA kit was used. For data analyses, One-way ANOVA was used. Data analysis showed that there was a significant difference between control and concurrent training groups in slow muscle CGRP. Also, the content of CGRP in both fast and slow muscles was significantly difference in resistance training group with control group. Both resistance and concurrent training increased the content of CGRP in the fast and slow muscles. Therefore, CGRP increase depends on the nature of activity and probably duration and intensity of it, but not the type of muscle. Finally, CGRP content is depending on activity and stimulus more than muscle type so that concurrent training has caused CGRP increase in both slow and fast muscles.

EFFECTS OF STRENGTH TRAINING ON CALCITONIN GENE-RELATED PEPTIDE (CGRP) CONTENT IN SLOW AND FAST MUSCLES OF WISTAR RATS

GHARAKHANLOU, R., ESLAMI, R., PARNOW, A.H., VAHIDPOUR, SH., MADIAN, R.

UNIVERSITY

Calcitonin Gene-Related Peptide (CGRP), a 37-amino acid peptide, generated by alternative processing of primary transcripts from calcitonin gene, is broadly distributed in the peripheral and central nervous systems of vertebrate and invertebrate species. The purpose of the present study was to investigate the effect of Strength Training on the content of CGRP in Slow and Fast Muscles of Wistar Rats. A number of 12 male Wistar rats (10 mo of age, 220 ± 15 gr) randomly were divided to tow groups (control (n=7) and strength training (n=5)). The strength training protocol consisted of climbing a 1- meter–long ladder set at an 85° angle, with a weight attached to a tail. For CGRP assay, ELISA kit was used. Data showed that there was not a significant difference between slow and fast muscle CGRP of control group. Nonetheless, the strength training leaded to increase in CGRP content of slow muscle and decrease in CGRP content of fast muscle that both increase and decrease were not significant compare with control group (respectively, p= 0.155 , p=0.083). In conclusion, the results of current study show that slow and fast muscle CGRP content changes with strength training which the quantity and the direction of this changes may depend on duration and intensity of training protocol.

EFFECTS OF 8 WEEKS OF RESISTANCE TRAINING ON HAEMATOLOGICAL VARIABLES IN MEN

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Resistance exercise or weight training is used extensively to improve physical fitness, enhance performance, prevent injuries, increase muscle size and also is used in rehabilitation programmes (1). The acute effects of resistance exercise on selected haematological variables have been recently investigated (2,3). However, no information is available regarding the chronic effects of resistance exercise haematological parameters. Therefore, the present investigation was designed to examine the effects of 8 weeks of resistance training on red blood cell and platelet indices. Training group (N = 9; age, 22 ± 1.5 y) undertook a strength-training programme three days a week for 8 weeks, while the control group (N = 6; age, 23 ± 1 y) were asked to avoid any regular physical activity during this period. Resistance exercise protocol included the performance of 3 sets of 8-10 repetitions of six exercises at 80% of 1RM. After 4 weeks of training subjects performed another 1RM test and the exercise intensity was set at 80% of new 1RM for the remaining 4 weeks. Four resting blood samples were taken before training, after 4 and 8 weeks of training and after 4 days of recovery and were analysed for RBC count, haemoglobin, haematocrit, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), red blood cell distribution width (RDW), fibrinogen, platelet count, plateletcrit, mean platelet volume (MPV), and platelet distribution width (PDW). No significant difference between pre and post-training values was observed in the control group for all measured platelet variables. Resistance training resulted in a significant increase in muscular strength by 20% to 35%. Statistical analyses of the data indicated that RBC count, haemoglobin, and haematocrit decreased significantly during first 4 weeks of training and increased significantly ($P < 0.01$) between weeks 5 to 8 to nearly pre-training level. However, the other RBC indices did not change significantly in response to resistance training. A significant effect of training was found for platelet count and plateletcrit ($P < 0.01$). Post-hoc analyses revealed a significant increase in platelet count and plateletcrit during first 4 weeks of training with no significant changes between weeks 5 to 8. However, MPV, PDW, and fibrinogen did not change significantly in response to resistance training. It was concluded that resistance training doesn't change red blood cell parameters, while increases platelet count and PCT. Therefore, it could be

suggested that the performance of resistance exercise in patients with impaired cardiovascular function should be considered with caution when prescribing exercise.

1. Winnet, R.A. and Carpinelli, R.N. Prev. Med. 2001, 33: 503-513.

2. Ahmadizad, S. and El-Sayed, M.S. J. Sports Sci. 2005, 23: 243-249.

3. Ahmadizad, S. and El-Sayed, M.S. Med. Sci. Sports Exerc. 2003, 35: 1026-1033.

RESISTANCE TRAINING IMPROVES SOME CARDIOVASCULAR RISK FACTORS IN OBESE WOMEN DESPITE A DECREASE IN SERUM ADIPONECTIN LEVELS

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Objective: The purpose of this study was to examine the relationships of plasma adiponectin and different body composition variables with insulin resistance and lipid profile when a resistance training program (PRT) is applied to a group of hyperholesterolemic obese women with a concomitant weight-loss diet.

Design and methods: Thirty four hypercholesterolemic obese (BMI: 30-40Kg/m2) women, aged 40-60y, were randomized to 3 groups: a control group (C; n=9); a diet group (WL; n=12) with a caloric restriction of 500Kcal/d; and a diet plus resistance training group (WL+RT; n=13) with the same caloric restriction as group WL and a 16-week supervised whole body PRT of 2 sessions/week.

Results: In the WL+RT group significant improvements in different cardiovascular risk factors (insulin sensitivity, baseline insulin levels, total cholesterol or LDL-C) was observed in spite of a significant decrease of serum adiponectin levels. The decrease in circulating adiponectin being observed in 11 over 13 subjects. However, in the WL group, a similar diet in terms of caloric content and nutrients composition and a loss of body mass and adipose tissue of similar magnitude was accompanied by no changes in serum adiponectin levels or in lipid profile, although an increase in insulin sensitivity and a decrease in baseline insulin levels were observed.

Conclussion: In hypercholesterolemic obese women a PRT plus a weight-loss diet is accompanied by significant improvements in different cardiovascular risk factors in spite of a significant decrease of circulating adiponectin. Overall, the data suggest that a decrease in circulating adiponectin levels may not be always a negative health marker.

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NEURAL ADAPTATIONS FOLLOWING STRENGTH TRAINING IN CHILDREN AND ADOLESCENTS: A TMS PILOT STUDY.

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Introduction: It has been suggested that when an individual participates in strength training, much of the initial increase in strength is attributed to adaptations (plasticity) in the central nervous system (CNS; Griffen and Cagarelli, 2005). It has been proposed (Adkins et al., 2006) that strength training is comprised of a form of motor skill learning, to explain short-term improvements in strength in children and adolescents (Faigenbarum et al., 1999) This preliminary study examined strength changes and central nervous system (CNS) adaptations following a four week training of the biceps brachii (BB) muscle in healthy children and adolescents who were novice to strength training.

Methods: Ten participants (five male, five female; 12-17 years of age) completed 12 strength training sessions (two sets, increased to three sets of 15 repetitions at individualised prescribed weights) over a four week period. Prior to and post-training period participants were tested for BB maximal voluntary contraction (MVC) strength (via hand-held dynamometry) and sub-maximal strength (10 RM test); relaxed and flexed upper arm girths; and motor evoked potential (MEP) excitability, using single–pulse transcranial magnetic stimulation (TMS).

Results: Significant improvements (p=.01), in both arms, were shown post-training in group mean MVC (9.7 ± 3.7% and 12.8% ± 5.0% left and right arm respectively) and 10 repetition max strength test (22.7 ± 5.6% and 21.6 ± 4.0 % left and right arm respectively). Conversely, no changes were shown in group mean upper arm girths in both arms, for the relaxed and flexed conditions. Group mean corticomotor excitability projecting from the motor cortex to the BB showed significant increases (p=.001) post-training. Mean MEP amplitudes projecting from the motor cortex to the right arm increased from 1.7 (± 1.3 mV) to 2.4 (± 1.3 mV) and to the left arm from 1.2 (±.6 mV) to 1.6 (±.8 mV).

Discussion: The data in this study provides further evidence of rapid strength increases and CNS changes that may account for rapid increases in strength without associated muscle hypertrophy. The study further demonstrates the safety of single-pulse TMS use in children and adolescents. However, this is the first time CNS plasticity, following a period of strength training, has been demonstrated in children and adolescents. Further study will aim to investigate longer training period durations.

References

Griffin L, Cafarelli E. (2005) Can J Appl Physiol, 30, 328-340.

Faigenbaum AD, Westcott WL, Loud RLR, Long C. (1999). Pediatrics, 104, 1-7.

Adkins DL, Boychuk J, Remple MS, Kleim JA.(2006). J Appl Physiol,101, 1776-82.

CORTICO-SPINAL MECHANISMS OF THE REGULATION OF CONCENTRIC AND ECCENTRIC MUSCLE CONTRACTIONS

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Introduction: Concentric and eccentric muscle contractions make up the essential part of motor activity of humans. There are a lot of researches devoted to studying of EMG changes, activity and specific modulation of motor units at concentric and eccentric contractions (Pasquet et al., 2006; Semmler et al., 2007). The purpose of the present research was to study parameters of motor evoked potentials (MEP) and the EMG silent period of skeletal muscles under transcranial magnetic stimulation (ТМS) in the process of concentric and eccentric muscle contractions.

Methods

Subjects aged 19-23 took part in the research. All the subjects were informed about conditions of the research and gave a written consent to participation, and it conformed to the Helsinki Declaration. The subjects performed concentric and eccentric muscle contractions (plantar\dorsi flexion) making 50 % of maximal voluntary contraction. The MEP parameters, EMG silent periods of lower extremities mus-

cles during ТМS of the brain were registered by the magnetic stimulator «Magstim 200», the dynamographic system «Biodex Multi-Joint System Pro-3» and the electroneuromyograph «Neuro-МЕР-8».

Results: It was revealed, that MEP amplitude of the researched muscles during contractions considerably increased in comparison with that at rest. It is marked that the most significant growth of the MEP amplitude of m. gastrocnemius med. and m. soleus at the concentric contraction, exceed the values at rest in 5-8 times. The greatest MEP amplitude was registered in the middle of concentric contraction, and minimal was at the moment preceding the final part of it. At the eccentric contraction the MEP amplitude of the m. tibialis anterior was higher, than that of the other muscles. The silent period of the researched muscles was longer at the performance of concentric contraction, the maximum of the silent period duration was achieved in its final part.

Discussion: The MEP amplitude increase at muscle contractions is explained by the MEP facilitation phenomenon which is determined by change of excitability of elements of the nervous system (Mills et al., 1996). We have every reason to believe that the MEP amplitude increase of m. gastrocnemius med. and m. soleus at the concentric contraction proves higher excitability of the cortical neurons.

Conclusion

The revealed facts testify variability of descending cortical currents during voluntary concentric and eccentric muscle contractions.

References

Mills K, Kimiskidis V. (1996). Muscle Nerve, 19:953-958.

Pasquet B, Carpentier A, Duchateau J. (2006). J Physiol, 577.2, 753-765.

Semmler J, Tucker K, Allen T, Proske U. (2007). J Appl Physiol, 103:979-989.

DIURNAL VARIATION IN THE H-REFLEX IN HUMAN

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The monosynaptic Hoffmann (H)-reflex that is evoked by Ia afferents from muscle spindle to homonymous MNs (excitability of spinal α-motoneurons) is widely used as a tool for investigating the changes in excitability of the MN pool. Diurnal variation in the H-reflex amplitude has been identified primarily in rats, mice and monkeys. H-reflex amplitude in the rat is the largest in the late morning and the smallest around midnight. In contrast, the primate H-reflex and spinal stretch reflex amplitude are the largest at midnight and the smallest in the morning. These results suggest that the central nervous system activity and reflex function vary with the time of the day. This phenomenon could be observed in human, nevertheless little is known about diurnal H-reflex in human. The purpose of this study was to investigate H-reflex on the diurnal variation in human. Six healthy males were voluntarily participated in this study. H-reflex of soleus muscle (SOL) and rectal temperature were recorded at 7:00, 11:00, 16:00, 20:00, 22:00, 3:00, and 7:00 h. Participants were allowed to sleep for 8 hours, from 23:00 to 7:00. H-reflex and rectal temperature were measured after a 20 minute rest period. Subjects maintained the prone position to minimize the variation of the H-reflex caused by changes in position or muscle activity. H-reflex of SOL was evoked by electrical stimulation at the tibialis nerve in the popliteal fossa continuously, once per 4 second interval. The stimulus to elicit the H-reflex was delivered as 1-ms square pulse. With the maximal H wave, there was a small M-wave (10% of the maximal M wave) and the amplitude of this M-wave was monitored to maintain constancy of nerve stimulation during the experiment. We measured the peak-to-peak amplitude of the H-reflex, which indicates the excitability of spinal α-motoneurons. Also, we compared the time interval between the time on positive peak of M and H wave (loop time), which indicates the recruitment threshold of motor units. Rectal temperature significantly changed during 24 hours ($p < 0.05$); natural circadian rhythms were seen in all participants. Rectal temperature was significantly lower in the morning and midnight compared to the daylight ($p < 0.05$). In contrast, the loop time was significantly shorter in the daylight than in the morning and midnight ($p < 0.05$). In fact, the rectal temperature and loop time varied in a mirror image. These results suggest that the recruitment threshold of motor unit is low in the early morning and midnight. H-reflex amplitude did not show any diurnal variation. These results were varied from the previous studies. We consider that it is because of the discrepancy in method for evaluation of excitability of spinal α-motoneurons. In conclusion, the data shows that the diurnal variation is present in the time interval between the time on positive peak of M and H wave.

IGF-I AND HORMONAL RESPONSES TO ARM CURL EXERCISE UNDER DIFFERENT HYPOXIC CONDITIONS

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Introduction: It has been reported that several hormonal responses including growth hormone (GH) and catecholamine are enhanced by exercise in a hypoxic condition compared that in a normal condition. The present study aimed to examine the effects of arm curl exercise under different hypoxic conditions on insulin-like growth factor-I (IGF-I) and hormonal responses, which relate to muscle hypertrophy.

Methods: The subjects were 8 healthy male adults (23±2 yrs, 171.9±4.2cm, 68.3±13.5kg). They performed an exhaustive arm curl exercise in three different conditions, that is, 1) normal condition (N), 2) hypoxic condition corresponding to 3000m (H1), and 3) to 5000m above sea level (H2). Arm curl exercise was done at the load of pre-determined 8 RM to the exhaustion in each set, and it was repeated 3 sets with 1 min rest between sets. The range of elbow joint motion was from 10 to 100°(0°at full extension), and the exercise was performed at a fixed cadence (flexion action 3-s, extension action 3-s). Before the exercise, the subject rested in a sitting position for 30 min breathing the gas of each condition. Blood samples were obtained before, and immediately, 15min, and 30min after the exercise to determine serum IGF-I, GH, cortisol, and blood lactate concentrations (BLa).

Results: Mean values of BLa at immediately after the exercise were significantly higher than those before the exercise in the all conditions ($P<0.05$). Furthermore, BLa in H2 kept significantly higher until 15 min after the exercise when compared to that before the exercise. When time course of serum GH were compared in each condition, no significant changes were observed in all conditions. However, when those were compared among conditions, the values at 15 min and 30 min after the exercise were significantly higher in H2 than those in N and in H1 ($P<0.05$). Time course of serum cortisol did not change significantly in all conditions, either. In the comparison among conditions, the values of serum cortisol at 15 min and 30 min after the exercise were significantly higher in H2 condition compared to that in N ($P<0.05$). In serum IGF-I, neither time course of changes in each condition nor differences among conditions were found.

Discussion/Conclusion: These results suggest that hypoxic stimulus could enhance the hormonal responses which relate to muscle hypertrophy but that mild hypoxic stimulus corresponding to 3000m above sea level would not be strong enough to induce such hormonal responses. On the other hand, it is suggested that serum IGF-I would not change within 30 min after the exercise by the hypoxic and exercise stimulus used in this experiment.

THE EFFECT OF STRETCHING ON MUSCLE FORCE PRODUCTION IN HAMSTRING MUSCLES

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The purpose of this study was to explore the acute effect of proprioceptive neuromuscular facilitation stretching (PNF) on maximal voluntary contraction (MVC), rate of force development (RFD) and power in both isometric and dynamic contractions of hamstring (knee flexion).

10 volunteer male kickboxers participated in the experiment. The subjects underwent two days of testing, and randomly the subjects were tested with or without stretching the first or the second day of testing. The day without PNF was used as a control condition for the day with PNF.

Each experimental condition conducted of a 10min warm up on at treadmill at 60% of the subjects HFmax. Immediately after warm up the day without stretching the dependent variables in both the isometric and dynamic contractions of the hamstrings were tested. After warm up the other day the subjects underwent a controlled PNF sequence of the hamstring that was immediately followed by a test of the dependent variables. The subjects hamstring flexibility was controlled by the "sit and reach test" after warm up both days of testing, and after PNF. Only the dominant leg was tested.

The results indicate that PNF increases hamstring flexibility, but has an acute negative effect on MVC, RFD and power in both isometric and dynamic contractions of hamstring muscles.

Therefore it is concluded that PNF has an acute negative effect on muscle force production measured as MVC, RFD and power in both isometric and dynamic tasks, and is not a type of stretching that should be recommended in before performing activities that require high force production.

14:15 - 15:15

Poster presentations

PP-PH08 Physiology 8

SCALING OXYGEN CONSUMPTION TO BODY MASS IN REAL ELITE CROSS-COUNTRY SKIING PERFORMANCES

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LIVI

Introduction: Maximal oxygen consumption (VO2max) is a frequently evaluated test parameter in cross-country skiing. Most often the units L min(-1) and mL min(-1) kg(-1) are used as performance ability markers, but earlier research have suggested that VO2max divided by body mass raised to 2/3 power would theoretically better reflect the physiological demands in cross-country skiing (Bergh and Forsberg, 1992). Changes in cross-country skiing in the last decades might place different physiological demands regarding VO2max. The purpose was therefore to find the optimal body mass exponent for test parameter VO2max for real elite cross-country skiing performances and ranking points.

Methods: Four to seven days prior to the first ski race twelve highly motivated male Swedish national elite cross-country skiers (age 23.9+/-4.2 years; weight 76.2+/-5.8 kg; VO2max 5.34+/-0.34 L min(-1)) completed an incremental treadmill roller skiing test in diagonal technique determining VO2max.

Performance data were collected from the Swedish National Championship (SNC) in cross-country skiing (13-17 March 2008): 15-km with individual start in classical technique (SNC15); 30-km double pursuit with mass-start (SNC30) also divided in the two halves in classical technique (SNC30:15c) and free-style technique (SNC30:15f); sprint prolog in free-style technique (SNCsprint). In addition to ski races, overall seasonal ski ranking points were collected from International Ski Federation's (FIS) 3rd Cross-Country Points List 2007/2008 published before SNC for distance (FISdist) and sprint (FISsprint) races.

Body mass scaling of VO2max for each of the skiing performances was determined using Pearson´s correlation analysis. Optimal mass exponent was set to the scaling value between zero (L min(-1)) and one (mL min(-1) kg(-1)) where Pearson's product-moment correlation coefficient showed highest correlation for the relationship between VO2max and the ski performance parameter.

Results: Optimal body mass exponents for VO2max regarding ski performances SNC15, SNC30, SNC30:15c SNC30:15f and SNCsprint were 0.49, 0.57, 0.55, 0.58 and 0.31, respectively. Optimal scaling factor for FISdist was 0.63 and corresponding value for FISsprint was 0.25.

Discussion: This study indicates that optimal body mass exponents for maximal aerobic power depends mainly on work intensity of the actual skiing performance. Sprint skiing performance places higher metabolic demands than distance races which are reflected by a lower scaling factor. The fact that SNC15 had a lower optimal body mass exponent than SNC30:15c despite both were performed in the same course and technique supports the work intensity theory because in double pursuit the physiological resources should be sufficient to go 15-km more resulting in lower work intensity. Summarizing the reasoning above heavier skiers are favored in shorter race distances with higher metabolic demands.

References

Bergh U, Forsberg A. (1992). Med Sci Sports Exerc., 24, 1033-9.

PHYSIOLOGICAL DEMANDS OF REAL ELITE CROSS-COUNTRY SKIING PERFORMANCES

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LIVI

Introduction: Which are the main physiological differences between a successful and less successful cross-country skier? To our knowledge no previous studies have examined a real elite cross-country ski competition. Main purpose of this study was therefore to validate commonly used test parameters to skiing time and to International Ski Federation (FIS) overall seasonal ranking points and to create multiple regression models to predict skiing performances.

Methods: Twelve highly motivated male Swedish national elite cross-country skiers completed a test battery consisting of: isokinetic knee extensor peak torque tests at three different velocities; three different vertical jumps tests; two-part treadmill roller skiing test determining lactate markers, maximal oxygen consumption (VO2max) and time to exhaustion; 60 and 360 s double poling tests determining mean upper-body power (DP60Pmean) (DP360Pmean) and mean oxygen consumption (DP60VO2mean) (DP360VO2mean).

Performance data were collected from the Swedish National Championship (SNC) in cross-country skiing (13-17 March 2008): 15-km with individual start in classical technique (SNC15); 30-km double pursuit with mass-start (SNC30); sprint prolog in free-style technique (SNCsprint). In addition to ski races, overall seasonal ski ranking points were collected from FIS 3rd Cross-Country Points List 2007/2008 published before SNC for distance (FISdist) and sprint (FISsprint) races.

Correlations between test parameters and performance data were established using Pearson´s correlation analysis. Prediction models were created using standard multiple linear regression analysis.

Results: Time to exhaustion during the incremental treadmill roller ski test is best correlated with both SNC15 ($r = -0.86$, $p < 0.001$) and SNC30 ($r = -0.81$, $p < 0.01$). For SNC15 significant correlations were shown with VO2max both absolute and relative to body weight, lactate markers, DP60Pmean and DP60VO2mean. Corresponding correlations for SNC30 were: lactate markers, DP60VO2mean and percentage decrease in mean knee extension peak torque when comparing highest and lowest velocities. Highest correlation coefficient for SNCsprint was found for DP60Pmean ($r = -0.93$, $p < 0.05$). Significant correlations for SNCsprint was also detected for DP360Pmean as well as DP360VO2mean and jump height in squat jump.

Prediction models explain 68, 91, 68, 77 and 82% of the variance in performance for SNC15, SNC30, SNCsprint, FISdist and FISsprint, respectively.

Discussion: Correlations found in this study have validated several commonly used physiological tests with real elite cross-country skiing performances. Frequently investigated test parameters like VO2max and anaerobic thresholds are of great importance for success in cross-country skiing. Many recent research studies have focused on upper-body capacity and we could confirm that high mean power production in double poling is necessary to be successful as elite skier in both sprint and distance races.

INTERACTION BETWEEN OXIDATIVE STRESS AND ANTIOXIDANT MARKERS IN ELITE FEMALE PLAYERS FOLLOWING A SOCCER GAME.

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Introduction: Exhaustive exercise may produce an excessive amount of free radicals leading to oxidative stress. Under normal conditions, the production of free radicals is in a fine-tuned equilibrium with the antioxidant defence system (Blomhoff, 2005). During a soccer game the aerobic energy system is highly taxed and increased free radical production is expected. Thus, we aimed to investigate the interaction between biomarkers of oxidative stress and antioxidants levels in elite female soccer players in response to a 90-min game.

Methods: Blood samples were taken from 16 field players (22±3 yrs, 167±5 cm, 64±2 kg, 54±3 ml•kg-1•min-1) before, immediately and 21 h after a 90-min game. Plasma oxidised glutathione (GSSG), the ratio of reduced to oxidised glutathione (GSH:GSSG) and lipid peroxidation measured by D-Roms test were used as biomarkers of oxidative stress. Plasma endogenous (uric acid, total glutathione–TGSH) and dietary antioxidants(α-tocopherol, ascorbic acid- AA, total carotenoids, and polyphenols) were analysed using liquid chromatography and the Folin-Ciocalteu method. The food intake was standardised for all players during the study and secured an optimal intake of macro nutrients.

Results: Immediately after the game GSSG significantly increased, GSH:GSSG decreased and D-Roms levels were unchanged. Uric acid, TGSH, AA and α-tocopherol significantly increased immediately after the game whereas total polyphenols decreased and total carotenoids remained unchanged. GSSG and GSH:GSSG ratio returned to baseline at 21 h whereas D-Roms levels remained unchanged. Uric acid, TGSH and AA returned to baseline 21 hrs after the game. In contrast, total polyphenols remained significantly reduced whereas α-tocopherol remained elevated. Significant increases above baseline were observed in total carotenoids only at 21 h.

Conclusion

A soccer game in elite female soccer players induced a transient increase in GSSG and reduction in GSH:GSSG ratio accompanied by a robust response of the antioxidant defence systems. The orchestrated endogenous and dietary antioxidant responses in well-trained players helped to prevent the occurrence of lipid peroxidation after a soccer game. These results differ from that observed following soccer games in males where increased lipid peroxidation occurred for several days following the game (Ascensao et al., 2008; Ispirlidis et al., 2008). The differences may be related to the antioxidant functions of the female hormone estrogens. Furthermore, as polyphenols are only found in the circulation and not stored in the tissue, we suggest that the reduction in polyphenols following the game may be used as a marker of increased free radical production.

Referenses

Ascensao A, Rebelo AN, Oliviera E, Marques F, Pereira L, Magalhaes J. (2008). Clin Biochem, 41, 841-851.

Blomhoff, R. (2005). Curr Opin Lipidol, 16, 1, 47-54.

Ispirlidis I, Fatouros IG, Jamurtas AZ, Nikolaidis MG, Michailidis I, et al. (2008). Clin J Sport Med, 18, 423-431.

THE SHORTEST TIME TO REACH MAXIMAL OXYGEN UPTAKE WITHOUT PRIOR WARM UP IN PROFESSIONAL SOCCER PLAYERS

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Introduction: In very heavy exercise, preceded by adequate warm-up, VO2max and HRmax can be attained within one minute (Astrand et al., 2003). However, with a restricted warm up, VO2 during short exhaustive treadmill runs of ~2min duration (i.e. 800 m run) was shown to plateau at different levels below VO2max depending on pacing strategies (Sandals et al., 2006). The question arises about the shortest time to achieve VO2max with optimal pacing and without a preceding warm up.

Methods

Eight professional male soccer players, accustomed to sprint training, performed a progressive paced field test to exhaustion consisting of two laps on a track (first lap 50%, half lap 70% of the self estimated maximal performance capacity followed by an all-out sprint to the finish line) and an incremental treadmill test (work increments of 1 km/h per minute). Oxygen uptake, minute ventilation and heart rate

were measured with a portable spirometric-telemetric device (Oxycon mobile, Jäger, Germany). In the 3rd minute after cessation of work, blood lactate concentrations were determined.

Results: The highest VO2 values in the field test were achieved after 230±17s. When using 30 s averages of data collection VO2max values differed significantly between the field and the lab test, however no differences were found for the 15 s averages (r=0.824 ($p<0.05$)). The total errors of estimation for the field test were 2.6 and 1.8 ml/min/kg for the 30 and 15 s averages, respectively. Lactat concentrations in the lab test were significantly lower than in the field test.

Discussion: These results demonstrate that a test duration of approximately 230s without warm up is sufficient for eliciting VO2max in professional soccer players, provided a progressive pacing strategy is applied. An explanation for the rapid attainment of VO2max may be that the relative intensive "warm up" run (first 1.5 laps) speeds up (Gerbino et al., 1996) or increases the primary VO2 response amplitude (Burnley et al., 2001) of the 200 m run to exhaustion. Furthermore the progressively increasing speed in contrast to other pacing strategies lengthens running time so that the slow component of the VO2 increase can occur and possible O2 delivery limitation due to reduced muscular temperature or pH changes is avoided (Burnley et al., 2001).

References

1 Astrand PO, Rodahl K, Dahl HA, Stromme SB. (2003). Textbook of work physiology. Canada: Human Kinetics.

2 Sandals LE, Wood DM, Draper SB, James DVB. (2006) Int J Sports Med, 27, 37-42.

3 Gerbino A, Ward SA, Whipp BJ. (1996). J Appl Physiol, 80, 99-107.

4 Burnley M, Doust JH, Carter H, Jones AM. (2001). Exp Physiol, 86, 417-425.

PRE-SEASON CORRELATIONS BETWEEN SPRINT, 1RM AND RUNNING ECONOMY IN PROFESSIONAL SOCCER PLAYERS

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Pre-season correlations between sprint, 1RM and running economy in professional soccer
players

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Strength training has the potential to improve sprint performance and running economy in athletes[1,2], but it is uncertain whether it is the increase in maximum strength per se or other factors affected by strength training which accounts for these findings. Therefore, the aim of this study was to investigate the relationship between strength in leg extensors, measured as one repetition maximum (1 RM) in squat, and sprint abilities as well as running economy in professional soccer players.

METHODS: Fifteen professional Norwegian soccer players (±SD) age 25±5 years, height 184±5 cm, weight 77.3±7.8 kg and maximal oxygen uptake 64.2±5.0 ml·kg-1·min-1 (range: 56.4-71.4 ml·kg-1·min-1)

were tested for 1 RM in half squat, sprinting performance (0-40m) and running economy, measured while running on 5.5% incline at 10 km/h.

RESULTS: The 1 RM in half squat was 149.2 ±17.3 kg (range: 100-180kg), 10m sprint time was 1.78±0.06 sec, 30-40 meter sprint time was 1.16±0.05sec and total sprint time (0-40m) was 5.37±0.16sec. Relative strength in half squat (1RM/body weight) was correlated with both 10m

acceleration (r=0.70) and total time on the 40m sprint (r=0.75). Running economy was 47.2±0.6 ml·kg-1·min-1 (range: 0,265-0,303). Relative strength in half squat was not correlated with running economy (r=0.16).

DISCUSSION: The results of this study confirm that relative strength is important for performance in activities like sprint where athletes accelerate their own body weight [1]. Earlier studies [2,3] has indicated that an increase in 1RM increase running economy. However, in the present study running economy was not correlated with 1RM. This might indicate that maximal

strength per se is not important for running economy. It may be that the rate of force development (RFD) and muscle-tendon stiffness are more important for running economy than maximum strength. A tight musculo–tendinous system, and consequently a higher degree of stiffness, may be advantageous for running economy and strength training has been

reported to increase muscle-tendon stiffness [4]. In conclusion, our results confirm that relative strength in leg extensors is important for the performance in sprint, but no relation was found between relative strength and running economy.

REFERENCES

[1] Wisløff et al. Br J Sports Med. 38:285-288,2004

[2] Støren et al. Med & Science in Spor t& Exercise. 2008

[3] Stølen et al. Sports Med.35(6);501-536, 2005

[4] Kubo et al. J Appl Physiol. 91(1);26-32,2001

COMPARISON BETWEEN SOCCER AND BASKETBALL PLAYERS IN STRENGTH, AEROBIC AND ANAEROBIC CAPACITY

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The aim of this study was to compare the strength, aerobic and anaerobic capacity of elite soccer and basketball players prior to the beginning of a pre-season training period. Thirty nine soccer players (S) and thirty basketball (B) players participated in an exercise capacity assessment two days prior to the beginning of their pre-season training. Their strength (quadriceps and hamstrings) was assessed in an isokinetic apparatus, the aerobic capacity using a metabolic cart and their anaerobic capacity via the wingate test. The anaerobic capacity was assessed first, then the strength and finally the aerobic capacity. The results showed that there was no difference between the two groups in anaerobic (S = 10.66 + 1.0 W/kg, B = 10.28 + 1.0 W/kg) and aerobic capacity (S = 52.1 + 4.8 ml/kg/min, B = 50.5 + 4.3 ml/kg/min). However, there was a significant difference between the two groups in hamstring strength, with the S exhibiting higher relative values compared to B. The fitness level of both players was not at a high level and this is something that trainers should give a closer attention.

REDUCTION IN HIGH INTENSITY ACTIVITY DURING SENIOR ELITE RUGBY LEAGUE MATCHES

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Introduction: The amount of high intensity activity (HIA) performed by players has been shown to discriminate between playing standards in soccer (Mohr et al., 2003). Moreover, irrespective of playing standard, fatigue during competitive match play will manifest itself as a reduction in HIA during the final 15 min of play (Mohr et al., 2003). However, in the only study to-date investigating the changes in movement intensities in competitive rugby league (RL) matches, the researchers reported findings that were inconsistent and seemingly dependent on playing standard (Sirotic et al., 2009). Therefore, the aim of the present study was to clarify the changes in movement intensities observed during senior elite RL matches.

Methods: Following ethical approval, a semi-automated match analysis image recognition system (ProZone 3, ProZone®, Leeds, England) was used to track players (n = 78) during three senior elite matches. The players' movements were classified into locomotive categories of standing: <0.2 m/s; walking: 0.2-1.9 m/s; jogging: 2.0-3.9 m/s; running: 4.0-5.4 m/s; high intensity running: 5.5-6.9 m/s and sprinting: ≥ 7 m/s (low intensity activity – LIA: 0-3.9 m/s; HIA: ≥ 4.0 m/s). The distance covered in each of the locomotive categories was calculated per half, for every 20 min of the match and for the whole match. To prevent the effects of clock stoppages, only data obtained from the first 40 min of each half was used for analyses.

Results: Distances covered in running and sprinting were significantly lower in the second half in comparison to the first ($P<0.05$). Furthermore, mean distance covered in HIA was 14.4% lower in the second half (708 ± 146 m) than the first (827 ± 117 m; $P<0.05$). In addition to a reduction in HIA during 20-40, 40-60 and 60-80 min compared to 0-20 min, there was also a reduction in HIA during 60-80 min compared to 40-60 min ($P<0.05$). Conversely, mean total distance covered was only 1.4% (-56 m) lower in the second half due to HIA accounting for only 24.1% of the overall distance covered and a non-significant 2.0% increase in LIA in the second half ($P>0.05$).

Discussion: The finding of this study that senior elite players exhibit an inability to maintain HIA in the second half (- 14.4%), especially toward the end of a match (60-80 min), is in-line with previous research reporting significant reductions in running and sprinting in the second half of senior elite RL matches (Sirotic et al., 2009). Furthermore, evidence from the current study suggests distance covered in HIA is more effective at detecting fatigue than total distance covered. Therefore, coaches should implement appropriate training interventions to ensure that players are capable of maintaining HIA for the duration of a match.

Mohr et al. (2003). J Sports Sci, 21, 519-528.

Sirotic et al. (2009). J Sports Sci, 27 , 203-211.

A COMPARISON OF EXERCISE PERFORMANCE USING DIFFERENT TYPES OF ERGOMETERS IN COMPETITIVE CYCLISTS, RUNNERS, ROWERS AND SWIMMERS.

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PURPOSE: The purpose of the study was to compare physiological responses during different modes of maximal exercise testing.

METHODS: Twenty competitive athletes and five recreational athletes performed incremental exercise tests using Bicycle, Treadmill, Rowing and Swim-Bench Ergometers.

Physiological variables (O2 max , O2 pulse , Anaerobic Threshold, Maximum Lactate, Heart Rate, Blood Pressure , R. Q ,) were measure using a Quark b2 gas analyzer, Polar Heart Rate monitors and a Dr. Lange lactate analyzer). Blood lactate was measure post-exercise. Outcome variables were analyzed with repeated measures ANOVA.

RESULTS: The data suggested differences in measured variables obtained using different modes of exercise. Caution is suggested when training guidelines and physiological assessment is made with athletes of different event specialization tested on various exercise modes.

THE EFFECT OF CARRYING A PORTABLE RESPIRATORY GAS ANALYSIS SYSTEM ON ENERGY EXPENDITURE DURING RUNNING

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Introduction: Improvements in respiratory gas analysis technology have made the availability of portable gas analysers widely available. Previous studies have shown that the majority of these systems are a valid and reliable method of determining respiratory responses during intense (Meyer et al., 2005) and light exercise (Ingle et al., 2007). Whilst these systems have been widely used, little is known of the impact on energy expenditure (EE) on individuals that are required to carry them during exercise bouts. Method: Eight male participants of mean (SD) age 25.0 (9.47) y, body mass 78.5 (8.39) kg, and height 1.83 (0.08) m, completed two randomly ordered incremental exercise bouts on a motorised treadmill. Following a period of four minutes of standing, participants were required to walk at 4km/h for four minutes. Thereafter the treadmill increased in speed every four minutes in order to induce a variety of exercise intensity demands (7, 10, 12, 14, km/h and maximal exercise). The experimental trial required participants to complete the exercise bout whilst wearing a portable (PT) respiratory gas analysis system (Metamax 3B, Cortex, Germany) in a harness on the chest. During the control trial (CT) the weight of the gas analyser was supported by a harness adjacent to the treadmill. Throughout each exercise trial respiratory gases, heart rate (HR) and rating of perceived exertion (RPE) were measured. Respiratory gases were used to calculate EE via indirect calorimetry (Frayn 1983). All data were analysed using a General Linear Model ANOVA with Repeated Measures, significance was accepted at $p< 0.05$. Results: During the exercise bouts, the rate of EE increased as the intensity of exercise increased ($p<0.001$). There was a significantly greater rate of EE during PT between the running speeds of 7 – 14 km/hr ($p=0.048$), but no significant differences were observed during standing, walking or at maximal exercise ($p>0.05$). Conversely there were no significant effects of wearing the gas analyser on VO2 max. (4.10±0.53, and 4.28 ±0.75 for the LC and PT trials respectively), HR or RPE ($p>0.05$). Conclusion: The use of portable gas analysis systems have no effect on the energy expended during standing or walking for short periods, but caution may need to be taken, particularly if exercise bouts are both submaximal and prolonged in nature.

References:

Frayn, K. N., (1983), Calculation of substrate oxidation rates in vivo from gaseous exchange, J App Phys, 55: 628-634.

Mayer, T., Davidson, R.C.R., and Kindermann, W. (2005) Ambulatory gas exchange measurements – current status and future options. Int. J Spo Med 26: S19-S27.

Ingle, L., Wilkinson, M., Carroll, S., Boyes, C., Butterly, R., King, R., Cooke, C., Cleland, J., and Clark, A., (2007). Cardiorespiratory requirements of the 6-min walk test in older patients with left ventricular systolic dysfunction and no major structural heart disease. Int. J Spo Med, 28 (8): 678-84.

UPPER BODY AEROBIC AND ANAEROBIC CAPACITY IN CANOE AND KAYAK PADDLERS: ASPECTS OF AGE AND GENDER

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Introduction: Canoe and kayak flat water paddling are upper-body sports that make varying demands for upper body aerobic and anaerobic capacity. There is only little evidence on the upper body aerobic and anaerobic capacity data in paddlers across the different age categories and/or males and females using the same methods and test protocols (Bishop, 2000). Therefore, the aim of the present study was to evaluate the physiological parameters obtained in upper body aerobic and anaerobic exercise tests in young (youngster, youth junior and junior) and adult (senior) trained male and female paddlers and evaluate the results from point of view of age and gender.

Methods: Altogether 306 elite flat water paddlers (99 female kayak paddlers, 135 kayak and 72 canoe male paddlers) were tested by a 30-s Wingate anaerobic arm test at a resistance load 4 W.kg-1 (=0.069 kg.kg-1) in males and 3.3 W.kg-1 (=0.057 kg.kg-1) in females, and an incremental maximum aerobic arm-cranking test. The results were compared in canoe paddlers and in male and female kayak paddlers in four age categories 13 to 14 ("youngster"), 15 to 16 ("youth junior") and 17 to 18 and years of age (junior) and in seniors (19 years and older), respectively. Statistics included correlation analysis and a 2-way ANOVA was used to determine the effects of gender and age.

Results: Maximum aerobic performance in male canoe and kayak paddlers increased from 13-14 to 15-16 age category and was not different in junior (17-18 years) and senior paddlers. However, in the anaerobic arm test, both peak power and mean power output increased with age from the youngest to the oldest age categories. These anaerobic capacity indices were strongly related to the amount of fat-free mass (PP: r= 0.69 and r= 0.62; MP: r= 0.72 and r= 0.71 for the canoe and kayak paddlers, respectively). In female kayak paddlers, the indices of upper body aerobic and anaerobic capacity also increased with age, however the differences among the age groups were smaller than in male paddlers. In contrast to male paddlers, in female kayak paddlers the upper body aerobic and anaerobic capacity indices (relative to body mass) were unrelated to the amount of fat free mass.

Discussion: The results of the present study seem to be comparable with the previous reported data in paddlers including gender differences in aerobic and anaerobic performances of paddlers (Bishop, 2000; Fry and Morton, 1999). It could be concluded that aerobic upper body capacity in canoe and kayak paddlers is increasing from the youngster to the junior age category. Higher upper body anaerobic capacity, lower body fat and a higher amount of fat-free mass may account for the main physiological differences between senior and junior flat water paddlers.

References

Bishop D (2000). Eur J Appl Physiol, 82, 91-97.

Fry RW, Morton AR (1991). Med Sci Sports Exerc, 23, 1297-1301.

SECRET CLOCK MANIPULATION AFFECTS TIME-TO-TASK FAILURE DURING HIGH-INTENSITY EXERCISE

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SECRET CLOCK MANIPULATION AFFECTS TIME-TO-TASK FAILURE DURING HIGH-INTENSITY EXERCISE

Introduction: Task failure is an important feature of performance, ageing and many diseases. While there is currently considerable debate regarding the principal cause(s) of task failure, some of the more popular hypotheses include a failure of skeletal muscle motor unit recruitment, the depletion of muscle energy stores, and metabolite accumulation (1). Recently, it has been suggested that exercise tolerance in humans may be limited by self-perceived ratings of exertion (2). As poorer performance has also been associated with the perception of time slowing (3), we decided to test the hypothesis that secretly manipulating the clock calibration would influence time-to-fatigue (TTF).

Methods: Eight healthy males each performed an incremental test on a cycle ergometer to determine their power at VO2max (P100%), followed by a familiarisation trial and 3 identical time-to-fatigue tests at P120%. During all tests a large digital clock with the time of the test was shown to the subjects. During test 3 and 4, the speed of the clock was either manipulated by a factor 0.9 (slow clock) or 1.1 (fast clock). The subjects were unaware of the time manipulation and the tests with the slow and fast clock were conducted double blind and in a random, counter-balanced order. Manipulated clock times were later converted to real times.

Results: Analysis of the results showed that TTF with the fast clock (182 ± 44 s) was significantly longer compared to the slow clock (156 ± 46 s). The average TTF of the normal clock was 168 ± 38 s and was not significantly different from the other two conditions. Heart rate at task failure was significantly higher in the trial with the fast clock (178 ± 7 bpm) compared to the slow clock (174 ± 10 bpm), but was not different from the normal clock (177 ± 9 bpm). There was no significant difference in VO2 between the three conditions (49.5 ± 5.5, 50.5 ± 5.5 and 49.8 ± 6 ml/kg/min for the normal, fast and slow clock respectively).

Discussion/Conclusions: The results show that subjects were able to increase TTF when they were looking at the fast compared to the slow clock. We hypothesise that the perception of time speeding may have motivated subjects to continue exercising. These results provide strong evidence that task failure is not only related to physiological factors, but is also influenced by perception. This has important implications for both research and for coaching.

References

1. Abbiss CR, Laursen PB. Models to explain fatigue during prolonged endurance cycling. Sports medicine. 35:865-898, 2005.

2. Marcora SM, Staiano W, Manning V. Mental Fatigue Impairs Physical Performance in Humans. J Appl Physiol. 2009.

3. Snyder CM, Brewer BW. (1994). A between-sport analysis of peak performance characteristics. Applied Research in Coaching and Athletics Annual 1994, Boston, 96-105.

TREADMILL EXERCISE ENHANCES ABCA1 EXPRESSION IN RAT LIVER

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ATP-binding cassette transporters (ABCs) belong to a large family of the mammalian transmembrane transporters that play a crucial role in plasma HDL-C remodeling. The purpose of this study was to investigate the expression of ABCA1 in rat liver in response to treadmill exercise. Ten adult Wistar male rats (300-322 g) were used for this purpose. Animals were divided into control (n = 5) and Training (n = 5) groups. Training group was given exercise on a motor-driven treadmill at 25 m/min (0% grade) for 60min/day, 5 days/week for 12 weeks. Rats were sacrificed 48h after the last session of exercise. A portion of the liver were excised, immediately cleaned, washed in ice-cold saline, and frozen in liquid nitrogen for extraction of ABCA1 mRNA expression and ATP measurement. Plasma collected for plasma lipids, lipoproteins, apolipoprotein A-1, LCAT, and pre β-HDL measurements. Liver ABCA1 mRNA expression was significantly (P <0.024) higher in trained rats compared to control rats. Liver ATP concentrations remained unchanged. Plasma HDL-C and HDL2- C and, Apo A-1, pre ß-HDL, and LCAT concentrations were significantly higher in trained rats at the end of treadmill exercise. In conclusion, an elevated plasma HDL-C was accompanied by higher ABCA1 mRNA expression in liver tissue, Apo A-1, LCAT, pre β-HDL concentrations, but not in liver ATP concentrations.

Hoang A, Tefft C, Duffy SJ, Formosa M, Henstridge DC, Kingwell BA, Sviridov D, 2008, ABCA1 expression in humans is associated with physical activity and alcohol consumption. Atherosclerosis. 197:197-203.
Zannis VI, Chroni A, Krieger M , 2006, Role of apoA-I, ABCA1, LCAT, and SR-BI in the biogenesis of HDL. J Mol Med. 84: 276–294.

14:15 - 15:15

Poster presentations

PP-PH09 Physiology 9

EFFECT OF ENDURANCE AND RESISTANCE TRAININGS ON SALIVARY IGA, CORTISOL, DHEA AND DHEA: CORTISOL CONCENTRATION RATIO IN UNTRAINED FEMALES

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Introduction:
Moderate, Regular physical training is associated with improved health including decreased blood pressure and body weight and possibly a decreased sensitivity to upper respiratory tract infection(URTI) (1).Mucosal immune of URT is the first defense of the body that by salivary IgA protect the body against the pathogenic factors(1,2). DHEA has anabolic effects on several tissues. excessive trainings increase DHEA concentration(3).
Methods: 28 untrained female students (aged; 24 2.58 yr, height; 161  8.2 cm, weight; 56.8  14.61 kg) were randomly divided into three groups; Control (C; n=8), Endurance (E; n=10), resistance (S; n=10). E training consisted of running %65 MHR for 16 minutes during the first week, reaching %80 MHR for 30 minutes during the 8th week. S training consisted of having four leg-press, bench-press, pull down curls, and legs curls. During the first week, the training were done at %50 1RM in two sets with 10 repetitions. The intensity of training was increased to %80 1RM in 3 sets and 6 repetitions, during the 8th week.
Before and after of 4 and 8 weeks of trainings unstimulated saliva samples were collected at 8 o'clock in the morning. Samples were assayed using an ELISA.
Results:
ANOVA for repeated measures showed IgA,DHEA and DHEA :cortisol ratio in S group compared with another groups had meaningful increase (p 0.05) that In between group comparison differences were meaningful .there was no alterations in cortisol concentration of groups and significant correlation was not found between IgA and cortisol (p 0.05).
Discussion: This finding indicated that resistance training by increasing IgA, DHEA and DHEA :cortisol ratio caused improvement of immune function and anabolic status of the body but had no effect on cortisol.
Refrences:
1. Fahlman MM,Engels HJ(2005).Mucosal IgA and URTI in American college football players:a year longitudinal study. Med Sci Sports Exerc. Mar:37(3):374-80
2. Kursat Karacabey, Ozcan saygin, Recep ozmerdivenli,(2005)The effects of exercise on the immune system and stress hormones in sportswomen. Neuroendocrinol Lett 26(4): 361-366.
3. Iac.G, Berthon.p.(2000).changes in cortisol and testosterone levels and T/C ratio during an endurance competition and recovery. Sports Med phys fitness 40:139-144.

EFFECT OF ENDURANCE, RESISTANCE AND CONCURRENT TRAININGS ON THE HEART FUNCTION IN FEMALE STUDENTS

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Introduction: Regular and long term training causes physiological adaptation of the heart that opposite pathological adaptation (2). impact of physical training on cardiac function depends on the type, intensity and duration of training as well as previous physical fitness, heredity and gender(1,3).
Methods:

39 untrained female students (aged; 25 2.8 yr, height; 165  7.2 cm, weight; 55.8  11.63 kg) were randomly divided into four groups; Control (C; n=9), Endurance (E; n=10), Strength (S; n=10) and concurrent (SE; n=10). E training consisted of running %65 MHR for 16 minutes during the first week, reaching %80 MHR for 30 minutes during the 8th week. S training consisted of having four leg-press, bench-press, pull down curls, and legs curls. During the first week, the training were done at %50 1RM in two sets with 10 repetitions. The intensity of training was increased to %80 1RM in 3 sets and 6 repetitions, during the 8th week. The SE training included a combination of two S and E training in the same manner of each respective group.

Pre and post of training heart rate, QT and PR intervals, the distance of ST segment from isoelectric line, deceleration time, ejection fraction percent measured by electrocardiography and echocardiography.

Systolic and diastolic blood pressure and vo2 max (through Bruce protocol and treadmill) also gauged.

Results: According to the finding of inter_group comparison, decrease of heart rate, systolic blood pressure and increase of PR interval, vo2max, decrease of diastolic blood pressure of endurance group was meaningful which in between group comparison in four parameters of first, differences were meaningful. (p 0.05) on the other hand, in resistance group, the parameters of heart rate and systolic blood pressure showed meaningful increase which in between group differences were meaningful. (p 0.05)

And in concurrent group parameter of vo2max, showed meaningful increase which in between group comparison this difference was also meaningful. (p 0.05) .

Discussion: It is suggest that performing of endurance training after resistance training creations combine of cardiac adaptation with due of endurance or resistance training alone and causes to eliminate some side effects of resistance training on heart.

Refrences:

1- Ferketich, Kirby TE. Always SE. 'Cardiovascular and muscular adaptations to combined endurance and strength training in elderly women'. Acta physiol scand. 164(3):259-267. (1998).

2-pluim Babette M., MD; Aeilko H.zwinderman, Arnoud V, Ernst E.Vander wall. the Athlete's heart. Circulation. 101: 336-342. (2000)

3-Sang-kab P, jae HP, yoo- chan k, mi-sooky, chang sun kim. The affect of long-term aerobic exercise on maximal oxygen consumption, left ventricular function and serum lipids in elderly women. J physiological anthropology. 22(1): 11-17. (2003).

DOES LEFT VENTRICULAR DIMENSIONS FURTHER INCREASE BY CONTINUING EXERCISE TRAINING IN ALREADY WELL-TRAINED ENDURANCE ATHLETES?

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Introduction: Left ventricular (LV) dilatation/hypertrophy is commonly observed in endurance athletes. However, there are few evidences about whether LV dimensions can further increase by continuing intensive training. The aim of the study was to evaluate long-term changes in LV dimensions in already well-trained athletes.

Methods: The subjects were Japanese 16 female middle/long distance runners (15-16 y/o) in a competitive high school team with the national level of achievements. They had had >3 years of experience as competitive runners before recruited but in the high school team the intensity and distance of running increased (at a speed of 12-20km/hr for 200-500km/month). Echocardiography, underwater weighing, blood and maximal exercise tests were performed mostly at the beginning of the first semester and repeated after 20+/-6 months. LV mass (LVM) was calculated according to Devereux RB, et al (1) and LVM and LV end diastolic dimension (LVDd) were indexed to height (ht)^2.7, body surface area (BSA), and fat free mass (FFM). The changes in variables were tested by paired t-test ($p<0.05$ was considered significant).

Results: Many had no or a few menstruations during the follow-up period. Ht, FFM, and maximal oxygen uptake (VO2max) significantly but slightly increased (159.5 to 160.3cm, 39.5 to 41.1kg, and 59.8 to 60.8ml/kg/min, respectively) and the records of 1500 and 3000m track races were significantly improved (4'50" to 4'42" and 10'18" to 9'59", respectively). There were no differences in weight (46.6 vs 47.2kg), fat% (14.9 vs 13.0%), hemoglobin concentration (13.0 vs 12.7g/dl), blood pressure (100/62 vs 99/61mmHg), and resting heart rate (55 vs 50 bpm). Although LVDd, LVM, LVM/ht^2.7, and LVM/BSA significantly increased (48.7 to 50.1mm, 135.2 to 146.2g, 38.4 to 41.1g/m^2.7, and 93.4 to 100g/m^2, respectively), LV septal/posterior wall thicknesses, LVDd/ht^2.7, LVDd/BSA, LVDd/FFM, and LVM/FFM did not change (8.2 vs 8.4mm, 8.3 vs 8.5mm, 13.8 vs 14.1mm/m^2.7, 33.7 vs 34.3mm/m^2, 1.24 vs 1.23mm/kg, and 3.44 vs 3.58g/kg, respectively).

Discussion: Body scales, particularly FFM, were the most powerful predictor for LV dimensions (2). The subjects trained hard enough to improve the performance but without substantial increase in body scales. Their energy availability should be low to become a/oligomenorrhea and they were supposed to be under the least hormonal influence. These backgrounds yielded an optimal model to evaluate the independent effect of training to the LV dimensions. They had already large left ventricles as compared to the former published data at the beginning and LVDd and LVM increased further by keeping training. However, the changes did not persist when indexed to FFM. In conclusion, LV dimensions hardly increase further beyond expected from FFM increase along with training continued in already well-trained athletes.

References

1. Devereux RB, et al. Am J Cardiol. 1986;57:450.

2. Whalley GA, et al. J Am Coll Cardiol 2004;44:892.

EFFECT OF INTERMITTENT HYPERCAPNIC GAS INHALATION ON VENTILATORY RESPONSE IN TRIATHLETES

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Introduction: Hypercapnic stimulation has a strong power to ventilatory response. Therefore, the application of hypercapnic stimulation may provide a novel impact on sports training. We have recently demonstrated the physiological responses during exercise under hypercapnic condition (Kato et al. 2005, 2006, 2007). However, there is no study to address the effect of hypercapnic stimulation on sports training. Thus, the purpose of this study was to investigate the effect of hypercapnic stimulation on sports training, and we tested the intermittent hypercapnia (IHC) on ventilatory response in endurance athletes.

Materials and methods: Six male and one female triathletes volunteered to participate in the present study. As an IHC, each subject performed hypercapnic gas (21%O2, 3%CO2, N2=balance) inhalation for one hour each day for two weeks. Hypercapnic ventilatory response (HCVR) and hypoxic ventilatory response (HVR) were determined four times in each subject; 1) before IHC; 2) after one week of

IHC; 3) after two weeks of IHC; 4) one week after the cessation of IHC. The maximal exercise performance test was also carried out before and after IHC.

Results: HCVR and HVR did not significantly change throughout the experiment period. On the maximal exercise test, maximal minute ventilation tended to increase from 146.0 ± 29.0 l/min to 155.4 ± 34.2 l/min by IHC (P = 0.059). But maximal workload (255.7 ± 36.4 W vs. 255.7 ± 40.4 W), exercise performance (891 ± 109 sec vs. 904 ± 130 sec), VO2max (58.9 ± 7.4 ml/kg/min vs. 60.9 ± 8.1 ml/kg/min), maximal respiratory rate (67.9 ± 17.8 f/min vs. 71.7 ± 21.3 f/min), and maximal heart rate (188.3 ± 8.7 beats/min vs. 189.1 ± 8.2 beats/min) did not differ between before and after IHC.

Conclusion: Our present results suggested that IHC for two weeks may promote ventilation capacity, but could not lead to the change in HCVR and HVR.

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References

Kato et al. Eur J Appl Physiol 95: 400-408, 2005.

Kato et al. ECSS (abstract): 62, 2006.

Kato et al. ECSS (abstract): 396, 2007.

EFFECT OF CONCURRENT TRAINING SESSION ON RECOVERY HYPOTENSION AND ITS HEMODYNAMIC AND NEURAL MECHANISMS

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Introduction: Post-exercise hypotension and cardiac sympathetic activation have been reported after a single session of aerobic as well as resistance exercise. Nowadays, concurrent training has been recommended for healthy maintenance. Nevertheless, the effects of the association between aerobic and resistance exercise on post-exercise hemodynamics and autonomic modulation have been poorly studied. Thus, the objective of this study was to evaluate the isolated and combined effect of aerobic and resistance exercise on post-exercise hypotension and its hemodynamic and neural mechanisms.

Methods: Twenty-three normotensive young subjects (12 men, 26±1 yr, 113±1/75±1 mmHg) were submitted to 4 experimental sessions: Control (C) - seated rest; Aerobic exercise (A) – cycle ergometer, 30 min, 75% of VO2peak; Resistance exercise (R) – 6 exercise, 3 sets, 20 repetitions, 50% of 1RM; and aerobic followed by resistance exercise (AE). Before and after each intervention, blood pressure (BP- auscultatory), heart rate (HR – ECG), cardiac output (CO - CO2rebreathing), and HR variability (HRV- spectral analysis) were measured. Data were compared by a 2-way ANOVA for repeated measures. Data are shown as mean±SE.

Results: Systolic BP decreased significantly after all the exercise sessions, and this decrease was similar between A and AR (A=-12±1 and AR=-11±1 mmHg), and greater than at R (-7±1 mmHg). Diastolic BP decreased significant and similarly in all exercise sessions. CO decreased similarly in all the exercise sessions, while systemic vascular resistance (SVR) increased in all the sessions, but this increase was greater in AR than in R and A (AR=+7±2 vs. R=+4±1 and A=+4±1, $P<0.05$). Stroke volume decreased in all the exercise sessions, and this response was significantly greater in the AR than in the other sessions. On the other hand, HR and cardiac sympathovagal balance increased in all the exercise sessions, and these responses were also greater in the AR session (AR=+22±2 vs. R=+15±2 and A=+15±2 bpm, and AR=+1.4±0.2 vs. R=+0.9±0.2 and A=+0.9±0.2, respectively, $P<0.05$). In the C session, most of the variables did not change after intervention, except for SVR and diastolic BP that increased significantly.

Conclusion: The association of aerobic and resistance exercise in the same training session do not produce any increase in post-exercise hypotension, but this association results in a greater and longer maintenance of cardiac sympathetic activation and tachycardia during the recovery period. Since blood pressure lowering reflects a reduction in cardiovascular risk, but cardiac sympathetic activation reflects an increase in this risk, the association of aerobic and resistance exercise brought out a controversial effect on cardiovascular risk that might be considered when thinking in concurrent training for subjects with cardiovascular disease or risk factors.

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PHYSIOLOGICAL REPONSE DURING TIME LIMIT AT VO2 MAX PLATEAU.

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According to Hill and Lupton (1923), during a physical test, subject had 1) an upper limit to oxygen uptake and 2) this VO2 max was limited by ability of the cardio respiratory system to transport O2 to the muscles. But, actually, only 50% of the subjects showed a plateau of VO2 at the end of a graded exercise test(Howley. and al 1995). In addition, if the subject had a poor anaerobic capacity, the v peak and the V VO2 max were the same. In fact, the subject stopped the exercise because he attained the V peak and not because he attained the v VO2 max. he hadn't a VO2 max plateau(Noakes. 1998);

In other hand, Billat et al 2000 showed that all the subject had a plateau of VO2 max if they did a test between 90% and 140 % PMA. In addition, it was possible to obtain a plateau of VO2 max more longer if the subject did a intermittent test (Billat. and al 1999). But, this test was very difficult and we didn't controlled exactly the VO2 at the upper limit.

We put forward the hypothesis that the plateau at VO2max can be maintained more longer significantly, reducing the power after VO2 maximum achievement. The delay of exhaustion at VO2 max does not depend on cardiac output but on the power output.

They realized 3 tests on ergocycle in moderation of the VO2. The first one was a test raised to determine the VO2max, the power in the lactic threshold (Psl) and the smallest power that elicit VO2max (PMA).

The second one was a test of limited time at VO2max with variation of the power. The initial power was PMA, then from VO2max reach, the power was adjusted to maintain the VO2 to it maximum as long as possible. Finally the last test was a time limit to maintain PMA with no variation of the power.

The time limit at VO2max during the second test was significantly longer than the time limit at VO2max during the PMA test ($p=0.0057$). On the other hand, stroke volume and the cardiac frequency were not significantly different between the second and the third test. Furthermore, the average power of VO2max plateau during the second test corresponded to the power at lactate threshold which represents 80% of PMA.

We showed that decreasing the muscular mechanical demand allowed to maintain the VO2max for 15 min 57 sec +/- 6 min 6 sec, in men and women of different fitness levels.

The physiological response during a VO2 max plateau were correlated with the power and not with the cardiac output.

These results thus open towards new training protocols , which remain to be defined, allowing to work on VO2 max much longer while decreasing the risks of damage and the recovery time.

references:

Billat VL, Blondel N, Berhoin S. Eur J appl Physiol 1999 , 80:159-161

Billat VL, Morton RH, Blondel N, Berhoin S, Bocquet.V, Koralsztein JP, Barstow TJ. Eur. J. Appl. Physiol 2000. 82:178-187.

Hill AV and Lupton H. Q; J Med: 1923: 16: 135-171.

Howley ET, Basset DR and Welch HG. Med. Sci. Sports. Exerc. 1995:27:1292-1301.

Noakes TD. Med. Sci.Sports. Exerc. 1988. 20:319-330.

EFFECTS OF PRE-SLEEP INTENSIVE EXERCISE ON SLEEP IN YOUNG MEN

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Introduction: There are various researches concerning the effect of aerobic exercise on sleep (Youngstedt et al. 1997 ;Dworak et al. 2008). However, few researches have been conducted with focus on the effect of anaerobic exercise. The purpose of the present study is to examine the effect of high-intensity exercise on sleep components evaluated by electroencephalogram (EEG).

Method: Seven male adults participated in the experimental condition consisting of three consecutive days. The first night was set for acclimatization. Subsequent two nights were set as "no-exercise day (second night, control condition)" and "exercise day (third night, exercise condition)", respectively. On the exercise day, the subjects performed ten sets of 5 sec maximal pedaling exercise with 25 sec rest periods between sets. An applied load for maximal intermittent exercise was equivalent to 7.5 % of each subject's body weight. The exercise was then repeated after 30 min. Respiratory parameters and blood lactate concentration were measured before and after exercises. During sleep (bedtime from 23:30-07:30), EEG, heart rate, and rectal temperature were continuously recorded.

Results: Exercise caused acute increases in resting oxygen uptake, blood lactate concentration, and heart rate ($p<0.01$). The average of maximum heart rate during exercise was 172 bpm. At the point before bedtime, heart rate was significantly higher in the exercise condition than in the control condition ($p<0.05$). However, no significant differences were observed in sleep variables (i.e., sleep efficiency, sleep onset latency, REM latency, sleep stages) between control and exercise condition.

Conclusion: Although intensive exercise showed significant increase in heart rate immediately before bedtime, it did not affect sleep variables. These results suggest that intensive exercise during the night does not have strong impact on sleep in young individuals.

References

1. Youngstedt et al. (1997), Sleep, 20, 203-214

2. Dworak et al. (2008), Sleep Med, 9, 266-272

CHANGE IN BLOOD PROPERTIES BEFORE AND AFTER CLIMBING OF HIGH MOUNTAINS

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High mountain climbing places a great deal of stress on climbers. Body composition and blood tests before and after climbing were examined in climbers who scaled 8,000m or higher two times over a two year period.

Methods: Examinations were conducted on four climbers: A (26 years old), B (27), C (28) and D (29). Body weight and body fat were measured. Particular items involved in the blood test included measuring red blood cell count (RBC) and haemoglobin (Hb), hematocrit (Ht), serum iron, ferritin, total cholesterol, triglyceride, and total protein levels.

Results: The mean RBC (106/mm3) levels before and after climbing were 4.87±0.14 and 5.73±0.49 ($p<0.05$), respectively. The mean Hb (g/dl) levels before and after climbing were 15.4±0.60 and 17.6±1.3 ($p<0.05$), respectively. The mean Ht (%) levels before and after climbing were 45.6±0.8 and 53.0±4.4 ($p<0.05$), respectively. In looking at each subject on an individual basis, we found that although in three of the subjects the figures for Hb, Ht, and serum iron had all increased after high mountain climbing; in one of the subjects we were unable to find any significant changes in these indices between before- and after-ascent levels.

Discussion: In a hypoxic atmosphere, oxygen-carrying capacity decreases. Because of this, hematopoietic function becomes hyperactive to improve oxygen-carrying capacity and as a result RBC increases. In all of these two times of climbing, 4 climbers stayed at more than 2,500m for more than 60 days, and generally gained altitude during the period and finally reached more than summit of 8,000m. We did a blood test for three to four weeks after descending to less than 2,500m, and three out of four climbers had an increase of RBC compared to what they had before climbing and also had an increase in Hb, Ht and serum iron. Three to four weeks after descending the mountain, the effects of high altitudes were still apparent. Their reticulocyte count decreased after going down the mountain, which means there was no hyperactivity of the hematopoietic function at this time.

On the other hand, the fourth climber didn't see any changes in RBC, Hb, Ht and serum iron after descending the mountain, compared to before climbing. He also didn't have experience any changes in reticulocyte count before and after climbing. This means he didn't have any changes of hematopoietic function in a hypoxic atmosphere. However, there was no decreased ability to exercise and he succeeded in climbing to more than 8,000m two times. This means there was no decreased ability to exercise in a hypoxic atmosphere.

Conclusions

Under low oxygen and low pressure conditions the effects of climbing activity showed themselves in the increase after climbing rates of RBC, Hb, and Ht. We did, however, see individual differences among the subjects regarding these increases.

HEMATOLOGICAL RESPONSES TO TWO DIFFERENT INTERMITTENT HYPOXIC TRAINING REGIMENS

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Introduction: Hypoxic training has been reported to enhance athletes' altitude and sea level performance by augmenting oxygen carrying capacity of the blood, as a consequence of increases in hematocrit (Hct) and hemoglobin (Hb) concentrations (Friedmann-Bette, 2008). However the effect of intermittent hypoxic training on hematological responses remains unresolved (Muza, 2007). The present study investigated the effect of two intermittent hypoxic training regimens on the response of hematological indices.

Methods: Twenty seven healthy male subjects (mean+SD age=21.5 ± 3 yrs, height=181 ± 5 cm, body mass=74.8 ± 8 kg, VO2max= 47.8 ± 7.5 ml•kg-1•min-1) were equally assigned to either a control group (CON), a live low-train high (LL-TH) or a intermittent hypoxic exposure (IHE) group. All subjects conducted a 1 hour submaximal endurance exercise on a cycle ergometer, 5 days per week for 4 weeks, at an intensity corresponding to 50% of normoxic peak power output (PPO) for the CON and IHE groups, and to 50% of hypoxic PPO for the LL-TH group. Thus, all groups trained at the same relative work rate. The absolute work rate during the training was 18-20 W lower for the LL-TH group compared to the CON and IHE groups. All groups lived at an altitude of approx. 300 m above sea level. The CON and IHE groups also trained at this altitude, whereas the LL-TH group performed their training in a hypoxic chamber, breathing a hypoxic mixture (FIO2=12%). In addition to the daily exercise training, the IHE group also inspired a hypoxic gas mixture at rest, prior to the cycle ergometry. The intermittent hypoxic training comprised breathing a hypoxic mixture during 7 phases. Each phase consisted of 5-min breathing a hypoxic mixture, followed by 3-min breathing a normoxic gas mixture. Prior to, during, at the end, and ten days after the training period, blood samples were taken from all subjects in order to measure Hb, Hct, Erythrocytes, Ferrittin and Transferrin concentrations. The blood analyses were performed using the cythochemical impedance method (Pentra120; Horiba ABX Diagnostics) for hemogram, and the turbo-bidiametrical method (Hitachi 912; Roche Diagnostics) for transferrin analysis.

Results: No significant differences were observed between groups in any measured hematological variables. Similarly, no significant differences were found within groups at different testing periods.

Discussion: Although it has previously been reported that both LL-TH and IHE protocols provide hematological benefits (Hamlin and Hellemans, 2007; Hendriksen et. al 2003), this was not confirmed by our study. The tested protocols did not induce any changes in the measured hematological variables; therefore no improvements of the oxygen carrying capacity of the blood should be expected following this type of hypoxic training.

References

Friedmann-Bette B, (2008). Scand J Med Sci Sports, 18 (Supl. 1), 11-20.

Hendriksen IJ, Meeuwsen T. (2003). Eur J Appl Physiol, 88, 396-403.

Hamlin MJ, Hellemans J. (2007). J Sports Sci, 4, 431-441.

Muza SR, (2007). Med & Sci Sports Exerc, 39, 1625-1631.

OXYGEN CONSERVATION BY THE DIVING RESPONSE IMPROVED AFTER 2 WEEKS OF APNEA TRAINING

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Introduction: Physiological long-term effects of apnea training have previously been demonstrated, including an increased cardiovascular diving response (Schagatay et al 2000), but the effect of this improved diving response on arterial oxygen saturation after apneas has not been studied. Another response to apnea is spleen contraction and elevation of haemoglobin concentration (Hb), but it is not known from any longitudinal studies whether this response can be altered by training. We aimed to reveal if 1) two weeks of apnea training increases cardiovascular and spleen responses during apnea, and 2) if any effects result in a higher SaO2 after apneas of the same duration after training – which could indicate adaptive changes e.g. by an increased diving response-related oxygen conservation or enhanced splenic erythrocyte ejection.

Methods: Four females and 6 males of mean age 25 years performed 10 apneas per day for at least 12 days within a 2-week period. Apneas were divided into two series of 5 maximal duration apneas with resting pauses of 2 min, and with 10 min rest between series. Each apnea was preceded by 1 min of hyperventilation in order to maximize duration, which was recorded for all training apneas. Before training, subjects performed a test including 3 maximal duration apneas without hyperventilation. After the training period subjects performed one series of 3 apneas mimicking the duriations from the pre-training test as well as one series of maximal duration apneas, in weighted order and spaced by 20 min of rest. Heart rate (HR), venous Hb, SaO2 and spleen volume (ultrasonic imaging) were recorded.

Results: After training, maximal apneic duration had increased from 142 sec to 185 sec (by 30 %; $P<0.01$). Self-recorded durations indicated a steady increase until training day 8. The phase without CO2-induced involuntary breathing movements had increased by 20 sec during maximal duration apneas (22%; $P<0.05$). Apneic HR had decreased after training by 12 % in the time-mimicked series ($P<0.01$). SaO2 after apnea was 84% before training but 89% after the time-mimicked apneas after training ($P<0.05$). In the maximal apnea series after training SaO2 was 72 % ($P<0.05$). Spleen contraction and Hb increase during apnea tended to be attenuated in the time mimic series, but were of a similar magnitude in the maximal duration series after training.

Discussion: The cardiovascular diving response was increased after apnea training in accordance with previous studies (Schagatay et al 2000). As no increase of the spleen contraction or Hb increase was observed after the training, we concluded that the elevated SaO2 after the time mimic apneas indicates improved oxygen conservation by the enhanced cardiovascular diving response. The 2-week apnea-training period may have been too short for adaptive changes in spleen contraction to occur.

Reference

Schagatay E, van Kampen M, Emanuelsson S, Holm B. (2000). Effects of physical- and apnea training on apneic time and diving response in humans. Eur J Appl Physiol 82, 161-169.

14:15 - 15:15

Poster presentations

PP-PH10 Physiology 10

EFFECT OF FATIGUING PEDALING EXERCISE AT MAXIMAL POWER ON NOCICEPTIVE WITHDRAWAL REFLEXES IN THE UPPER AND LOWER LIMB MUSCLES

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High-intensity electrical stimulation of peripheral nerves can give rise to withdrawal reflexes, which are thought to be protective reflexes involving coordinated muscle contractions meditated by polysynaptic pathways. To date, it remains unknown how muscle fatigue modifies the withdrawal reflex. Therefore, we investigated the effect of fatiguing pedaling exercise (PE) at maximal power on the nociceptive withdrawal reflex (NWR) in the upper and lower limb muscles in the present study. NWR was elicited by delivering electrical stimulation (1 ms duration) to the superficial radial nerve at the wrist (SR, 4 pulses at 250 Hz) and the sural nerve at the ankle (Sur, 8 pulses at 250 Hz). Stimulus intensity was set at 7–10 times the perceptual threshold, which was sufficient to induce a painful sensation at each innervation area. Electromyographic (EMG) signals were recorded from the right brachioradialis (BR) and biceps femoris (BF) muscles with bipolar surface electrodes. Subjects performed three sets of PE using a bicycle ergometer (Power Max VII, Combi Co Ltd., Japan) with ~10 min rest. One set of PE consisted of five bouts of pedaling for 7 s at maximum effort, and the PE was repeated five times with 40-s intervals. The PE load was determined beforehand using the built-in program of the ergometer to perform maximum power. During the rest period, blood lactate was measured with a conventional sensor (Lactate pro, Arkray Co Ltd., Japan). NWRs were elicited before and immediately after three sets of PE. The level of pain sensation for the electrical stimulation was measured by visual analogue scale (VAS, 100 mm). We found that the magnitude of NWR for BR was significantly increased after the first set of PE. This increase was retained after the second and the third sets. In contrast, the magnitude of NWR for BF did not show any significant change. The level of blood lactate before the first set of PE was 2.2±0.8 mmol/l and increased significantly after the first set of PE (12.2±0.6 mmol/l), reaching a plateau thereafter (15.1±1.1 mmol/l). The VAS for SR stimulation tended to increase after the first set of PE, and this increase was retained after the second set of PE. Interestingly, both the VAS for SR stimulation and the magnitude of NWR for BR returned to the pre-PE level 20 min after the end of the third set of PE with a similar time course. These results suggest that fatiguing PE at maximal power increases NWR in non-exercising upper limb muscles.

MODULATION OF MOTOR REFLEX EXCITABILITY IN MONOSYNAPTIC CIRCUITS DURING DOSED MUSCLE EFFORT

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Introduction. Most researchers study the peculiarities of the spinal control of excitability of leg muscles in the athletes specializing in cyclic sports requiring endurance. The change of motor neurons excitability of leg muscles was studied at an isometric assigned effort. Multisegmental monosynaptic responses (MMRs) were evoked (G Courtine et al., 2007) by stimulating afferent fibre roots of the peripheral nerves between the T11-Т12 spinous processes to evaluate alpha-motoreuron reflex excitability.

Methods. Ski-racers and racing cyclists aged 20, with the height of 175 sm and weight – 68 kg, who have achieved some results in sports, took part in the research. The athletes (adapted to endurance work) made an isometric effort in the ankle joint.

The subject was seated with the right leg fixed at 110° of the knee and 90° of the ankle joints; the left foot was propped with the knee and ankle joints at 90°. An electric stimulus of 80 mA was delivered at sustained muscle effort of 25%; 50%; 75% of the maximal and during a maximal isometric effort performance in a sitting position. The period of the applied stimulation was 1 minute. The MMR amplitude and latency of the shin and rectus femoris muscles were registered.

Results. The latent period of MMRs of the proximal leg muscles is shorter than that of the distal ones at rest, which is consistent with the original method data (G Courtine et al., 2007) and proves the identity of the monosynaptic reflex nature.

It is determined that the MMR amplitude of rectus femoris, medial gastrocnemius, tibialis anterior and soleus of the right leg, an active one, increases with growth of effort, and the latent period has some tendency to shortening. At the same time some of the subjects demonstrate a decrease of alpha-motoneuron reflex excitability of the inactive leg muscles while others have some increase. The subjects of the research showed significant differences of quantitative changes of the MMR amplitude of the muscles studied.

Discussion. The received results allow to assume that modulation of alpha-motoreuron reflex excitability of leg muscles is defined by a degree of the applied effort, a function of the leg in the test task (active/inactive), motor preferences (the right leg is pushing off or swinging) and peculiarities of muscle interaction during the motor task.

References. G. Courtine, S.J. Harkema, Ch.J. Dy et al. (2007). J. Physiology; 582; 1125-1139.

CORTICO-SPINAL MODULATION OF ANTAGONIST COACTIVATION DURING DIFFERENT INTENSITIES OF CONTRACTION

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Introduction: During a voluntary contraction of a muscle group, antagonist muscles are usually active. This concurrent activation is referred to as coactivation. The aim of the current study was to investigate the control mechanisms, at cortical and spinal levels, of antagonist coactivation during different intensities of contraction of the ankle dorsiflexor muscles.

Methods: Changes in surface electromyogramme (EMG) of the tibialis anterior and of two antagonist muscles, the soleus and medialis gastrocnemius, were investigated during ten different levels of contraction, ranging from 0 to 100% of maximal voluntary contraction (MVC). Furthermore, we recorded motor evoked potentials (MEP) in response to transcranial magnetic stimulation of the motor cortex, as well as the Hoffmann reflex (H-reflex) and maximal M-wave (Mmax) elicited by electrical stimulation of the tibial nerve.

Results: The results showed that the average EMG (aEMG) of the tibialis anterior and antagonist muscles, normalized to their respective MVC, increased linearly (r2=0.99; r2=0.97 and r2=0.97, respectively; P<0.001) with the augmentation of the agonist torque. While the MEP (normalized to Mmax) of the tibialis anterior increased (~ 71%; P<0.01) up to 60% MVC and then plateaued, the responses in both the soleus and medialis gastrocnemius increased gradually throughout the different intensities of contraction, respectively, from 3.8 ± 2.5% to 5.5 ± 2.2% (~ 44%; P< 0.01) and from 1.7 ± 1.1% to 3.4 ± 1.7% (~ 98%; P< 0.01). In contrast to the increase of the antagonist MEP, the H-reflex amplitude (normalized to Mmax) of the antagonist muscles declined linearly from 64.8 ± 12.6% to 8.7 ± 9.9% (P< 0.01) and from 22.9 ± 10.3% to 3.1 ± 1.9% (P< 0.001) in the soleus and medialis gastrocnemius, respectively. The Mmax evoked in both muscles did not change significantly.

Discussion: In conclusion, the results indicate that the level of antagonist coactivation increases linearly with the torque produced by the agonist muscles. Because the changes of the H-reflex were observed when the MEP and aEMG are increasing, the reduction in H-reflex cannot be due to a decreased excitability of the motor neurone pool of the antagonist muscles. In contrast, our results suggest that the decrease of the H-reflex in the antagonist muscles during the increased intensity of contraction of the ankle dorsiflexor muscles, is likely caused by modulation of presynaptic inhibitory mechanisms (Leonard et al., 1999; Stein et al., 2007).

References

Leonard CT, Sandholdt DY and McMillan JA. (1999). Long-latency contributions to reciprocal inhibition during various levels of muscle contraction. Brain Research 817:1–12.

Stein RB, Estabrooks KL, McGie S, Roth MJ and Jones KE. Quantifying the effects of voluntary contraction and inter-stimulus interval on the human soleus H-reﬂex. Exp Brain Res (2007) 182:309–319.

MODULATION OF THE CUTANEOUS REFLEXES INVOLVING LOWER LIMB MUSCLES IN SUBJECTS WITH FUNCTIONAL INSTABILITY OF THE ANKLE JOINT

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Ankle sprains are known as one of the most common injuries in sports activities. Furthermore, ankle sprains frequently recur if not given adequate and continuous treatment. Many persons with ankle sprain complain of a degradation of the ability to control the ankle joint. We hypothesized that cutaneous afferents about the ankle joint and foot are influenced by ankle sprain with functional instability, hence cutaneous reflexes of the lower limb muscles may be modified in the subject with ankle sprains. Therefore, the present study investigated the extent to which cutaneous reflexes in the lower leg muscles are modified in subjects with ankle sprain who reported functional instability of the ankle. The participants were 9 males with unilateral ankle sprain and functional instability (5 right and 4 left). In addition, the Functional Instability Score which investigates pain, swelling, instability, stiffness and so on, was determined using the responses to a survey questionnaire. The subjects were asked to perform different levels of isometric dorsiflexion, plantarflexion and eversion while sitting (5 - 40% of maximum EMG amplitude). The cutaneous reflexes were elicited by applying non-noxious electrical stimulation to the sural nerve at the ankle joint (333Hz, 5pulses). Stimulus intensity was set to 2.5 times the perceptual threshold for all cases. EMG signals were recorded from both sides of the tibialis anterior (TA), medial gastrocnemius (MG) and peroneus longus (PL). The EMG signals were full-wave rectified and averaged (20 times). The middle latency component (~70-120msec, MLR) of the cutaneous reflex was analyzed by off-line analyses. For all muscles tested, an inhibitory MLR was identified on EMG following stimulation of the sural nerve. The amplitude of the MLR was well graded with the background EMG activity for all muscles. It is worth noting that in PL, the slope of the regression line between the magnitude of the MLR and background EMG activity was significantly increased on the injury side compared to that on the intact side ($P < 0.05$). In TA and MG, there was no significant difference between the slopes for the injured and intact side. These findings suggest that ankle sprain with functional instability may increase the excitability of the inhibitory MLR pathways for PL. Since PL has the functions of stabilizing and increase the stiffness of the ankle joint, an increase in inhibitory MLR may lead to instability of the ankle joint in response to tactile sensation given to the lateral margin of the foot.

CHANGES OF THE LATENT TIME OF H WAVE IN HUMAN GASTROCNEMIUS MUSCLE TO ARM CRANK EXERCISE AT DIFFERENCE OF EXERCISE INTENSITY.

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INTRODUCTION: The sthenia of the autonomic nervous system influences the activity of spinal cord α-MN. We defined that the interval between the latent time of M wave and H wave (loop time) of medial gastrocnemius (MG) significantly shortened after arm crank exercise which intensity was 60% peak oxygen uptake (ECSS 2006). Additionally, the loop time returned to the pre-exercise level with recovery examination. The loop time depended on change of cardiac parasympathetic nervous system activity. It is identified that the recovery examination of cardiac autonomic nervous activity is slower after high-intensity exercise than after low-intensity exercise. In addition, the difference of exercise intensity has an influence on activity of spinal cord α-motoneuron. The purpose of this study was to investigate the effects of low-, middle- and high-intensity arm crank exercise on the loop time in MG. METHODS: Nine young males volunteered to participate in this study. After the H-reflex was elicited at rest, subjects performed 10 min arm crank exercise trials at low- and middle- (30% and 60% peak oxygen uptake) intensity. High-intensity condition was encouraged until exhaustion. After exercise, subjects kept lying in a prone position, and H-reflex in MG was measured immediately after exercise and during recovery. We measured Heart rate (HR), cardiac parasympathetic nervous system (CPNS) modulation, rectal temperature (RT) and H-reflex. The analysis of CPNS modulation examined the R-R interval data for 30 seconds, which was calculated by the MemCalc methodology before each H-reflex. log HF was an index of CPNS modulation. The H-reflex was evoked by the electrical stimulation of the tibialis nerve in the popliteal fossa continuously for 10-20 times in all of once per four seconds interval. Analysis of the H-reflex signal showed an average 4-8 times wave patterns, the amplitude of the M wave was maintained the same. The latent time of M wave was not influenced by exercise. Therefore, we compared loop time. RESULTS and DISCUSSION: HR, log HF and RT indicated the response that depended on exercise intensity. Amplitude of H-reflex indicated that as much as exercise intensity becomes higher, variation trend cause large. The loop time of immediately post exercise was significantly shorter than loop time of the pre-exercise (P<0.05, middle condition, -0.30±0.27 ms; high condition, -0.50±0.28 ms), however the loop time of low condition did not short. The loop time gradually returned to the pre-exercise with the recovery examination (ANOVA: P<0.05, middle and high conditions). The loop time depended on exercise intensity with recovery examination and returned to a value before the pre-exercise from low intensity sequentially. Similarly, CPNS modulation and RT also depended on exercise intensity with recovery exami-

nation. These data suggests that recovery response of different to exercise intensity between CPNS modulation and RT has a meaningful influence on loop time.

USING TMS TO MEASURE THE EFFECT OF HYDROTHERAPY IN ATTENUATING CENTRAL FATIGUE FOLLOWING REPEATED EXERCISE.

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Introduction: Hydrotherapies such as cold water immersion (CWI) and contrast hot/cold water therapy (CWT) are commonly used by athletes, following competition or training, to assist in the recovery process and to return the athlete to normative physiological state as quickly as possible. To date, investigations on recovery have focussed on peripheral variables to measure the effectiveness of hydrotherapies. Conversely, limited study has been completed to investigate the role of the central nervous system (CNS) fatigue (known as central fatigue) during the post-exercise recovery period. Using transcranial magnetic stimulation (TMS), we investigated the CNS in subjects following repeated exhaustive exercise bouts followed with hydrotherapy based recovery modalities.

Methods: Eight trained subjects (6 m; 20 to 35 years of age; mean VO2max 59.43 ± 3.73 ml.kg-1.min-1) participated in a cross-over design of three interventions (CWI, 12-14° C for 14 mins; CWT of alternating one min hot, 38 – 40° C, and cold immersion, 12-14° C, repeated seven times; and passive rest at room ambient temperature 22° C for 14 mins) following exhaustive performance conducted over five days. Measures included excitability of the CNS (motor evoked potential amplitude or MEP) assessed using TMS, time to fatigue (TTF) performance, blood markers for muscle inflammation (lactate dehydrogenase and c-reactive protein) and damage (myoglobin and creatine kinase), and visual analogue scales (VAS) for soreness and fatigue.

Results: No changes were observed with muscle damage or markers of inflammation when compared to pre-exercise values. All subjects, participating in all conditions, showed a progressive reduction in performance and MEP amplitude (p=0.04). However, greater cumulative decrements in TTF performance and MEP amplitude were demonstrated in the passive condition (30.8% decrease in performance by day five) compared to the CWI or CWT conditions (17.7% and 13.5% decrease by day five respectively). Further, MEP amplitude was associated with performance (r=0.83; p=0.01) and VAS for fatigue (r=0.75; p=0.01).

Discussion: Although no differences were observed between the two hydrotherapy conditions, the results showed that hydrotherapy modalities, compared to the passive recovery, were more effective in reducing repeated performance decrements and MEP amplitudes. However, immediate changes in MEP amplitudes post recovery were not observed.

EFFECTIVE RECOVERY STRATEGIES FOR ATHLETES RUNNING SEVEN MARATHONS ON SEVEN CONTINENTS IN SEVEN DAYS <7MM>

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SPORTS INSTITUTE NORTHERN IRELAND

A blind athlete and his guide runner ran seven marathons on seven consecutive days on seven continents. The challenge involved circumnavigating the globe, travelling more than 35,000 miles through 24 time zones, experiencing widely variable environmental conditions (Range: 60C, 40% humidity to 370C, 90% humidity) and disrupted sleep patterns.

PURPOSE: To assess the effectiveness of recovery strategies during a unique extreme endurance event. METHODS: Indices of physiological and psychological stress and recovery were measured immediately before and after each marathon. Muscle condition, mood state, quality of sleep, appetite, mental and physical fatigue (scale: Fantastic, OK, Poor) as well as illness and injury (scale: 0=none, 5=extremely) were measured using a questionnaire. Blood creatine kinase (CK) levels were assessed prior to the start of the event, at the mid-point (pre-marathon 4) and at the end of marathon 7. Body mass (kg) and hydration (usg) were also measured. Recovery strategies incorporated: hydration and nutrition, ice bath immersion, pool sessions, massage, compression leggings and acupuncture. RESULTS: Following each of the marathons both athletes reported muscle condition as Poor or OK (Athlete 1 (A1), poor x 4; Athlete 2 (A2), poor x 3); however, prior to each marathon the athletes reported muscle condition as Fantastic or OK indicating an improvement in muscle condition. Similar improvements in mood state and fatigue levels were also observed; indeed physical fatigue levels improved from an average of 3.3 post-marathon to an average of 1.9 pre-marathon.

During the event both athletes gained between 1-2 kg body mass and hydration levels were maintained throughout (usg < 1.01). After an initial rise in CK levels from baseline (A1: 567 u/l vs. 2650 u/l and A2: 183 u/l vs. 2627 u/l) both athletes experienced a marked decline in CK levels by the end of the event (A1: 885 u/l, A2: 1639 u/l). CONCLUSION: These results reveal that the specific strategies employed enhanced recovery; muscle condition and fatigue were improved between marathons and, perhaps surprisingly, CK levels had fallen markedly by the end of the event when compared to mid-event levels. Beyond this, maintenance of body mass and appropriate hydration levels demonstrate the effectiveness of the hydration and nutritional strategies.

CORRELATION BETWEEN URINARY STEROIDS LEVELS WITH MUSCLE MASS, BMC AND BMD

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The muscle and bone development is influenced directly by the quantity of steroid hormones produced in the body. Purpose. The aim of this study was to correlate the urinary steroids concentration with the muscle mass, the bone mineral content (BMC) and the bone mineral density (BMD). Methods. 17 university males [age: 24.1 (2.61), height: 1.75 (0.06), weigh: 72.05 (8.33)], who did not perform strength training, were evaluated by DXA. Muscle mass, BMC and BMD were analyzed. Moreover, the first urine of the morning was taken. Testosterone, DHEA, androstenedione, androsterone, ethiocolanolone, cortisol, cortisone, tetrahydrocortisol, tetrahydrocortisone levels were performed by gas chromatography-mass spectrometry. Results. Was observed that the urinary concentration of Testosterone and Cortisol correlated negatively with the level of muscle mass (r =-0,441 and r = - 0,487). At the same time, the urinary concentration of Cortisone and Cortisol also correlated negatively with the BMC (r =-0,401 and r =-0,502) and with the BMD (r =-0,427 and r =-0,448). Any more significant correlations were found. Conclusions. On the one hand, these results suggest that the muscular development depends on the endogenous levels of androgens and corticosteroids, being able to be evaluated through the urinary steroid excretion. On the other hand, low cortisol and cortisone endogenous levels can contribute to a major muscle mass and BMC and BMD.

References:

Kvorning T, Andersen M, Brixen K, Madsen K. Suppression of endogenous testosterone production attenuates the response to strength training: a randomized, placebo controlled, and blinded intervention study. Am J Physiol Endocrinol Metab. 291(6): E1325-1332. 2006
Chiodini I, Torlontano M, Carnevale V, Trischitta V, Scillitani A. Skeletal involvement in adult patients with endogenous hypercortisolism. J Endocrinol Invest. 31(3): 267-276. 2008.

THE CHANGES OF THYROID HORMONE AND STIMULATING THYROID HORMONE AFTER AEROBIC RUNNING EXERCISE

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Triiodothyronine (T3) and thyroxine (T4) are both secreted by the thyroid gland in response to thyroid-stimulating hormone (TSH) secreted by the anterior pituitary gland. This research has been conducted in order to study the changes of secretion of thyroid hormone i.e. (T4), (T3), and (TSH) following an aerobic physical activity. A group of 10 male university athletes with over three years experience in different fields of sport participated in this semi- experimental research. The obtained average and standard deviations of factors such as age, height, weight and body mass index (BMI) are as follows: (23.1±1.65), (171.1±4.51), (68.5±4.8) and (21.4±1.1). The exercise training of this research consisted of 20 minutes of running around the track and field, each being 10 rounds in two minutes.

The results showed that aerobic activities did not have any significant effect on amount of T3 and TSH secretion, although the results proved a significant difference in concentration level of serum T4 after 20 minutes (4000 m) aerobic physical activity ($p = 0.002$). So, it seems that aerobic activities can have different reactions on the secretion of thyroid hormone while factors like hematocrit, plasma decrease, as well as changes in PH of blood and also mental conditions may lead to a significant change in concentration of hormone.

References:

1. Giorgio Delbello Hormonal responses to a long duration exploration in a cave of 700 m depth Eur J Appl Physiol (2007) 100:71–78
2. Holly M. Brown-Borg Hormonal regulation of longevity in mammals Ageing Research Reviews 6 (2007) 28–45

STEROID PROFILE CHANGES AFTER SUBMAXIMAL EXERCISE IN TRAINED MALES

MUÑOZ, D., TORIBIO, F., OLCINA, G., TIMÓN, R., ROBLES, M.C., SAYAVERA, J., MAYNAR, M.
UNIVERSITY OF EXTREMADURA

Some research has shown that exercise can induce physiological stress which alter hormonal profile. Urinary excretion of these hormones and its metabolites can be used in order to evaluate physical exercise load. Testosterone and its metabolites as well as suprarenal androgens are in relation with anabolic status, while cortisol´s metabolites and cortisone are determined for assess catabolic status PURPOSE: the aim of this study is to analyze if submaximal efforts (75-80% VO2 max) provokes changes in urinary steroids profile in endurance trained subjects.METHODS: Twenty male cyclists participated in this study (age: 23,83 2,32 years; height: 176,00  3,65 cm; weight: 66,94  3,59 kg; body fat %: 8,57  1,22; VO2 max: 65,53 ± 9,35 ml/kg/min). The trial performed was a submaximal ergometric test during 30 min, at 75-80% VO2 max. Urine samples were collected before and after the text. All tests were conducted in a physiology laboratory, room temperature was 23 - 25ºC, humidity was 45 - 55%. Urinary samples were analyzed by gas chromatography techniques in order to determine testicular androgens, suprarenal androgens and corticosteroids values. Sample urinary density was in the range of 1,005-1,025 g/mL, pH was between the normal range of 4,7-7,8. Creatinine levels of all samples were determined in order to report the steroid concentrations relative to this urinary parameter. The Wilcoxon test was performed for statistical analysis. A $p<0.05$ was used to determine statistical significance. RESULTS: We obtained no changes in testicular androgens and corticosteroids We obtained statistically significant decresases ($p<0.05$) in androstenedione (43.98 ± 21.87 to 32.74 ± 19.32 ng/mg creatinine) and total suprarenal androgens (250.54 ± 117.29 to 163.09 ± 59.01 ng/mg creatinine), and in DHEA/THC (0.04 ± 0.01 to 0.01 ± 0.005 ng/mL) and DHEA/THCol (0.026 ± 0.008 to 0.015 ± 0.004 ng/mL) ratios. CONCLUSION: Results suggest a immediately response in adrenal glandule following submaximal exercise while there were not changes in hypophisary-testicular axis. It could be due to the short duration and intensity of exercise. The DHEA/THC and DHEA/THCol ratios are some markers of the subjects' anabolic/catabolic status following the exercise session.

14:15 - 15:15

Poster presentations

PP-BM04 Biomechanics 4

RELATIONSHIP BETWEEN TORQUE VALUES OF HIP JOINT MUSCLES AND CROSS-SECTIONAL AREAS OF PSOAS MAJOR AND ERECTOR SPINAE MUSCLES IN OLDER MALES

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MUSASHINO ART UNIVERSITY

Introduction: The relationship between the cross sectional areas of the psoas major and erector spinae muscles, which are deep muscles not readily accessible for muscle strength evaluation, and the torque values of hip joint muscles, which are relatively easy to measure, was studied in three older (age: 66 – 68 years) males who exercise regularly. The torque values of hip joint muscles during inward and outward rotations and the left and right cross-sectional areas of the psoas major and erector spinae muscles were each measured 11 times over a period of two years using magnetic resonance imaging (MRI) and an exclusively developed torque measuring device for hip joint muscles.

Experiment Outline

Period: March 2006 – March 2008

Location: Bodily Movement Study Laboratory, Nippon Sports Science University

Subjects: three males aged 66-68 years No. of experiments: 11times (at 2-month intervals)
MRI device: AIRIS II (Hitachi Medicon, Inc.)
Analytical software: Aquarius NetStation Version 1.1 (Terarecon Inc.)
Measuring instrument for hip-joint muscle strength: Newly developed exclusively for the study
Results: The study revealed significant correlations between abductor force during outward rotation of the hip joint muscles and the left and right psoas major and erector spinae muscles ($r = 0.595$, 0.514, 0.611 and 0.726 respectively; $p < 0.01$).
Observations
the study indicated the possibility that the torque values of hip joint muscles can be used effectively as a substitute measure for evaluating the strengths of the psoas major and erector spinae muscles, which are not readily accessible for muscle strength evaluation.
References
1) Yamamoto Tadahiro et al. M.psoas major muscle power evaluation measurment device、The14th 3)about the masurement of the torque-Comparative study of student and the middle aged、The10th European College of Sport Science(ECSS)、Belgrad、Aug、2005
2) Yamamoto Tadahiro et al. Study Regarding Torque Measurements, The 13th European College of Sport Science (ECSS), Estoril-Portugal, Jul, 2008
3) Aoyama Hareo et al. Research on Torque Measurement, The 13th European College of Sport Science (ECSS), Estoril-Portugal, Jul, 2008

QUANTITATIVE ULTRASOUND OF THE GASTROCNEMIUS MUSCLE ARCHITECTURE IN CHILDREN: VARIABILITY, RELIABILITY, AND COMPARISON BETWEEN PORTABLE AND STATIONARY MACHINES

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Muscle architecture is believed to be affected by muscular disorders, including the chronic spasticity associated with cerebral palsy. Although there is clear evidence that muscle thickness is reduced with spastic cerebral palsy in children and adults, the effects of spasticity on other parameters of muscle architecture remain unclear. However, a high biological and/or methodological variability might explain why differences in muscle fiber length or pennation angle between groups of individuals might be difficult to detect. This may be particularly important in children due to their smaller muscles and potential difficulty in remaining still. The first aim of this study was therefore to determine the inter-leg and inter-individual variability in ultrasound measurements of gastrocnemius muscle architecture in young children. Our second aim was to establish within-session and between-session reliability of measurements for the same child. Third, we compared measurements obtained using a stationary ultrasound (Phillips HD11) with those obtained using a less costly and portable machine (Chison 8300) to evaluate the appropriateness of a more widely accessible and practical option for the quantification of gastrocnemius muscle architecture in children.
Muscle thickness, pennation angle and fiber length of the medial gastrocnemius were determined in healthy children (13 boys, 8 girls) aged 4-10 years. Ultrasound images were obtained from each leg, twice at each of two ankle positions (90º and maximal plantar flexion), and with each of the two machines in succession, within the same session. The same measurements were made on a second occasion, between 4 and 6 weeks later, in 4 of the children.
There was no significant difference between the absolute values, coefficients of variation (CV) or intra-class correlation coefficients (ICC) of measurements determined by the two ultrasound machines. The CV and ICC of duplicate images taken during the same session for the same leg, ankle position, and machine ranged from 2.1-3.1% and 0.94-0.98 for muscle thickness, 4.1-6.0% and 0.85-0.96 for pennation angle, and 4.5-6.3% and 0.87-0.96 for fiber length, similar to that reported previously for adult muscle architecture. CV for variables for the same child measured on two separate sessions were within the same ranges. There was wide inter-individual variability at both ankle positions for pennation angle (range 11-22°), fiber length (26-68mm) and muscle thickness (26-68mm).
Since the CVs for repeated measurements within a subject (2.3-6.3%) were much less than the group SD relative to the mean for the same measurement (13-25%), we suggest that the variability attributable to the methods is acceptable given the biological variation seen. We conclude that the portable ultrasound is suitable to determine muscle architecture and that thickness, pennation angle and fiber length can be reliably determined in the gastrocnemius muscle of young children.

TRI-AXIAL INERTIAL MAGNETIC TRACKING DETECTS CHRONIC ANKLE INSTABILITY.

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CENTRO DE ESTUDIOS, INVESTIGACIÓN Y MEDICINA DEL DEPORTE

Introduction: Ankle sprains are one of the most common lower extremity injuries. Real time human motion tracking is an accurate, inexpensive and portable system to obtain kinematic and kinetic measurements (2). The purpose of this study was to discriminate between subjects with chronic ankle instability (CAI) and subjects with stable ankles through inertial/magnetic tracking technology.
Methods: Twelve subjects (23.16 ± 5.32 years, 174.83 ± 8.78 cm, and 73.58 ± 17.10 kg) with stable ankles and thirteen (24.69 ± 5.91 years, 173.31 ± 9.07 cm, and 69.61 ± 15.32 kg) with chronic ankle instability performed the Star Excursion Balance Test (SEBT) (1). The SEBT is a dynamic postural control task that may hold promise in detecting deficits related to CAI (1). The subjects complete anterior (A), posteromedial (PM), and posterolateral (PL) reaching directions of the SEBT. Static force platform (IBV, Valencia, Spain) and a body-mounted sensor MTx (Xsens Technologies B.V. Enschede, Netherlands) were used to record simultaneously force, acceleration and orientation data. The inertial motion tracking was placed close to the centre of mass, which is located within the pelvis with the aim of study ¨whole-body¨ movements. Wavelet analyse based on time–frequency information was used for analysing all signals (2-3).
Results: CAI group showed greater (81%) values than the stable ankle group both in the peak amplitude of the approximation signal of the rotation around the z-axis ($p=0.053$) in the A direction and in the peak amplitude of the approximation signal (102%) of the rotation around the x-axis ($p=0.086$) in the PM direction. No significant differences were observed in the other orientation parameters. The approximation of the z acceleration coordinate signal ($p=0.014$) showed significant differences between groups. In addition, there were significant differences in the sum of the coefficients of the details 1 ($p=0.02$) and details 2 ($p=0.007$) of the y acceleration coordinate signal. When the corresponding analyses were performed from the force plate measurements no significant differences were observed between groups.
Discussion: The rotation around the z-axis and the x-axis acquired from the MTx unit discriminated differences between groups. The wavelet details of the y acceleration coordinate signal were the most accurate parameters discriminating between ankle groups. How-

ever, these differences were not observed from the force plate signals. This may indicate that different aspects of the movement may be measured by each monitoring system of human motion. The real motion human tracking is a promising technique of evaluating and distinguishing between CAI and stable ankles which may be also applicable in clinical settings outside a laboratory.

References

1.Olmsted LC, et al. J Athl Training. 37: 501-506, 2002.

2. Rioul O and M. Vetterli. IEEE Signal Processing Mag. 8: 14-38, 1991.

3.Zhu R and Zhou Z. IEEE Trans Neural Syst Rehab Eng. 12: 295-302, 2004.

APPLICATION OF A CONTACT-TYPE MUSCLE HARDNESS METER DURING VOLUNTARY ISOMETRIC CONTRACTION

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Muscle hardness is a possible index of muscle conditioning. Several methods of evaluating muscle hardness have been reported, for instance, the indentation method. Previous studies have demonstrated that a high correlation between muscle contractile tension and muscle hardness is obtained when the indentation method is used for evaluation in humans (1, 2, 3). However, it is difficult to assess the real-time change in hardness, e.g., during muscle contraction. Furthermore, joint movement or muscle shaking that occurs during a contraction increases the difficulty in evaluating hardness by the indentation method. We developed a contact-type muscle hardness meter using an ultra-slim pressure sensor which assesses the change in muscle hardness continuously. The purpose of the present study was to compare the change in muscle hardness during isometric contraction evaluated by the new contact-type device and the conventional indentation device.

Contact-type muscle hardness (CMH) meter: The hemisphere hard rubber tip was bonded with the front of the ultra-slim pressure sensor and then bonded with a metal plate. This hardness meter was set on the muscle belly of the biceps brachii and bound with adhesive non-elastic surgical tape. Therefore, it could continuously detect the internal pressure change with muscle activation. Indentation type muscle hardness (IMH) meter: The muscle hardness meter was connected to the stage controller system. Mechanical indentation with 25 mm amount was performed with a remote control. The muscle hardness value with indentation was calculated by measuring the slope of the force/displacement relationship that ranged from the length eliminated the thickness of subcutaneous tissue up to 15% muscle thickness (4). Measurement of 2 types of muscle hardness during isometric contraction: Six healthy males performed isometric contractions in the range 20–100% of the maximal voluntary contraction (MVC). Two types of muscle hardness in the elbow flexor muscles, namely, CMH and IMH, were simultaneously measured while the target contraction level was sustained.

The measured mean relative CMH was linearly related to the isometric force (r = 0.856). On the other hand, the relationship between the mean relative IMH and the isometric force was non-linear even when IMH was increased up to 90% MVC. The mean relative CMH also showed a non-linear relationship with the mean relative IMH (r = 0.862). Therefore, it was suggested that CMH could be used to assess the extent of muscle contraction at a higher intensity than IMH. We conclude that the contact-type muscle hardness meter can be used to quantitatively evaluate muscle hardness during isometric contraction, and CHM can be used to estimate the extent of contraction.

References.

1. Arokoski et al. (2005) Physiol Meas, 26, 215-28.

2. Leonard et al. (2004) J Electromyugr Kinesiol, 14, 709-14.

3. Murayama et al. (2004) Adv Exer Sport Physiol, 10, 128.

4. Murayama et al. (2008) Proceeding of ECSS 08, 339.

THE EFFECT OF DYNAMIC STRETCHING ON MUSCLE PERFORMANCE AFTER FATIGUING EXERCISE

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Stretching is one of common exercise widely performed during warm up or cool down. It is also widely accepted that stretching would be useful strategy to recover from muscle fatigue; however, it was not fully elucidated by scientific evidences. The purpose of this study was to examine the effect of dynamic stretching on muscle fatigue using EMG analysis. Subjects were eleven healthy females. Subjects visited our laboratory three times including familiarization for testing protocol as the first visit. On the second and the third visit, subjects were performed 30% maximal voluntary contraction (MVC) of isometric plantar flexion until exhaustion (1st EX) with active dynamic stretching (ST) and without stretching (CON). After 1st EX, subjects performed active dynamic stretching for five minutes for ST. One minutes after active dynamic stretching, subjects performed 30%MVC of isometric plantar flexion again until exhaustion (2nd EX). On the other visit, subjects were asked to keep resting instead of dynamic stretching for CON. MVC forces of isometric plantar flexion were recorded before and after 1st and 2nd EX for both ST and CON. MVC force decreased significantly after 1st and 2nd EX compared to the baseline. Exercise time of 2nd EX decreased significantly than that of 1st EX for both ST and CON. However, % decline in the exercise time of 2nd EX was significantly smaller for ST. Integrated EMG of lateral heads of gastrocnemius, medial heads of gastrocnemius, soleus, and tibialis anterior muscle increased significantly with time for both 1st and 2nd EX during both ST and CON, while mean frequency of EMG signals evaluated by FFT analysis decreased significantly with time for all exercise. Integrated EMG of soleus muscle during first 10% of exercise time showed significantly lower level for ST than that for CON. In addition, mean frequency of medial heads of gastrocnemius decreased earlier than that of iEMG increase with time for ST, although those two parameters of medial heads of gastrocnemius muscle changed simultaneously for CON. From the results of this study, it is indicated that active dynamic stretching would be effective to reduce muscle fatigue by modifying neuromuscular activity by active stretching.

THE RELATION BETWEEN EXERCISE STYLE AND ACTIVATED AREA DISTRIBUTIONS WITHIN HUMAN MEDIAL GASTROCNEMIUS

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The purpose of this study was clarifying the relation between exercise style and activated area distributions within human medial gastrocnemius(MG).

Method: Eight healthy young male participated in this study. Each subject performed a calf-raise exercise (104bpm), submaximum hopping and maximum hopping with measuring EMG activity. EMGs were recorded from the proximal and distal area of the MG. The EMG and goniometer signals sampled at 2kHz. The EMG signals were full-wave rectified and then determined as the RMS value. RMS during submaximum hopping and maximum hopping was expresses as percentage of the corresponding values (%calf-raise) obtained during the calf-raise exercise.

Result : In submaximum hopping, the %calf-raise of the proximal area (92±15%) was larger than the distal area (60±11% ; P<0.05). In maximum hopping, the %calf-raise of the proximal area (148±10%) was larger than the distal area (88±12% ; P<0.05). These findings indicate that the proximal area of MG performed major role in hopping, in contrast, the distal area of MG performed major role in calf-raise exercise.

Discussion : Tibial nerve forks off into two branches of nerve which innervating the proximal area and the distal area of the MG. In addition, the Pennation angles at proximal area of the MG are larger than that at distal area (Kawakami et al., 2000). Furthermore, the proximal compartment of rat MG had higher oxidative capacity than the distal (De Riuter et al.,1995). Therefore, from innervation, architectural and biochemical properties of MG, it is expected that the function of proximal portion differ from that of distal portion. In the present study, EMG data suggested that muscle activation was distributed unequally along the longitudinal axis in the MG. The proximal area activated higher in hopping, It develop the advantage for lengthening the tendon and aponeuroses to calcaneus.

In conclusion, individual areas of the MG play different functional roles during exercise.

IN VIVO BEHAVIOR OF MUSCLE TENDINOUS COMPLEX OF GASTROCNEMIUS DURING REBOUND DROP JUMP : COMPARISON BETWEEN THE JUMPER AND THE GENERAL ADULT MALE

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Introduction : The explosive power is demanded by dynamic movement in sports. In research for the mechanism of explosive power, the importance of the tendinous tissue(TT) during movement was clarified by the research that uses the ultrasonography in recent years. In this research, it aimed to examine the mechanism of the explosive power by comparing jumper (RDJindex=3.0) and general adult male (RDJindex=1.0) with observing the behavior of muscle tendinous complex during rebound drop jump (RDJ).

Method : Jumper(n=1, age 22 yr) and general adult male(n=1, age 21 yr) performed RDJ. Change of TT-length during RDJ was measured by the high speed camera and the ultrasonography. In addition, The electromyography and the ground reaction force were measured in synchronized with camera and ultrasonography.

Result and Discussion : Jumper pre-activated the gastrocnemius medialis (GM) muscle and did not change the TT-length in pre-contact phase with the ground. In contact phase, TT-length was elongated in the braking phase and shorten in the subsequent push-off phase. On the other hand, the general adult male's GM was hypoactivate and TT-length shorten during the just before the contact with the ground to the braking phase. Therefore, the general adult male could not elongate the TT-length sufficiently in the braking phase. Why was the general adult male's GM hypoactivate? One possibility is that, the hypoactivity of GM is possible to reduce the stress which exert on the TT in the braking phase. In contrast, the jumper's GM elongated TT with never hypoactivity during the just before the contact with the ground to the braking phase.

In conclusion, the jumper prepared the jump motion by preactivation of GM in pre-contact phase with the ground. Moreover, his TT-length was elongated in the braking phase, and rapidly shortening in the subsequent push-off phase. These results suggest that the jumper achieve the explosive power by functional strategy for use of TT.

TENDON STRUCTURAL PROPERTIES AND THE DEVELOPMENT OF PATELLAR TENDINOPATHY

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Introduction: Patellar tendinopathy (jumper's knee) is a disabling overload injury of the patellar tendon. The prevalence rate of patellar tendinopathy is very high in sports involving repeated jumping. Tendon stress and elongation during loading is related to tendon structural and mechanical properties. However, very little is known about potential predisposing mechanical and structural tendon properties in the development of tendinopathy.

Purpose: To examine the in vivo structural and mechanical properties of the patellar tendon, in elite male badminton players with and without patellar tendinopathy.

Material & Methods: Seven players with unilateral patellar tendinopathy (PT-group) (22±1yrs, 83±3kg, 1.87±0.03m) on the dominant-side (DOM) and 9 players with no current or previous patellar tendinopathy (CT-group) (26±1yrs, 76±2kg, 185±0.02m) were included. Clinical assessments and ultrasonography were used to confirm the presence or absence of patellar tendinopathy both on the DOM and non-dominant side (NDOM). MRI was used to assess whole patellar tendon structural properties bilaterally. Whole patellar tendon mechanical properties were assessed using simultaneous ramped isometric (MVC) knee extension and ultrasonography on both knees.

Results: Tendon cross-sectional area (CSA) normalized for body weight (mm2/BW2/3) was greater in the CT-group compared to the PT-group on both the NDOM (7.3±0.3 vs. 6.0±0.3, P<0.01) and DOM (8.2±0.4 vs.6.5±0.5, P<0.05). In addition, greater DOM-CSA compared to NDOM-CSA was observed in the CT-group (p<0.05), but not in PT-group Tendon stress was lower in the CT-group compared to the PT-group for both the NDOM (20.3±0.7 vs. 23.4±1.1MPa, P<0.05) and the DOM (17.9±0.9 vs. 24.6±2.0MPa, P<0.01). Again, stress was lower on the DOM compared to the NDOM in CT-group (P<0.01), but not in PT-group. No other differences were found between PT-group and CT-group.

Conclusion: PT subjects had a smaller tendon CSA on both the injured (DOM) and uninjured side (NDOM) compared to the CT group. The smaller CSA yielded a greater tendon stress for a given force, which may be related to the etiology of patellar tendinopathy. Further, the smaller tendon CSA on both sides may indicate that it is a predisposing factor.

GENDER DIFFERENCES IN STIFFNESS DURING THE LANDING MOVEMENT FROM A VERTICAL JUMP

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Introduction: Women athletes have shown higher injury rates than their male counterparts in the anterior cruciate ligament, in sports where vertical jumps are common. Besides the anatomical and mechanical gender differences some authors have attributed the greater injury rate in women to kinetic and kinematic differences in the landing technique. Previous studies have found gender differences in the kinetic behaviour during the landings from jump tests (Abián et al., 2008), and others have also described differences between young and adult subjects in the stiffness of the push off and landing phases of a counter movement jump (CMJ). Although these two factors have been related to the injury rate, the gender differences in stiffness during CMJs remain to be studied. Therefore, the purposes of this study were to describe gender differences in vertical ground reaction forces, path of the center of gravity and vertical stiffness in the push off and landing phases of maximal CMJs, in applicants to a Sports Sciences university degree.

Methodology: 110 young subjects (19.1±2.7 years), 24 women and 86 men, volunteered for the study. A Quattro Jump force platform (Kistler, Switzerland) with a sample rate of 500 Hz was utilized for the jump tests. All the subjects have been previously informed of the jump test protocols, and received a previous demonstration of the test in situ. They were allowed for a 10-minute warm up, and had two trials to reach a minimum jump height of 21 cm and 29 cm, for the women and the men, respectively.

Results: The men's group showed greater jump performance than their female counterparts, with greater jump heights (men 34.1±4.5 cm; women 25.1±4.3 cm, P<0.001) and peak power during the push off phase (men 50.8±5.7 W/kg; women 41.9±5.1 W/kg, P<0.001). During the landing phase, men showed greater peak forces than women. However, the relationship between peak forces during landing and jump (landing) height was low (r=0.23, P<0.05). Women's group lowered more their center of gravity during the landing, although the difference only reached significance when it was expressed as percentage of standing height (men 18.8±4.2 cm, women 19.7±5.7 cm, not significant; men 10.7±2.4%, women 12.0±3.4%, P<0.05). Women also showed greater stiffness values during the landing phase (men 7.67±1.64 kN/m; women 9.24±1.92 kN/m; P<0.001).

Discussion-Conclusion: The gender differences in vertical stiffness during the landing phase from a vertical found in the present study can improve the understanding of the different landing technique between men and women. This could be applied to the design of injury prevention programs that focus on the landing technique.

Aknowledgements

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References

Abián J, Alegre LM, Lara A, Rubio J, Aguado X. (2008). J Sports Med Phys Fitness, 48: 305-310.

EFFECT OF PEDAL FORCE TO ANAEROBIC POWER GENERATION CAPACITY DURING CYCLING EXERCISE.

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Introduction: Anaerobic power generation capacity is important factor in any athletic activities. Its power output capacity effected by muscle size and athletic training mode were many reported previously. Whereas, it was not cleared that the pedal force effect to the anaerobic power generation capacity during cycling exercise with different loads. Therefore, the purpose of this study was to investigate effect of pedal force on the anaerobic power generation capacity during cycling exercise with different loads.

Methods: The subjects were thirty-one collegiate male athletes of physical education. The anaerobic power generation capacity was obtained by bicycle ergometer (Power max VⅡ, Combi co. Japan) in all the subjects. Subjects were performed ten seconds with the maximal efforts intermitted of three steps load, and requested to have warm-up and two minutes rest. The load of first trial was 4.0±0.4kp, second trial was 6.2±0.6kp, third trial was 8.2±0.7kp. The peak pedal force and clank angle of the peak pedal force on each pedaling were measured by bicycle ergometer with custom-made measurement system. The pedal force and its impulse during first to fifth pedaling were analyzed on all the trials. Moreover, the ratio of anaerobic power to pedal force and impulse were calculated in each trial.

Results: Significant differences of the peak pedal forces were observed in fourth and fifth pedaling among the three trials. The clank angles of the peak pedal force were differed by trials with different loads. The pedal force and impulse were showed significant difference among the three trials (first trial < second trial < third trial, p<0.05). In first and second trials, significant correlation coefficients were observed between pedal force and anaerobic power. In addition, pedal impulses for fifth pedaling were closely related to the anaerobic power in first and second trials. However, pedal force and impulse in third trial were not observed significant correlation to the anaerobic power. The ratio of anaerobic power to pedal force and impulse on first and second trials were significantly higher than that of third trial.

Discussion: In this study, it was considered that the pedal force was effected by increase of load. And, significant correlation was obtained between the pedal force and anaerobic power during cycling exercise with light work load. Whereas, the pedal force was not related to the anaerobic power generation capacity in case of high load. From these results, it was cleared that relationship between pedal force and anaerobic power generation capacity in cycling exercise with different loads.

References

G.Mornieux. et al. (2008). Int. J. Sport Med. 29, 817-822.

S. Pierre. et al. (2007). Med. Sci. Exerc. 39. 4. 680-687.

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Poster presentations

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EMG ANALYSIS AND METABOLIC EXPENDITURE IN TAI CHI CH'UAN (YANG STYLE) PRACTITIONERS

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Introduction. Tai Chi Ch'uan (TCC) is a branch of traditional Chinese martial arts; its metabolic intensity can be defined as low to moderate and depends on the adopted style (e. g. Yang, Wu or Ch'en), posture (semi-squat) and on the exercise duration [1]. The characteristics of the classical Yang style (investigated in this study) are: extended and natural postures, slow and even motions, light and steady movements. TCC involves long duration of co-activation of the lower limb muscles that continuously change their action from concentric to isometric to eccentric [2]. Aims. The aim of this study was to investigate the relationship between the metabolic requirement of TCC and the co-contraction of the lower limb muscles in expert practitioners and beginners. Material and Methods. Experiments were performed on 14 subjects (41.4±7.3 yrs of age, 67±13 kg body mass 171±8 cm stature, 10M and 4F) 10 experts, practising TCC for 15±5 yrs, and 4 beginners (3±1 yrs of experience). On these subjects we measured the oxygen consumption (VO2) of the first sequence of movements (Tai Chi Ch'uan Ti I Lu) by means of a portable gas analyzer (K4b2, Cosmed, I) and we recorded the electrical activity (at a sampling frequency of 1000 Hz) of selected lower limb muscles (VL: vastus lateralis; BF: biceps femoris: GM: gastrocnemius medialis; TA: tibialis anterior) by means of a surface EMG analyzer (Zerowire, Aurion, I). The duration of the co-contraction between VL and BF and between GM and TA was calculated by means of the software Chart (AD Instruments, NZ); the sum of the co-contraction times (left and right limb) was then expressed in percentage of total exercise duration (% co-co-leg and % co-co-thigh). Results. Expert practitioners had a lower net VO2 (above resting) compared to beginners (11±2 vs. 14±6 ml.min-1.kg-1) and were able to perform the sequence of movements at a slower speed (229±45 vs. 180±9 s). A significant relationship was found between the metabolic requirement and the level of co-contraction of the thigh: net VO2=6.2+23.8% co-co-tight (n=14, R=0.650, $p<0.01$). A similar relationship was found between net VO2 and the level of co-contraction of the lower limb as a whole (R=0.634, $p<0.05$). Discussion. Longer co-contraction times are thus related to higher metabolic demands, as expected. However, data of experts and beginners are not clustered but interspersed. This finding can be tentatively explained as follows: expert practitioners assume a lower squat posture but are capable of a smoother transition from one movement to the other while beginners adopt a less pronounced squat that compensate, at least in part, for their still imperfect postural control and fluidity of movement.

References

[1] Lan et al. (2008) The exercise intensity of Tai Chi Cuan. Med Sport Sci 52 : 12-19

[2] Wu et al. (2004) Spatial, temporal and muscle action patterns of Tai Chi gait. J Electromyogr Kinesiol 14: 343-354

SYMMETRY OF MUSCLE ACTIVITY DURING ABDOMINAL EXERCISES

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Introduction: Studies indicated that 50% of working adults have symptoms of low back pain (van Tulder et al., 1997). To prevent low back pain, abdominal-lumbar equilibrium is needed. Normally, abdominal muscles are weaker than muscles of the back. Therefore in order to maintain abdominal-lumbar equilibrium it is required to strengthen the abdominal muscles by executing strength exercises (of these muscles). The aim of the experiment was to determine whether symmetrical exercises actually produce symmetrical muscular action.

Methods: In this study, symmetry of EMG activity of right and left part of muscles: rectus abdominis, erector spinae, rectus femoris have been tested during isometric exercises.

The analysed exercises consisted in isometric action of abdominal muscles in a precisely specified position - lying on the back with the shoulders raised above the floor and the lumbar part of the spine contacting the floor. Individual exercises differed in the position of the lower and upper limbs in relation to the trunk. Three positions of the lower limbs and three positions of the upper limbs were selected, thus making nine exercise combinations.

Results: Differences in EMG activity between specific exercises for left and right part of each muscle were tested for significance with a one-way ANOVA. It was concluded that EMG activity of left and right side of m. rectus abdominis and m. rectus femoris does not differ significantly; nevertheless statistically important differences were noticed between left and right side of m.erector spine.

Discusision: In our study m. rectus abdominis showed symmetry in its activity while the m. erector spine showed activity in the right side higher than in the left one. The asymmetry of lumbar muscles was also reported in a study examining the EMG activity of m. erector spinae and m. trapezius (Furjan-Mandic et al., 2002). In all the analysed exercises, the dominance in the electrical activity of the right side of the muscles was observed. On the other hand, Axler and McGill (1997) reported a different pattern of asymmetry. Muscle rectus abdominis showed higher activity in its left side than in the right one. Our study indicates symmetry in the activity of the m.rectus abdominis and asymmetry (dominance of the right side) of m.erector spine irrespective of external load. This may result from the fact that the experiment test subjects were previously active sportsmen.

References

van Tulder M, Koes B, Router L. (1997) Spine, 22(18), 2128-2156.

Axler CT, McGill SM (1997) Med Sci Sport Exer, 29(6), 804-811.

Furjan-Mandic G, Milkovic R, Medved V, Oreb G. (2002) Proceedings Book of the 3rd International Scientific Conference – Kinesiology New Perspectives. Croatia, Zagreb, 693-696.

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MUSCLE ACTIVITY DOES NOT CHANGE IN RESPONSE TO DIFFERENT LOADS DURING BENCH PRESS

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Introduction: Among the exercises used in heavy-resistance training programs, bench press is one of the most popular upper body lifts. Myoelectrical activity of upper-body muscles during bench press exercise has attracted a great deal of interest (Clemons & Aaron, 1997; Welsch et al. 2005) however limited research have been found related with the effects of different loads on electromyographical activity of upper body muscles during the bench press. Therefore the aim of this study was to determine if muscle activation changes in response to different loads during non-bar release concentric bench press motion.

Methods: Seventeen male handball players volunteered to participate in this study. Subjects performed five explosive non-bar release concentric bench press motions at 50, 60, 70, 80 and 100 % of their 1-RM at 200 % of their biacromial distance (BAD). The EMG activity of clavicular pectoralis major (CPM), sternocostal pectoralis major (SPM), anterior deltoid (AD) and triceps muscles of dominant side were recorded by using surface electrodes. For each muscle at each different loads, root mean squares of EMG signals were calculated spontaneously from the beginning of the lift until the maximum force formation and all root mean squares values were summed to get a total muscle activation value. Maximum force for each lift at different loads was calculated by inverse dynamics Methods: Results: Results of one way ANOVA with repeated measures did not indicate any significant differences in muscle activation at different loads in non-bar release concentric bench press motion ($p>.05$).

Discussion: The present study suggested that different loads did not result in differences in muscles' activation patterns during non-bar release concentric bench press motion at 200 % BAD. This implicates that CPM, SPM, AD and triceps muscles are similarly activated during the bench press at different loads.

References

Clemons JM, Aaron C. (1997) J Strength and Cond Res, 11(2), 82-87.

Welsch AE, Bird M, Mayhew JL (2005) J Strength and Cond Res, 19 (2), 449-452

MUSCLE ACTIVATION AND LOADING OF THE SHOULDER JOINT IN HUMERAL EXTERNAL ROTATION BY PULLEY AND VARIABLE RESISTANCE

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Introduction: Free weights, such as dumbbells and rubber bands and cable pulley devices are traditionally used for rehabilitation of shoulder disorders (Reinhold et al. 2007). Also the weight of the arm itself has been used as resistance. The aim of the study was to evaluate the differences in the loading of the muscles and the glenohumeral joint between a cable pulley machine (CP) and variable resistance machine (VR) during axial humeral external rotation.

Methods: Eleven healthy male subjects took part in the study. Intramuscular electromyography from five muscles of the shoulder (medial and posterior parts of deltoideus, supraspinatus, upper part of trapezius and infraspinatus), torque and power output were measured with different rotation angles and different loads (10%, 50% and 100% of 1RM). Also the compressive and shear force in the glenohumeral joint was analysed (Harms-Ringdahl et al. 1985) at the horizontal level at particular angles of rotation. External rotation was self-paced and performed in the scapular plane.

Results: The range of the movement (ROM) when using the CP reduced compared to the VR along with the increasing workload ($P<0.05$). The activity of infraspinatus did not increase in the CP after 50% load, while it did in the VR ($P<0.01$). The upper part of trapezius was activated less in the CP than in the VR ($P<0.01$) when using the high loads (50% and 100%). In comparison with the CP, the shear forces that retract the head of the humerus were more evenly distributed in the VR than in the CP at through the ROM ($P<0.001$).

Discussion: We conclude that since the VR exercise makes it possible to utilize a larger range of motion, activates the infra- and supraspinatus muscles more at the end of the movement range, and the shear forces in the joint are more constant throughout the motion than in CP, it is especially suitable for glenohumeral rehabilitation. However, it is necessary to controlled to the position and form of the exercise, otherwise the upper part of trapezius is also highly activated, which is not desirable. Activity of the upper part of trapezius has been linked to headaches in some patients with neck and shoulder pain (Ashina et al 1999). In people suffering from frontal joint instability, it is important for rehabilitation that the shear forces in the joint are steady throughout the motion (Lugo et al 2008), such as in the VR machine. Thus, it is possible to control the stress of the anterior side of the joint and it's stability by adjusting the resistance.

References

Ashina, M., Bendtsen, L., Jensen, R., Sakai, F., Olesen, J. (1999). Pain. 79, 201-205.

Harms-Ringdahl, K., Arborelius, U.P., Ekholm, J., Nemeth, G., Schuldt, K. (1985). Scandinavian Journal of Rehabilitation Medicine. 17, 3, 129-140.

Lugo, R., Kung, P., Ma, C. (2008). European Journal of Radiology. 68, 16-24.

Reinhold, M., Macrina, L., Wilk, K., Fleisig, G., Dun, S., Barrentine, S., Ellerbusch, M., Andrews, J. (2007). Journal of Athletic Training 42, 4, 464-469.

THE INFLUENCE OF BREATHING PATTERN ON ABDOMINAL MUSCLE ACTIVATION DURING TRUNK CURLS

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Introduction: Abdominal muscles serve a multitude of functions in controlling posture and movement, providing stabilization for the spine and participating in breathing. Exercises for the abdominal muscles are an integral part of most training programs in sports and rehabilitation. The purpose here was to further elucidate the multifunctional role of abdominal muscles by investigating the effects of systematic breathing interventions during a commonly used training exercise, the trunk curl.

Methods

Ten healthy habitually active young females performed straight trunk curls from a supine position with bent knees. The movement speed was set by a metronome and the upward and downward phases each lasted approximately 2 s. Five different variants were carried out: 1) spontaneous breathing 2) inspiration during the upward and downward phases 3) expiration during the upward and downward phases 4) breath-holding on a maximal inhalation level and 5) breath-holding on a maximal exhalation level. Kinematics was recorded

with a position transducer and air flow with a respiratory flow-meter. Intramuscular electromyography (EMG) was recorded via bipolar fine-wire electrodes placed under the guidance of ultrasound in the Transversus Abdominis (TrA), Obliquus Internus (OI), Obliquus Externus (OE), and Rectus Abdominis (RA) muscles on the right side. EMG amplitude was calculated for 1 s intervals in the middle of the upward and downward phases and expressed as % of the EMG obtained in an isometric maximal voluntary trunk curl in a supine position.
Results: The overall range of relative EMG-levels was 6-72%. The activation of TrA was lower than that of the other muscles (6-29% vs 19-72%). All muscles showed higher activation during the upward than downward phase (ranges: 13-72% vs 6-56%). A significant effect of an intervention was present only for breath-holding in exhalation, which showed higher EMG-values than the spontaneous breathing situation for OE and RA both in the upward (difference OE: 45%, RA: 16%) and downward phases (difference OE: 21%, RA: 12%). The breath-holding in exhalation also caused higher activation than the inhalation situation for OI, OE and RA. Comparisons between trunk curls with ongoing breathing showed higher EMG with exhalation than inhalation for OI and OE. No significant differences between situations were seen for TrA.
Discussion: The level of activation of superficial abdominal muscles, OE and RA, can be increased by holding the breath in maximal exhalation during trunk curls. A possible reason for that could be that an extreme exhalation decreases the lever arm for the prime trunk flexor muscles and thus a higher level of activation is needed to carry out the movement. The lack of significant effects of breathing interventions on the deep abdominal muscles, OI and TrA, was unexpected, considering their potential role in control of breathing. Possibly, the generally low activation of the TrA, and a concomitant low intra-abdominal pressure, would be mechanically beneficial for the execution of the trunk curl.

EFFECTS OF ARM POSITION AND TWIST DIRECTION ON ABDOMINAL MUSCLE ACTIVATION DURING TRUNK CURL EXERCISES

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Introduction: Sit-ups are common exercises in sport and recreational training. A multitude of practical recommendations flourish on how to best perform this type of exercise to reach a specific effect. In recent years, special attention has been paid to training of the innermost abdominal muscle, the Transversus Abdominis (TrA), which has been ascribed a role in trunk stabilization and posture control, but whose mechanical contribution to trunk movements is uncertain. Here, we use fine-wire electromyography to investigate effects of arm position and twist direction on the involvement of all four abdominal muscles during trunk curl exercises.
Methods: Ten healthy habitually active young females performed trunk curls from a supine position with bent knees. The movement speed was set by a metronome and the upward and downward phases each lasted approximately 2 s. Five different variants were carried out: 1) straight trunk curl with straight arms in front of the body, 2) ditto with arms crossed over the chest, 3) ditto with hands behind the neck, 4) trunk curl with left twist, and 5) trunk curl with right twist. Kinematics was obtained with a position transducer. Intramuscular electromyography (EMG) was recorded via fine-wire electrodes placed under the guidance of ultrasound in TrA, Obliquus Internus (OI), Obliquus Externus (OE), and Rectus Abdominis (RA) on the right side. EMG amplitude was calculated for a 1 s interval in the middle of the upward and downward phases and expressed in % of the EMG in an isometric maximal voluntary straight trunk curl in a supine position.
Results: The overall range of relative EMG-levels was 7-70%. The activation of TrA was lower than that of the other muscles (7-36% vs 14-70%). All muscles showed higher activation during the upward than the downward phase (ranges: 14-70% vs 7-52%). Changing the arm position increased the EMG of all muscles in both phases. EMG on the right side was increased in the upward phase with right twist for OI and with left twist for OE. TrA and RA activation was unchanged with twist.
Discussion: As expected, the modification of arm position, and thereby load, caused a general increase in activation of the prime abdominal flexor muscles. Interestingly, there was an increase also in TrA activation, which can be interpreted either as related to a concomitant increase in the need for spine stabilization or to a hitherto undefined mechanical role of TrA in trunk flexion itself. The asymmetric activation of the oblique abdominal muscles is in accordance with their main fibre directions. A tendency towards a similar pattern of activation in TrA and OI is in line with our earlier observations during trunk twisting in a standing position and suggests a mechanical role for TrA in ipsilateral trunk rotation. From a practical viewpoint, the data presented can provide guidelines for specific trunk muscle training and for explaining effects thereof.

REACTION TIME ANALYSIS FOR KENDO STRIKES IN RESPONSE TO LIGHT SIGNALS USING ELECTROMYOGRAPHY AND A TRANSCRANIAL MAGNETIC STIMULATOR

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PURPOSE: Latency of motor-evoked potentials (MEP) reflects neural conduction time between stimulus location, i.e., cortical or peripheral, and muscle, and can be recorded using a transcranial magnetic stimulator (TMS). Furthermore, visual-motor related time (VMRT), central motor conduction time (CMCT), and peripheral response time (PRT) can be calculated by subtracting MEP latency from pre-motor time (PMT) in simple-reaction time using electromyography (EMG). We assessed time factors of EMG reaction time and MEP latency during kendo strikes.
METHODS: Eight male college students were asked to perform kendo strikes in response to visual stimulation from a flashing light signal. The strikes, Hiki-men (HM) to the frontal region of the head and Hiki-kote (HK) to the right wrist, were performed as quickly as possible with a bamboo sword (shinai) using the upper limbs. EMG signals from bilateral biceps brachii and triceps brachii muscles were recorded together with elbow joint angle and hitting shock. MEP latencies were also recorded from bilateral biceps brachii and triceps brachii muscles using TMS. Total task time (TTT), VMRT (PMT - MEP latency of cortical stimulation), CMCT (MEP latency of cortical stimulation - MEP latency of spinal stimulation), PRT (MEP latency of spinal stimulation), motor time (MT) and action time (AT) were measured for HM and HK tasks.
RESULTS: TTT and AT were significantly shorter in the HM task than in the HK task (TTT, $P<0.01$; AT, $P<0.05$). However, no significant differences were observed for VMRT, CMCT, PRT or MT between tasks. Significant and strong positive correlations were observed between VMRT and TTT for both tasks ($P<0.01$, $r=0.91$-0.92). Multiple regression analysis was used to determine the contribution of each component of the model in TTT. The standardized partial regression coefficient (β) was highest for VMRT (β=0.96-0.82). Individual

time ratios for PMT, MT and AT to TTT were approximately 50%, 20% and 30%, respectively. Furthermore, individual time ratios for VMRT, CMCT and PRT to PMT were approximately 92%, 3% and 5%, respectively.

DISCUSSION/CONCLUSION: We have already demonstrated in previous studies that PMT is the most important component contributing to TTT. The present findings suggest that VMRT is the most important component contributing to TTT in kendo strikes. Differences in TTT and AT were evident in according to different striking tasks, i.e., HM and HK tasks.

REPEATABILITY OF MINIMUM MEAN FREQUENCY OF EMG POWER SPECTRUM DURING EXHAUSTING VOLUNTARY ISOMETRIC CONTRACTIONS OF THE TRICEPS BRACHII MUSCLE AT DIFFERENT INTENSITIES

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Mean frequency (MNF) of the power spectrum of surface EMG decreases during the sustained voluntary isometric contraction due to progressive development of fatigue as observed by many researchers 1. An exponential decrease of MNF, first reported by Lindstrom et al. (1977), was usually observed. MNF decreased and reached some plateau asymptotic value. However in our study a slightly different pattern of the MNF decrease was observed and was best fitted by a polynomial curve. Minimum instead of plateau values were therefore obtained close to the end of contraction. The aim of our study was to investigate whether the minimum values of MNF differ with respect to the different starting intensity of the contraction. Repeatability of the minimum achievable MNF of long head (TBLoH) and lateral head (TBLaH) of triceps brachii muscle at the end of a sustained isometric contraction was investigated. Twelve volunteers performed isometric elbow extensions at the elbow angle 90° at 60%, 80% and 100% of the maximal voluntary contraction (MVC) until exhaustion on three different days with enough time to recover from previous contraction. Fourier transform was used for estimation of power spectrum of one second non-overlapping segments of the EMG signal. MNF values were calculated for all segments and plotted as a function of time. A 5th order polynomial model was fitted to the results in order to obtain the minimum value of MNF labelled TBLoH and TBLaH for the long and lateral head, respectively. The MNFs for TBLoH were 49.6 ± 6.9, 48.2 ± 7.8 and 49.5 ± 7,8 Hz for 60%, 80% and 100%, respectively and for TBLaH 62.3 ± 11.7, 62.1 ± 11.9 and 62.5 ± 10.7 Hz. Using repeated measures ANOVA, no statistically significant differences in minimum MNF among the contractions performed at different intensities were found. Repeatability was calculated using Intraclass Correlation Coefficient (ICC). ICC (2,1) for TBLoH and TBLaH and were 0.77 and 0.65, respectively. No differences in TBLoH and TBLaH among the contractions of different intensities and relatively high ICC values imply high repeatability of estimate of the minimum MNF value after a long sustained contraction for a wide range of contraction intensity level. TBLoH showed greater repeatability then TBLaH (P=0.02).

References:

Lindstrom L., Kadefors R, Petersen I, (1977) : An electromiographic index for localized muscle fatigue. J Appl Physiol 43:750-754

Merletti, R., Rainoldi, A., & Farina, D. (2004) Myoelectric manifestations of muscle fatigue. In: R.Merletti, F. A. Parker (Eds.): Electromyography, 233-253. New Jersey: IEEE Press.

THE COORDINATION OF MULTI-JOINT POINTING MOVEMENTS IN 3D-SPACE

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Introduction: The ease with which humans point to distant visual targets hides the intrinsic complexity of those movements. Due to the redundancy of the neuro-motor-system, humans are able to perform pointing movements in countless ways. The key issue is how humans select one specific movement out of the plethora of possible movements. In this context one of the main assumptions is that the information about the process of movement coordination in the central nervous system can be deduced from behavioural regularities (Bernstein, 1967). A large number of such regularities have been reported in literature (Goodman & Gottlieb, 1995). Nevertheless, the analysis of multijoint 'daily life' movements in 3D-space is rather rare. Thus, the purpose of this study was to analyse multi-joint pointing movements in 3D-space with respect to the selection of regularities.

Methods: Twenty students performed five standardized pointing gestures to four different targets. Subjects were instructed to perform the gestures similar to daily living. All pointing movements were tracked at 120 Hz using an IR-tracking system. For the calculation of joint angles and generalized actor forces the simulation framework MKD-Tools was developed in Matlab consisting of a recursive multibody algorithm to numerically establish the spatial dynamic equilibrium equations for arbitrary systems (Stelzner, 2008). An implemented nonlinear constrained least-square approach transfers motion capture data to subject-specific anthropomorphic models. The full-body model consisted of 38 dof and the dynamic parameters were taken from the literature. Inverse dynamics was performed in order to calculate the generalized actor forces.

Results: The results show that the shapes of the hand trajectories of all subjects were curvilinear. Although some unsystematic differences concerning the trial-to-trial variability could be observed, these results indicate that the hand movements in space show a topological invariance concerning the shape of the hand path in all investigated pointing tasks. Additionally, the velocity profiles of the hand trajectories are single peaked and almost bell-shaped. Concerning the head-hand coordination all subjects moved their head, first, followed by the hand. However, Desmurget and Grafton (2000) recently showed that this sequential organization does not seem to have a functional foundation but results primarily from inertial factors. These results indicate that in multi-joint movements in 3D-space humans produce movements with certain regularities. In the next step mathematical models have to be constructed in order to detect and reproduce those regularities.

Bernstein, N. (1967). The Coordination and Regulation of Movement. Pergamon Press.

Desmurget, M. & Grafton, S. (2000). Trends in Cognitive Science, 4, 423-431.

Goodman, S.R. & Gottlieb, G.L. (1995). Biological Cybernetics, 73, 311-322.

Stelzner, G. (2008). http://digbib.ubka.uni-karlsruhe.de/volltexte/1000010134

ENDURANCE EVALUATION WITH SURFACE EMG DURING UNILATERAL STATIC BALANCE IN ELITE TAEKWONDO ATHLETES

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Introduction: Proper balance control is mainly based on muscular synergies that minimize displacements of the centre of the gravity while maintaining upright stance, proper orientation and adapt techniques imparted to the sport practised (10,5). Taek-won-do requires a unipedal posture to perform different technical movements (eg. kicking).

Purpose: The aim of this study was to to evaluate the activation patterns of M. Biceps femoris and M. Quadriceps Femoris of elite Taek-won-do athletes during unilateral stance.

Method: Six national male Taek-won-do athletes (age=22.8±2.5 years, sport age=10.6±4.2 years, height=173±5.5 cm, weight=66.5±6.3 kg, BMI=22±0.7) participated in the study. Surface EMG data were recorded from M. Biceps Femoris and M. Vastus Lateralis during the unipedal stance condition on the stabilometer. We asked to maintain right and left unilateral stance positions as long as possible. EMG Ag-AgCl (silver/silver chloride) surface disk electrodes were placed according to the recommendation by SENIAM. The amplifier EMG 100C was equipped with a band pass filter 10-500 Hz; gain was chosen 1000. The EMG signal was sampled at 2000 Hz.

Results: Endurance time for the right leg was longer (429.9 s versus 298.4 s; $p<0.05$). According to EMG measurement, the subjects employed different muscle activation patterns as they became fatigued. M. Biceps Femoris mean EMG frequency was at 100 Hz for all measurements. For both stance conditions, the activation of M.Quadriceps Femoris (root mean square) and mean EMG frequency was higher. Also, alternating activation of the two muscles was also observed. There were no significant differences for Center of Pressure, Forward-Backward Standart Deviation, Medium-Lateral Standart Deviation, Average Forward-Backward Velocity, Average Medium-Lateral Velocity, Perimeter and Ellipse Area between unilateral left foot stance and right foot stance.

Discussion: Elite male Taek-won-do athletes employ similar muscle activation strategies during unilateral stance, but endurance time is different for the right and left leg

14:15 - 15:15

Poster presentations

PP-BC01 Biochemistry 1

RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY, AGE, BODY MASS INDEX AND IGF-1 SERUM CONCENTRATION IN HEALTHY, ELDERLY MEN

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Introduction: Insulin–like growth factor (IGF-1) plays a pivotal role in mediating metabolic and especially anabolic responses during altered energy states. IGF-1 has been indicated as an important modulator of muscle strength and muscle function, but studies on relationships between IGF-1 and physical activity have provided conflicting results (Gómez et al 2003 ,Onder et al 2006)

The aim of our study was to investigate associations between the level of physical activity, age, BMI and plasma concentrations of IGF-1 in healthy, elderly men of European origin.

Methods: We randomly selected 900 adult men from one administrative region of Poland (Lower Silesia). From among them 387 (aged 24-72 y) agreed to participate in the study. We used the International Physical Activity Questionnaire (IPAQ, last 7-days recall) for the assessment of the level of physical activity of the studied subjects. IGF-1 serum concentration was measured using RIA kits (BioSource, France).

Results: IGF-1 concentration was significantly lower in men aged >45 y. (B=-4,05) and >55 y. (B=-2,82). IGF-1 was also associated with body weight (B=0,1), height (B=0,084), BMI (B=0,29) and physical activity (B=1,4).

Conclusions: Age, anthropological parameters and physical activity are associated with serum concentrations of IGF-1. A statistically significant correlation between IGF-1 and locomotion is found only in men presenting low and medium, but not high level of physical activity.

This work was supported by the Ministry of Science and Higher Education of Poland (grant code: 2PO5D 0730).

References

Onder G, Liperoti R, Russo A, Soldato M, et al (2006) .Body mass index, free insulin-like growth factor I, and physical function amongolder adults: results from the ilSIRENTE study. Am J Physiol Endocrinol Metab. 291(4), 829-34.

Gómez JM, Maravall FJ, Gómez N, Navarro MA, et al (2003). Interactions between serum leptin, the insulin-like growth factor-I system, and sex, age, anthropometric and body composition variables in a healthy population randomly selected. Clin Endocrinol 8(2), 213-9

ADRENALINE DOES NOT BLOCK GLYCOGEN SYNTHASE ACTIVATION AFTER EXERCISE.

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NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH

Background: Glycogen is the most important energy substrate during endurance exercise of high intensity and fatigue occurs when the glycogen stores in the active muscles are depleted. After exercise, the glycogen stores are gradually refilled when glucose is available. For glycogen synthesis, glucose has to be transported into the muscle cells and phosphorylated before glycogen synthase incorporates the glucose moieties into the glycogen particles. Exercise activates both glucose transport and glycogen synthase. Insulin also stimulates glucose uptake and activates glycogen synthase. Glycogen synthase activity is regulated by phosphorylation at nine different sites and allosterically activated by glucose 6-phosphate. This complex regulation has made it difficult to get a thorough understanding of the mechanisms for regulation of glycogen synthase.

Purpose: The main purpose of the present study was to investigate the effect of adrenaline on glycogen synthase activity after contraction. Furthermore, the effect of adrenaline on insulin-mediated glycogen synthase activation was investigated.

Methods: Rat epitrochlearis muscles were stimulated electrically in vitro for 30 min; non-contracted muscles served as controls. After contraction, muscles were incubated 15 min with or without adrenaline. Non-contracted muscles were also incubated with insulin in the presence or absence of adrenaline. Muscle glycogen synthase activity was analysed to achieve kinetic data for GS affinity for UDP-glucose and affinity for glucose 6-phosphate (fractional velocity).

Results: Muscle contraction reduced glycogen content from 196.4±10.8 mmol/kg to 93.7±4 mmol/kg dry weight ($p < 0.05$, n=8 in each group). Furthermore, glycogen synthase fractional activity increased from 10.4±0.9 % (basal) to 51.9±1.3 % 15 min after contraction. Adrenaline reduced glycogen synthase fractional activity to 4.1±0.3 % in non-contracted muscles. In contracted muscles, glycogen synthase fractional activity remained elevated (25.5 ±6.0 %) when adrenaline was present. Insulin increased GS fractional activity to 17±1.3 %, and adrenaline completely blocked insulin-stimulated glycogen synthase fractional activity (9.8±1.4 %). Glycogen synthase Km for UDP-glucose decreased from 0.65±0.04 (basal) to 0.15±0.01 mM after contraction. Insulin reduced glycogen synthase Km for UDP-glucose to 0.42 ±0.02 mM. Adrenaline did not significantly influence glycogen synthase Km for UDP-glucose.

Conclusions: Muscle contraction is a much stronger activator of glycogen synthase than insulin, and glycogen synthase fractional activity remains high even when adrenaline is present in contracted muscles. Insulin-mediated glycogen synthase activation, on the other hand, is completely blocked by adrenaline.

THE EFFECTS OF A WATER POLO GAME ON THE BLOOD REDOX STATUS OF MALE WATER POLO PLAYERS.

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The purpose of this study was to examine the effects of a single water polo game on the blood redox status of male water polo players. Twelve male adult athletes (25.8±3.7 yrs) participated in the study and blood samples were taken before and after a water polo game of the Greek national championship. Mean playtime was 42.8 ± 9.4 min, which corresponded to 78.12±17.14% of the total playtime. Blood lactate concentration after the game reached considerably high values (9.16±3.91 mmol/L). Blood volume didn't change after the game. Thiobarbituric acid-reactive substances (TBARS) increased significantly following the game (44%) whereas there was no difference in oxidized glutathione concentration (GSSG), protein carbonyls, catalase activity and total antioxidant capacity. Eventhough the results suggest that an intense exercise, like a water polo game, can induce blood oxidative stress, as it is indicated by the increase of TBARS, the absence of change in the other redox status indices measured in this study, indicate that further studies need to be done in this field to elaborate a possible connection between this type of activity and the redox status of the athletes.

EFFECT OF RUNNING EXERCISE ON THIOL REDOX STATUS AND INFLAMMATORY MEDIATORS IN HEALTHY UNTRAINED MEN

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Introduction: Glutathione is the major non-protein thiol and one of the reactive oxygen species (ROS) sensors engaged in cellular control of thiol redox. The ratio of reduced (GSH) to oxidised glutathione (GSSG) plays an essential role in regulating thiol-depend metabolic pathways. Changes in thiol redox affect transcriptional activity via activation or inhibition of transcriptional factors, finally modulating the synthesis of many molecules such as cytokines (Allen and Tresini 2000, Ji et al. 2006). The present study was designed to evaluate the plasma marker of ROS activity and pro- and anti-inflammatory cytokines, and their relationship with thiol redox status in nonathletes exposed to running exercise.

Method: Twelve untrained male subjects performed 90-min run at 60% VO2max. Blood was sampled before, 20 min, 6 h, 24 h and 48 h following exercise to measure blood thiol redox status (GSHt - 2GSSG/ GSSG), plasma concentrations of interleukin IL-beta1, IL-4, IL-6, IL-10, tumour necrosis factor (TNF)-alpha and 8-isoprostane as a marker of ROS activity. The post-exercise values were corrected for changes in plasma volume.

Results: The running exercise caused significant increase in thiol redox status at 6 h, 24 h and 48 h rest. The pro-inflammatory cytokines did not change following exercise whereas anti-inflammatory IL-6 and IL-10 increased 5-fold and 1.76-fold at 20 min rest. Changes in IL-6 and IL-10 levels were independent of thiol redox status but were associated with 8-isoprostane concentration. 8-isoprostane increased at 20 min and 6 h rest and directly correlated with IL-6 ($r = 0.761$) and IL-10 ($r = 0.617$).

Discussion: Our study has shown 1) changes in thiol redox status and anti-inflammatory cytokines in nonathletes performed running exercise and 2) an integration of changes anti-inflammatory cytokines with marker of ROS activity but no relationship with thiol redox status.

References

Allen GR, Tresini M. (2000). Free Radic Biol Med, 28, 463-499. Ji LL, Gomez-Cabrera MC, Vina J. (2006). Ann N Y Acad Sci, 1067, 425-435.

THE LEVELS OF PRO- AND ANTI-INFLAMMATORY CYTOKINES AND REACTIVE OXYGEN AND NITROGEN SPECIES IN NON-ATHLETES EXPOSED TO RUNNING EXERCISE

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Introduction: The induction of reactive oxygen and nitrogen species (RONS) by physical exercise is well documented in both animal and human studies. RONS are physiological products of aerobic metabolism, and impact on variety of metabolic processes including gene expression, protein turnover, inflammatory reaction, arachidonic acid immobilisation, cellular differentiation etc. RONS are released from muscle, endothelial, and immune cells to stimulate changes in the immune status related to the cytokine synthesis (Kosmidou et al. 2002, Valko et al. 2007). The aim of the study was to determine the changes in RONS and pro- and anti-inflammatory cytokines levels in response to running exercise.

Method: Twelve untrained male subjects performed 90-min run at 60% VO2max on a treadmill. Blood was sampled before, 20 min, 6 h, 24 h and 48 h following exercise to measure plasma concentrations of hydrogen peroxide (H2O2), nitric oxide (NO), interleukin IL-1beta,

IL-4, IL-6, IL-10, tumour necrosis factor (TNF)-alfa and number of immunological cells. The post-exercise values were corrected for changes in plasma volume.

Results: The running exercise did not caused any changes in levels of pro-inflammatory cytokines IL-1beta, IL-4 and TNF-alfa but significantly elevated anti-inflammatory cytokines IL-6 and IL-10 at 20 min rest. The significant changes in H2O2 and NO took place at 6 h rest. H2O2 concentration increased from 6.26  0.93 to 8.29  1.48 mmol . ml-1 whereas NO increased from 24.92  2.79 to 32.27  3.30 mmol . ml-1. NO remained on high level to 48 h rest. The number of neutrophils increased at 20 min and 6 h rest, and monocytes was elevated to 48 h rest. Neutrophil count directly correlated with concentrations of IL-6 (r = 0.768) and IL-10 (r = 0.442).

Discussion: Our results have shown the 90-min running exercise at submaximal intensity induces changes in RONS and anti-inflammatory cytokines level but has no effect on pro-inflammatory cytokines in nonathletes.

References

Kosmidou I, Vassilakopoulous T, Xagorari A, Zakynthinos S, Papapetropoulos A, Roussos C. (2002). Am J Respir Cell Mol Biol, 26, 587-593. Valko M, LeibfritZ D, Moncol J, Cronin MTD, Mazur M, Tesler J. (2007). Int J Biochem Cell Biol, 39, 44-84.

EFFECT OF ACUTE EXERCISE ON HEART TISSUE PROTEINS OF WISTAR RATS

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Physical activity is known as an external agent capable to promote stress response and biological adaptation. This adaptation on cardiac myocit indicates work capacity, resistance to physical stress and cardiovascular system improvement (ROBERGS & ROBERTS., 1997). These exercise-promoted adaptations can be pointed by biological markers, some of them specific proteins as the hsp70 (MELLING et al, 2007). To verify the acute responses of one session of moderate and intense exercise, Wistar rats were submitted to 30 minutes of intense or moderate swimming exercise. 15 male Wistar rats with 8 (+/-1) weeks, were distributed into 3 groups: control (C, n=3), moderate exercise (ME, n=6) and intense exercise (IE, n=6) group. The moderate and intense exercises were performed by 30¨ of swimming with 5 or 10% of overload related to the animal body weight, attached to its chest. After the exercise session all animals were sedated (Chloroform 100%) and sacrificed. The left ventricular fragment of each rat was excised, immediately liquid N2 frozen and stored at -80 oC. The tissues were homogenized according to SHORT et al. (2005) and protein content was obtained by the Bradford method. The samples were analyzed by 12% SDS-PAGE and 2DE, with strips of 3-11 Ip range. The analysis indicated a modification on the proteins pattern between the ME and IE group and between them and the CG. SDS-PAGE indicated that proteins of approximately 70 kDa are over expressed on the MEG compared to the CG. It was verified that one session of moderate and intense exercise is capable to promote proteins modification indicating a possible biological adaptation by the cardiovascular system.

References

Melling, C.W.J., et al. Exercise-mediated regulation of Hsp70 expression following aerobic exercise Training. Am J Physiol Heart Circ Physiol 293: H3692–H3698, 2007.

Robergs, R.A.; Roberts, S.O. Exercise physiology: exercise, performance and clinical applications. Ed. McGraw-Hill, Boston, USA. 1997. 840p.

Short, K.R., et al. Changes in myosin heavy chain mRNA and protein expression in human skeletal muscle with age and endurance exercise training. J Appl Physiol 99: 95–102, 2005.

14:15 - 15:15

Poster presentations

PP-NU02 Nutrition 2

EFFICIENCY OF THE FOOD SUPPLEMENT 'TRIBULUS' USED BY ATHLETES

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Introduction: Tribulus is one of the quite popular food supplements used by a big number of athletes. When investigation of the effect of Tribulus Terrestris had been started more widely, it was found out that this herb had influence on masculine hormone testosterone level in blood, on strengthening immunity, improving endurance, when its effect was started to be analyzed widely (Antonio et al., 2000; Elder et al., 2001; Rogerson et al., 2004). The aim of the research was establishing the influence of food supplement Tribulus on athletes' physical development, physical working ability, aerobic functional capacity, blood circulation and respiratory systems.

Methods: The sample of the research included thirty-two 20-22 year old athletes. The first experimental group consisted of 20 individuals. For 20 days they used 3 capsules of the food supplement Tribulus (produced by the USA Company (OPTIMUM NUTRITION) a day. The control group (n=12) participants did not consume any food supplements.

Results: Their relative AAMP the members of experimental group, having used food supplement Tribulus for 20 days, have increased from 16,3±1,1 to 17,2±1,5 W/kg (F= 5,12, p=0,03). Relative alactate glycolyte working capacity (AGWC), when work duration is 30-s, in 20 days have increased from 8,2±0,8 to 8,7±0,8 W/kg (F=4,34, p=0,04). VO2max at the critical intensity threshold have increased from 50,3 to 55,4 ml/min/kg (F=3,63, p=0,07). During the experimental period still growing erythrocyte sedimentation rate, statistically importantly increased percentage of granulocytes and decreased percentage of leucocytes show negative impact of this food supplement on changes of leucocytes formula in athletes' blood. Accordingly, complete blood counts (CBC) for athletes who consume food supplement Tribulus 25 mg per 1 kg of body mass for the period of 10 days or longer must be carried out.

Creatinkinase concentration in athletes' blood statistically importantly has increased and creatinine amount has had a tendency to decline during 20 days period of consuming food supplement Tribulus. The declining tendency of urea, cholesterol and bilirubin concentrations has appeared. The concentration of blood testosterone increased statistically reliable during the first half (10 days) of the experiment; it did not grow during the next 10 days while consuming Tribulus still.

References
Antonio J, Uelmen J, Rodriguez R, Earnest C (2000). The effects of tribulus terrestris on body composition and exercise performance in resistance-trained males. International J Sport Nutrit Exerc Metabol, 10 (2), 208-215.
Elder PA, Hellemans J, Lewis, JG, Dawson, T (2001). Tribulus Terrestris ingestion: does it work? New Zealand J Sports Med, 29 (4), 74-77.
Rogerson S, Marshall-Gradisnik S, Weatherby R, Cawley A, Noble-Jerks J (2004). The effect of a Tribulus terrestris extract on plasma steroid hormone concentrations and the urinary testosterone/epitestosterone (TE) ratio. (Abstract) J Sci Med Sport 7 (4), 50.

EFFECT OF CO-INGESTION OF CARBOHYDRATE AND WHEY PROTEIN HYDROLYSATES ON EXERCISE PERFORMANCE AND BLOOD BIOCHEMICAL PARAMETERS OF CARBOHYDRATE METABOLISM IN MALE ATHLETES.

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WASEDA UNIVERSITY

Introduction: It has been reported that co-ingestion of carbohydrate (CHO) and protein induces more effective replenishment of muscle glycogen following exercise than CHO alone. We have also demonstrated that whey protein increased liver and skeletal muscle glycogen content to higher levels in exercise-trained rats than casein (Br J Nutr 2005). Furthermore, we reported recently that BCAA-containing dipeptides, identified in whey protein hydrolysates (WPH), increased glucose uptake in isolated muscles (J Nutr Sci Vitaminol 2009). We therefore hypothesized that ingestion of CHO plus WPH may have beneficial effects on post-exercise glycogen repletion, thereby resulting in increased exercise performance. The aim of this study in male athletes was to compare the effect of co-ingestion of CHO and WPH with CHO alone on 1) blood biochemical parameters of carbohydrate metabolism during the post-exercise phase and 2) exercise performance.
Methods: The study was a double-blind, cross-over design. Eight male athletes exercised continuously for 60 min on two separate occasions using a cycle ergometer at 68% VO2max, interrupted by six 2-min intervals at 88% VO2max. The subjects cycled at 60% VO2max during the last 10 min. Immediately after exercise and 30, 60, 90 and 120 min later, the subjects received a supplement containing either 1) 17.5 g CHO, 2) 3.0 g WPH and 17.5 g CHO (L-WPH), or 3) 8.0 g WPH and 17.5 g CHO (H-WPH). After a 2 hr recovery period an exercise performance test (time trial) was performed. Blood samples were drawn before exercise, at 0, 30, 60, 90 and 120 min after exercise, and also after the exercise performance test.
Results: Data expressed as AUC for the entire 120 min trial showed that the blood glucose response was lower in the H-WPH group compared to the CHO group, while the plasma insulin response was significantly higher in the H-WPH group than in the CHO group. The concentrations of plasma amino acid and dipeptide were also higher in the L-WPH and H-WPH groups compared to the CHO group. In addition, there was a strong positive correlation between the plasma concentrations of insulin and Leu, Ile, Met, Thr, Tyr, Phe, Trp, Ile-Leu and Val-Leu ($P<0.001$, $r>0.650$). Furthermore, the plasma IL-6 and free fatty acid (FFA) levels after the performance test were significantly lower in the H-WPH group than in the CHO group. Although endurance performance was not statistically different between the three groups, 6 of the 8 subjects improved their performance in response to intake of H-WPH.
Discussion: This study demonstrated that co-ingestion of CHO and WPH was more effective than ingestion of CHO alone for stimulating insulin secretion and plasma amino acid and dipeptide availability in exercise-trained athletes. Furthermore, blood parameters of substrate metabolism, such as FAA and IL-6 also changed after co-ingestion of CHO and WPH. These results therefore may suggest that ingestion of CHO with WPH has a beneficial role of increasing post-exercise glycogen repletion rates, resulting in an improvement in exercise performance.

EFFECT OF RHODIOLA ROSEA SUPPLEMENTATION ON PHYSICAL PERFORMANCE FOLLOWING ENDURANCE TRAINING

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Introduction: Rhodiola Rosea (RR) is a medicinal plant, known as an ergogenic and adaptogen aid, and supposed to enhance physical and mental performance. Studies showed positive effects on cognitive function and mental fatigue (Olsson et al., 2008; Fintelmann et al., 2007). However, literature pointed out equivocal results on physical performance (Walker et al., 2006). The aim of the present investigation was to evaluate the increase in aerobic performance following RR supplementation combined, or not, with an endurance training programme.
Methods: Thirty-two young male or female subjects (mean 22 y) were divided into three groups; one group received a RR supply and the two other groups received a placebo (PL). The RR group and one PL group performed two sessions of endurance training per week during three months. Before and by the end of training, maximal oxygen uptake was assessed by a triangular exhaustion test on a treadmill. The average speed maintained 20 minutes at a target heart rate (85% of the maximal heart rate) was also recorded on a treadmill, 3 days after the maximal test. Heart rate was recorded during the three minutes following the end of the exercise.
Results: The maximal oxygen uptake increased in the trained RR group (5.5 % ± 3.5) while this parameter decreased in the non-training PL group (4.8 % ± 6.3). Significant difference was showed between the RR group and both PL group (trained and untrained) and between the trained (0.2 % ± 4.5) and the untrained PL group for the maximal oxygen uptake. After training, the maximal aerobic speed increased significantly for the RR group (5.2 % ± 7.5), and tended to increase for the trained PL group (4.3 % ± 6.7). Significant difference for the maximal aerobic speed was obtained between the trained RR and PL groups and the untrained PL group. The average speed at the target heart rate rose for the trained RR group only (6,6 % ± 11.5), the regression in heart rate tended to occur faster in the RR group compared to the PL groups.
Discussion: The present study pointed out an increase in maximal oxygen uptake, maximal aerobic speed and average speed at target heart rate in RR group, showing improved aerobic performance compared with the PL groups. Furthermore, the RR group appears to recover faster after endurance training session.

References
Olsson EM, von Schéele B, Panossian AG. (2008). Planta Med. Nov 18.
Fintelmann V, Gruenwald J. (2007). Adv Ther. 24(4):929-39.
Walker TB, Robergs RA. (2006). Int J Sport Nutr Exerc Metab. 16(3):305-15.

THE JUSTIFICATION OF DIET SUPPLEMENTATION OF THE POLISH NATIONAL TEAM OF ATHLETES

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Nutrition is an important aspect of an athlete's training program. Every deficiency and excessive intake of nutritive elements may negatively influence sportsman performance especially high class athletes. However, for various reasons, not all athletes are able to consume a diet that meets nutritional needs and thus resort to nutritional supplements with the intention of preventing deficiencies and even enhancing performance (1, 2, 3).

The aim of the study was to examine the justification of the diet supplementation.

The investigation was carried out on a group of 62 athletes, members of Polish national team of middle and long distance runners (24 women aged between 19-31 and 38 men aged between 18-36). General information concerning respondents, their nutrition (food consumed within 24 hours before an interview) and their diet supplementation (frequency and quality) was gathered using the method of questionnaire interview at training camps and sport competitions. Values of energy and nutritive elements contents in athlete's diets were calculated by means of a computer program "Wikt 1.3" based on current tables of food products' nutritional value prepared by the National Food and Nutrition Institute in Warsaw (2001).

In the result of the investigation concerning diets quality some abnormalities has occurred. The examined daily food portions of women (W) and men (M) supplied amount of energy (2892 kcal-W; 3955 kcal-M) sufficient to fulfill daily requirement in case of moderate active people, not high class athletes. The investigated diets provided too low energy from carbohydrates and proteins limited by greater percentage of delivered energy from fat. The quantity of macroelements (Ca, P, Na, K, Mg), microelements (Zn, Cu, Mn) and vitamins (A, D, B group, C) in the analyzed diets was sufficient to fulfill daily requirement of athletes. The examined diets provided insufficient amount of Fe and vitamin E to ensure against potential deficiency.

According to diet supplementation 100% of the examined women and 94,7% of the examined men used dietary supplements. Most of the investigated athletes reached for carbohydrates powder products, vitamin-mineral products, vitamins C and B group, ferrum and magnesium supplements. Moreover, the examined runners also often enriched their diet in BCAA and carnitine.

In the analyzed daily food rations of Polish national team of runners only carbohydrates, ferrum and vitamin E supplementation seems to be justified.

1. Benardot, D. (2000). Nutrition for serious athletes. An advanced guide to foods, fluids, and supplements for training and performance. Human Kinetics, Champaign, USA

2. Lukaski, H.C. (2004). Vitamin and Mineral Status: Effects on Physical Performance. Nutrition, 20, 632-644

3. Williams, M.H. (1999). The Ergogenics Edge. Granice wspomagania. Medicina Sportiva, Kraków

THE EFFECT OF ORAL VANADYL SULPHATE ON MUSCULAR STRENGTH, POWER AND BODY COMPOSITION IN TRAINED AND NON-TRAINED MALES

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UNIVERSITY OF WESTMINSTER

Background: Athletes use vanadyl sulphate supplementation to promote muscle growth and glycogen synthesis in the muscle and liver, with little scientific basis (Jentjens and Jeukendrup, 2002).

Purpose: To investigate the effects of oral Vanadyl Sulphate (VOSO4)

(30mg/day) supplementation on anthropometrical variables, body composition, and performance within a double blind, placebo-controlled trial of both untrained and trained participants.

Method: Eleven males (mean ± SD age 24 ± 2 yrs, mass 74 ± 11 kg), of whom n=5 were classed as trained and n=6 as untrained (mean ± SD scheduled training hrs/ wk 6 ± 2 and <1 hr, respectively), and allocated to 2 supplementation groups (G1 and G2), participated in a double blind placebo controlled study of 5 weeks total duration. Physiological trials, which were always at the same time of day, and 1 week apart, were conducted in the order T_Familiarisation (Wk 1, all); T_Baseline (B, Wk 2, all); and then either T_VS (vanadyl sulphate supplementation, VS, G1 or T_P (placebo supplementation, P, G2) (wk 3); T_Washout (wk 4, no supplementation, all), and then T_P (placebo supplementation, P, G1) or T_VS (vanadyl sulphate supplementation, G2) (wk 5). During the week prior to each trial, each subject consumed no supplement (Wks 1 and 2), or 10mg of either VS or P, with each of their morning, lunch and evening meals (i.e. a total daily dose of 30mg/day for a total of 7 days) (wks 3 and 5). Muscular strength, anthropometrical variables and 10s Wingate test power variables were assessed, in triplicate, within each physiological trial.

Results: Two way repeated ANOVA revealed no significant effect over baseline of one weeks supplementation of either VS or P, at the p>0.05 level, for bench press one-rep maximum (1RM) (Bas 79 ± 8 kg, VS 84 ± 9 kg, P 80 ± 8 kg), leg extension 1RM (Bas 54 ± 4 kg, VS 60 ± 3 kg, P 58 ± 3kg) vertical jump height (B 0.44 ± 0.03m, VS 0.43 ± 0.02m, P 0.43 ± 0.02m), peak power (B 734 ± 44 W, VS 783 ± 42 W, p 786 ± 44 W), average power (B 663 ± 34 W, VS 723 ± 40 W, B 705 ± 33 W), or fatigue ratio (B 9 ± 2, VS 11 ± 2, P 11 ± 2), biceps girth (B33 ± 1mm, VS 34 ± 1mm, P 33 ± 1mm), or (BODPOD) % body fat (B 13 ± 1, VS 13 ± 2, P 14 ± 1). However, VS values tended to be higher than B or P values (NS); and more so in trained than in untrained subjects (NS), especially for bench press 1RM (trained B 98 ± 33 kg, VS 101 ± 39 kg, P 100 ± 33 kg; untrained B 61 ± 11 kg, VS 65 ± 3 kg, P 67 ± 7 kg).

Conclusions:

The influence of 1 week of oral VS supplementation on muscular strength and anthropometric variables, and the extent to which this is influenced by subjects' training status, requires further investigation using larger sample sizes.

References:

Jentjens & Jeukendrup (2002) Int J Sport Nut Exerc Metab, 12, 470-9.

THE EFFECT OF CHRONIC TAURINE SUPPLEMENTATION ON HIGH INTENSITY, SHORT DURATION EXERCISE PERFORMANCE.

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UNIVERSITY OF WESTMINSTER

Background: Taurine supplementation has been observed to lead to improvements in exercise performance in both rats and mice (Yatabe et al., 2003; Hamilton et al., 2006). Supplementation with (a higher than typical dose of) 6000 mg taurine for 7 days (Zhang et al., 2004) has also been found to result in increases in both cycle time to exhaustion and maximal cycle workload in humans.

Purpose: This study investigated the influence of 7 days of daily oral dosage of 1000 mg taurine on muscular power related variables in untrained humans.

Methods: Seven healthy, untrained, males (age (mean ± SD) 22.9 ± 1.9 yrs, height 1.74 ± 0.08 m, mass 69 ± 6 kg, body mass index 22.9 ± 1.9), randomly allocated to two supplement groups (G1 and G2), took part in a six week, single blind, placebo controlled cross over study. Physiological trials, which were always one week apart and at the same time of day, were conducted for each participant in the order: 1st Familiarisation (week 1, all); 2nd Familiarisation (week 2, all); Baseline (B, week 3, all); Taurine (T, week 4, G1) or Placebo (i.e. cornflour) supplementation (P, week 4, G2);Washout (week 5, all); and then Placebo (P, week 6, G1), or Taurine (T, week 6, G2) supplementation. Muscular power was assessed via Vertical Jump test (Newtest, UK) height (m); and peak power output (PPO), mean uncorrected power (P_av), and fatigue index (FI) within a 30 s Wingate cycle test. Fingertip blood lactate concentration ([BLA]) was determined (using a Lactate Pro) both immediately- and 1 min- post test.

Results: One way repeated measures ANOVA showed no significant difference (for $p>0.05$), on any of the measured variables, between the results at baseline and after either T or P supplementation (for Vertical Jump test B = 0.40 ± 0.08 m, P = 0.41 ± 0.08 m, T = 0.41 ± 0.10 m; for peak power output B = 772.2 ± 203.9 W, P = 849.5 ± 174.5 W, T = 761.1 ± 186.8 W); for uncorrected P_av (B = 588.0 ± 101.1 W, P = 564.9 ± 110.0 W, T = 545.1 ± 115.9 W); for FI B = 35.8 ± 17.4 %, P = 46.4 ± 12.1 %, T = 39.4 ± 18.7 %); for [BLA] immediately post exercise B = 4.9 ± 1.6 mM, P = 5.6 ± 3.0 mM, T = 5.5 ± 2.8 mM; for [BLA] 1 min post exercise B = 8.9 ± 3.1 mM, P = 10.3 ± 3.4 mM, T = 11.1 ± 3.5 mM).

Conclusion: The effect of different dosages of taurine supplements on exercise performance in humans requires further investigation, using larger sample sizes.

References:

Hamilton et al. (2006). The effect of taurine depletion on the contractile properties and fatigue in fast- twitch skeletal muscle of the mouse. Amino Acids 31(3), 273-278.

Yatabe et al. (2003). Effects of taurine administration in rat skeletal muscle on exercise. J Orth Sci 8 (3), 415-419.

Zhang et al. (2004). Role of taurine supplementation to prevent exercise induced oxidative stress in healthy young men. Amino Acids 26 (2): 203-207.

DIETARY SUPPLEMENT USE OF ELITE GERMAN ATHLETES AND KNOWLEDGE ABOUT THE CONTAMINATION PROBLEM

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Introduction: Dietary supplement (DS) use is widespread in elite athletes. Mainly described motives for DS use are increasing performance, maintaining health or optimizing regeneration. (Braun et al., 2009) The benefits of most products are still unclear because their effectiveness is often not scientifically proven. In contrast, since 1999 the risk on DS for contaminations and adulterations with doping substances is well described (Geyer et al. 2008). Therefore, the aim of the study was to evaluate DS use in elite athletes and their knowledge about the contamination problem.

Methods: During the preparation period (June-July 2008) for the Olympic Games 2008 in Beijing, we provided to 193 elite German athletes a closed-ended questionnaire to assess the past and present (DS use in the past 4 weeks) use of DS. Additionally, athletes have been asked about the contamination problem, motives of DS use, sources of advice, and supplement sources. The questionnaires were voluntarily returned by 117 (age 26.4 ± 5.8 y, male n = 74, female n = 43) athletes from 16 different sports.

Results: Almost all athletes (97 %) have used DS in their active sports career, while 88 % reported a use (range 1-19) in the present period. For the group of DS users Minerals (74 %), vitamins (65 %), sport beverages (63 %) were most frequently used in the present period. Major motives for using supplements were optimizing regeneration (70 %), immune functions (64 %), health related (61 %) and increasing performance (48 %). Physicians (56 %), coaches (35 %), nutritionists (30 %) and physiotherapists (22 %) mainly recommended DS.

Among all athletes, 63 % classified the contamination problem correctly (CCPC). However compared to the non-CCPC, this did not influence their supplement use according to frequency, motives, sources of advice, and supplement sources. Apart from that, the group of CCPC used more often individual nutrition consulting ($p = 0.002$) and felt better elucidated about usage of DS ($p = 0.002$).

Discussion: The present data confirm the fact that DS use is widespread in elite athletes. Leading sport organizations recommend that: "athletes should be ensure they have a good diet before contemplating supplement use" (Maughan et al., 2007). However, only 54 % of the athletes ever had an individual nutrition consulting.

Almost 2/3 of the athletes reported to be aware of the contamination problem. This is more than we found in young athletes (Braun et al., 2009). Anyway, it still seems necessary to educate athletes about risks and benefits of DS and include physicians, coaches, nutritionists and physiotherapist into this process.

References

Braun H., Koehler K., Geyer H., Kleinert J., Mester J., Schaenzer W. (2009). Int J Sp Nutr Exerc Met, 19(1), 97-109

Geyer H., Parr M., Koehler K., Mareck U., Schaenzer W., Thevis M. (2008). J. Mass Spectrom, 43, 892–902

Maughan R.J., Depiesse F., Geyer, H. (2007). J Sp Sci, 25, S103-13.

EFFECTS OF CREATINE SUPPLEMENTATION ON 12-WEEK WATER EXERCISE PROGRAM IN OLDER ADULTS

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Introduction: Water exercise is well-rounded exercise program to improve not only cardiovascular fitness but also muscular strength. And it is getting popular for older people (Takeshima et al. 2002). Recently it is reported that Cr supplementation can apply to older people to improve muscle strength and fat free mass with resistance training (Brose et al. 2003). However, it is not clear whether the effects of

water exercise program can be enhanced with Cr supplementation in older people. The purpose of this study was to investigate the effects of 12-week water exercise program (WEP) with Cr supplementation on health-related fitness in older adults.

Methods: Sixteen elderly men and women (age 68.1±5.1yr), free of cardiorespiratory and nuerological diseases, gave informed consent to participate as volunteers for this study. Subjects were randomly assigned in a double-blind design to either a Cr supplementation group (CRE, n=8) or a placebo group (PLA, n=8). The CRE ingested 3-g doses of Cr monohydrate (Creapure, AlzChem Trostberg GmbH, Germany) per day for 3 months, whereas the PLA ingested the same dosage of lactose. Before (pre-) and after (post-) the supplementation period, the following physical characteristics were measured; chair stand (CS), arm curl (AC), sit-up (SU), up & go (UG), sit & reach (SR), and 6-min walk (6-MW). In addition, body composition was estimated using a bioelectrical impedance method (InBody 3.2, Biospace, Japan). After the first test, all subjects completed 12-week WEP (70min./d, 3times/week, total 36 sessions). This WEP consisted of 20 min. of warm-up and stretching, 30 min. of endurance-type exercise (walking and dancing), 10 min. of resistance exercise, and 10 min. of cooling down exercise. During the WEP, heart rate was monitored continuously for all subjects using a heart rate monitor (S610i, Polar, Finland). In addition, all exercise session was led by trained fitness instructors and semi-supervised by the researchers.

Results: In both groups, body weight, fat, %fat, and fat free mass were not significantly changed after 12-week WEP. On the other hand, improvements were observed in CS, AC, SU, UG, SR, and 6-MW in both groups after 12-week WEP ($P<0.05$). However, % increase of CS and AC in CRE (CS: 23.8±10.0%, $P<0.05$, AC: 24.6±9.0%, $P<0.05$) was significantly higher than PLA (CS: 12.0±5.3%, AC: 13.9±9.2%).

Conclusion: It has been demonstrated that 12-week WEP improves health-related fitness for older adults. Moreover, the additional of Cr supplementation to the water exercise have a beneficial effect on an increase of muscular strength in older adults.

References

(1) Brose, A., et al., Creatine supplementation enhances isometric strength and body composition improvements following strength exercise training in older adults. J. Gerontol. A Biol. Sci. Med. Sci., 58, 11-19, 2003

(2) Takeshima, N., et al., Water-based exercise improves health-related aspects of fitness in older women. Med. Sci. Sports Exerc., 33, 544-554, 2002

EFFECTS OF CHRONIC RHODIOLA ROSEA SUPPLEMENTATION ON SPORT PERFORMANCE AND ANTIOXIDANT CAPACITY IN TRAINED MALE: PRELIMINARY RESULTS

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Rhodiola Rosea (RR), is an adaptogen plant, that belongs to Crassulaceae family, that has been reported to affect several physiological mechanisms, stimulating metabolism, promoting fatty acids utilisation, having an ergogenic function, improving body resistance to physical strenuous efforts [1,2] and showing an antioxidant function [3]. The purpose of this study is to investigate the effects of chronic Rhodiola Rosea supplementation on physical performance parameters, redox status and the capacity of substrate consumption during endurance exercise in a group of competitive athlets.

We selected 14 well trained male athletes, between 20 and 35 years old. After an admission test evaluating the maximal oxygen uptake (VO2 max), the subjects underwent a chronic supplementation with Rodhiola Rosea (170 mg/die) or placebo (P) every morning for 4 weeks in a double blind clinical trial. At the end of supplementation period, the athletes underwent the cardio-pulmonary exhaustion test at 75% of their VO2 max.

Physical performance parameters evaluated show that HR Max (171±10 for P vs 172±8 bpm for RR), the Borg Scale level (all 4-5), VO2 max (49.86±12.75 for P vs 52.61±12.35 ml/kg/min for RR) and duration of the test (19±9 for P vs 19±11 min for RR) are essentially the same after Rhodiola Rosea or placebo intake.

Rhodiola Rosea reduced in a statistically significative manner ($p<0.05$ at acme and $p<0.01$ after 30 minutes recovery) plasma free fatty acids levels in supplemented group (12.86±1.62 for P vs 7.31±1.31 mgFFA/dl plasma for RR at acme and 11.41±0.56 for P vs 7.01±1.16 mgFFA/dl plasma for RR after 30 minutes recovery). No effect on blood glucose was found.

Blood antioxidant status (Haemolysis, Total Antioxidant Status, Manoldialdheyde) and inflammatory (Interleukine-6) parameters results unaffected after RR supplementation.

Blood lactate ($p<0.05$) and plasma creatine kinase (all $p<0.01$) levels decreases in a statistically significative way in Rhodiola Rosea group compared to placebo (37.19±7.29 for P vs 23.50±3.96 U-CK/L plasma for RR at acme and 35.52±4.20 for P vs 25.70±5.24 U-CK/L plasma for RR after 30 minutes recovery).

In conclusion, we demonstrate that a chronic Rhodiola Rosea supplementation can be useful for sports activity, during endurance exercise by decreasing lactate levels, parameters of skeletal muscle damage as creatine kinase and ameliorating fatty acid consumption.

[1] De Bock K, Eijnde BO, Ramaekers M, Hespel P. Acute Rhodiola Rosea intake can improve endurance exercise performance. Int J Sport Nutr Exerc Metab. 2004; 14: 298-307

[2] Earnest CP, Morss GM, Wyatt F, Jordan AN, Colson S, Church TS, et al. Effects of a commercial herbal-based formula on exercise performance in cyclists. Med Sci Sports Exerc 2004; 36: 504-9

[3] Chen TS, Liou SY, Chang YL. Antioxidant evaluation of three adaptogen extracts. Am J Chin Med. 2008; 36: 1209-17

14:15 - 15:15

Poster presentations

PP-MB02 Molecular Biology 2

LOCALIZATION OF SEVERAL ANGIOGENIC FACTORS IN THE MOUSE MYOCARDIUM IN RESPONSE TO ENDURANCE TRAINING

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Introduction: Previous studies carried out in our laboratory showed the presence of hypertrophy associated with angiogenesis in the mouse myocardium in response to endurance training (I). Moreover, we analysed the expression of several angiogenic factors as VEGFR-1/Flt-1, VEGFR-2/Flk-1, HIF-1a, iNOS and MMP-9 showing that the exercise differently regulates their expression levels in the angiogenic hearts according to the intensity and length of endurance training (II).

The aim of this study was to examine the localization of VEGFR-1/Flt-1, VEGFR-2/Flk-1, HIF-1a, iNOS and MMP-9 in the same experimental model in order to observe in which cells these proteins are expressed in response to exercise.

Methods: Hearts from sedentary and trained mice were fixed with formalin, embedded with paraffin and cut to obtain 5μm sections that were used to perform the immunohistochemical analyses. Sections were incubated with the monoclonal primary antibodies for VEGFR-1/Flt-1, VEGFR-2/Flk-1, HIF-1a, iNOS and MMP-9 at specific concentrations. Nonimmune mouse serum was substituted for negative controls.

Results: We observed that VEGFR-1/Flt-1 and VEGFR-2/Flk-1 were specifically expressed by vascular endothelial cells of the myocardium. HIF-1 alpha was localized in nucleus of vascular endothelial cells and myocardiocytes. iNOS was expressed in cells of interstitial connective tissue and smooth muscle and MMP-9 localized in interstitium and vascular endothelial cells. We did not find any difference in the localization of these factors between sedentary and trained groups; instead we noted different expression levels between sedentary and trained groups and within the trained group in agreement with our previous data from immunoblotting analyses.

Discussion: Our results suggest that both VEGFR-1/Flt-1 and VEGFR-2/Flk-1 might be involved in the proliferation of capillary endothelial cells in the cardiac angiogenesis induced by exercise. The expression of HIF-1a suggests that brief and transient episodes of hypoxia may occur in the heart during cardiac cycle in response to endurance training. This factor could modulate the gene expression of VEGF to increase the angiogenic response of heart to exercise. The expression of iNOS suggests the production of NO by the cells of interstitial tissue and smooth muscle in order to promote the vascular relaxation fundamental in the early steps of angiogenesis. The localization of MMP-9 in the vascular endothelial cells and interstitium suggests that endurance training can promote the expression and release of pro-enzymatic form of MMP-9; and a possible conversion of pro-MMP-9 in the active form in the interstitium.

References

I) Bellafiore M et al.: Increased cx43 and angiogenesis in exercised mouse hearts. Int J Sports Med. 2007; 28:749-55.

II) Bellafiore M. et al.: Molecular factors involved in the angiogenesis process of exercised mouse hearts. 13th Annual Congress of the European College of Sport Science. Estoril, 9-12 July 2008, 13, p. 532.

ENDURANCE TRAINING RESTORES HEPATIC CARNITINE PALMITOYLTRANSFERASE ACTIVITY IN CACHECTIC TUMOUR-BEARING ANIMALS

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Introduction: Cancer cachexia is a syndrome characterized by various metabolic alterations, and liver lipid metabolism is markedly affected, in concommitance to systemic increased pro-inflammatory factor expression Our previous studies show that sub-maximal intensity endurance training is able to increase the capacity for fatty acid oxidation and regulate the inflammatory profile in the cachexia-inducing Walker 256 carcinosarcoma animal model .

Methods: The effect of endurance training on PGE2 levels and on the activity of hepatic carnitine palmitoyltransferase (CPT) system was studied in Walker 256 tumour-bearing rats. Animals were randomly assigned to a sedentary control (SC), sedentary tumour-bearing (ST), or exercise control (EC) and exercise tumour-bearing (ET) group. Trained rats ran on a treadmill (60%VO2max) for 60min/day, 5 days/week, for 8 weeks. The maximal activity of carnitine palmitoyltransferase system (CPT I and CPT II) in the liver was measured by radioassay. Gene expression of hepatic cyclooxygenase type 2 (COX-2) was measured by RT/PCR. PGE2 content in serum, liver and tumour tissue was determined by ELISA.

Results: Maximal activity of CPT I and CPT II were decreased ($p<0.01$) in ST (2.66±0.0 and 0.16±0.10 nmol min-1mg-1protein, respectively) as compared with SC (3.66±0.38 and 1.68±0.16 nmol min-1mg-1protein, respectively). In contrast, mRNA COX-2 in the liver of cachetic animals increased, as well as serum PGE2 (2526±132 pg/mL, $p<0.05$) when compared to SC (1901±259 pg/mL), and in liver (2030 ± 47 pg.ug protein-1, $p<0.05$) as compared to SC (997±36 pg.ug protein-1). High levels of PGE2 were found in tumour tissue (4580±88 pg.ug protein-1). Endurance training restored maximal activity of CPT I and CPT II in tumour-bearing (10.61±1.62 and 9.25± 1.12 nmol min-1mg-1protein, respectively, $p<0.0001$) when compared to ST. Besides, exercise restored PGE2 levels in the liver of cachectic rats (1150±53 pg.ug protein-1, $p<0.05$) and decreased PGE2 levels in tumour tissue (2750±96 pg.ug protein-1, $p<0.01$), as well as decreased hepatic COX-2 gene expression.

Discussion: Endurance training promoted the reestablishment of hepatic carnitine palmitoyltransferase (CPT) system activity that was a key role in lipid oxidation. This alteration was followed by a reduction in PGE2 levels in liver, serum and tumour mass in cachectic animals and a reduced COX-2 gene expression in liver. These changes in inflammatory state can be related with the improvement on lipid metabolism in tumour bearing rats, submitted to a treadmill sub maximal exercise.

References

Lira FS, Tavares FL, Yamashita AS, et al. (2008) Cell Biochem Funct, 26, 701-708.

Tisdale MJ. (2004). Langenbecks Arch Surg, 389, 299-305.
Barber MD, Ross JA, Fearon CH (1999). Surgical Oncology, 8, 133-141.

ACE ION/DELETION I/D POLYMORPHISM AFFECT ARTERIAL COMPLIANCE IN ENDURANCE ATHLETES

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Arterial stiffness is an important determinant of cardiovascular morbidity and mortality. The I/D polymorphism of angiotensin-converting enzyme (ACE) gene is associated with cardiovascular disease. However, the relationship between ACE polymorphism, arterial stiffness, and wave reflections in healthy, low-risk population has not been defined yet.
Objective: This study was aimed to evaluate the role of insertion/deletion (I/D) polymorphism in intron 16 of the ACE gene, in endurance master athletes.
Methods: A group of 41 white healthy male endurance athletes, aged between 36 and 45 years, were enrolled in this study. All of them participated primarily in endurance sports, training for at least >8 h/week, for at least 5 years. All subjects underwent clinical visit, rest electrocardiography and cardiopulmonary test. Maximal oxygen uptake (VO2max) was 46,7±7,6 whit Anaerobic Threshold (AT) at 62%±14,1. The ACE genotype (insertion [I] or deletion [D] alleles) was ascertained by polymerase chain reaction (DD 35, ID 36 and II in 3). Echocardiography analysis was performed using an ultrasound system with 3,7 MHz transducer, to evaluate systolic and diastolic left ventricular function. Arterial distensibility was assessed by augmentation index using the PulsePen tonometer.
Statistical analysis: A dominant model for I allele was assumed (DD vs ID+II). All statistical analyses were performed using the program SPSS 13.0.
Results: No difference was found between the 2 groups concerning subjects characteristics like age, body mass index (BMI), blood pressure (BP), VO2max and plasmatic markers. ACE-DD group showed an higher augmentation Index (AI) (24,9±11,5) by comparison with ACE-ID/II group (7,7±14,7), p=0,004.
Conclusions: Although endurance training is efficacious in increasing arterial compliance, we found that ACE-DD group is associated with a lower arterial compliance and this founding is independent on BP.

EFFECTS OF NAD PH OXIDASE P22PHOX POLYMORPHISM ON CARDIOVASCULAR REMODELING IN ENDURANCE ATHLETES

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Introduction: An acute bout of exercise increases the production of ROS through several mechanisms including (NAD(P)H. Even though regular physical exercise is generally reported to be the most effective non-pharmacological intervention to enhance the endogenous anti-oxidant capability and to alleviate oxidative stress-induced damages, its influence can be strictly affect by genetic aspect. We focused our attention on p22phox, a subunit of the NAD(P)H oxidase, and on its allelic polymorphism C242T, which is known to affect the functional activity of the enzyme. Aim of our study was to investigate whether p22phox C242T gene variants can influence cardiovascular adaptations to physical exercise in middle-aged endurance athletes. Methods: Seventy-three long distance male runners (26-44 years) participated to the study. All subjects underwent clinical visit, rest electrocardiography and cardiopulmonary test. The p22phox C242T polymorphism was determined by polymerase chain reaction-restriction fragment length polymorphism. Echocardiography analysis was performed using an ultrasound system with 3,7 MHz transducer, to evaluate systolic and diastolic left ventricular function. Arterial distensibility was assessed by augmentation index using the PulsePen tonometer. Statistical analysis: All statistical analyses were performed using the program SPSS 13.0. Results: The subjects were divided into two groups (CC and TC+TT) for further evaluation. There was no difference between demographic subject characteristics like age, BMI or biochemical examination. We did not found significant differences in left ventricle remodeling. About vascular function parameters TC+TT subjects showed a significant reduction (p=0,021) of augmentation index (7,7±15,6) by comparison with CC subjects (16,5±11,9). Moreover TT subjects showed a significant (p=0,010) lower DBP (75±5,7) by comparison with CT+TT subjects (79,4±7,9) and a significant lower (p=.,004) MBP (89,3±6,3) as compared whit CT+TT group (94,3±7,4). Conclusion: We found that p22phox polymorphism is associated with differential adaptive responses of cardiovascular system to aerobic exercise training, supporting a different oxidative state. Endurance athletes with TC+TT allele show better vascular compliance, thanks to a reduced susceptibility to the oxidative damage.

THE EFFECTS OF TRAINING AT DIFFERENT INTENSITIES UPON LIPID METABOLISM IN THE LIVER

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Introduction:
Low intensity continuous training (50-70% Vo2 max) is known to improve fatty acid oxidation in the skeletal muscle. However, there are few studies concerning the adaptations of lipid metabolism in response to intermittent exercise training in the liver. Intermittent exercise is characterized by repeated bouts of brief near-maximal or maximal intensity work, interspersed with periods of recovery (rest or low intensity work) (Glaister, 2005). We evaluated the capacity of intermittent exercise training to induce increased lipid metabolism in the liver, considering the important role of this organ during exercise. Many studies show that the adaptations of lipid metabolism in the liver are closely related with modulation of gene expression of the involved proteins.
Methods: Male adult Wistar rats were distributed in 3 groups: Sedentary (S), intermittent (IT) and continuous (CT) exercise trained. The IT rats swam for fifteen bouts (60-second, with a overload equal to 10% of the body weight). The CT rats swam 1 hour per day (overload 5% of the body weight). Both training strategies were performed 5 times a week, during 8 weeks (Lima et al., 2005).
The mRNA expression of fatty-acid transporter (FAT/CD36), apoliprotein B (apoB), microsomal triacylglycerol transfer protein (MTP) and the proliferator-activated- receptor (PPAR were assessed by real time PCR.
Results: No difference among the groups (P>0.05) was found regarding the expression of the studied proteins.

Discussion: Our aim was to compare the interference of the liver upon the systemic lipid metabolism using two different protocols: Intermittent (around 100% of the VO2max) and continuous (60%VO2max) exercise training. Despite the different exercise stimuli, we found no different adaptations between the groups. Therefore, we can speculate that the two protocols induce similar adaptation in regard to liver lipid metabolism (Chilibeck et al., 1998; Chapados et al., 2008).

References:

Chapados NA, Seelaender M, Levy E, Lavoie JM. (2008). Horm Metab Res, 40, 1-7.

Chilibeck PD, Bell GJ, Farrar RP, Martin TP. (1998). Can J Physiol Pharmacol, 76(9), 891-4.

Glaister M. (2005). Sports Med, 35(9), 757-77.

Lima WP, Carnevali LC Jr, Eder R, Costa Rosa LF, Bacchi EM, Seelaender MC. (2005), Clin Nutr, 24(6), 1019-28.

TGF-β ISOFORMS INHIBIT IN VITRO MIGRATION AND FUSION OF MYOGENIC PROGENITOR CELLS

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Introduction: Following muscle injury, the damaged tissue and influx of inflammatory cells stimulate the secretion of various growth factors and cytokines into the afflicted area to initiate repair processes. This release of chemotactic signaling factors activates resident myogenic precursor cells (quiescent satellite cells, other local sources of myocytes) and precursors from external fibers to participate in regeneration. These signaling molecules also control cellular responses required to stimulate the mobilization and migration of cells from distant niches to the site of injury, where fusion can occur to form myofibers. Specifically, sports injuries (e.g. muscle contusions) are a primary concern to athletes who cannot afford the time off to recuperate. While treatment options are limited and time-consuming, research has shown administration of autologous conditioned serum, which stimulates the release of growth factors aiding regeneration, to be a promising new approach by reducing recovery time (Wright-Carpenter et al, 2004). The three Transforming Growth Factor-ß (TGF-ß) isoforms and Insulin-like Growth Factor-I (IGF-I) are among the known factors released following muscle damage. We investigated the effect of TGF-ß1, -ß2, -ß3 and IGF-I on muscle progenitor cell migration and the effect of TGF-ß isoforms on myoblast fusion.

Methods: The C2C12 skeletal muscle satellite cell-line was used to determine the effect of recombinant active TGF-ß1, -ß2 and -ß3, IGF-I and TGF-ß isoforms + IGF-I on the migration of myogenic precursor cells. In addition, the effect of 72 hr TGF-ß treatment was analysed on C2C12 fusion.

Results: IGF-I significantly increased migration compared to TGF-ß isoforms which had no effect on the mobilization of C2C12 cells. Although all isoforms decreased IGF-I-induced cell migration, the number of migrated cells was still significantly higher compared to control. Myoblast fusion was significantly reduced in all TGF-ß-treated C2C12 cells.

Discussion: The ability to regulate cellular processes in response to injury could be of important therapeutic value (Smith et al., 2008). We have previously shown that all three TGF-ß isoforms significantly increase C2C12 satellite cell proliferation (Schabort et al., 2009). We have now gone on to show that both myocyte migration and fusion are negatively regulated by all three isoforms. By distinguishing the factors involved in, and the molecular signals required for myoblast recruitment during repair processes, strategies can be developed towards improved cell-mediated therapies for muscle injury. Future research should involve in vivo combined-effects studies using multiple growth factors. These results highlight the importance of understanding the cytokine milieu of progenitor cells when determining viable treatment options.

References

Smith C, Kruger M, Smith R, et al. (2008). Sports Med, 38(11), 947-969.

Wright-Carpenter T, Opolon P, Appell H, et al. (2004). Int J Sports Med, 25(8), 582-587.

Schabort E, Van der Merwe M, Loos B, et al. (2009). Exp Cell Res, 315(3), 373-384.

THE MODULATION OF LIPID METABOLISM-RELATED GENES IN THE LIVER OF TRAINED TUMOUR-BEARING RATS.

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Introduction: Lipid metabolism in the liver is clearly altered by the syndrome of cancer cachexia. Previous studies by our group have shown that, in one such model, liver capacity for the oxidation of long chain fatty acids and for ketone body production is decreased (Seelaender et al., 1996). The activity of the CPT (carnitine palmitoyltransferase) enzyme complex, the main step in the control of mitochondrial long chain fatty acid transport, is reduced in cachectic rats, aggravating cachexia Regular moderate exercise is known to contribute for the prevention of cancer, enhancing resistance against tumour growth. (Lira et al., 2008). A previous study by our group showed that moderate exercise training (60% VO2max, 60min per day, 5 day a week, for 8 weeks) may increase hepatic lipid oxidation and augment very low density lipoprotein (VLDL) secretion in the trained tumour-bearing rats (Lira et al., 2008). Changes in lipid metabolism are closely related with associated protein gene expression modification, which is in many cases, mediated by mechanisms dependent on the activation of PPARs. Some studies show that training is able to induce gene expression of proteins such as CPT I, CPT II, PPARalpha, FABP. Hence, we investigated whether 8 weeks of moderate training would promote changes in the liver lipid metabolism in tumour-bearing rats.

Methods: Male adult Wistar rats were distributed in 4 groups: Sedentary control (SC), Sedentary tumour-bearing (ST), exercise-trained control (EC) and exercise trained tumour-bearing (ET). The mRNA expression of fatty-acid binding protein (FABP), apoliprotein B (apoB), microsomal triacylglycerol transfer protein (MTP), Carnitine Palmitoyltransferase I (CPT I), Carnitine Palmitoyltransferase II (CPT II), peroxisome proliferator-activated- receptor alpha (PPAR alpha) were assessed by real time PCR.

Results: Cachexia (tumour vs control group) induced an increased gene expression of PPAR alpha ($P<0.028$), CPT I ($P<0.026$), CPT II ($P<0.009$) and FABP ($P<0.033$). Moreover, MTP and apoB genes were shown to be affected by both cachexia and training ($P< 0.006$ and $P< 0.012$ respectively).

Discussion: Our results indicate a strong modulation of lipid metabolism-related gene expression both by cachexia and training. Previous studies by our group have shown that moderate endurance training was efficient in improving VLDL secretion in the tumour-bearing rats. Our present data confirmed such results and additionally indicated that the tumour presence per se induced a higher gene expression of such proteins in an attempt to restablish the hepatic cell function. We conclude therefore, that the endurance training was efficient to promote a higher modulation of lipid metabolism-related genes in the liver of tumour-bearing rats.

References

Lira FS, Tavares FL, Yamashita AS, et. al.(2008). Cell Biochemistry and Function, 26, 701-708.
Seelaender MC, Nascimento CM, Curi R (1996). Biochem Mol Biol Int, 1037-1047.

LEPTIN RECEPTOR EXPRESSION IN HUMAN SKELETAL MUSCLE.

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Leptin plays a crucial role in the regulation of appetite, body fat mass and basal metabolic rate. We have recently shown the presence of leptin receptor (OB-R), long and short protein isoforms, in human skeletal muscle. Human obesity is characterised by a high concentration of leptin in plasma associated with leptin resistance. Yi-Wen Chen et al, showed OB-R expression in human muscle fibers from immobilized muscles whereas no positive signals were observed in healthy control muscles using traditional Immunohistochemistry.

Purpose. The aim of this study was to determine the cellular distribution of leptin receptors (OB-R) at the protein level in healthy human skeletal muscle.

Methods. Muscle biopsies were obtained from the musculus vastus lateralis in fourteen, healthy men (age = 33.1 ± 2 yr, height = 175.9 ± 1.7 cm, body mass = 81.2 ± 3.8 kg, body fat = 22.5 ± 1.9%). The expression of OB-R was determined by immunohistochemistry and indirect inmunofluorescence. Serial 5-μm-thick frozen muscle sections were cut from muscle biopsies obtained from the musculus vastus lateralis, and incubated using a polyclonal rabbit anti-human leptin receptor, a polyclonal rabbit anti-perilipin A and the blue-fluorescent DAPI nucleic acid stain. The specificity of the anti-OB-R antibody was confirmed in our laboratory by Western Blot (Guerra et al., 2007).

Results. OB-R protein was localized in the subsarcolemmal regions of the subject's muscle fibers and this pattern was revealed by an antibody specific for the OB-R long isoform (170 KDa), which is not expressed in the adipose tissue. The OB-R staining near the perinuclear region was negative. There was no co-localization between Perilipin A (a protein exclusively expressed in adipocytes) and the OB-R long isoform. No clear fiber-type specific pattern was observed.

Conclusion. The long isoform of the leptin receptor is abundantly expressed in the subsarcolemmal regions of the skeletal muscle fibers of the m. vastus lateralis in healthy humans.

References.

Guerra et al., J Appl Physiol. 102:1786-92, 2007.
Yi-Wen Chen et al., Physiol Genomics 31: 510–520, 2007.

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14:15 - 15:15

Poster presentations

PP-HF08 Health and Fitness 8

OBESITY AND THE METABOLIC SYNDROME IN GREEK CHILDREN AND ADOLESCENTS

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Introduction: The increasing prevalence of the MS and its components in young populations (Steinberger & Daniels, 2003) suggests that the onset of the syndrome in adulthood may has its roots early in life (Katzmarzyk et al., 2001) and underlines the need for early identification of the condition. In Greece, an alarmingly increase in the prevalence rates of childhood obesity has been documented, accompanied by unfavourable blood lipid profiles and high blood pressure values (Angelopoulos et al. 2006; Bouziotas et al. 2001). However, there is a paucity of data examining the clustering of metabolic risk factors in Greek pediatric populations. The aim of the present study was to determine the prevalence of obesity and the MS in Greek children and adolescents.

Methods: The sample consisted of 112 primary (mean age11.4±0.4 years) and 279 high school students (mean age13.6±0.9 years) living in Central Greece. Data was obtained on children anthropometry, blood pressure, fasting glucose and fasting lipids. The body mass index cut-off points adopted by the International Obesity Task Force (Cole et al. 2000) were utilized for the assessment of overweight and obesity. MS was defined using criteria analogous to the Adult Treatment Panel III definition (De Ferranti et al. 2004) Chi-square tests were used for statistical analyses. The level of significance was set at $p<.05$.

Results: Using the International Obesity Task Force's (IOTF) BMI cut-off points, the prevalence of overweight and obesity was estimated to be 29.5% and 10.7% among primary school and 26.2% and 11.1% among high school students, respectively. 7.2% of the participants were diagnosed with MS, without differences between education levels (primary education: 5.4%, secondary education: 7.9%, $p>0.05$). The prevalence of the syndrome increased directly with the degree of obesity (normal weight: 5.0%, overweight: 7.6%, obese: 18.6%, $p<0.006$).

Discussion/Conclusion

In the present cohort of Greek children obesity and MS prevalence were alarmingly high. MS prevalence was extremely high in obese schoolchildren. Given that obesity and other cardiovascular risk factors track from childhood into adult life, these data suggest that the prevalence of MS among Greek adults will increase, unless effective prevention efforts will be implemented early in life.

References

Angelopoulos PD, Milionis HJ, Moschonis G, Manios Y (2006). Eur J Clin Nutr, 60(10), 1226-1234.
Bouziotas C, Koutedakis Y, Shine, R, Pananakakis Y, Fotopoulou V (2001). Ped Exerc Sci, 13, 173-184.
Cole TJ, Bellizzi C, Flegal KM, Dietz WH (2000). BMJ, 320, 1240-1253.
De Ferranti SD, Gauvreaub K, Ludwig DS, Neufeld EJ, Newburger JW, Rifai N (2004). Circulation, 110, 2494-2497.

Katzmarzyk PT, Perusse L, Malina RM, Bergeron J, Després JP, Bouchard C (2001). J Clin Epidemiol, 54, 190-195.
Steinberger J, Daniels SR (2003). Circulation, 107, 1448-1453.

THE ASSESSMENT OF LEAD OCCURRENCE FREQUENCY IN THE BLOOD OF CHILDREN FROM THE INDUSTRIAL REGION

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Introduction: Lead is one of these elements whose occurrence in the environment causes its degradation. In recent years our knowledge about toxic effects of lead on human organism increased significantly (Andrzejak, Smolik, 1996). Children and youth are the most sensitive to the toxic influence of lead, therefore they constitute a higher risk group than adults. Negative health effects caused by lead are observed in almost every systems and organs, however the most significant changes appear in the nervous system, kidneys and the hematopoietic system. The toxic effects of lead include lowering one's intelligence, weakening neurobehavioural development and general impairment of development (Ignasiak et al. 2006, 2007). In Poland several measures were taken in the 1990s to limit lead emissions to the environment, especially in ecologically threatened regions.
The aim of our work is to estimate lead concentration in the blood of rural children and youth living in ecologically threatened areas in 1995 and 2007.
Methods
Since 1995 we have been conducting research regarding health and development of children and youth from the industrial region of Lower Silesia (Legnica-Głogow Copper District). To meet the objectives of the presented work we concentrated on the amount of lead in the blood of children aged 7 – 15 examined in 1995 and 2007. A blood sample was drawn by venipuncture and tested for lead level by atomic absorption spectrometry in a graphite furnace. 1591 people were tested, 899 in 1995 and 692 in 2007.
Results: Comparing the concentration of lead in the blood of girls and boys, a significant decrease is observed in the 2007 research. The highest percentage of children tested in 1995 indicated the concentration of lead in the range 5 – 10 μg/dl, while in 2007 the largest group of the tested children had their concentration in the range 0 – 5 μg/dl.
The apparent decrease of lead concentration in the blood of children and youth in 2007 may be connected to the significant limitation of lead emissions by the copper industry.
References
Andrzejak R, Smolik R. (1996). Post. Hig. Med. Dosw., 50, 6, 581-585
Ignasiak Z, Slawinska T, Rożek K, Little B.B, Malina R.M. (2006). Annals of Human Biology, vol.33, 4, 401-414
Ignasiak Z, Domaradzki J, Slawinska T, Krynicka I. (2006). Polish Journal of Environmental Studies, vol.15, 5B, 1, 122-124.
Ignasiak Z, Slawinska T, Rozek K, Malina R.M, Little B.B. (2007). Annals of Human Biology, vol.34, 3, 329-343.

CROSS-SECTIONAL ANALYSIS OF OBESITY IN CHILDREN BETWEEN 3 AND 12 YEARS IN RURAL POPULATION

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Introduction: This study examines the state of obesity between boys and girls of primary school education in a rural area, aged between 3 and 12 years. To conduct this analysis, we have updated references to studies of subjects with similar characteristics. The aim of this study was to identify the characteristics of the sample of rural community and compare it with the national average.
Methods: In this work involved 519 subjects of both sexes, belonging to rural villages. Were organized into age groups: G1 (3, 4, 5 years), G2 (6, 7 years), G3 (8, 9 years), G4 (10, 11 years), G5 (12 years). It has weight and height measurements and from these data have been obtained for BMI (Body Mass Index). We have used the statistical program Statistica (for Windows, v 7.0).
Results: Looking to the average values obtained in relation to height, weight and BMI, we see that all are above average, compared to data obtained by the "Research Institute Growth and Development". Only one case was found near the risk BMI (G1 male). Furthermore no significant differences were found between boys and girls in any of the three variables studied. By gender, comparing one group with the following significant differences were observed in all cases, except in weight between the G4 and G5 male in height between G4 and G5 both female and male, and all in between BMI.
Discussion: As can be seen in the data obtained, the averages of all the subjects are above the national reference, which may indicate that they have healthy levels but above the average. Furthermore, analyzing the relationships in BMI there was no significance in the references made, there are no differences. Finally, both the weight and height, there is an important significance, obtained by a general $p < 0.001$, so if there are differences.
References:
Fundación Faustino Orbegozo Eizaguirre (2004). Growth curves and tables. Fundación Faustino Orbegozo Eizaguirre. Bilbao.
Clavijo, Z. (2009). Aspects to relationship between obesity and hypertension. Int J Med Sci Phys Educ Sport, 5(1):49-58.
Bastos, A. A., et cols. (2005). Obesity, nutrition and physical activity. International journal of medicine and science of physical activity and sport, 5 (18). (consulted 10 – 2 - 2009)

SEDENTARY BEHAVIOUR AND INTENSITY-LEVELS OF PHYSICAL ACTIVITY VARIATION DURING ADOLESCENCE YEARS IN BOYS

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Introduction: Active lifestyles are a topic of current scientific discussion, especially in terms of health promotion and disease prevention. On the other hand, sedentary habits are indicated as a major risk factor for morbidity in adults, and also are increased among children and adolescents. However, most studies have not measured sedentary behaviour or differentiated it from light activity (Pate et al., 2008). The present study examines the age-variation of sedentary habits and physical activity [PA] in its different intensities portions among a sample of male adolescents.
Methods: The sample comprised 173 boys [13-14 years, n=108; 15-16 years, n=65]. Somatic characteristics included body weight, height, sum of six skinfolds and umbilical circumference. PA was estimated using an uniaxial accelerometer (Actigraph,7164) on five consecutive

days assuming a minimum amount of 10h of valid data per day (criterion of inclusion). Freedson et al (1997) and Puyau et al. (2002) cut-points were used to data analysis of PA intensities-levels and sedentary behavior, respectively. Age effect was tested on intensity-levels of physical activity and sedentary habits.

Results: Compared with younger group, older boys are taller [13-14yr: 159.9±9.3 cm; 15-16yr: 170.6±5.9 cm; t=-7.898; p<0.001] and heavier [13-14yr: 50.3±10.9 kg; 15-16yr: 62.6±10.1 kg; t=-7.430, p<0.001]. No significant differences were found for BMI [13-14 yrs: 19.51±3.09 kg/m2; 15-16 yrs: 21.51±3.37 kg/m2]. Both 13-14 and 15-16 years-old groups were less sedentary on week-end than during week days, and no significant differences were found throughout week between groups. Younger boys were significant more active on high intensity level of PA than their counterparts in both week [13-14yr: 108±39 min; 15-16yr: 74±31 min; t=6.004, p<0.001] and week-end days [13-14yr: 66±40 min; 15-16yr: 49±32 min; t=2.783, p<0.01]. Moderate to very vigorous PA had a substantial decrease from week days to week-end on two compared groups.

Conclusion: The present study showed that older adolescents were less active than younger boys, especially on moderate to very vigorous PA. In addition, it was found a decrease of high PA intensity-levels and also in the sedentary habits at the week-end. Then, physical activity and sedentary behaviour could not be two sides of the same coin, and it requires the need to track sedentary activities across the second decade of life by longitudinal design studies.

References:

Pate et al. (2008). Exerc. Sport Sci. Rev., 36 (4), 173-178.

Freedson et al. (1997). Med Sci Sports Exerc, 29: 45.

Puyau et al. (2002). Obesity Research, 10 (3):150-157.

LOSS OF LEAN BODY MASS DURING AN 8-WEEK INPATIENT PROGRAM DOES NOT REDUCE VO2PEAK IN OBESE ADOLESCENTS

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Introduction: Loss of muscle mass is a frequent observation in inpatient weight reduction programs. The aim of this study was to evaluate if rapid reduction of lean body mass (LBM) was associated with a change of peak oxygen consumption (VO2peak) in severely obese adolescents. The investigation was undertaken during a multidisciplinary inpatient weight reduction program consisting of daily physical activity, a balanced nutrition regimen, and behavioural modifications (Knöpfli et al., 2008).

Methods: 90 severely obese adolescents (33 girls and 57 boys) with a median (25th, 75th percentile) age of 14.3 years (12.3, 15.8) and a median BMI of 33.5 kg/m2 (30.6, 37.3) were analyzed. LBM and VO2peak were measured before and after an 8-week intervention. Patients were randomized to receive either daily supervised exercise training including whole body vibration (WBV; Powerplate®) 3 times per week or exercise training and educational sessions without WBV. The correlation between the changes in LBM and VO2peak was analysed and the influence of WBV training was investigated. Pre-post treatment differences were analyzed with the Wilcoxon signed rank test. Linear uni- and multivariat regression models were used to analyze correlations between primary outcome parameters.

Results and Discussion: The intervention significantly improved VO2peak by 8.7ml/min/kg (6.0, 11.9; p<0.001) in all subjects despite an average loss of LBM of 0.8kg (0.2, 2.0; p<0.001). No correlation could be found between changes in VO2peak and LBM for the total population (r2<0.001; p=0.925). We assume that individuals experiencing a rapid weight loss may not need all muscles any longer to the same extent for their daily activities resulting in a LBM decrease. For subjects receiving WBV training, a positive correlation between changes of VO2peak and LBM could be observed (r2=0.114; p=0.023) resulting in a stronger improvement of VO2peak in subjects with increasing LBM, which was not the case in the control group.

Conclusion

In a multidisciplinary inpatient weight reduction program in severely obese adolescents, the improvement of VO2peak is independent of a possible loss of LBM and can additionally be increased by WBV training.

References

Knoepfli BH, Radtke T, Lehmann M, Schaetzle B, Eisenblaetter J, Gachnang A, Wiederkehr P, Hammer J, Wildhaber J (2008). J Adolesc Health, 42, 119-127.

GROWTH OF CHILDREN FROM RIO MAIOR, PORTUGAL. COMPARISION WITH LISBON REFERENCES AND THE WORLD HEALTH ORGANISATION <WHO> STANDARDS

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Introduction: Physical growth of a population is an indicator of the quality of life, reflecting both social, economic and political conditions of the environment. Better conditions lead to improved physical growth, namely in height (Bogin, 1999). Therefore, the aims of this study were to document the physical growth of children from Rio Maior-Portugal (2007) and to compare these data with references from Lisbon (2001) (Fragoso & Vieira, in press) and the WHO standards, using anthropometry.

Methods: We assessed 823 children (421 boys), 3 to 9 years old, from the Rio Maior county's public and semi-public school network. Informed consent and assent were obtained. Height, weight, subscapular and triceps skinfolds were measured according to the International Society for the Advancement of Kinanthropometry (Marfell-Jones et al., 2006). Descriptive statistics and one sample t-test were used to compare results between samples. The alpha value was set at less than 0.05.

Results: From 3 to 9 years old, the values of the anthropometric measures follow the expected tendency (increase with age). Compared with Lisbon, Rio Maior children's generally had higher mean values in weight and height. Statistical significant differences were found in boys at 9 years (height and weight) and in girls at 4, 5 and 7 years for weight and at 4 years, for height. Although the higher weight found in Rio Maior, skinfolds were not higher than in Lisbon. Looking at WHO standards for height and weight, the same tendency was found. Statistical significant differences were found in boys at all ages except at 3 years (height and weight) and, in girls, at all ages except at 3 years for weight and from 6 to 9 years in height.

Discussion: Concerning to physical growth, we infer that children from Rio Maior live in better environmental conditions than those from Lisbon. Considering the differences found in weight and the values of the skinfolds, we presume that Rio Maior children's are heavier, but not due to fat mass. However, we must keep in mind the difference in data collection year between Rio Maior and Lisbon. Regarding

WHO standards Rio Maior children's generally present higher mean values either in height and weight. Life conditions should be studied to better understand these differences.

References

Bogin B (1999). Patterns of Human Growth. Cambridge University Press, Cambridge.

Fragoso I, Vieira F (in press). Reavaliação Antropométrica da População Infantil de Lisboa. Tendência Secular. Edição Câmara Municipal de Lisboa, Lisboa.

Marfell-Jones M, Olds T, Stewart A, Lindsay Carter, JE (2006). International Standards for Anthropometric Assessment. The International Society for the Advancement of kinanthropometry, Australia.

WHO. www.who.int/growthref/en

METHODS FOR DETECTING AND MONITORING CHANGES IN BODY COMPOSITION AND FUNCTIONAL CONDITION LIKE ADOPTED METHOD BY YOUNG POPULATION

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Introduction: Specific playtime or sport locomotion induced load of young population will be manifested in the functional status in their body composition (BC) and by the condition of the locomotive system's executive structures. The monitoring and determination of changes in BC, in particular the body water volume and the body fat percentage and fat free mass has become a standard procedure of detecting the current state of health and appropriate training activity. BC and its changes during the ontogenetic development is a significant parameter of an individual's ontogenetic development (Bunc and Dlouhá, 1998). It may help us to diagnose overtraining (Roche et al. 1996) or incomplete player's adaptation to training load. Observing of contracted muscle tissue were based on method Functional muscle test by Janda (1995) and dynamic range of joints.

Methods: Bioelectric impedance methods represent modern non-invasive methods for the determination of BC, both in laboratory and field conditions (Fidanza, 1991; Lukaski, 1987).

The condition of the locomotive system will be determined by means of an examination detecting shortened muscles. We used 3 rank scale for testing from unshortened to much contracted muscles (Janda, 1995). For dynamic range we used angular measuring.

Results: The results of the BC have shown asymmetries in the distribution of body liquids between the lower extremities, upper extremities and the trunk. Kinesiological testing of probands diagnosed the occurrence of numerous muscular shortenings in muscular groups specifically participating in moving. The most prominent muscular shortenings are found in the area of the dominant lower extremity and in the area of the dominant upper extremity.

Discussion and conclusions

Based on this study, we should decide, that these methods are useful for detecting of changes in motional apparatus of body. We presume that the dominant and therefore the more loaded body segments, or muscular groups of population, contain more body liquid as a result of morphological changes in the muscular tissue. Another potential field of the used methodology implementation includes diagnostics of sport induced injuries of the locomotive apparatus, or the convalescence period (using changes in the volumes of liquid in the respective segment). We, therefore, assume that the occurrence of muscular shortenings and dynamic range of joints are caused by the unilaterality of the locomotive activity during moving and by insufficient and inadequately targeted compensation mechanisms.

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References

Bunc V, Dlouhá R. (1998). Med. sport. bohem. slov., 7(3), p.89

Fidanza , F. (1991). Nutritional Status Assessment- A manual for population studies, London: Chapman & Hall, 1991

Janda, V. (2004). Svalové funkční testy. Praha: Grada.

Lukaski, HC. (1987). American Journal of Clinical Nutrition, 46, 537-556.

Roche AF, Heymsfield SB, Léhman TG. (1996). Human Body Composition, Champaign: Human Kinetics.

PHYSICAL ACTIVITY AND MOTOR FUNCTION IN PRIMARY SCHOOL STUDENTS OF RURAL AND URBAN ENVIRONMENTS

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Physical activity (PA) is considered as an important factor for public health. In contrast to its impact, PA decreases in most western civilizations. It is stated that changes in transportation, media access as well as activity-toxic environments are the main reasons for the drift towards a less active population. In addition to health factors, it is assumed that subjects with low PA also show deficits in motor function (MF, e. g. acceleration, physical endurance, coordination). Following the argumentation that urban environments are crucial for lower PA, this study compared PA and MF of children living in an urban and in a rural area in the north of Germany.

To reflect urban situations, 58 children (30 girls, 9.8 ± 0.7 years, 139.8 ± 5.8 cm, 33.4 ± 6 kg, BMI 17.0 ± 2.3) of a primary school in Bremen were recruited. As rural equivalents, 58 children (31 girls, 10.1 ± 0.7 years, 144.3 ± 7.4 cm, 34.7 ± 6.2 kg, BMI 16.5 ± 2) were included from three primary schools in the region "Wendland" (district Lüchow-Dannenberg).

PA was assessed with the Step-Activity-Monitor (OrthoCare Innovations, USA) storing the number of gait cycles for 7 consecutive days. Motor skills were evaluated by the AST 6-11 [1] during physical education in school. All procedures were carried out within four weeks to avoid seasonal effects. The data was tested for normal distribution and significant differences by t-tests or Wilcoxon signed-rank tests.

In PA, children of the urban and the rural area showed high significant differences ($p<0.01$) by accumulating 7569 ± 1559 and 9724 ± 2206 gait cycles per day on average, respectively. An area-related significant difference is also found when separating in weekdays vs. weekend ($p<0.01$) and by gender ($p<0.01$). The mean score as well as all subcategories except of 'steeplechase' of the AST 6-11 revealed significant differences ($p<0.01$) between the children from rural and urban area. Significant area-related differences ($p<0.01$) were found when distinguishing between by gender as well as between skills reflecting coordination or physical condition. Moderate correlations were found between number of daily steps and AST 6-11 ($r=0.3$, $p<0.05$).

In MF, the children of the urban area achieved comparable results to the reference of BÖS [1]. However, children of the rural area exceeded the values by far. PA of children in the urban area was lower, activity of children from the rural area was higher than values

obtained from a smaller city in Germany [2]. Due to the similarities of the subjects, the rural environment can be considered as the determining factor for more PA and enhanced motor skills. The link between daily PA and motor skills might increase in adults due to the lapse of the institutionally organized school day.

Acknowledgements: we thank the motionlab-muenster for providing additional monitors.

[1] Bös et al., 2000, Haltung und Bewegung 20(2), 5-16.

[2] Uhlenbrock et al., 2008, Dtsch Z Sportmed 10, 228-33.

PEDOMETER-DETERMINED PHYSICAL ACTIVITY LEVELS OF PORTUGUESE ADOLESCENTS. DIFFERENCES BY GENDER, BODY MASS INDEX AND TIME OF WEEK

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Introduction: The increasing prevalence of overweight and obesity in adolescents is a major public health problem. A sedentary lifestyle is implicated in the development of these conditions (Bouchard et al., 2006). Therefore it is essential to develop interventions that will increase the physical activity levels (PAL) in adolescents. The aims of this study were: (1) to examine current levels of pedometer-determined PAL in Portuguese adolescents and (2) to investigate the variation in PAL among weekday and weekend step counts, gender and body mass index (BMI).

Methods: A cross-sectional study was carried out in the city of Matosinhos, northern Portugal, in 2008. A total of 345 adolescents of both gender (girls-n=179; boys-n=166; mean age:13.6±1.2) attending basic schooling was surveyed. PAL was assessed using an electronic pedometer (OMRON HJ-113-E) to measure mean steps counts for 5 consecutive days (2weekend/3weekdays). Adolescents were classified as normal-weight, overweight, or obese using international BMI cut-off points suggested by Cole et al. (2000). Differences in adolescents PAL between gender, BMI and time of week were assessed by ANOVA models. Data were analyzed using SPSS version 16.0.

Results: (1) Mean step counts for this sample were 9871.7±3364.9 (girls) and 13159.1±4142.5 (boys) on weekdays, and 5081.5±3037.9 (girls) and 6396.8±3696.5 (boys) on weekends. (2) Significant differences in step counts were observed between weekdays and weekends ($P<0.001$) and among gender ($p=0.004$). (3) Twenty-five percent of adolescents were overweight (girls=23.9%; boys=26.0%) and 7.6% were obese (girls=11.3%; boys=4.1%). (4) No significant differences in PAL were found between normal-weight, overweight and obese adolescents ($p=0.345$). (5) No significant interaction between gender and BMI was found ($p=0.523$).

Discussion: The results showed that pedometer-determined PAL dropped significantly on weekends when compared with all other days of the week and boys were more active than girls. Similar results have been found previously in other reports (Van der Horst, 2007; Duncan et al., 2006). Like other studies no evidence of a link between PAL and BMI in adolescents was found (Van der Horst, 2007). In summary the findings of this study emphasize the importance to develop programmes of PAL that would specially focus on girls and during the weekend.

References:

Bouchard C, Blair S, Haskell, W. (2006). Physical activity and health. Champaign: Human Kinetics.

Cole, T.J.; Bellizzi, M.C.; Flegal, K.M.; Dietz, W.H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ – British Medical Journal, 320: 1-6.

Duncan, J., Schofield, G. & Duncan, E. (2006). Pedometer-determined Physical Activity and Body Composition in New Zeland Children. Med.Sci.Sports Exerc. 38: 1402-1409.

Van Der Horst K, Paw MJ, Twisk JW, Van Mechelen W. (2007). A brief review on correlates of physical activity and sedentariness in youth. Med Sci Sports Exerc. 39: 1241-1250.

INFLUENCE OF DEMOGRAPHIC AND SOCIAL-CULTURAL CORRELATES IN PHYSICAL ACTIVITY. A STUDY IN PORTUGUESE ADOLESCENTS FROM 12 TO 16 YEARS

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Introduction: It is absolutely certain that physical activity (PA) is very important to promote an healthy lifestyle, not only in early childhood and adolescence, but also during adulthood (Kristensen et al., 2008). This behaviour which seems to be determined by an interaction between someone's genetical inheritance and its family and schooling influence, plays, nowadays, a very important role in preventing disease and premature death, with clear benefits to adolescence and adulthood (Rowland, 2006). It is, therefore, extremely important to identify the correlates of participating in PA, that is, the personal characteristics and the participating factors, which have an influence upon the usual PA patterns (Van der Horst et al., 2007). The purpose of this study was to determine the association between adolescents PA and demographic (age, gender and body mass index (BMI)) and social-cultural correlates (family PA and peers influences). Methods: A cross-sectional study was carried out in the city of Matosinhos, northern Portugal, in 2008. A total of 345 adolescents of both gender (girls-n=179; boys-n=166; mean age:13.6±1.2) attending basic schooling was surveyed. PA was assessed using an electronic pedometer (OMRON HJ-113-E) to measure mean steps counts for 5 consecutive days (2weekend/3weekdays). Factors associated with adolescents PA were investigated using multiple regression. Data were analyzed using SPSS version 16.0. Results: (1) age and BMI were not related to adolescents PA; (2) boys were more involved in PA than girls; (3) siblings PA had a positive and significant influence in the adolescents' PA; (4) no significant influence of father, mother and peers were found. Discussion: Demographic and social-cultural correlates - in particular gender and siblings PA - were significantly associated with adolescents' PA. Portuguese boys were more physically active than girls, which is consistent with other studies (Van der Horst et al., 2007). It is generally accepted that socio-cultural support, namely family and peers influence, is important and critical for child and adolescent development, interest and involvement in PA. However, in this study only siblings seem to exert a positive influence upon the habits of PA. In summary these results suggest that intervention programmes should focus on girls who face a higher risk of inactivity and need to include siblings because they positively influence adolescents' PA. References: Kristensen PL, Moller NC, Korsholm L, Wedderkopp N, Andersen LB, Froberg K. (2008). Tracking of objectively measured physical activity from childhood to adolescence: the European youth heart study. Scand J Med Sci Sports. 18: 171-178. Rowland T. (2006). Physical activity, fitness, and children. Physical activity and health. Champaign: Human Kinetics. 259-270. Van Der Horst K, Paw MJ, Twisk JW, Van Mechelen W. (2007). A brief review on correlates of physical activity and sedentariness in youth. Med Sci Sports Exerc. 39: 1241-1250.

14:15 - 15:15

Poster presentations

PP-HF09 Health and Fitness 9

ADOLESCENTS TRYING TO LOSE WEIGHT: PREVALENCE, PHYSICAL ACTIVITY, AND WEIGHT LOSS STRATEGIES IN 13 TO 15 YR OLD NORWEGIANS

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UNIVERSITY OF AGDER

Purpose

The purpose of this study was to quantify the prevalence of weight loss behaviour in Norwegian teenagers from age 13 to 15 and compare weight loss behaviour with anthropometrics, body image, and physical activity characteristics.

Methods

Norwegian adolescents from 12 public schools (n= 1059), initially 13.4±0.4 years (8th grade) were tested during the fall of their 8th, 9th and 10th grade years. Height, weight and BMI were recorded. Physical activity (PA), body image and body change strategies were measured by questionnaire. Current and desired body shapes were quantified using a 9-silhouette scale. A normally distributed physical activity index was derived from 6 different questions related to sports activity, transport to school, school physical education participation, and frequency of intense PA.

Results: Physical activity index (0-25 pt scale) decreased modestly in both genders from 8th to 10th grade (F: 10.9±3.5 to 10.1±4.1; M: 13.1±4.2 to 12.2±4.6, $p<0.05$). Males were more physically active than females at all 3 time points ($p<0.05$). Cole et al standards based overweight prevalence was 11.4% and 13.2% in females and 13.4% and 13.5% in males at age 13 and 15 respectively. Females reported a significant discordance between present and desired body shape that increased from age 13 to 15 (13 yrs: 4.7±1.3 vs. 4.2±0.9; 15 yrs: 5.1±1.2 vs. 4.3±1.0, $p<0.05$), and more females than males were trying to lose weight (13 yrs: F: 24%, M: 10%; 15 yrs: F: 35%, M: 10%, $p<0.05$). Males reported no discordance between present and desired body shapes. By age 15, males more frequently reported trying to gain weight (13yrs: F: 7 %, M: 9%; 10th: F: 5%, M: 17%, $p<0.05$). 15 yr olds trying to lose weight had significantly higher mean BMI values but also greater variation in BMI (F: 24.0± 3.6, M: 25.2±4.5), and 15 yr olds trying to gain weight had significantly lower BMI values (F: 18.0±1.8, M: 18.4±1.7) compared to those not trying to change their weight (F: 20.7±2.4, M: 20.0±2.0) or stay the same weight (F: 21.3±2.2, M: 21.4±2.4) ($p<0.05$). However, PA index was not significantly different among the 4 weight strategy groups. Among the 35% of 15 yr old females in the sample who reported trying to lose weight, 84 % reported using exercise, and 72% reported trying to reduce caloric/fat intake.

Conclusions

Norwegian female adolescents report discordance between desired and present body shape and a prevalence of weight reduction behavior clearly exceeding the prevalence of objectively identified overweight. In contrast, male adolescents show no body shape discordance and report marked lower prevalence of weight reduction efforts despite similar objectively measured overweight prevalence.

EFFECTS OF A TWO-YEAR ADDITIONAL PHYSICAL EDUCATION PROGRAM ON PHYSICAL PERFORMANCE AND SELF-PERCEPTION IN OVERWEIGHT GIRLS

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Introduction: A relatively small number of longitudinal studies have been designed to evaluate the impact of physical activity (PA) on physical performance and self-perception in overweight children. Data suggest that the rising prevalence of obesity has occurred simultaneously with changes in PA patterns (Wareham, 2007), and that an age-related decline have occured in both physical education (PE) participation and out of school PA in the last years, with decrease more marked for girls than boys (Nader et al., 2008).This study investigated the effects of two-year additional PE lessons program (2 times.week-1) on motor abilities, phisical self-efficacy, and body image in primary school children.

Methods: Participants were 30 overweight and 30 obese girls (8.3±0.5 yrs) equally (n=15), randomly assigned to either an experimental group (EG) or a control group (CG). Weight status was classified using body mass index (BMI) cut-off points (Cole et al., 2000). The Perceived Physical Ability Scale for Children (PPAS_C; Colella et al., 2008), Collins' Child Figure Drawings (1991), and fitness tests of standing long jump (SLJ), 20m sprint, basketball throw and agility (4x10m) were administered to each participant at baseline, mid- and post-test. A 2 (weight status) × 2 (group) × 3 (test) univariate analysis of variance with repeated measures on the last factor and Scheffé post-hoc were performed for each variable.

Results: Significant group × test interaction effects were found, with EG reporting better performances on 20m sprint ($p<.02$) and agility tests ($p<.001$), higher self-efficacy mean scores ($p<.001$), and lower body dissatisfaction ($p<.005$) at mid- and post-test. Differences emerged for weight status, with obese participants showing poorer SLJ performances ($p<.005$), lower scores in the PPAS_C ($p<.01$), and a greater body discrepancy ($p<.004$) than overweight peers. Weight status × test interaction effects were obtained, with obese girls at baseline reporting higher sprint time ($p<.04$) and body dissatisfaction ($p<.01$), and a lower self-efficacy score ($p<.03$) than the other groups.

Conclusions

The study revealed positive effects on weight-bearing tasks and physical self-perception of overweight girls after a two-year additional PE program. These improvements were not due to changes in BMI. Findings suggest that physical self-efficacy and body image are potential targets for PA intervention programs involving overweight children. Long term follow-up studies are essential to assess whether changes in overall volume of PA provide psychosocial benefits, and wheter improvements in psychosocial functioning lead to increase PA levels, or both.

References

Cole TJ et al. (2000) BMJ, 320:1240-3

Colella D et al. SBP Journal, 36:841-8
Collins ME (1991) Int J Eat Disord, 10:199-208
Nader et al. (2008) JAMA, 300(3):295-305
Wareham N (2007) Obes Rev, 8(Suppl. 1):115-21

CORRELATES OF CHILDREN'S COMPUTER USE ON WEEKENDS: BASELINE RESULTS FROM HEIA, A TWO-YEAR MULTI-COMPONENT SCHOOL BASED INTERVENTION PROGRAM

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Introduction: In order to regulate children's weight it is important to increase physical activity (PA) and reduce sedentary activities (van Sluijs et al, 2008). As part of sedentary activities, children's computer use has increased substantially. Hence, determinants of children's computer use seem important to identify.

Purpose

To examine the associations of gender, BMI and social-environmental influences with children's computer use on weekends.

Methods

Eleven year olds 6th graders from the eastern part of Norway and their parents (n=1209) taking part in the HEIA project, a school based intervention to promote healthy weight development, participated at the baseline data collection (September 2007). The dependent variable consisted of child's self-reported time spent on computer use on weekends. Independents were gender and BMI and parental (mother) data on a) mother's computer use on weekends, regulation of child's computer use and support of child's PA, and b) perceived screen use as an indoor limitation to PA.

Results: Entered in step 1 gender (beta = .23, $p < .001$) and BMI (beta = .09, $p < .01$) related significantly to child's computer use on weekends; altogether accounting for 6% of the variance in computer use. Entered in step 2, mother's time spent on computer use on weekends (beta = .11, $p < .01$); parental regulation of child's computer use (beta = -.07, $p < .05$) and parental social support for child's PA (beta = -.08, $p < .05$); altogether accounting for 2% additional explained variance in child's computer use. By entering screen use as a perceived limitations to PA (beta = .15, $p < .001$) this added 2% additional variance in child's computer use. The total predictor set accounted for 10% of the total variance in child's computer use. When entering screen use as a perceived limitation to PA in step 3, the relative influence of parental support for child's PA and parental regulation of child's computer use no longer were significant. In contrast, the role of mothers computer use on weekends for child's computer use was upheld.

Discussion:

Current findings suggest that boys more strongly than girls use computers on weekends and that parents to some extent may be in the position to reduce child's computer use by reducing their own computer use, by being more supportive of child's PA, and by strengthening their regulation of child's computer use. Interestingly, when parents report screen use to be a limitation to child's PA child's computer use is increased.

Reference

van Sluijs EMF, Page A, Ommundsen Y, Griffin SJ (2008). Br J Sports Med. Doi:10.1136/bjsm.2008.049783

APPLICABILITY OF SEGMENTAL BIO-ELECTRICAL IMPEDANCE FOR ESTIMATING SKELETAL MUSCLE VOLUME IN CHILDREN AGED 6-12 YEARS.

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Background: The skeletal muscle volume is closely related to physical functions, and it increases rapidly during growth age. There is increasing interest in the use of bio-electrical impedance analysis to estimate segmental skeletal muscle volume (Miyatani et al. 2000, Ishiguro et al. 2006). However, available information on the applicability of bio-electrical impedance method for predicting the fat free mass for children is limited (Fuller et al, 2002). No study has attempted to examine whether bio-electrical impedance analysis can be used to estimate segmental skeletal muscle volume in children.

Objective: To investigate whether segmental bio-electrical impedance analysis is useful for estimating segmental skeletal muscle volumes in children.

Methods: Fifty boys and 15 girls aged 6 to 12 yrs (mean age 10.0yr) volunteered under permission of their parents to participate in this study. Contiguous MRI images with a 1-cm slice thickness were obtained from the first cervical vertebra to the lateral malleoli. The volume of skeletal muscle was calculated from the summation of digitized cross-sectional area for every body segment, i.e., arm, trunk, thigh and lower leg, with the separation between segments based on anatomical landmarks visible in the scanned images. The electrical impedance of 6 segments (right and left side of arm, thigh and lower leg, and trunk) was measured by a bio-electrical impedance apparatus (500μA, 50kHz). An impedance index (BI index: L2/Z) for each segment was calculated as the ratio of the segment length squared (L2) to the impedance (Z).

Results and discussion: The MRI-measured total volume of skeletal muscle was 10496 +/- 2654 cm^3 for boys and 8234 +/- 1990 cm^3 for girls. For each segment, the volume of skeletal muscle was significantly correlated with BI index with the correlation coefficients of 0.78 to 0.94 ($P < 0.001$). This result indicates that bio-electrical impedance analysis is useful for assessing segmental skeletal muscle volumes of adolescents below the age of 12. The difference of correlation coefficients between segments was caused by error of measurement due to the electrode position. A small difference of the electrode position has substantial influence on measured values. Thus the electrode position becomes important to raise the accuracy of estimation.

References

Miyatani et al. (2000). Eur J Appl Physiol, 91:386-394.
Ishiguro N, et al. (2006). J Appl Physiol, 100:572-8.
Fuller et al. (2002). Int J Obes Relat Metab Disord, 26:692-700.

RELATIONSHIP BETWEEN IMPROVEMENTS OF EATING HABITS AND PHYSICAL FITNESS BASED ON A 3-YEAR LONGITUDINAL STUDY OF JAPANESE CHILDREN

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Introduction: The Ministry of Education, Culture, Sports, Science and Technology (MEXT) in Japan (2006) reported that endurance performance in groups of children who ate breakfast everyday was higher than the other groups (sometimes or never). However, there is a need for longitudinal studies, since the previous study was based on a cross-sectional survey which provided only limited information about the changes in eating habits and the physical fitness of children. The purpose of this study was to examine the effects of a change in eating habits on a change in physical fitness in Japanese children using 3-year longitudinal data. Methods: The participants were 456 Japanese children aged 6-9 (230 boys, and 226 girls). Data were collected on 3 occasions over a one year period. Survey items included eating habits (3-point ordinal scale: eating breakfast every day; 3, sometimes; 2, never; 1), physical fitness (Japan Fitness Test: Grip Strength, Sit-ups, Sit & Reach, Side Steps, 20m Shuttle Running, 50m Dash, Standing Long Jump, and Handball Throwing). Physical fitness in participants was graded into five categories according to norm-referenced criteria. A latent growth modeling (LGM) was used to examine the influence of the change in a eating habit score to a change in a physical fitness score. The LGM allow researchers to examine the change at both individual and group levels. In the LGM, the intercept term provides the initial level of scores and the slope describes how much a score was changed from initial value over time (Park and Schutz, 2005). In addition to an analysis using all data, for examining LGMs of each physical fitness level, the data were split into two groups (lower level group: lower two categories, higher level group: higher three categories) according to norm-referenced criteria. The LGM was conducted with Amos 7.0 (SmallWaters Corp., Chicago, IL) using maximum likelihood estimation. Statistical significant was set at .05. Results: There were no significant differences in physical characteristics between participants and Japanese standard values of each age. Results for LGMs using all data and data of the lower level group indicated good fits to the data (e.g., CFI = .997, and 1.000, RMSEA = .030, .000, respectively). With the physical fitness change factor, there was statistically significant and a positive direct effect from the change in eating habits (slope) (beta = .66) only in the lower level group, and the initial levels of the eating habits in all data (beta = .31) and the lower level group (beta = .55). CONCLUSION: These findings, with limited samples and a statistical method, might suggest that an improvement of eating habits (specifically, eating breakfast) has an effect on improvement of physical fitness in a lower level group of physical fitness, and an initial level of eating breakfast also affects improvement of physical fitness. Because eating breakfast is part of a lifestyle, future research should investigate relationships between comprehensive lifestyle and physical fitness.

COMPARISON OF THE LIPID PROFILE BETWEEN ADOLESCENT ATHLETES AND NON-ATHLETES

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Introduction: Data have shown an increase in the number of adolescents with an unfavorable lipid profile to health. The practice or not of physical activity may be related to the lipid profile of adolescents, so the purpose of this study was to compare the lipid profile of adolescent athletes and non-athletes.

Methods

Were evaluated 137 children with mean age of 14.39 ± 1.81, with 33% of basketball players and 67% did not practiced any competitive activity, all from city of Curitiba, Paraná, Brazil. For the estimation of cholesterol (CT), high-density lipoprotein (HDL-c) and triglycerides (TG), we used the automated colorimetric-enzymatic method (Abbott Spectrum, model CCX). The LDL-c was calculated by Friedewald formula (LDL-c = CT - HDL-c – TG / 5).

Results: It was observed that the basketball players were significantly higher and heavier than the peers not practicing, but the BMI showed no significant difference. Regarding lipid profile, individuals who practice basketball training had lipid values of CT (t =- 3.8 p <0001), HDL-c (t =- 5.5 p <0001), LDL-c (t =- 2.6 and p <0001) and TG (t =- 4.6 p <0,001) significantly lower than non-practitioners.

Discussion: Consistent with the findings of this study, Durstine and Haskell (1994) found that physically active individuals and involved in programs of aerobic training have lower levels of total cholesterol and triglycerides when compared to their sedentary peers. This is physiological characteristics of the exercise, which improves the ability of muscle to hold the oxidation of fatty acids, in addition, stimulates the activity of the enzyme lipase in the muscle, thereby contributing to the decrease in plasma lipids and lipoproteins, including young individuals (Wood et al., 1990; Durstine et al., 1994).

References

Friedewald WT, Levy RL, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma without the use of preparative ultracentrifuge. Clinical Chem. 1972; 18: 499-502.

Durstine JL, Haskell WL. Effects of exercise on plasma lipids and lipoproteins. Exercise Sport Sci Rev. 1994; 22: 477-521.

Wood PD, Stefanick ML. Exercise, fitness and atherosclerosis. In: Bouchard C, Shephard RJ, Stephens T, editors. Exercise, fitness and health: a consensus of current knowledge. Champaign: Human Kinetics Publishers; 1990. p. 409-23.

PHYSICAL ACTIVITY, HEALTH, BMI AND BODY COMPLAINTS IN HIGH SCHOOL STUDENTS

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Background

Children and adolescents in the industrial world are becoming less physically active and are adopting a sedentary life-style in front of computers and television screens. Aim: The aim of the present investigation was to determine self-related health, physical activity, prevalence of overweight and body complaints in high school students in Norway. Based on these aspects another aim was to compare students in academic programs with those in vocational programs.

Methods: 702 high school students aged 16-19 years participated in the study. A questionnaire was completed at three high schools and included questions about weight and height, health, physical activity, type of physical activity/sport, intensity, possible injuries or complaints, during the last three months.

Results: Twenty three percent of the students suffers from overweight/obesity or are at risk of being overweight. Males reported better health than females (p<0.02). Sixty-six percent of the study group reported body complaints during the last three months, a higher number of females than males (p=0.0001). Students in vocational programs reported poorer self-related health than those in academic programs and the males reported better self-related health generally than females. Furthermore, there were a higher level of prevalence of overweight students in vocational programs than academic programs (p=0.039).

Conclusions

It is important to make it easy for school children and adolescents to perform physical activity at school and during leisure-time in order to prevent overweight and obesity as well as chronic diseases later in life.

CHANGES IN PHYSICAL FITNESS AND BMI DURING EARLY ADOLESCENCE IN A NORWEGIAN SAMPLE

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Purpose: Given the potential connections among PA, overweight, and future risk of disease, considerable attention has been given to increasing physical activity to improve cardiovascular fitness and reduce or maintain a healthy body composition. Current data quantifying different components of fitness in Norwegian children are scarce, making longitudinal assessment in the adolescent population difficult. The purposes of this study were; 1) to provide normative data quantifying the current physical fitness level of 13-to 15 year old Norwegian youth using a multi-component fitness assessment, 2) to quantify longitudinal changes in fitness in adolescents during this period of rapid physical growth, and 3) to compare the fitness of Norwegian teenagers with available European and International fitness data.

Methods: 1059 adolescents (529 male, 530 females) from 12 public schools were invited to testing at age 13, 14, and 15. Test participation was 75-80%. The participants performed the following tests in October-November each year: Physical fitness: Standard or modified Push-ups (PU) to failure, standing broad jump (SBJ), Sit & Reach (SAR), Flamingo balance test (FLB), side to side hop (SS), Endurance Shuttle Run (ESR), and anthropometric measures: height, weight and BMI.

Results: At 13 yrs, there was no significant gender difference in bodyweight (females 51.5 + 9 kg, males 51 + 10 kg) or height (females 162 + 7 cm, males 163 + 8 cm). By 15 yrs males were both significantly heavier (females 59 + 9 kg, males 65 + 11 kg, p<0.001) and taller (females 167 + 6 cm, males 176 + 8 cm, p< 0.001). Females increased their performances in all fitness-tests (PU: from 22 – 31 reps; SBJ: from 160 – 172 cm; SS: from 76 – 90 reps; FLB: from 10 – 8 errors; SAR: from 19 – 23 cm), except ESR, from age 13 to 15. Males improved in PU (from 18 – 30 reps), SBJ (from 176 – 204 cm), and SS (from 75 – 92 reps). There were also improvements in ESR, SAR, and FLB, but only from age 13 to 14. When FLB, SBJ, and SAR, results were compared with age-matched data from 23 other European countries, and the ESR test with age-matched data from 37 countries globally our Norwegian sample was on average at the 72nd percentile for ESR, 71st for FLB, 58th for SBJ, but only the 29th percentile for SAR.

Conclusion: As expected, gender differences in fitness expand during puberty. Strength and power relative to bodyweight increases more in males than females. Aerobic capacity increases in males while remaining stable or tending to decline in females. However, balance and coordination improve identically in males and females from age 13 to 15 yrs. Correlations among fitness components were modest (Pearson's r = 0.2-0.5), supporting the need for a multi-component index of fitness. Summation of test results as a combined Z score, with equal test weighting, yields a normal distribution for fitness index in both males and females.

OBJECTIVELY ASSESSED SLEEP DURATION AND EFFICIENCY IN OVERWEIGHT AND NORMAL-WEIGHT 11-YEAR OLD CHILDREN

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BACKGROUND AND AIMS: The growing epidemic of obesity is becoming more and more pronounced, even among children. Inverse associations between sleep duration and the risk to develop childhood obesity were consistently reported (Cappuccio et al., 2008). However, studies that evaluated sleep with objective measures are scarce. Therefore, the aim of the current study was to objectively evaluate sleep duration and efficiency in overweight and normal-weight 11-year old children in Croatia.

SUBJECTS: Fifty seven 5th grade students (35 girls and 22 boys, mean age 11,3 [0,2] years) from five different elementary schools in Zagreb (Croatia) were selected to participate in the study.

METHODS: Height and weight were measured and body mass index (BMI) was calculated. Ten girls and nine boys were considered overweight or obese according to IOTF BMI cut off points for age and gender (Cole et al., 2000). Sleep patterns were assessed using a multi-sensor body monitor (SenseWear Pro2 Armband, BodyMedia, Pittsburgh, USA). SenseWear armband has recently been validated as a sleep detection device (Germain et al., 2006). The device was worn for four consecutive nights including 2 weekdays and 2 weekend days. Sleep duration and time spent lying down were estimated and times of going to and out of bed were detected. Sleep efficiency index (SEFI) was calculated as sleep duration divided by time spent lying down. Group differences were tested using Student's t-test for independent samples. All values are presented as mean [SD].

RESULTS: No significant differences between overweight and normal-weight children were found regarding either sleep duration (434 [36] min/day vs. 425 [40] min/day, respectively p=0,40) or time spent lying down (548 [45] min/day vs. 531 [39] min/day, respectively p=0,15). The average time children went to bed did not differ between overweight (22:33 [00:49]) and normal-weight children (22:47 [00:42]), (p=0,30). The same was found for the time children got out of the bed (07:50 [00:55] and 07:44 [00:45], in overweight and normal-weight children, respectively, p=0,65). No significant difference between groups was found for SEFI (0,80 [0,07] vs. 0,80 [0,07], p=0,73).

CONCLUSION: Results from this study do not support the hypothesis that overweight children have shorter sleep duration or lower sleep efficiency than their normal-weight counterparts.

REFERENCES:

Cappuccio FP, Taggart FM, Kandala NB, Currie A, Peile E, Stranges S, Miller MA. (2008) Sleep; 31(5):619-26.

Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. (2000) BMJ; 320:1240-3.

Germain, A, Buysse, DJ, Kupfer, J. (2006) Sleep; 29: A1028.

EFFECT OF OBESITY ON AEROBIC FITNESS OF CHILDREN AND ADOLESCENTS

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A large sample of schoolchildren and adolescents from primary and secondary schools of Slovenia (n=5012, 2658 boys, 2354 girls), 7 to 19 years of age participated in 2003/4 in a large national repeated cross-sectional study, leaded by Janko Strel.

Body mass index (BMI) and % body fat, estimated by bio-electrical impedance method using Maltron BF–906 instrument were used to diagnose excessive weight and categorize children into normal, overweight and obese category. Aerobic fitness was evaluated by 600-metre run and shuttle run test. According to IOTF norms 17.5% boys and 15.5% of girls in the sample were found overweight, whereas 4.4% of boys and 4.5% of girls were obese. Patterns of changes of aerobic fitness with gender and age mostly coincided with those found in other European countries (Armstrong, 2007), as though some differences existed, especially in boys in early puberty, where mean/median values in both 600-metre and shuttle run were almost unchanged in the period of 12–14 years of age.

The effect of excess weight on aerobic fitness was evaluated by multi-factor ANOVA separately for each measure of excess weight (BMI, % body fat) and each measure of fitness (600-metre run, shuttle run). After controlling only for gender and age, BMI category explained 7.3% of variance in 600-metre run and 6% of variance in shuttle run. The effect of body fat % was even higher, explaining 10.8% variance of 600-metre run and 7.1% of variance in shuttle run. Obese boys and girls achieved worse results in both aerobic fitness tests and the highest differences in comparison to their leaner peers were found in the period of early puberty (10 to 12 years of age).

In order to establish the influence of body fat on differences between different weight categories, % body fat was partialed out of 600-metre and shuttle run. After partialization differences between weight categories almost disappeared with BMI category explaining only 1.4% and 1% variance of 600-metre run and shuttle run, respectively. At some ages overweight boys and girls achieved even better results then their non-overweight peers. This result is not surprising, as it was found in this same sample that amount of physical (sport) activity of obese and non-obese pupils is similar. The results also coincide with the results of several other studies (review by Armstrong, 2007) where little or no influence of habitual physical activity on peak VO2 existed. On the other hand, these results are reassuring for obese boys and girls because they indicate that if obese children loose their weight even after puberty they can expect to be equally successful in aerobic activities as their non-obese peers.

Armstrong, N. (2007). Physical fitness and physical activity patterns of European youth, Chapter 2. In W.D., Brettschneider, R. Naul (eds.). Obesity in Europe: young people's physical activity and sedentary lifestyles (pp. 27-56). Sport sciences international, vol. 4. Frankfurt am Main [etc.]: Peter Lang.

14:15 - 15:15

Poster presentations

PP-HF10 Health and Fitness 10

URMEL-ICE (ULM RESEARCH ON METABOLISM, EXERCISE AND LIFESTYLE INTERVENTION IN CHILDREN) EFFECTS ON SPORT MOTOR ABILITY IN OVERWEIGHT AND NON-OVERWEIGHT SECOND GRADE SCHOOL CHILDREN IN GERMANY

STEINER, R., BRANDSTETTER, S., KLENK, J., PROKOPCHUK, D., WARTHA, O., PETER, R., GALM, C., BERG, S., WABITSCH, M., STEINACKER, J.

SPORT AND REHABILITATION MEDICINE

Sedentary lifestyle and obesity are risk factors for various diseases. In the last decades motor ability declined while overweight rate rose even in children. Therefore prevention should start in early childhood. URMEL-ICE (Ulm Research on Metabolism, Exercise and Lifestyle Intervention in Children) is a school based intervention program targeting physical activity, reduction of sugar-sweetened beverage and reduction of media consumption. The intervention is integrated in normal school classes, without consuming additional teaching time. It included two daily movement exercises each 5 to 7 min and 29 teaching units on health behavior. Aim of the intervention was to educate and motivate children for a healthier lifestyle. Purpose: The effect of this intervention on sport motor ability, in overweight and non-overweight second grade children in Germany is examined. Methods: 1119 children (average age: 7.6 +/-0.4 yrs) in 64 classes, in south Germany were included in the URMEL-ICE program. After school-wise randomization the intervention was done with 579 children (32 classes), 540 children (32 classes) were controls. Children were measured for overweight according to Kromeyer-Hauschild percentiles and participated in 8 sport motor ability tests, both at the beginning and after one year of intervention. Regression analysis for each of the 8 sport motor ability tests with intervention as independent variable, controlled for baseline results and sex, was calculated with and without grouping in overweight and non-overweight children. Results: In control group prevalence of overweight at baseline was 10.5 %, at follow-up 13.5 %, in intervention group at baseline 14.5 %, at follow-up 15.1 %. In the intervention group children covered more distance in 6 min endurance run (B = 18.251 m, p = 0.017, N = 919) and were by tend faster in 20 m sprinting (B = 0.04 s, p = 0.091, N = 949). The split in overweight and non-overweight children showed a similar effect of the intervention on sport motor ability for both groups. Non-overweight children in the intervention group again covered more distance in 6 min endurance run (B = 16.93 m, p = 0.038, N = 774) and where faster in 20 m sprinting (B = 0.05 s, p = 0.032, N = 799) than non-overweight children in control. Overweight children in the intervention group covered by tend more distance in 6 min endurance run (B = 32.81 m, p = 0.110, N = 113) and scored higher in ball aiming (B = 1.07 points, p = 0.087, N = 116) than overweight children in control. Conclusion: These findings suggest an effect of intervention on endurance performance and sprinting. Children being overweight at baseline do not benefit in sprinting, but seem to benefit in ball aiming through intervention. It is especially remarkable to get an effect on sport motor ability without systematic sportive training and consuming additional teaching time.

PHYSICAL ACTIVITY, GENDER AND PHYSICALITY IN ELDERLY WOMEN

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FACULTY OF SPORT

Regular physical activity has been described as a co-adjuvant for the prevention of many physical, psychological and social aspects related to the ageing process. Although the majority of the elderly subjects recognize the importance of regular physical activity for the functionality and well-being, older people are inactive, being this type of behaviour associated with social impositions and with poor self-perception of physical fitness and physicality. As a formative construction, physicality, in its broadest sense, explores how the body physically engages life, and how it can be understood as the physical expression of agency (McDermott,2000). Maintaining functionality and physicality is currently considered a crucial element for the quality of life and socialization of older people.

Accordingly and considering that bodily experiences lived by elderly women were submitted to a clear regime of discipline and standardisation of the body that was perceived as a "natural gift" (i.e.grace, frailty), it is extremely important to understand the impact of regular physical activity on physicality and "body empowerment" of elderly women.

Within this context, the main purpose of this study is to identify and analyze the multicomponent physical activity program to the notion of physicality.

Methods: This research consisted in a longitudinal evaluation of elderly women (n= 19; mean age=69.5±5.3 years old) living in the area of Porto, submitted to a multicomponent exercise program of 2 sessions/week, for 10 months.

To understand how elderly women experience their bodies and the gender influence, it was applied semi-structured interviews, focus groups and depth interviews in different moments of the exercise program: baseline - conduct prior the beginning of training (1st/2nd week of September), during (after 5 months - 1st/2nd week of February) and at the end of training program (1st/2nd week of July). In order to inspect the interviews results, content analysis technique and interpretation was applied, after data being processed by the program QSRNVivo7.

Results: Qualitative analysis before the beginning of exercise program allowed to access physical identity perceptions that reveal a concern with the body image and with physical limitations.

After training, older women speeches reflect: (i) a better capacity to cope with chronic disease and counter with advancing age; (ii) a physical repositioning of identities that result in feelings of self-confidence conferred by a more active, agile, balanced and flexible body; (iii) a clear perception of femininity as socially constructed category.

Conclusion

The results suggest that, a generalized physical activity program can be considered as an important tool for body empowerment and physicality, witch, in turn, highlights the significance of social body in the commitment to an active life style of elderly women.

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References

McDermott, L.. Sociology of Sport Journal, 2000. 17: p. 331-363.

EFFECTS OF A FEASIBLE AEROBIC TRAINING ON OLDER WOMEN'S BODY COMPOSITION, BLOOD PRESSURE, PHYSICAL FITNESS, AND HEALTH-RELATED QUALITY OF LIFE.

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INTRODUCTION: Several models have been suggested to explain the interaction between active lifestyles and prevalence of chronic diseases and their impact on physical fitness, quality of life and morbidity of older adults. According to Jette et al. [1] and Rikli & Jones [2], all these factors interact each one another. The clinical manifestation of a chronic disease leads to physical fitness decline, which, in turn, represents enhanced functional limitation that, most of the times, is linked to a tendency on reducing physical activity, functional capacity and therefore, worsening disease [3]. In this way, it seems important to identify the impact of different types of physical activity in functional fitness and cardiovascular risk factors in older people. Identifying the type, quantity and intensity of exercise to promote general and specific benefits to health can lead to better and accurate recommendations for those who begin training program aiming the improvements on cardiovascular health and on functional ability.

PURPOSE: To evaluate the effects of a moderate walking program, as one of the most accessible and feasible ways of aerobic training for older adults, on older women's body composition, blood pressure (BP), physical fitness and perceived health-related quality of life (HRQOL).

METHODS: Twenty-two older women (71,4±5,9 yrs; BMI= 27,7±2,6) without habitual exercise practice but physically independent were evaluated in 3 distinct moments, at baseline (M1), after 4 months with no exercise (M2- control period) and, finally, after participated in a 4 months walking program (M3). Subjects walked 3 times/week at progressive duration (15-30 min.) and intensity (50-70% of HRreserve; 4-5 of CR10 scale). BP, body composition (Dual-energy X-ray Absorptiometry), physical fitness (Senior Fitness Test) and, perceived HRQOL (Medical Outcomes Study Short-Form-36) were assessed at each moment. One-way ANOVA for repeated measures was used.

RESULTS: Data demonstrate that: i) to the exception of diastolic BP and upper limb strength, no significant changes occurred in the control period; ii) After walking training (M3) it was observed: a reduction on systolic (-12,0mmHg, p=0,04) and diastolic (-5,0mmHg, p=0,015) BP, improvements on emotional role limitation (+29,6, p=0,019) and lower limb strength (+4 reps, p=0,001).

CONCLUSION: These findings suggest that a walking program with progressive duration and intensity is able to reduce older women BP, improve muscle function and emotional dimensions of quality of life. Granted by FCT (PTDC/DES/70261/2006; SFRH/BD/33124/2007).

[1] Jette, A.M., et al. J Gerontol A Biol Sci Med Sci, 1999. 54(1): p. M3-6.

[2] Rikli, R.E. and C.J. Jones. JAPA, 1999. 7: p. 129-161.

[3] Laukkanen, J.A., et al. Eur Heart J, 2004. 25(16): p. 1428-1437.

EFFECTS OF PHYSICAL TRAINING ON BONE STATUS AND MENTAL HEALTH IN YOUNG AND OLDER WOMEN

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Benefits of regular exercise on bone mass accretion are greatest during childhood and adolescence when peak bone mass can increase to the greatest extent. These benefits often accrue into the seventh and even eighth decades of life. The portion of bone mass

variation attributable to diet may actually reflect how diet interacts with genetic factors, physical activity patterns, body weight, and diet or medication use. Despite these interactive effects, adequate calcium intake throughout life remains the prime defense against bone loss with age. PURPOSE: To determine the effects of habitual physical exercise on bone status and mental health in college female athletes; judo, long distance running, volleyball, swimming (n=32, aged 20.9 yrs.) and older women; walking/jogging, tennis, gate ball, aqua exercise/swimming (n=49, aged 62.6 yrs.). METHODS: The Calcaneus was measured twice at interval of 9 to 12 months by the ultrasound method (AOS-100NW, ALOKA), and sound of speed (SOS), % young age matched (YAM) and % age matched were calculated. A questionnaire survey examined mental health status, such as subjective happiness and geriatric depression score. Daily intake of milk also reported. RESULTS: % YAM and % age matched of college swimmers was significantly lower compared with those of judo and volleyball players. There were no significant differences between college long distance runners and age-matched non-exercise controls. % YAM and % age matched of college volleyball players was significantly higher than that in long distance runners. % YAM and % age matched in older swimmers (swimming time 28.6 hrs/month, milk intake 188 ml/day) decreased significantly during 9.8 months. Tennis players (playing time 21.3 hrs/month, milk intake 290 ml/day) increased SOS, % age matched and % YAM during 10 months. Significant improvements in exercise groups were seen in regard to subjective health degree, everyday feeling, human relation and life satisfaction degree. RESULTS: The judo and volleyball were good effects on bone health status increase in the young period, and it is important for older women to do mild physical exercise, take in calcium in milk. Habitual physical activities improve in psychological items.

THE CHANGES OF AUTONOMIC AND PSYCHOLOGICAL INDICATORS IN A LONG-TERM LIGHT EXERCISE PROGRAM FOR ELDERLY PEOPLE

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Introduction: The QOL for elderly people has two aspects; physical health and mental health WHO (2000). Exercise maintains and promotes physical and mental function. Exercise is also one of the main stated factors that influence the improvement of QOL. Furthermore, some studies suggest that a sedentary lifestyle result in negative mood symptoms, especially feeling of fatigue and depressive symptoms (Blumenthal et al., 2005; Weinstein et al., 2007).

Objective

The purpose of this study was to make a clear that the changes of the heart rate variability and psychological parameters for long-term light exercise in elderly people and to assess the program's effect on QOL.

Subject & Method: Subjects in this study were 23 elderly people with a mean age of 64.1±6.0. They participated in a senior fitness class once a week for about 17 months. Physical and psychological measurements were taken once every about four months. The physical measurements were anthropometric indexes, fitness tests and autonomic nervous system activity. Anthropometric indexes were height, body weight, body fat, systolic and diastolic blood pressure, chest girth, abdominal girth, hip girth, left and right thigh girth, left and right lower leg girth. Fitness tests were grip strength, sit-ups, sitting trunk flexion, foot-balance opening with eyes opened, 10 m walking crossing over obstacles, up and down step test. Heart rate variability (HRV) was measured as autonomic nervous system activity. The psychological measurement used a 30-item General Health Questionnaire (GHQ30) and QOL was measured at the same time by WHO/QOL26. And activity checks including number of steps, sleeping hours, and daily activity hours were taken for 7 days every once a month.

Results: In the physical measurements, left and right thigh girth and grip strength significantly improved. Systolic blood pressure, sit-ups, sitting trunk flexion, and step test had a tendency to improve. GHQ30 and QOL26 did not significantly changed. In each factor on the GHQ30, the ratio of the person with a high score (3-5point) of insomnia was about 30 percent. It was higher than in the other factors. HRV and activity checks had seasonal changes.

Discussion: From these results, it was suggested that the physical indices changed clearer than the psychological index in a long-term light exercise program for elderly people. And it was also supposed that activity of the autonomic nervous system changed seasonally. The psychological index did not significantly change, but from the ratio of the persons with the highest scores in the factor of the GHQ30, it was suggested that one in three or four persons experienced a sleeping disorder. Continuous measurement is necessary to assess the change of psychological index.

References

Blumenthal et al., (2005), JAMA, 193,1626-1634

Weinstein et al., (2007), Med. Sci. Sports Exerc, 39,4, 735-741

WHO (2000), QOL, General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine

AEROBIC TRAINING EFFECTS ON SALIVARY IGA AND PLASMA IGA, IGG AND IGM ON OLDER WOMEN AND MEN

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Introduction: As people age, they experience a decline in immune responses. Unusually heavy acute or chronic exercise could increase the URTI risk, while regular moderate physical activity may reduce URTI symptomatology. The purpose of the present study is to analyze how an aerobic exercising program is able to promote chronic adaptations in plasma IgA, IgG and IgM, and salivary IgA, in both elderly women and men.

Methods: Forty three independently living older men (n=16) and women (n=27) voluntary for the study. The age varied between 65 and 96 years-old. Participants were randomly separated into an aerobic exercising and a control group. They all passed a complete medical examination and received permission from their doctors to be included. Each participant was submitted to three evaluations (pre, post exercise and follow up) separated by a period of 16 weeks. Factorial 2x2 ANOVA with repeated measures, and multiple comparisons based on the Bonferroni were performed.

Results: Control group shows a salivary IgA decrease between post-evaluation and follow up-evaluation (p≤0.05), and an increase in the plasma IgG between pre-evaluation and post-evaluation (p≤0.01) followed by a decrease in the follow up-evaluation (p≤0.05). The plasma IgA did not show any significant changes [F(1, 14)=1.08, p=0.32], and the salivary IgA secretion rate shows a tendency for decreasing [F(2, 15)=3.27, p=0.07] between pre-evaluation and follow up-evaluation.

Aerobic exercising group increased plasma IgA concentration from 1.08g/L±0.50g/L to 2.29g/L±0.93g/L while salivary IgA concentration was unchanged. The IgG and the IgM plasma concentrations increased in both aerobic and control groups. However, exercising group maintained raised values in the third evaluation which did not happen in control group.

Discussion: The results have shown an improvement in the plasmatic IgA during the exercise period that is in accordance with others [1,2,3], and maintenance in the salivary IgA concentration and secretion rates, in both women and men. Aerobic exercise seems to have been effective in promoting IgA immunity and in protecting against the deterioration in the sIgA values that occurred in control group. Regarding the plasma IgG and the IgM concentration results, a positive effect due to the moderate intensity aerobic exercise protocol used could not be confirmed because positive changes also occurred in the control group. Finally, one would emphasize that women and men, submitted to the same physical exercising programs, have a similar chronic immune response for the four variables analyzed.

References

1. Akimoto T et al. (2003). Effects of 12 months of exercise training on salivary secretory IgA levels in elderly subjects, Br J S Med, 37:76-79.
2. Gleeson M et al. (2000). Immune status and respiratory illness for elite swimmers during a 12-week training cycle, Int J S Med, 21:302-307.
3. Karacabey K et al. (2005). The effects of exercise on the immune system and stress hormones in sportswomen, Neuro Endocr Letters, 26:361-366.

IS STRENGTH TRAINING AS EFFECTIVE AS AEROBIC TRAINING ON THE CONDITIONING AND DECONDITIONING OF FUNCTIONAL FITNESS IN OLDER ADULTS?

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Introduction: Environmental factors play an essential role in the aging process, which confers importance to the physical exercise training. The aim of the current study is to determine if a strength exercise program is as effective as a cardiovascular exercise program to promote chronic outcomes in the functional fitness including upper and lower strength, upper and lower flexibility, aerobic endurance, and velocity, agility and dynamic balance. Additionally, the effects of the detraining are also studied.

Methods: Seventy two women (76.72±8.38 years old) and forty six men (74.61±6.43 years old), aged at least 65 years-old, were randomly separated into control, strength and aerobic group and were evaluated three times. They all passed a medical examination and received permission from their physicians to be included in the study. Between evaluations a sixteen-week period elapsed. The Senior Fitness Test battery [1, 2] was used to evaluate the functional fitness. The intensity of the cardiovascular training varied between moderate and vigorous, with a frequency of 3 times per week, during a 16-weeks period. The moderate strength training was based on eight exercises for the major muscular groups, with 1 set of 8 repetitions increasing progressively to 3 sets of 15 reps. Factorial ANCOVA and a MANOVA, with post hoc test of Bonferroni were used.

Results: On the 6-minute walk test, 100% of the participants in the three groups were below the percentile 50 of the published norms. This lower performance on the tests suggests that participants were unfit. After the exercise period, control group did not show any improvement in any one of the six functional fitness parameters. Contrarily, strength exercising group improved all functional fitness variables during exercise the same occurring on aerobic exercising group, with exception for the upper flexibility, in both sexes, and the lower flexibility, in women. After the detraining period, aerobic group only maintains gains in the lower strength and upper flexibility, while strength group maintains gains in the lower flexibility.

Discussion: The key findings are that both specific aerobic and strength exercising programs are able to improve the various components of the functional fitness of older women and men, and the positive effects remain beyond the end of the training period in some functional fitness parameters.

Presented data sustain the idea that strength exercise alone is as effective as cardiovascular training in developing the physical parameters that support the functional mobility in later years. Moreover, even considering that after a detraining period some functional fitness parameters still raised, negative effects of interrupting exercise programs are visible.

References

1. Rikli RE & Jones CJ (1999). J of Aging and Phys Activ, 7: 129-61.
2. Rikli RE & Jones CJ (2001). Senior Fitness Test Manual. Champaign IL, HK.

RELATIONSHIP BETWEEN ONE-LEG STANDING TIME WITH EYES OPEN AND PHYSICAL FUNCTION AMONG COMMUNITY-DWELLING ELDERLY FEMALES

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PURPOSE : One-leg standing ability and its related factors have been studied in elderly subjects. In past studies on muscular strength in the upper and lower limbs, only part of the muscles were examined. To examine factors involved in one-leg standing, it is necessary to measure and evaluate total body function. In this study, we measured the muscular strength of the lower limbs, foot grip, and plantar sensibility, which were considered to affect one-leg standing, and evaluated the relationship between these parameters and one-leg standing time with eyes open. SUBJECTS : The subjects were 56 community-dwelling elderly women with an average age of 74.8 ± 6.3 years. METHODS : The isometric contraction was measured as the muscular strength of the lower limbs using Hand-held dynamometer, and the foot grip was measured using a foot grip meter. The plantar sensibility was evaluated using Semmes-Weinstein monofilaments. The attention function was using Trail making test - Part A. These measurements were performed in the dominant leg. ANALYSIS : The relationships between one-leg standing time and other body measurement values were examined using Pearson's correlation coefficient. Multiple regression analysis (stepwise method) was performed using body sway on one-leg standing as the objective variable, and factors affecting one-leg standing time were extracted. RESULTS : One-leg standing time with eyes open was significantly correlated with foot grip (0.61), attention function (-0.45) , femoral quadriceps muscle strength (0.38), and grip strength (0.27). Factors involved in body sway in the one-leg standing position extracted by stepwise regression analysis were the foot grip (0.49) and attention function (-0.35). Standing balance was stabilized as the foot-gripping force and attention function increased. CONCLUSIONS : These results suggested that foot functions, such as foot grip, affected body sway in the one-leg standing position rather than the strength of major muscles in the lower limbs, such as femoral quadriceps muscles. Further, the attention function of elderly women may be directly involved in duration of standing on one leg.

DAILY PHYSICAL ACTIVITY RELATED TO AEROBIC FITNESS IN YOUNG CHILDREN: THE COPENHAGEN SCHOOL CHILD INTERVENTION STUDY

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UNIVERSITY HOSPITAL MAS

Background: Aerobic fitness (VO2PEAK) is a strong, independent risk factor for cardiovascular disease and mortality in adults. It is therefore of interest to investigate how VO2PEAK is related to daily physical activity, both volume and intensity, already in childhood. The purpose of this study was to investigate the cross-sectional relationship between accelerometer measured physical activity and VO2PEAK (ml/min/kg), by direct measurement in a population-based cohort of young children, since such data are scarce.

Methods: Cross-sectional study of 475 (248 boys and 227 girls) children aged 6.8±0.4 yrs (range 5.7-8.2 yrs), recruited from a population-based cohort. VO2PEAK was measured by indirect calorimetry during a maximal treadmill exercise test. Physical activity was assessed by accelerometers during four consecutive days. From accelerometer data number of minutes of light activity (LPA), moderate activity (MPA), moderate-to-vigorous (MVPA), and vigorous activity (VPA) per day were calculated. Mean count per valid minute of recording (counts/min) was considered to reflect general physical activity (GPA).

Results: All children were Tanner stage 1. Boys were more physically active than girls, with the exception of LPA that did not differ. Boys vs. Girls for GPA, LPA, MPA, MVPA, and VPA; 769 vs. 703; 634 vs. 638; 84 vs. 73; 95 vs. 83; 12 vs. 10 ($P<0.01$ for all, except LPA $P=0.05$, NS). Boys had higher VO2PEAK level than girls 49 vs. 45, $P<0.01$. Pearson correlation coefficients indicated a low-moderate relationship between daily physical activity variables and VO2PEAK in boys, with the exception of LPA that was not related to VO2PEAK. None of the daily physical activity variables were related to VO2PEAK in girls. Summary of Pearson correlation between VO2PEAK and physical activity variables (GPA, LPA, MPA, MVPA, and VPA) for boys; 0.16, -0.02 NS, 0.21, 0.21, 0.16 ($P<0.05$), and for girls; 0.05, -0.06, 0.08, 0.09, 0.08, all NS.

Conclusion: In this population-based cohort most daily activity variables were positively related to aerobic fitness in boys, but no such relationships could be detected in girls.

ASSOCIATED PHYSICAL PERFORMANCE OF SARCOPENIA IN NON-OVERWEIGHT ELDERLY JAPANESE MEN AND WOMEN

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Background:

Sarcopenia is a term utilized to define the loss of muscle mass and strength that occurs with aging. Sarcopenia is believed to play a major role in impaired physical performance that occurs with old age in Western populations. Little is known about sarcopenia among Asian elderly populations.

Objectives:

Our aim was to determine whether skeletal muscle mass was associated with physical performance in non-overweight elderly Japanese population with sarcopenia.

Subjects and Methods: Thirty-one men and 19 women aged 65-82 years were recruited from the community of Tatebayashi-City, Gunma Prefecture, Japan. All 50 subjects were screened at the time of enrollment with clinical history, physical exam and a number of laboratory tests to ensure their eligibility, such as non-overweight and/or non-obese (body mass index < 25 kg/m2) and sarcopenia. Sarcopenia was defined according to previously established criteria based on appendicular skeletal muscle mass (ASM) /height2 (kg/m2) by dual energy X-ray absorptiometry (DEXA). Physical performance was determined using a battery of physical performance tests (8 item) approved by the Ministry of Education, Culture, Sports, Science and Technology in Japan.

Results: Mean ASM was 6.82 and 5.77 kg/m2 in men and women respectively. In men, ASM was significantly associated with muscle strength [hand grip ($r = 0.560$, $p<0.001$) and sit-up ($r = 0.524$, $p<0.01$)]. However, there were no significant correlations between ASM and sit-to-stand movement from a chair, static balance [timed up and go, and one-leg standing with opened eyes], dynamic balance [functional reach and body flexibility [sit-and-reach], and agility [stick response]. On the other hand, in women, ASM was associated with sit-up ($r = 0.719$, $p<0.001$), timed up and go ($r = -0.645$, $p<0.01$), and sit-to-stand movement from a chair ($r = -0.626$, $p<0.01$), while hand grip, functional reach, sit-and-reach, one-leg standing with opened eyes, and stick response were not related to ASM.

Conclusions: Our hypothesis was that lower skeletal muscle mass in sarcopenic population was associated with impaired muscle performance. Hand grip, sit-up and sit-to-stand movement from a chair tests were assessed muscle performance in this study. ASM was strongly associated with sit-up in both sexes. However, the sex-related differences in correlation between muscle mass and hand grip and sit-to-stand movement from a chair tests were found in non-overweight elderly Japanese population with sarcopenia. These results suggest that sit-up may be a good indicator of physical performance in sarcopenic population. Further studies with large numbers of subjects are needed.

Reference:

Baumgartner RN, Koehler KM, Gallagher D, Romero L, Heymsfield SB, Ross RR, Garry PJ, and Lindeman RD. Epidemiology of sarcopenia among the elderly in New Mexico. Am. J. Epidemiol. 147: 755-763, 1998.

14:15 - 15:15

Poster presentations

PP-HF11 Health and Fitness 11

STABLE BMI BUT INCREASED WEIGHT LOSS BEHAVIOUR IN NORWEGIAN ADOLESCENTS BETWEEN 1996 AND 2008

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Purpose

This study was performed to investigate changes in BMI, prevalence of overweight, obesity, and weight loss behaviour in Norwegian adolescents over the last 12 yrs.

Methods: Data from three different assessments performed in public schools in Kristiansand, Norway over a 12 year period were collected and compared. These data, based on measurements in 1996 (246 males, 287 females), 2005 (332 females, 387 males) and 2008 (259 females, 284 males), were all performed in the fall semester on 14 yr olds (median age 14.5 yrs for all three samples). Participation rates were similar for all 3 samples (~75%). Prevalence of overweight and obesity was estimated based on age and gender specific internationally derived cut-offs from Cole et al (2000)*.

Results: Mean BMI was stable in both boys and girls between 1996 and 2008 (Females: 95% CIs 20.3 to 20.9, 20.0-20.7; Males: 19.9 to 20.5; 19.9 to 20.7). Overweight prevalence in the female sample was 11% in 1996 and 12% in 2008. In males overweight prevalence was 15% in 1996 and 16% in 2008. The prevalence of obesity in the 1996 male and female samples was <1%, but had increased to 1.5% in females and 2.5% in males by 2008. Corresponding data from 2005 was essentially identical to the other two measurement time points. We observed no statistically significant changes in overweight or obesity prevalence. In contrast to quite stable BMI data over the 3 time points, self-reported weight loss efforts increased significantly. In 1996, 18% of 14 yr old females reported having tried to lose weight. In 2005 and 2008, 32 and 34% respectively, reported weight loss efforts. Among males, only 3% reported trying to lose weight in 1996, compared to 10 and 13% in 2005 and 2008 respectively.

Conclusions: These data, based on similar samples taken in 1996, 2005, and 2008 suggest that mean BMI has remain relatively stable over the last decade in southern Norway. We see no evidence of a generalized increase in BMI in Kristiansand teenagers. Slight trends towards an increase in the proportion of overweight and/or obese teenagers were not statistically significant in these samples of only a few hundred children, but the data suggest that the small proportion of children with obesity is increasing. There does appear to be a marked increase in the proportion of both males and females who report trying to lose weight from 1996 to today. Currently, the proportion of females reporting weight loss efforts greatly exceeds the proportion with objectively measured overweight.

References

* Cole, T.J., Bellizi, M.C, Flegal, K.M. & Dietz, W.H. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ, 320, 1240-1247, 2000.

PREDICTORS OF WALKING SPEED IN NURSING HOME RESIDENTS

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Walking is a simple and natural form of movement that can be recognized as a good indicator of independence and mobility of the elderly. Many studies have confirmed significant association between strength and functional performance [1, 2, 3]. Also maintaining balance (postural sway) has previously been identified as one of the significant independent determinants of self selected walking speed [1].The aim of the present study was to determine the influence of strength and balance on sex-meter walking test in nursing home residents that represent lower part of elderly population regarding mobility.

We measured 105 elderly people (31 men and 74 women), aged 80 ± 7 years, who voluntarily participated in the study. The maximum torque (adjusted for body mass) of plantar and dorsiflexors, knee extensors as well as trunk flexors, extensors and lateral flexors was measured during isometric MVC. Static balance on force platform (area of path of force application point) was measured in two conditions: opened and closed eyes. Berg balance test was administered as well – only total score used for analysis. For walking, time to cover 6-m distance in self-paced speed was used. Relationship between strength, balance and the walking time was explored using linear regression. Relationships between the tests were determined with Pearson's correlation coefficient.

The subjects needed on average 8,0 ± 6,1 s to cover the 6 m distance, that accounts for average gait speed of 0,75 m/s, which is in accordance with previous reports for elderly population [4]. All nine relative strength and balance tests showed significant correlations with time to complete the 6 m walking task (r= 0,19 to -0.76; $p<0.025$). Stepwise linear regression revealed that the strength measures and balance test explained 59% ($p<0.000$) of the variance in walking time, where the Berg balance test had the highest and the only significant beta weight (-0.85; $p<0.000$).

As the Berg balance scale was the only significant predictor of 6 meters walking time, it seems that the static balance and strength are of less relevance for walking in this population. On the other hand, the relative strength of leg and trunk muscles was highly correlated with walking ability. Therefore it seems that their variance was incorporated into Berg balance scale and didn't provide any unique variance relevant to walking. For that reason dynamic balance seems to be the best predictor of walking ability in nursing home residents.

[1] Tiedemann A. et al. 2005. Gerontology 51(6):390-5.

[2] Lamoureux, E.L. et al. 2002. J Am Geriatr Soc 50(3): 468-73.

[3] Buchner D.M. et al. 1996. Age Ageing 25(5): 386-91

[4] Steffen T.M. et al 2002. Physical Therapy 82(2): 128-137.

LOW-LOAD SLOW RESISTANCE TRAINING CAUSES MUSCLE HYPERTROPHY AND STRENGTH GAIN, BUT DOES NOT IMPROVE MOTILITY FUNCTION IN ELDERLY PEOPLE.

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BACKGROUND It has been reported that resistance training at intensities lower than 65% of one repetition maximum (65%1RM) is virtually ineffective for increasing muscle size and strength. However, the concept of enhancing exercise movement variation was not explored in these studies. When exercise movement is designed to place muscles under continuous tension throughout the exercise movement, resistance training, even with low-intensity loads of less than 65% 1RM, promotes muscle hypertrophy and increases strength. We previously reported that relatively low-load (50% 1RM) resistance training with slow movement and tonic force generation (named LST) caused as significant an increase in muscular size and strength as high-load (80% 1RM) resistance training with normal speed in young men. However, that study targeted a limited age group. PURPOSE The present study was performed to examine whether LST is effective for muscle hypertrophy and strength gain in elderly people as well. METHODS Thirty-two healthy elderly men and women were assigned into two groups and performed resistance training regimens comprised of knee-extension and knee flexion by the following methods: low-load (50% 1RM) with slow movement and tonic force generation (3 s for eccentric and concentric actions, and no relaxing phase; LST); low-load (same load as for LST) with normal speed (1 s for concentric and eccentric actions, 1 s for relaxing; LN). Each exercise session consisting of 8 repetitions and 3 sets was performed 2 times a week for 12 weeks. The load of LST (50%1RM) was about 8RM load with LST movement. In LN, both load and amount of work were matched with those in LST. Muscle mass, strength, and motility function were measured before and after the training intervention period. RESULTS LST training caused significant increases in muscle thickness in thigh (+9.7±3.3% in men, +4.1±5.4% in women), and significant increases in knee extension and flexion torques, whereas LN training did not cause increase in muscle thickness in thigh. However, LST training did not improve motility functions such as walk speed and sit-to-stand times. CONCLUSION The results suggest that LST resistance training is effective for improving basic ability of muscles through muscular hypertrophy, but does not improve motility functions such as coordination ability in daily life activities. When LST is adopted to improve muscle strength and motility functions, it should be combined with exercises that improve motility functions, such as plyometric training.

THE EFFECT OF 6-MONTHS EXERCISE INTERVENTION ON THE BRAIN FUNCTION, QUALITY OF LIFE, AND PHYSICAL FITNESS IN THE MIDDLE-AGED AND ELDERLY JAPANESE

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Introduction: It was reported that six months aerobic training (Kramer, A. F., et al., 1999) or resistance exercise (Cassilhas, R. C., et al., 2007) intervention improved cognitive function of the elderly. However there are few studies about the effect on the brain function by the overall fitness program in which many people popularly participate for improving their physical fitness. We investigated whether the brain function in middle-aged and elderly people were affected by the participation in 6-months exercise program which included aerobic and anaerobic exercise and whether the change of brain function and quality of life (QOL) were related to the change of physical fitness.

Methods: Eight men and six women (mean age 62.9 ± 6.2 years old) participated in a 6-months exercise program. All the subjects gave their informed consent for participation in the study. One hour exercise class, including aerobic exercise, strength exercise and stretching, was held once a week. Before and after the 6-months exercise program, the brain function, health-related QOL, and physical fitness of subjects were evaluated. In present study, brain function was evaluated by the revised version of Hasegawa's Dementia Scale (HDS-R) and a modified Stroop task. QOL was scored by the Short Form-36 (SF-36) (Ware, J. and Scherboume, C., 1992). Grip strength, sit-and-reach, whole-body reaction time, static balance test, sit-up, estimated maximal oxygen uptake and leg extension power were measured as physical fitness. A one-factor analysis of variance with two times (before and after) was introduced into the analysis for the brain function, QOL, and physical fitness.

Results and Discussion: Grip strength (pre 34.9 ± 7.7 kg, post 33.5 ± 7.5 kg, $P<0.05$) and whole-body reaction time (pre 387 ± 56 msec, post 363 ± 65 msec, $P<0.05$) were significantly decreased, sit-up (pre 14 ± 8 times, post 18 ± 6 times, $P<0.001$) and the score of social functioning in SF-36 (pre 89.2 points, post 97.5 points, $P<0.05$) were significantly increased by the exercise intervention. The time of a modified Stroop task was significantly shortened after the exercise intervention (Word test: pre 12.4 ± 0.6 sec, post 10.8 ± 0.5 sec, $P<0.01$, Color test: pre 16.6 ± 0.9 sec, post 14.5 ± 0.6 sec, $P<0.01$, Color Word test: pre 23.5 ± 0.9 sec, post 21.9 ± 0.8 sec, $P<0.01$,). No other significant change was observed. It was concluded that the exercise intervention designed for improving physical fitness could improve QOL and higher brain function in the middle-aged and elderly Japanese.

References

Kramer, A.F., et al.: Aging, fitness and neurocognitive function, Nature, 400: 418-419, 1999.

Cassilhas, R.C., et al.: The impact of resistance exercise on the cognitive function of the elderly. Med. Sci. Sports Exerc., 39(8): 1401-1407, 2007.

Ware, J. and Scherboume, C.: The MOS 36 item short form health survey 1: conceptual framework and item selection. Med. Care. 30: 473-483, 1992

ASSESSMENT OF PHYSICAL ACTIVITY PATTERNS AND LEVELS BY ACCELEROMETRY IN ADULTS AND ACROSS AGES – SISTEMATIC REVIEW OF STUDIES

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Background: Age has been shown to be inversely associated with PA in children, adolescents and adults, when evaluated by self-report and objective measures of PA. However, few studies have shown this considering in an adult or older population using objective measures.

Methods: Investigations with the aim of measuring physical activity, physical activity levels and patterns, in adult or older population, using accelerometry technology, were searched and reviewed.

Results: Data from studies indicate that mean counts decline with age, and males appear to be more physically active than females. The majority of older adults failed to accumulate minimum recommendations of 30 min of moderate to vigorous physical activity on 5 or more days of the week. In terms of pattern of PA throughout the week, participants were less active on weekends than weekdays.

Conclusions: More longitudinal studies using objective measures in combination with self-report methods are needed to better understand PA levels and patterns in young and older adults, in order to better prescribe intervention programs in these populations. Also, is advisable to consider more than one cutoff point for adults and older adults, in order to account for the decline in exercise capacity with age, and also to standardize them.

References:

Davis, M., & Fox, K. (2006). Physical activity patterns assessed by accelerometry in older people. European Journal of Applied Physiology, DOI 10.1007/s00421-006-0320-8.

Dinger, M., & Behrens, T. (2006). Accelerometer-Determined Physical Activity of Free-Living College Students. Med. Sci. Sports Exerc., 38(4), 774-779.

Hagströmer, M., Oja, P., & Sjöström, M. (2007). Physical Activity and Inactivity in an Adult Population Assessed by Accelerometry. Med. Sci. Sports Exerc., 39(9), 1502-1508.

Metzeger, J., Catellier, D., Eveson, K., Treuth, M., Rosamond, W., & Siega-Riz, A. M. (2008). Patterns of Objectively Measured Physical Activity in the United States. Med. Sci. Sports Exerc., 40(4), 630-638

Troiano, R., Berrigan, D., Dodd, K. W., Mâsse, L., Tilert, T., & McDowell, M. (2007). Physical Activity in the United States Measeured by Accelerometer. Med. Sci. Sports Exerc., 40(1), 181-188.

USING THE TIMED UP-AND-GO TEST TO HEALTHY OLDER PERSONS

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Introduction: The Timed Up-and-Go test was recommended for older persons with a high risk of falls 1). On the other hand, there were a few reports about the Timed Up-and-Go test for healthy older persons. If the Timed Up-and-Go test would be applied to healthy older persons, then it was possible to evaluate age-related decline in physical fitness. The purpose of this study was determined to whether the Timed Up-and-Go test was applied to healthy older persons.

Methods: The subjects were 42 young persons (young group, 20 male and 22 female, 19.3 ± 0.82 yr) and 34 healthy old persons who were frequently participated exercise classes or/and community meetings (old group, 15 male and 19 female, 65.2 ± 6.75 yr). All subjects were measured the Timed Up-and-Go test twice and the better score of two trials was recorded using a stopwatch (seconds). Additionally, it was videotaped while performing the Timed Up-and-Go test and five components of the Timed Up-and-Go test, standing up from a chair, walking 3 m, turning around, walking back to chair, and sitting down, were elevated their scores.

Results: The test scores were significantly differences between young and old groups (4.99 ± 0.51 sec vs. 5.35 ± 0.53 sec, $P < 0.05$). The stopwatch-measured scores were significantly faster than the videotape-measured score in both groups (young group: 4.99 ± 0.51 sec vs. 5.53 ± 0.53 sec, old group: 5.35 ± 0.53 sec vs. 5.70 ± 0.55 sec, $P < 0.05$, respectively). With respect to each component, the test scores of standing up from a chair, walking 3 m, turning around, and walking back to chair were significantly differences between two groups (standing up from a chair; 0.72 ± 0.12 sec vs. 0.84 ± 0.13 sec, walking 3 m; 1.08 ± 0.18 sec vs. 1.25 ± 0.19 sec, turning around; 0.80 ± 0.12 sec vs. 0.91 ± 0.14 sec, walking back to chair; 1.66 ± 0.21 sec vs. 1.86 ± 0.21 sec, $P < 0.05$, respectively). However, surprisingly, no significant differences existed for sitting down (0.82 ± 0.18 sec vs. 0.85 ± 0.14 sec, $P < 0.55$). As a result, we were suggested that the movement of sitting down was easier and simpler than the movements of other components.

Conclusion

We concluded that the Timed Up-and-Go test would be applied widely to not only frail older persons with a risk of falls but also healthy older persons and it would be possible to evaluate age-related decline in physical fitness.

Reference

1) American Geriatrics Society, British Geriatrics Society, American Academy of Orthopedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. J Am Geriatr Soc 2001; 49: 664–72.

FUNCTIONAL FITNESS, PHYSICAL ACTIVITY AND NUTRITIONAL INTAKE IN AZOREAN OLDER ADULTS

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Introduction: Considering that Portugal is one of the ten most aged countries of Europe, the maintenance of functional independence is a major public health goal. Physical performance tests can provide valuable information to establish a diagnosis and to plan the related preventive or counteractive strategies.

Methods: A total of 271 community-dwelling older adults (190 women and 81 men) aged between 65 and 90 years who participated in the Azorean Physical Health Study II. The Functional Fitness Test battery was performed to assess the physical parameters associated with independent functioning in older adults. Dietary intake was assessed with self-administered semi quantitative food frequency questionnaire, previously validated for Portuguese population [1]. Daily physical activity (PA) was assessed with the Modified Baecke Questionnaire for Older Adults and with a pedometer during 7 days.

Results: The prevalence of overweight in the whole sample was 94.6%. Sixty-one percent reported no leisure physical activity and only 9.9% reported being engaged in sports. A total of 8.1(±9.3) min/day of moderate-to-vigorous PA was achieved. Older women had lower performance (below the norm) than older men in the 6-min walk test, chair stand 30s, up and go and arm curl tests ($p<0.05$). On the other hand, older women had better upper and lower flexibility than older men ($p<0.05$). Based on the Dietary Reference Intakes from WHO/FAO [2], 39.5% of the elders met the adequate intake for carbohydrates and 14.1% met the adequate intake for proteins.

Discussion: The results suggest that Azorean older adults do not meet the recommended PA level and dietary intake. Moreover, the performance in the endurance and mobility/agility tests, on both genders, were, highly below the suggested norm values, previously established by Rikli and Jones [3]. In fact, poor functional performance may endanger a successful aging by limiting independence, functional capacity to perform various activities of daily living and quality of life. Urgent strategies aimed at increasing levels of PA of older adults are necessary in Azores.

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References

1. Ferreira, P.L., [Development of the Portuguese version of MOS SF-36. Part I. Cultural and linguistic adaptation]. Acta Med Port, 2000. 13(1-2): p. 55-66.

2. WHO/FAO, Diet Nutririon and the Prevention of Chronic Diseases. 2003.
3. Rikli, R.E. and C.J. Jones, Functional fitness normative scores for community-residing older adults, ages 60-94. J Aging Phys Activ, 1999. 7: p. 162-81.

MULTICOMPONENT EXERCISE IN OLDER ADULTS: EFFECTS ON FUNCTIONAL FITNESS AND ANAEROBIC THRESHOLD

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Introduction: Multicomponent exercise (ME) has been used as an interesting training alternative to endurance or resistance training programs for older adults, given the known positive effect on functional fitness (FF). As ME comprises a large variety of exercises, including aerobic, an increase in muscle ability to perform prolonged activities may be expected. However, no data have yet been provided regarding the effects of ME on aerobic capacity evaluated through anaerobic threshold (AT), an accurate physiological parameter sensitive to muscle metabolic adaptation beneficial for endurance activities. The blood lactate concentrations (BLC) corresponding to 4 mM has been set as the most accurate criteria for AT cross determination. Therefore, the purpose of this study was to analyze the effect of ME on AT and FF end-points in older adults.

Methods: Twenty-two healthy community-dwelling older adults (age 60-73 yr) were engaged in 8 months of ME (two times/ week for 60 min). Protocol included aerobic exercises, muscular endurance exercises and activities targeting to balance and flexibility improvement. Before- and after-training, FF was assessed using the 30-s chair stand (30-sCS), 8-foot up and go (8-fUG) and 6-min walk test (6-mWT). An incremental step test was used to determine the workload (V4) corresponding to AT as 4mM of BLC. During the test capillary blood was taken from the ear lobe 30s after the end of each step and immediately analyzed using an enzymatic blood analyzer (YSI 1500L-Sport). In addition, body composition was determined by bio-electrical impedance and habitual physical activity levels by Modified Baecke questionnaire for older adults.

Results: Following 8-months of ME significant increases in 30-sCS (27.74%, p=0.001) and in 6-MWT (10.09%, p=0.001) were observed, whereas V4 significantly decrease (-3.33%, p=0.006). No significant changes were observed in 8-fUG, physical activity levels and body fat mass after exercise intervention. No correlations were found between all the considered variables.

Discussion: Unexpectedly, the data suggested that 8 months (2 times/week) of ME was insufficient to positively alter AT, despite favorable changes in 6-mWT and 30-sCS performance. Taking into account the results of AT, it seems that it is possible that changes in 6-MWT may not represent a true alteration in aerobic capacity. Based upon these findings, it is possible that different factors may be involved in the modification of 6-MWT performance and AT after moderate intensity exercise in older population. Finally, future research evaluating the physiological variables determining AT changes with exercise training in older population is warranted.

Supported by FCT-MCTES Grants (PTDC/DES/70261/2006 and SFRH/BD/36319/2007).

INTERMITTENT CLAUDICATION AND PHYSICAL EXERCISE: EFFECTIVENESS OF A HOME-BASED PROGRAM

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Peripheral arterial disease (PAD) as a high incidence in general population and 12% to 20% of population with more than 60 years has already clinical symptoms, such as intermittent claudication (IC), pain, loss of strength and functional incapacity. There are already some studies who refer the possible positive effects of physical exercise in functional consequences of PAD. The purpose of this study was to verify the results of a home-based (HB) weekly supervised physical exercise program in patients with IC in consequence of PAD in lower limbs, and observe the medium number of diary steps walked by the subjects of our study.

Fourteen subjects (11 males and 3 female; 72.4±6.7 years; BMI 27.1±2.8 kg/m2) with IC participated in our study.

Through the 6 minutes walk test (6MWT) we have assessed the distance until claudication (DC) (distance walked until pain), maximal distance walked (MDW) (distance walked until maximal pain) and functional capacity (FC) (total number of meters walked in 6MWT). We assessed also the rate of perceived exertion (RPE) with CR10 of Borg and the highest number of repetitions of elevation of heel (EH). We have applied a HB program during 8 weeks. This program included daily execution of elevations of heels for leg muscles and a walk.

Results show elevation in DC (178.8±75.5 vs 259.6±116.7; p=0.01), MDW(255.7±104.4 vs 326.5±137.9; p=0.008), FC (299.1±115.1 vs 389.6±102.1; p=0.000) and EH (42.1±14.7 vs 59.9±21.6; p=0.002), respectively before and after HB program. The RPE has also decreased (3.1±1.1 vs 2.6±0.6) but not significantly. With a pedometer we have also observed that subjects of our study walked 4990±1872 steps a day.

Conclusions: A weekly supervised HB program with walk and strength training of leg muscles shows effectiveness with these patients in the relief of symptoms of IC. Nevertheless it is necessary not only to verify these results in a group with more subjects but also to give and spread orientations about the importance of physical exercise programs with these populations.

14:15 - 15:15

Poster presentations

PP-ML01 Motor learning 1

ELECTROMECHANICAL DELAY IN BALLISTIC MOVEMENT OF SUPERIOR LIMB: COMPARISON BETWEEN MALE AND FEMALE ATHLETES

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Introduction: The aim of the present study was to analyse the electromechanical delay (EMD) between male and female karate athletes when they performed a ballistic movement of superior limb on a makiwara (karate training instrument).

Methods: Ten male and eight female karate athletes performed 10 repetitions of a motor skill which consist in upper arm flexion and elbow extension (choku-zuki punch) to the makiwara. Surface EMG activity of the anterior (AD) and posterior deltoid (PD), pectoralis major (PM), latissimus dorsi (LD), triceps brachii (TB) and biceps brachii (BB) of these subjects were recorded, using bipolar electrodes connected to a Biovision System.

Time of movement, beginning and stopping instant, were recorded using electromagnetic tracking device, Flock of Birds System. It was used a set-up of two sensors located on arm and forearm. A third sensor was mounted on the makiwara.

The EMD was defined as the difference between the onset of the EMG and the initiation of movement. Motor skill movement time offset was defined when the subjects reach the target.

The motor skill means from each group were used for analysis. Aiming to verify if there were significant differences we used analysis of variance with One-Way Anova ($p<0.05$), using the statistical programme SPSS version 16.0.

Results: Results revealed that male athletes had smaller EMD (0.003 s ± 0.001) between the onset of AD muscle activation and the beginning of upper arm flexion than female athletes (0.061 s ± 0.046). The difference between groups is significant ($p=0.011$).

Significant differences were found to in agonists/antagonists relation of upper arm flexion, specifically in PM/PD ($p=0.005$) and in AD/LD ($p=0.047$), showing that male athletes had higher EMD in this relation.

No significant differences were found in upper arm flexion antagonists, in elbow extension agonist and antagonist muscles neither in elbow extension agonist/antagonist relation in the EMD.

Conclusion

We concluded that only in upper arm flexion movement was verified a gender influence reflected in EMD, namely in agonist muscular activity and in agonists/antagonists relation. Smaller EMD presented by male athletes in AD muscle reveals a larger effectiveness in the transfer of the contractile force to the beginning of movement and in its duration, but it leads to an antagonist activation instant adjustment, retarding the beginning of agonist/antagonist cocontraction. The differences in EMD between male and female athletes could represent a different strategy of control the neuromuscular coordination in those groups.

COMPARISON OF STRATEGIES FOR MODULATING RAPID GRIPPING BETWEEN THE LEFT AND RIGHT HANDS OF RACKET-SPORT ATHLETES

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TOKYO POLYTECHNIC UNIVERSITY

Introduction: When exerting rapid isometric force, the peak of force trajectory closely correlates to the peak of its second derivative. This high degree of correlation is seen within a certain range of force, and there are individual differences in the upper limit of force (critical force level) (S. Ono et al., 1997). However, to the best of our knowledge, no studies have measured the critical force level of the left and right hands in individuals with large differences in grip strength between the two hands. The objective of the present study was to ascertain strategies for modulating left and right hand grip strength during rapid gripping in racket-sport athletes with large asymmetry in grip strength.

Methods: Subjects were five tennis players and one badminton player. All were right-handed, and the grip strength of the right hand was 15.2-30.8% greater than that of the left hand. Each subject was instructed to grip voluntarily and isometrically at different exertion levels (10-90% MVC) 40-50 times each for the left and right hands. The subjects were asked to grip as rapidly as possible. Surface electromyography (EMG) was measured at the flexor digitorum superficialis (FDS). The following parameters were measured: peak of force trajectory (PF), peak of its second derivative (P-d2F/dt2), and onset-integrated EMG relating to P-d2F/dt2 (onset-I.EMG).

Results: The critical force level at which a positive linear relationship was maintained between P-d2F/dt2 and PF differed between the left and right hands in all subjects. For example, the left and right critical force levels for subject NE (woman, grip strength: 23 kg for the left hand and 33.8 kg for the right hand) were 57 and 35% MVC, respectively. Furthermore, the left and right critical force levels for subject UN (man, grip strength: 40.8 kg for the left hand and 48.1 kg for the right hand) were 61 and 83% MVC, respectively. In this manner, no relationship existed between grip strength and critical force level for the left and right hands. However, when calculating %Max P-d2F/dt2 (P-d2F/dt2 relative to the maximum value of P-d2F/dt2 obtained by rapid gripping with maximum effort), the critical force level as indicated by the relationship between %Max P-d2F/dt2 and PF (%MVC) was the same for the left and right hands. Moreover, except for the right hand of one subject, high correlation coefficients (r=0.667-0.930) were seen between onset-I.EMG and P-d2F/dt2.

Discussion: In racket-sports athletes with a large difference in left and right grip strengths, the critical force level [the relationship between %Max P-d2F/dt2 and PF(%MVC)] was the same for the left and right hands. In other words, strategies for modulating force levels over a broad range during rapid gripping are not based on an absolute scale of muscle force, but on a relative scale of muscle force and speed.

References

S. Ono, M. Okada, T. Kizuka, K. Tanii. (1997), Jpn J. Phys. Fitness Sports Med., 46, 289-296

SUCCESSION OF NEUROMUSCULAR ACTIVATION DURING DIFFERENT TECHNIQUES FOR GIANT SWINGS IN GYMNASTICS

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UNIVERSITY OF LEIPZIG

Introduction: The aim of the study was to analyse the chronological succession of the neuromuscular activation in high performance gymnasts during different techniques for giant swings on the horizontal bar, measured using a telemetric electromyography system (EMG). It should be examined how to optimize current teaching methods to the special demands of neuromuscular activation patterns during long hang swings.

Methods: The sample consisted of three high level gymnasts (male, age: 16-17 years, 28-30 hrs. of training /week). They first had to demonstrate giant swings backward in "conventional technique" (conv.GS, n=11), and then using the high accelerating "power technique" (pow. GS, n=5) (1). The EMG was captured with 1500 Hz (Telemyo 2400T, Noraxon, USA). The following muscles were plotted: Pectoralis major (Pect.), rectus abdominis (RAbd.), rectus femoris (RFem) as essential parts of the anterior muscle chain, and deltoideus, pars posterior (Delt.), erector spinae (ESpin), biceps femoris (BFem) as antagonists (posterior muscle chain). The kinematic data of the elements were captured using video kinemetric analysis with 50 Hz ("2D-Mess" of IAT, Leipzig). For synchronization, the systems were triggered by an analogue signal.

Results: During the leg acceleration phase, in all participants and in all elements, the results showed a succession of muscular activation of the anterior chain from "Punctum fixum" (PF) to "Punctum mobile" (PM). Pect. and RAbd. were coactivated nearly simultaneously. RFem. was always activated last, with no exception. During the upswing phase in conv.GS either a simultaneous or even a recurrent succession from PM to PF was found. In contrast to this, the muscle activation and deactivation patterns (anterior and posterior) during all phases of pow.GS ran through the body from PF to PM.

Discussion: The results support the thesis that for an effective segmental acceleration of PM the activation has to run from PF to PM, generally. To cause an impulse transmission of PM, however, an inverted pattern seems to be necessary. Thus, the succession of neuromuscular activation does not always correlate with the kinematic succession of segmental body movements (1). With regard to the fact, that training methodology is commonly based on kinematic models this could lead to ineffective patterns of neuromuscular activation and cause a prolonged learning process for developing high level swinging techniques. The findings should be verified in larger samples of high performance gymnasts. If these results are affirmed, then these aspects should be accounted for in training methodology for better differentiation and faster learning of correct muscular activation patterns with regard to long hang swings.

Reference

1: Arampatzis, A., Brüggemann, G.-P. (1999). Mechanical energetic processes during the giant swing exercise before dismounts and flight elements on the high bar and uneven parallel bars. Journal of Biomechanics 32 (1999), 811-820.

FORCE VARIABILITY DURING ISOMETRIC WRIST FLEXION IN HIGHLY-SKILLED AND SEDENTARY INDIVIDUALS

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LAB OF NEUROMECHANICS

The association of expertness in specific motor activities with a higher ability to sustain a constant application of force, regardless of muscle length, has been hypothesized. Ten Highly-Skilled (HS group) young tennis and handball athletes and ten Sedentary (S group) individuals performed maximal and submaximal (5, 10, 20, 50 and 75% of the MVC) isometric wrist flexions on an isokinetic dynamometer (Kin-Com, Chattanooga). The wrist joint was fixed at 5 different angles (230, 210, 180, 150 and 1300). For each position the percentages of the maximal isometric force were calculated and participants were asked to maintain the respective force level for 5 sec. Electromyographic (EMG) activation of the Flexor Carpi Ulnaris and Extensor Digitorum muscles was recorded using bipolar surface electrodes. Power spectral analysis of the EMG signal was performed to calculate the Median Frequency (MF) on 512-point by fast Fourier Transform technique (FFT). No significant differences were observed in maximal isometric strength between HS and S groups. Participants of HS group showed significantly ($p < 0.05$) smaller force Coefficient of Variability (CV) and SD values at all submaximal levels of MVC at all wrist angles. The CV and SD values remained unaltered regardless of wrist angle. No difference in normalised agonist and antagonist EMG activity was observed between the two groups. However, FFT analysis revealed a greater MF for the HS in comparison to the S group ($p < 0.05$). It is concluded that the greater force steadiness observed in experts was solely accompanied by higher MF of the agonist EMG.

STATIC BALANCE CONTROL AND LOWER LIMB STRENGTH IN BLIND AND SIGHTED WOMEN

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LAB OF NEUROMECHANICS

The purpose of this study was to examine static balance control and its possible relationship with the lower limb strength in blind women. Eleven blind (BL group) and eleven (SE group) seeing women performed 3 different tasks of increasing difficulty: Normal Quiet Stance (NQS, 1min), Romberg Stance (RS, 20sec) and One Leg Stance (OLS, 20sec). Participants stood barefoot on two adjacent force platforms and the Center of Pressure (CoP) variations [peak-to-peak amplitude (CoPmax) and SD of the CoP displacement (CoPsd)] were analyzed. Seeing participants performed the tests in Eyes Open (EO) and Eyes Closed (EC) conditions. Moment/angular velocity and moment/angular position relationships were also established using a Cybex dynamometer for knee extensors and flexors as well as for ankle plantar and dorsiflexors. The analysis showed that, in comparison to the SE group, the postural sway of the BL group was greater ($p < 0,01$) in A/P direction for all balance tasks, whereas in M/L direction was greater ($p < 0,01$) only for the OLS. When sighted participants performed the postural tasks in the absence of vision, CoP displacement in M/L direction was ($p < 0,05$) greater than in SE group for all tasks. Postural sway in A/P direction was greater only for the OLS. No significant differences were observed between the two groups concerning concentric and isometric tests for both knee and ankle muscles. The eccentric strength of the knee extensors was found to be greater ($p < 0,05$) in the sighted participants in comparison to visually impaired. It is concluded that great differences in static balance control between visually impaired and sighted humans mainly concern the A/P direction. When the sighted participants performed the tasks in the absence of vision, their differences tend to disappear. Strength of both knee and ankle muscles does seem to influence their static balance performances.

LATERAL SPECIFICITY OF BILATERAL TRAINING IN THE MOTOR CORTICAL ACTIVITY AND REACTION TIME DURING THE SIMULTANEOUS REACTION TIME AND STRENGTH TASK

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Introduction: The lateral specificity in the effect of bilateral and unilateral training is present in the resistance exercise (Taniguchi, 1997, 1998) but not in the reaction time (RT) task (Taniguchi, 1999). These mechanisms in the training have not yet been clarified. In many sports, quickness and strength are required simultaneously. The purpose of this study was to investigate 1) whether the lateral specificity in the effect of training in the simultaneous RT and strength task is present and 2) whether the cortical activity would be changed with the effect of bilateral and unilateral training.

Methods: Before and after the training session, fourteen right-handed subjects were measured simple RT tasks with isometric abduction of the index finger under three conditions; with the right hand, left hand, and both hands. Each response condition consisted of 2 blocks of 20 trials. The order of the blocks was randomized. Electroencephalogram (EEG) activity was recorded on 21 locations using the 10 - 20 system. During the preparatory period, EEG was averaged, time-locked to the preparatory signal, under the three task conditions. Electromyographs (EMGs) were recorded with surface electrodes on the right and left first dorsal interosseous muscles. Isometric abduction forces were recorded by force transducers. EMG-RTs were measured from the response signal to the onset of EMG. Movement times were measured from the response signal to the rise of force. Subjects were assigned to three groups; bilateral training group (BT), unilateral training group (UT), and control group(C). BT and UT continued the 2 blocks of 10 trials of each RT task, 3days a week for 3 weeks. C did not train.

Results and Discussion: A two-factor analysis of variance, with two times (before and after) x two sides (right and left) demonstrated that significant reduce in movement times were found in UT subjects regardless of condition. Movement time of unilateral condition tended to increase in BT. No change was found in RT of C. The amplitude of contingent negative variation (CNV) on motor cortical area (C3 and C4) just before the response signal, as an index of motor preparation, tended to increase for BT in bilateral condition. It was concluded that lateral specificity in the effect of training in the simultaneous RT and strength task was observed only for BT, but not for UT. More studies are needed to clarify whether motor cortical activity during the simultaneous RT and strength task would be changed with the effect of bilateral and unilateral training.

References

Taniguchi (1997). Lateral specificity in resistance training: the effect of bilateral and unilateral training. Eur J Appl Physiol 75: 144-50.

Taniguchi (1998). Relationship between the modifications of bilateral deficit in upper and lower limbs by resistance training in human. Eur J Appl Physiol 78: 226-30.

Taniguchi (1999). effect of practice in bilateral and unilateral reaction-time tasks. Perceptual and Motor Skills 88: 99-109.

TEMPORAL STABILITY IN DUAL RHYTHMIC MOTOR TASK

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INTRODUCTION: Most of the everyday human motor behavior belongs to the category of repetitive movements (e.g. cyclical locomotor behavior). Such oscillatory movements can be well described through periodicity, or in other words - regularity of timing. Research paradigm of interlimb coordination drawn from coordination dynamics and build on famous Haken Kelso Bunz model (HKB; Haken et al., 1985) is most concerned with temporal and spatial organization of movement. HKB model, which basically capture the level of stability of the coordination pattern, anticipates two stable coordination modes, so called in-phase (PH; limbs moves paralell) and anti-phase (APH; limbs move opposite one from another).

METHODS: Ten right-handed adults (aged 19 - 28) voluntarily participated in the experiment. Participants seated behind the desk where the board with two copper contacts plates was placed, another board with same contacts was set on the floor under the subjects feet. Subjects wore copper made contacts on their hands and feet connected to computer via data acquisition card. Contact of two plates provided closing of electrical circuit, thus, exact time and duration of touch was assessed. Participants produced tapping movement (1 Hz) with their hands and feet simultaneously under two initial conditions, in first hands were constrained to PH coordinative mode while feet were in APH, in second condition feet moves in PH while hands were in APH. Sixty seconds of performance were recorded. Customized software provided measures of phasing of homolateral and ipsilateral pairs of limbs. Relative phase was calculated as usual (Donker et al., 2001), standard deviations of relative phase as measures of variability were further analyzed.

RESULTS AND DISCUSSION: Most of the studies in dynamical approach belongs to bimanual coordination while just minority of them are oriented to quadripedal-like patterns. In a present study authors wanted to test the coupling and the stability of coordination patterns when all four limbs were involved. Surprisingly, there were no statistically significant differences in variability between the limbs of two girdles among the coordination modes. The only statistically significant difference acquired by univariate ANOVA was noticed in ipsilateral limbs on the left side (df=1, 17; F=5,10; p=.037). Even more interesting was the fact that the ipsilateral coupling was more stable then the homolateral. Overal variability of two patterns was high which is caused by novelty of joined motion patterns. Most of the trials were heavily saturated with switching to another mode - inside one or both girdle, or patterns simply did broke down. Findings proves known fact that the coalition of constraints most strongly influences stability of rhythmic coordination task.

REFERENCES

1. Haken, H., et. al. (1985). A theoretical model of phase transitions…, Biol. cybern., 51, p347

2. Donker, S. F., et. al. (2001). Coordination between arm and leg.., J. mot. behav. 33, p86

GENDER AND LEARNING THE BUTTERFLY STROKE TECHNIQUE

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INTRODUCTION: Swimming performance is surely related to gender, as well as spatial and temporal actions of the stroke. However, a discrepancy about gender and learning the swimming techniques seems to occur: in children no differences have been found in learning the front crawl, whereas in young beginners relationships between gender and learning have been shown as a result of different teach-

ing Methods: This study aimed to evaluate and compare the learning of the butterfly stroke technique under gender in young male and female beginners.

METHODS: Eighteen 16 to 21 years old subjects (10 females, F and 8 males, M) composed the sample. In order to proceed with the study, since anthropometric data differed as expected (F vs. M: height 166±5 vs. 177±5 cm, p<.001; weight 52.1±7.3 vs. 68.3±11.2 kg, p<.001; BMI 18.96±2.25 vs. 21.73±2.72, p<.05; arms span 164±6 vs. 177±5 cm, p<.001) aquatic skills were set as criteria of homogeneity: technical level, hydrodynamics, performance in 50m breaststroke. Subjects attended a 10-class program (50 min each class) and were taught the butterfly stroke by a mixed analytic-global method: analytic in the first half of the class and global in the second half.

Evaluation and analysis of the stroke learning process were carried out by a final 25m butterfly stroke. A qualitative analysis of stroke elements such as balance, arm to legs coordination, stroke rhythm, kick, underwater arm stroke phase, arm recovery, head control was carried out. Performance in a 25m butterfly stroke, stroke length (SL) and stroke rate (SR) were collected for a quantitative analysis. Swimming mean velocity (v) and Swimming Index (SI=v2/SR) were calculated.

RESULTS: M seemed to better perform arm to leg coordination and underwater arm stroke. They kept the hip lower underwater and the shoulders higher during recovery. F showed better rhythm and arm recovery, staying higher on the water and better performing the anticipation of the head movement.

Significant differences were found in the 25m performance (F vs. M, 26.5±2.2 vs. 22.5±4.3 s, p<.05) in SL (0.57±0.1 vs. 0.78±0.2 m/cycles, p<.05), SR (0.54±0.1 vs. 0.88±0.2 cycles/s, p<.001) and v (0.94±0.1 vs. 1.14±0.2 m/s, p<.05) but not in the SI (1.72±0.5 vs. 1.56±0.6, p>.05).

CONCLUSION

As expected, there were significant differences between female and male subjects due to physiological features gender related. Differences in force (very important in butterfly stroke) and anthropometric data fully explain better male performances. Anyway, qualitative analysis and SI results (i.e. index of swimmer's technical efficacy) induce to state that no gender differences can be observed in learning the butterfly stroke.

REFERENCES

Parker HE, Blanksby BA, Quek KL (1999). Learning to Swim Using Buoyancy Aides. Pediatr Exerc Sci. 11: 377-392.

Verger M, Verger NG, Robert A (2000). Influence of different skill-learning methods for acquiring the butterfly stroke, Science & Sports, 15, 1, 26-30(5).

NO EFFECT OF USING FLOTATION SUITS IN GLIDING AND FLOATING ABILITIES OF ADVANCED BEGINNERS IN SWIMMING TEACHING

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Introduction: Flotation suits are proposed as a means to enhance the effect of swimming teaching in children, however there are few empirical data on this effect. Wearing the suit would mean a safer child, more able to do exercises on their own, independently of the teacher, and possibly increasing the activity level. Disadvantages of using flotation aids in general are that children become dependent on the aid, not learning to float free and independently, and that self confidence of learning to swim unaided is not developed.

Purpose: The purpose of this study was to investigate the effect of wearing a flotation suit on the floating and gliding abilities of children in a learn-to-swim program.

Methods: 110 children, with previous swimming school experience, but not yet able to swim, were taught how to swim once a week for ten weeks. Each group were randomised to use flotation aids (FL, n=50, mean age 7.7±1.3 years, height 125±26 cm) in the form of a flotation vest, or non use of the vest (CON, n=60, mean age 7.4±1.0 years, height 121±29 cm). The reported previous swimming teaching experience was 3 or 4, 10 hour courses for the CON or FL respectively (p<0.03). The vest group did also exercises at the end of each lesson without the aid to enhance abilities of real floating. Their skills after 10 lessons were observed through video recordings, measured with a modified Aquatic readiness assessment test (Langendorfer and Bruya 1995) using tagging of events in the Dartfish software. Floating scores were given for each subject, and assisted, supported or free floating was taken into consideration, as well as the duration of the floating. For gliding scores, head up or down as well as the gliding distance were considered.

Results: The mean scores of floating abilities on front (prone position) were 7.6±1.7 and 7.9±2.1 for FL and CON respectively, and for floating on back (supine position) 6.9±2.2 and 7.4±2.3 respectively. The gliding test score for the FL group were 2.3±1.0 and or CON 2.6±1.1. There were no statistical differences between the groups either for floating or gliding abilities. However, looking at all subjects, front floating abilities scored higher than back floating (p<0.01). There were no differences in floating and gliding abilities between genders.

Discussion and Conclusions: There were no differences for floating or gliding abilities in advanced beginners after 10 one hour lessons using flotation suits compared to a control group. If the flotation suit is used wisely, and teaching is also done sometimes without the vest, teaching with a flotation suit does not slow the development of floating and gliding abilities - prerequisites for learning how to swim. Further research is needed to look at the effects on arm stroking, leg kicking and whole swimming abilities.

References:

Langendorfer SJ, Bruya LD. (1995). Aquatic readiness: Developing water competence in young children. Champaign, IL: Human Kinetics

ATTENTIONAL FOCUSING INSTRUCTIONS INFLUENCE FORCE CHARACTERISTICS DURING KNEE EXTENSION EXERCISE

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Introduction: Attentional focusing instructions (either internally or externally focused) can have a significant influence on the muscular activity during exercise type movements (e.g., (Vance, et al., 2004; Marchant, et al., 2008). Specifically, externally focused instructions (direct attention towards the movements being carried out and the object through which force is being exerted) result in lower EMG values when compared to internally focused instructions (directing attention to the movements of the limb involved in the movement). Recently (Marchant, et al., in press), externally focused instructions resulted in increased force production during elbow flexions when compared to internally focused instructions. The present research further addresses the nature of these force production characteristics during instructed exercise movements.

Methods: 15 healthy participants completed 10 isokinetic knee extension repetitions on a Biodex System 3 dynamometer under two counterbalanced conditions: production of maximal force using verbal internally (focusing attention onto the movements of the leg) and externally (focusing attention onto exerting force through the leg pad) focused instructions. Measures were the integral of the torque-time

curve (iT), force variability (fV – SD in iT) and a fatigue index (FI - % decline in iT). A 2 (Attentional Focus Type) X 8 (Repetition) Repeated Measures ANOVA analysed differences in iT. Paired samples t-tests were used to assess differences in fV and FI.

Results: iT was significantly ($p < 0.05$) greater when external focus was adopted (126.88, SE = 8.59 N m) compared to an internal focus (119.20, SE = 9.67 N m). An external focus was also associated with significantly ($p < 0.05$) greater fV (10.17 N m) compared to an internal focus (8.00 N m), but there were no differences in observed fatigue over the course of repetitions in either internal (88.72%) or external (85.55%) focus condition.

Discussion/Conclusion: Supporting recent previous research, an external focus of attention increased force production in an exercise task when compared to an internal focus. Attentional focus did not influence fatigue characteristics effects over the course of this exercise, but requires further research. These findings have significant implications for the instruction of exercise and rehabilitation exercises.

References

Marchant, D. C., Greig, M., & Scott, C. (in press). Attentional focusing instructions influence force production and muscular activity during isokinetic elbow flexions. Journal of Strength and Conditioning Research .

Marchant, D. C., Greig, M., & Scott, C. (2008). Attentional Focusing Strategies Influence Muscle Activity During Isokinetic Biceps Curls. Athletic Insight: The Online Journal of Sport Psychology, 10 (2).

Vance, J., Wulf, G., Töllner, T., McNevin, N., & Mercer, J. (2004). EMG activity as a function of the performer's focus of attention. Journal of Motor Behavior , 36 (4), 450-459.

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Poster presentations

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EFFECT OF MODERATE RESISTIVE TRAINING ON IMMUNE FUNCTION IN ELDERLY PEOPLE

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The purpose of this study was to examine the effect of resistive training on age-related impairment of immune parameters in elderly individuals. Twenty-four elderly subjects were assigned to an exercise training group (EXC: 3 males, 9 females; aged 61–76) or a non-exercise control group (CON: 4 males, 8 females; aged 62–79). Subjects in EXC participated in exercise sessions 2-days a week for 12 weeks. Meanwhile, subjects in CON maintained their normal physical activity levels during the study period. Blood samples were collected before and after the training period. Samples were measured for the number of leukocytes, lymphocytes and monocytes, as well as for CD3+, CD4+, CD8+, CD28+CD4+, CD28+CD8+, TRL-4+CD14+, CD80+CD14+ cells. The number of leukocytes, lymphocytes, monocytes, CD3+ CD4+ and CD8+ cells did not change after 12 weeks in both EXC and CON. The number of CD28+CD8+ cells significantly increased after the training in EXC ($P < 0.05$), while CON did not show significant changes. In the EXC group, CD80+CD14+ cell numbers were significantly higher following the training ($P < 0.05$), but the number of TLR-4+CD14+ cells was not changed. In the CON group, there were no significant alterations in TLR-4+CD14+ and CD80+CD14+ cell numbers. In conclusion, moderate resistance training in the elderly is associated with improvement of expressions of CD28 on Tc cells and CD80 on monocytes. Therefore, moderate resistive training could up-regulate T-cell activation in elderly people.

THE EFFECT OF LONG-DISTANCE TRANSPORTATION BY AIRPLANE ON SALIVARY SIGA AND CONDITION IN ELITE JUNIOR SPEED SKATERS

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Introduction: Elite athletes often use airplane when they participate in an international competition. It has been reported that a long-distance transportation decreased mucosal immune function (salivary secretory immunoglobulin A: SIgA) in healthy men and women (Terasawa et al., 2008). However, the effect of long distance transportation by airplane on salivary SIgA and condition in athlete has never been studied so far. The purpose of this study was to investigate the effect of long-distance transportation by airplane on salivary SIgA and condition in elite junior speed skaters.

Methods: The subjects were 7 elite junior speed skaters who participated in the North America (Calgary) expedition in 2008. Saliva samples were collected before and after the transportation, and saliva flow rate, salivary SIgA concentration, and salivary SIgA secretion rate were measured. A survey of upper respiratory tract infection symptoms was also conducted before the transportation, 1 day, 2 days, 3days, and 4 days after the transportation.

Results: The saliva flow rate (-21.4 %), SIgA concentration (-33.3 %) and SIgA secretion rate (-52.0 %) significantly decreased after the transportation ($p < 0.05$). One of 7 subjects exhibited upper respiratory tract infection (URTI) symptoms after the transportation. In addition, the decreasing rate of SIgA levels in the subject exhibited URTI symptoms was the highest of all the subjects.

Discussion: These results suggest that the transportation decrease salivary SIgA levels in elite junior speed skaters. In addition, our data might suggest that incidence of URTI symptoms is related to the SIgA level of each subject. There is a possibility that the long-distance transportation by airplane induces a decrease in SIgA levels of elite athletes and leads to a decrease in their condition. Because saliva collection is easy and non-invasive, it is easy to enlist a cooperation of elite athletes. If it becomes possible to measure salivary SIgA more easily, the monitoring of SIgA levels may be useful for the conditioning of elite athletes with an aim to prevent the incidence of URTI during long-distance transportation.

References

Terasawa J, Shimizu K, Abe A, Keisuke N, Suzuki T, Akama T (2008), Sport Science Research, 5, 163-171.

3D SCAPULOTHORACIC AND ISOKINETIC SHOULDER EVALUATION DURING INTERNAL/EXTERNAL ROTATION AT 90° ABDUCTION IN ELITE VOLLEYBAL ATHLETES WITH AND WITHOUT NERVUS SUPRASCAPULARIS LESION

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Introduction: The incidence of a n.suprascapularis lesion (NSL) in elite volleybal athletes is about 20% with a predilection at the spinoglenoid notch (Ferretti et al. 1998). Clinically presenting with a hypotrophy of the infraspinatus, these volleybal players do not complain of functional impairment nor pain.

Compared to asymptomatic elite volleybal athletes, the dominant as well as the non dominant shoulder of elite volleybal athletes with NSL present increased passive external rotation in 90° abduction, and no differences for internal rotation at 90° abduction (Witvrouw et al. 2000). In elite volleybal players with NSL, isokinetic concentric mean peak torque at 60° and 180°/sec was different from the asymptomatic volleybal athletes for internal rotation in both the dominant and non dominant shoulder, but only different for external rotation in the non dominant shoulder (Witvrouw et al. 2000).

No study combined isokinetic strength measurement with registration of dynamic scapulothoracic motion.

Methods: In this study, scapulothoracic motion and isokinetic concentric strength was evaluated for external rotation/internal rotation at 90° of abduction in 6 elite volleyball athletes with NSL and 8 without (age-matched groups, 24,2+2.1yrs). Concentric isokinetic testing of 5 at 60° and 240°/sec was evaluated with the Biodex System 3 Pro, simultaneously following the 3D scapulothoracic arthrokinematics by means of electromagnetic tracking (extended Flock of Birds, Ascension Technology) which is validly applicable up to 120° of elevation. Statistic testing was done non parametrically. Parameters evaluated with Biodex included average peak torque, internal and external rotation range of motion, agonist/atagonist ratio.

Results: No significant differences (.05 level) in isokinetic strenght were found in the dominant and non dominant shoulders between the NSL group and the asymptomatic group. Furthermore, in both groups, no differences in isokinetic strenght were found in between the dominant and non dominant shoulder. For the scapulothoracic motion behaviour, no significant differences were found in the scapulothoracic Euler angles between the asymptomatic control group and NSL group.

Conclusion: Examining isokinetic strength and scapulothoracic motion during internal/external rotation at 90° abduction, our data show no differences in isokinetic strength and scapulothoracic motion behaviour. As such, our data differ with Witvrouw et al.'s findings (2000) This may be due to differences in patient group and measurement procedure. Anyhow, our data apply more to the reality that elite volleyball players with NSL do not complain of functional impairment.

Ferretti A, De Carli A, Fontana M, Injury of the suprascapular nerve at the spinoglenoid notch, The natural history of infraspinatus atrophy in volleyball players. Am J Sports Med, 26, 1998, 759-763.

Witvrouw E, Cools A, Lysens R, Cambier D, Vanderstraeten G, Victor J, Sneyers C, Walravens M, Suprascapular neuropathy in volleyball players, Br J Sports Med, 34, 2000, 174-180.

THE EFFECTS OF REHYDRATE DRINKS ON THE EXERCISE PERFORMANCE TEST.

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Introduction:When sports player perform in prolong exercise in warm condition, they sweat a lot and lose their body mass. Current recommendations encourage athletes to drink sufficient amount to avoid excessive change in body mass. Adequate fluid intake during exercise is known to prevent cardiovascular strain, which could reduce performance capacity in prolonged exercise. However, how the effect on performance will change by drinking different type of drinks during exercise is not clear.

Purpose: The aim of this study is to investigate the effects of rehydration with drinks on the exercise performance test.

Methods: Ten university football players participated in this study (age 22.1 ± 1.1yr, Vo2max 50.5 ± 3.5ml/kg/min). Each subjects completed the four experimental trials, randomized and administered in a crossover manner, separated by at least 7 days. They exercised on a bicycle ergometer for 90min at 65% of Vo2max then performance test was conducted using the bicycle. In this exercise performance test the workload increased 2W every 5sec from 100W and stopped the bicycle in a state equal to or less than 50 rounds per minute. In experiment 1 lost sweat volume was measured without any fluid intake. Sweat loss during each period of exercise was determined through changes in body mass. In experiment 2.3.4 subjects exercised with drink intake (Gatorade® or Sports drink A or Placebo drink) during the experimental trials. The drink volume consumed was equal to 80% of sweat lost during exercise, provided in three equal bottles at 20 min intervals (drink time 20,40,60 min).

Results: Time of exercise continuance and workload was Sweat test 355±91(s) 242.4±37.5(W),Gatorade® 459.9±86.4(s), 277.6±30.5(W). Sports drink A 403.8±88.5(s) 260.0±36.3 (W), Placebo 394.5±99.4(s), 256.4±40.3 (W). Time of exercise continuance and workload with Gatorade® was significantly greater than those without any drink in Sweat test. There were no significant differences on exercise performance test time or workload among three drinks. However, Gatorade® showed the greatest time in total and 70% of subjects indicated the best time than other drinks.

Conclusions: We suggested that exercise performance was affected by rehydrate drink.

BIKE TRANSALP 2008: THE LIQUID INTAKE AND ITS EFFECT ON BODY'S FLUID HOMEOSTASIS IN THE COURSE OF A MULTI-STAGE MTB CROSS-COUNTRY MARATHON RACE IN THE CENTRAL ALPS

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Introduction: Despite the increasing number of bikers who practice off road cycling as recreational or competitive sport, scientific interest in mountain biking is still modest. The lack of sport-specific guidelines in training and competition often seduces athletes to orientate themselves to schemes and standards of related sports, risking a slump in terms of performance and health.

Therefore, the aim of this study was to analyse the drinking behaviour in a multi-stage MTB cross-country marathon race. Conclusions should be drawn about influencing factors and limits of an appropriate fluid intake during the race and about the reliability of body mass change monitoring to self-control body fluid homeostasis in course of the Bike Transalp competition 2008.

Methods

Body weight and complex impedance measurements (using BIA 2000-M, Data Input GmbH) for the estimation of body fat mass, body lean mass and body water compartments were performed at start and after completion of every race. At arrival of stage 5 and 6, blood samples were drawn from the finger pad to analyse for serum Na+, haemoglobin content and haematocrit. Participants were instructed to keep a careful mental note of liquids consumed during the race and to fill in a diary.

Results: Mean (± SEM) hourly fluid intake during the race correlated with air temperature and ranged between 494±191 and 754±254 mL/hour. In absence of exercise induced hyponatremia (EAH, Na+ <135 mmol/L) cases, we report 5 and 4 cases of asymptomatic post-race hypernatremia (Na+ >145 mmol/L), on day 5 and 6 respectively. While post-race serum sodium concentrations correlated with the liquid intake, normalized for race time and body mass (stage 5: r=-0.46, p=0.023; stage 6: r=-0.59, p=0.003), no correlation was found with the change in body mass from pre- to post-race.

Discussion: We hypothesise that the high exercise intensity, the riding on difficult terrain, the impracticality of drafting and the less recreative character of descents, which distinguish MTB sports from road cycling, may reduce the tolerance for drinking in MTB cross-country competition. Further, granted weight penalty by carrying along unnecessary load and the low number of provision stands may reduce the motivation for and the amount of fluid intake during the race. Even though the mean hourly liquid consumption during the race stages was found to lie within the limits of 400-800 mL, recommended for most forms of recreational or competitive exercise (Noakes TD, 2003), it was, however, associated with a high prevalence of dehydration in the studied group.

Organisers and mountain-bikers should be aware not to interchange lastly emphasised risks of overdrinking with the consequences of dehydration by restricted fluid intake. Particular attention should be paid to adjust fluid provision and drinking to air temperature. In this setting, body mass monitoring was not an accurate instrument to control body fluid homeostasis.

References

Noakes TD (2003). BMJ 327, 113-14.

INJURY SURVEILLANCE DURING A NATIONAL FEMALE YOUTH FOOTBALL TOURNAMENT IN KENYA. A PILOT STUDY

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Objective: To analyze the incidence, circumstance and characteristics of injuries during a two-days national female youth football tournament in Kenya.

Study design: Prospective cohort study.

Subjects: Girls under the age of 13 (U13), 16 (U16) and over 16 (O16).

Observation Technique: Specially trained Kenyan injury reporters registered on a standardised injury report form. They were supported by four physiotherapist and two doctors. Injuries were defined as all injuries, painful conditions or physical complaints that occurred during the match, even if the player could continue to play.

Outcome measurement: Injury incidence and characteristics in Kenyan female youth football players.

Results: 229 new injuries were reported from 105 matches, equivalent to an incidence of 174.7 injuries/1000 player hours (95% CI 152.1-197.3). Most injuries allowed the players to continue to play (n=188;82%). Regarding medical attention injuries, U13 players had higher injury rates (160.4 injuries/1000 h, CI 122.3 to 198.5) than O16 players (109.5 injuries/1000h, CI 80.0 to 139.0; RR=1.4, CI 1.0 to 4.0; P=.03). A total of 12 injuries (5%;9.2 injuries/1000h, CI 4.0 to 14.3) were expected to result in absence from play for at least 1-7 days. Risk of sustaining a time loss injury was 5-8 times higher in U13 compared to U16 and O16. Most injuries (57%) were caused by contact with another player, 26% were caused by other contact and in 17% of the injuries there were no contact with another player. The injuries most commonly involved the lower extremity (n= 185;81%) and 5% (n= 12) of the injuries involved the head or neck. The most frequent injury type was contusions (n= 154;67%), followed by superficial skin lesions (n= 47;21%) and sprains (n=19;8%), while a contusion to the knee (n=28;12%) and ankle (n=26;11%) was the most common injury diagnosis.

Conclusion: The incidence of injuries among female youth football players in a national tournament in Kenya was high. However, most of the injured players could continue to play. U13-players had the highest injury risk. Contusions to the knee and ankle were the most common diagnosis.

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INJURY PROFILE OF COLLEGIATE RUGBY UNION IN JAPAN: TRAINING INJURIES.

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Introduction: A consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union has recently been published from International Rugby Board (IRB). However, researches followed by the consensus statement have been limited among professional and international competition. The purpose of this study was to document the incidence, severity, nature, and causes of injuries in Japanese collegiate rugby union.

Methods: A prospective design for three consecutive playing-seasons was used to describe training injuries associated with 198 players from a collegiate rugby union team in Japan. The survey was performed according to the IRB consensus procedures. Team medical staffs reported all training injuries, and provided details of the location, diagnosis, mechanism of each injury and the date of return to play. Exposures of individual players in training were recorded on a daily basis. The main outcome measures were incidence (number of injuries/1000 player-hours), severity (days absence), location, type, phase and mechanism of injuries in training.

Results: The incidence of training injuries was 3.3/1000 player-hours (forwards 3.6; backs 3.1). The average severity of injuries was 38.9 days, and moderate (8~28 days absence) and severe (> 29 days absence) injuries were greater than minimal (2~3 days absence) and mild (4~7 days absence) injuries. While ankle, knee, and shoulder were the main injury locations, shoulder and ankle had high recurrence rate. The most common injury type was sprain/ligament. Running was the predominant of phase of injuries; also attempt to tackle and being tackled indicated the greater incidence. The most frequent injury mechanisms were contacting other players.

Conclusion: This study documented injury profile at collegiate amateur level in accordance with the IRB consensus statement. The incidence and severity of training injuries in collegiate level were higher than those in professional level. Ankle and shoulder were more vulnerable locations. Although this study showed the injury profile of collegiate rugby union, we need further studies to confirm the relationship training injury and other injury risk factors, such as training volumes and programs.

14:15 - 15:15

Poster presentations

PP-RE02 Rehabilitation 2

INFLUENCE OF THREE DIFFERENT BALANCE SHOES ON EMG-ACTIVITY DURING ONE-LEG STANDING

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Introduction: Injury prevention and rehabilitation is aimed by sensorimotor training on balance boards and on unstable surfaces. Different exercises in one-leg stance are commonly used in appropriate training devices. Recently, manufacturers advertise specific shoes featured by unstable sole constructions to induce appropriate stimuli. Therefore, the purpose of this study was to compare muscle activity during one-leg standing using three different balance shoes.

Methods

Ten healthy subjects, four men and six women, participated in this study (age: 35.1+/-13.3 years; height: 172+/- 0.1cm; weight: 74.1 +/- 21.2kg). Muscle activity of the lower leg was analysed during one-leg standing using surface EMG. Subjects' performance in postural control was assessed using a force plate recording displacements of centre of pressure. First, each person performed three standardised unshod trials lasting 20 seconds (control condition). Then, MBT® shoe (MBT), Finnamic-Rollenschuh® (FIN), and Reflex Control® shoe (RC) were applied and tested identical to control condition in a randomized order. EMG-activity was recorded of the following muscles: m. tibialis anterior (TIB), m. gastrocnemius medialis (GAS), and m. peroneus longus (PER). We calculated iEMG and postural sway for each trial whereas mean values were used for statistical analyses. The four testing conditions (barefoot and three therapy shoes) were compared by ANOVA for repeated measures. Furthermore, subjects answered a standardised questionnaire concerning subjective impression and expected training stimuli of the balance shoes.

Results: In comparison to control condition (barefoot - BF) we found no significant differences in EMG-activity in conditions MBT and FIN, whether in TIB, nor in GAS and PER (p=0,051-1,000). When subjects wore the RC-shoe EMG-activity increased in all tested muscles clearly.

The level of significance (p≤0.05) was not reached in GAS for comparison between RC and BF (p=0,110). But EMG-activity was significantly enhanced in TIB and PER in comparison to testing conditions BF, MBT, and FIN (p= 0,000-0,001).

Moreover, the RC led to significantly higher postural sway (p=0,000-0,072), while MBT, FIN, and control condition (BF) were not statistically different (p=0,818–1,000) in sway of centre of pressure. In questionnaire the RC was graded to be a training device and the FIN was considered to be a comfortable shoe.

Discussion: Our data indicate that the different therapy shoes apply varying demands during one-leg stance leading to different results in EMG-activity and performance in postural control. This study confirms that during upright one-leg stance the RC-shoe is a means for neuromuscular training. It evokes increasing demands in postural control and enhances EMG-activity, while MBT and FIN simulate barefoot stance. Further studies are demanded to assess the influence of the RC-shoe on injury prevention and rehabilitation in athletes and in elderly people.

ANALYSIS OF CHANGE OF 1RM, BODY COMPOSITION AND PHYSICAL FITNESS ACCORDING TO INTENSITY OF EXERCISE IN 12-WEEKS MUSCULAR RESISTANCE TRAINING PROGRAM FOR ELDERLY WOMEN WITH OBESITY

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NAMSEOUL UNIVERSITY, KOREA INSTITUTE OF INDUSTRIAL TECHNOLOGY

The purpose of this research is to provide important basic information for muscular resistance training program by investigating effect of 12-weeks muscular resistance training program for elderly women with obesity on body composition and 1RM which is recognized as a standard of measuring muscular strength. In this research, an analysis was made on change of 1RM and body composition according to intensity of exercise in 12-weeks muscular resistance training program for elderly women with obesity. For that purpose, 39 elderly women with obesity were put into 3 groups for 3 different types of muscular resistance training -high strength, mid strength, low strength- and their body composition and 1RM were checked after 6 weeks and 12 weeks respectively. The result was as follows. As for change of body composition, there was no meaningful difference between groups in terms of strength of exercise, but it is to be noted that since 6th week, body fat and percent body fat started to reduce and muscle mass started to increase. As for change of 1RM, there was meaningful difference between groups according to period of exercise, and especially in 12th week, higher increase of 1RM occurred in the high-strength and mid-strength groups than in the low-strength group. Each group has statistically meaningful differences between period analysis on the 30-Second Chair Stand, Arm Curl, Chair Sit-and-Reach, 244cm Up-and-Go, Functional Reach, but there were no differences on the 6-Minute Walk, Grip Strength(Right). Back Stretch(Right) has statistically meaningful difference in each group, but there was no difference between period analysis, and vice versa on the Grip Strength(Right). There were no differences in between-group at any measurement factor in the senior fitness test.

METHODS OF USE OF PHYSICAL CULTURE DEVICES DURING INFANT UNSTABLE HIP TREATMENT

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VOLGOGRAD STATE UNIVERSITY

The research actual continuity. Unstable hip is one of immediate problems of modern children`s orthopedics. This disease taking into consideration not only dislocation but also mild cases of hip joint underdevelopment, called "dyspasia", are common for 1% of newborn. If dyspasia is revealed at the age of 12 months or earlier, the conservative (functional) treatment is applied. The essential rule of dyspasia therapy is a possibly earliest initiation of functional treatment, which assessed completely the stability of the hip and save its flexibility. Massage and therapeutic exercises are cornerstones of unstable hip therapy.

Study methods and management. The research was carried out in the biomedical department of the Slavenskiy-on-Kuban Pedagogical State Institute and in the physical education and sanative technologies of the Volgograd State University. We worked out, approved and tested for seven years reflector-functional exercises with the use of physical culture devices for new-born and infants which proved its high effectiveness in development and health improving processes. Differences in physical and mental state, emotional bond with child, high level of knowledge about infant body were taken into consideration. During exercise amplification:

- we used only approved safe methods of treatment;
- we didn`t overcome infant active protest or resistance towards load raise and exercise amplification;
- we deversified, complexed exercises adding as more suppliment solutions as possible,.

Research results and their discussion. To achieve the pre set orthopedic tasks we used movement power, its adequate rate and direction. Whereby, appropriate, biologically reasonable methods of internal adapting, protective and compensatory characteristics of infant growing organism were used to prevent and restore mutual position of hip joint (cotyloid cavity, whirlbone with surrounding muscles, ligaments and joint capsule). During the rehabilitation both physical and psychoemotional cooperation were effected. The reflector-functional exercises with the use of physical culture devices were done according to the following regulations:

- establish a contact with the child;
- begin the massage and gymnastics from the easiest exercises with graduate amplification and new elements introduction;
- avoid strong hacks, repulsions, tissues and joints prelums;
- careful and professional exercise effecting;
- use the massage cream and dusting powder.

Conclusion: Actual material obtained proves high effectiveness of reflector-functional rehabilitation in exercises with the use of physical culture devices in protective and compensatory characteristics of infant growing organism due to emergent adaptation to one-time loads and long-term adaptation to persistent repetition.

EFFECT OF QI-GONG EXERCISE AND MANUAL MANIPULATION TO GIRL'S HIGH SCHOOL WITH VERTEBRAL SCOLIOSIS ON COBB'S ANGLE, MOIRE TOPOGRAPHY

GI DUCK, P.

NAMSEOUL UNIVERSITY

The purpose of this study is to evaluate the effects of Qi-gong Exercise and Manipulation which are not surgical procedures, performed on scoliosis patients in Y girls' high school for 8 weeks. A total of 31 students, including 16 scoliosis patients aged between 16 and 19, 16 normal students, made up the study population. Qi-gong Exercise was performed on 8 scoliosis patients and manual manipulation therapy on the remaining 8 patients. The patients were treated with Qi-gong Exercise and manual manipulation therapy for 8 weeks and the effects on Cobb's angle, Moire topography have been evaluated. The results of the analysis have shown the following:

Significant differences period, period*group, and group in the change of Cobb's angle among three group($P<0.5$). No significant in the change of SMC(left), HMC(left) in Moire Topography but, Significant differences in the change of another factor among three group($P<0.5$).

Qi-gong could be variously to the patients with chronic spinal disease as well as those with scoliosis who are required to have pliability because it synthesizes the merits of Cobb's angle and muscular exercise. More diverse patients group need to be applied and more studies should be performed in oder to prove the effect of Qi-gong Exercise by means of developing appropriate exercise programs and conservative treatment.

ADOLESCENT SOCCER IS CORRELATED WITH AN INCREASE OF KYPHOSIS: A CONTROLLED CROSS- SECTIONAL SURVEY

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INTRODUCTION: Low back pain during growth is recognised today as a possible problem, but risk factors are not yet well known. A long discussion exist about the possible influence of sport activities on spinal growth. Soccer is widely practiced by pupils in many different countries around the world, but we don't know if there is any correlation with changes in posture and/or spinal deformities.

METHODS: We evaluated 102 males practicing agonistic soccer two to three times per week in the age range 11-16, and compared them to a normal sample of 180 schoolboys of the same age range. We collected a series of already validated measurements: plumbline distances from kyphosis apex (C7, T12 and L3) and ATR according to Bunnell. We calculated the Sagittal Index (SI: sum of the distances of C7 and L3 - sagittal shape of the spine), and the Sagittal Ratio (SR: C7/L3 - relationship between kyphosis and lordosis). According to previous studies, we considered these normal references: 5° (ATR), and cm 1.5-5.5 (C7), 2.8-7.0 (L3) 5.5-11.0 (SI) 0.37-1.31 (SR). We used normality tests, ANOVA and chi-square.

RESULTS: In soccer players we found statistically significant increases of the plumbline distances from kyphosis apex in C7 (36.6±1.0 vs 33.6±0.7) and T12 (23.0±0.6 vs 21.3±0.8) as well as an increase of SR (0.80±0.03 vs 0.73±0.02). We did not find more pathological cases in soccer pupils than in normals for any of the considered parameters.

DISCUSSION: Apparently soccer adolescent players have a group a tendency to the increase of kyphosis, with an unbalance between the two sagittal curves in favour of kyphosis (increase of the Sagittal Ratio). Even if these changes were statistically significant, they were not clinically significant. We did not find an increase of pathological cases (spinal deformities), but this population was small to detect these variations.

ADOLESCENT SOCCER PLAYERS HAVE LESS LOW BACK PAIN THEN CONTROLS: A CROSS-SECTIONAL SURVEY

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INTRODUCTION: Low back pain during growth is recognised today as a possible problem, but risk factors are not yet well known Both in adults and children a U correlation has been proven between sport activities and low back pain. Soccer is widely practiced by pupils in many different countries around the world, but we don't know if there is any correlation of this specific sport with low back pain.

METHODS: We evaluated 102 males practicing agonistic soccer two to three times per week in the age range 11-16, and compared them to a normal sample of 668 schoolboys of the same age range. We proposed a validated questionnaire to collect data on low back pain prevalence and clinical charactheristics. Statistical analysis required the use of the χ2 test, with Yates' correction for 2-by-2 table when necessary. The Kruskall Wallis test for non parametric data was also applied.

RESULTS: When compared to normals, soccer players had a statistically significant reduction of most of the parameters: lifetime (30% vs 64%) and point (3% vs 12%) prevalence, chronic pain prevalence (1% vs 8%), limitation in activities of daily life (10% vs 55%), need of staying home for LBP (9% vs 24%), medical (4% vs 23%) and radiograpic (3% vs 10%) evaluations. Among LBP sufferers, intensity of pain was similar in the two populations.

DISCUSSION: According to our results, it appears that agonistic soccer players have less low back pain than controls. This is coherent with previous results in the literature, due to the fact that these adolescents were not sedentary nor practicing strenuous sport activities. In the meantime the differences found were high and these results should be compared with other sport activities.

FIRST RESULTS FOR THE COMPARISON OF MANUEL TECHNIQUES AND A BIOMECHANICAL DEVICE (FORMETRIC SYSTEM) IN THE IDENTIFICATION OF VERTEBRAL BLOCKADES

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UNIVERSITY OF HAMBURG

Introduction: It is the purpose of this study to verify the sensitivity (rate of identically marked findings) of an automatic examination device (Formetric® system) to identify vertebral blockades. The Formetric® system is known to be helpful in the process of clinical back shape diagnosis (Asamoah et al., 2000).

Methods : N=21 volonteers (no back pain patients; age 34 ±5 y from 22 to 44 y; BMI 24 ±3 kg/m² from 17 to 31 kg/m²) participated in this investigation. Their vertebral segments (each 13: C1/Th1 to Th11/12) lead to 273 cases. Spine shape was analyzed automatically by means of Formetric® system (resolution 7.500 pts/cm²; reconstruction error <0.2 mm) (Drerup & Hierholzer, 1994). The count of borderline crossing/ reaching in the curvature (2nd mathematical deviation of lateral projection) served as a dependent variable to indicate vertebral blockades. Data were analyzed chi-square-based with the McNemar Test and the contingency coefficient C (SPSS 12.0) and with the formula for the sensitivity: Formetric signal is correct positive * 100/ (Formetric signal is correct positive + Formetric signal does not fit the positive manual finding = wrong negative).

Results: In 73% of all cases (199 of 273) there were equal results for both examination methods. In deed this high number was related to the count of vertebral segments with no advice for a blockade. Coming from the valid finding (blockade found by the expert) sensitivity marked identical results for the automatic identification. Sensitivity of the automatic spine shape analysis in comparison to the manual technique (expert) was 23%. There was a significant (p=.014) difference between both, the manual and the automatic examination method. And there was no statistical correlation between the concurrent methods (C=0,028; p=.642).

Discussion: Formetric® system is meant to be helpful in the clinical back pain diagnosis (Asamoah et al., 2000) and is called the 'Gold Standard' in back shape analysis, because of its automatic and time saving data analysis procedure (Thorwesten et al., 2007). The poor rate of identically found vertebral blockades might be caused by mistaking in the expert judgement, too (Weber, 2004). But further investigations should point out the characters of the persons examined. Blockade patients or scoliosis patients are expected to show other results than the clients examined in this investigation who showed irregularities in the course of the spinal shape only accidentally. Single case analysis for back pain patients show a much higher score in the identification of vertebral blockades (Schröder & Färber, 2009).

References

Asamoah V, Mellerowicz H, Venus J, Klöckner C (2000). Orthopade, 29 (6), 480-489.

Drerup B, Hierholzer E (1994). Clinical Biomechanics, 9, 28-36.

Schröder J, Färber I (2009). Zs. f. Physiotherapeuten, 61 (5), accepted.

Thorwesten L, Schnieders D, Schilgen M, Völker K (2007). Dtsch. Zs. Sportmed, 58 (7/8), 255.

Weber B (2004). Unpublished.

SPINE MOVEMENT FUNCTIONS AND ABNORMITY SPINE DEVELOPMENT IN INFANCY

KOVALENKO, T., SHKLYARENKO, A., ULYANOV, D.

VOLGOGRAD STATE UNIVERSITY

The research actual continuity. Spine movement function is exercised by muscle work and due to its anatomico-physiological characteristics. A bigger movement amplitude in spine joints demonstrates its stability reduction. However the rise in flexibility of female body can be a possible solution for its normal development. Undue fatiguability and as a result relaxtion of back and abdomen muscles cause abnormities in posture and in perspective structural spine deformations.

Study methods and management. The research was carried out in the biomedical department of the Slavenskiy-on-Kuban Pedagogical State Institute and in the physical education and sanative technologies of the Volgograd State University. The presence of motility dextrality not only in movement but also in static position (prone, sitting and standing) was investigated to evaluate changes in scoliosis progression and posture.

Research results and their discussion. The present study demonstrated that spine motion range in different planes in infancy and adolescence with different scoliosis severity varies considerably depending on the age and hypo-, hypermobility. Flexibility of girls aged 5-7, 8-11, 12-14 and 15-16 is higher than that of boys. With the increase of years, the number of girls with high flexibility (hypermobility) as for their trunk extension reduces considerably and as for their flexing it increases. The general tendency being valid, per cent of examined boys with normal and bigger flexibility is higher than that of the girls of the same age with equal spinal deformity. At the age 5-7 and 8-11 girls' high spine flexibility is often accompanied with lumbar lordosis in standing position and kyphosis in sitting position. In our opinion this state is conditioned by joints functional instability together with genetic weakness of connective tissues. We believe that it is not recommended for girls at the preschool and primary school age with scoliosis diagnosed do such exercise which have multidirectional biochemical impact on spine and train its mobility, for example calisthenics, artistic gymnastics, water and trampoline jumping, rhythmic dancing, etc. In general average spinal mobility model modifies during bone growth. It differences according to the sex. Age characteristics of spinal mobility are modified considerably with people with high spinal deformation rate (drift angle is > 30° according to Cobb method).

Conclusions:

1. Diversified avaluation of spinal mobility functions is very important at all stages of ontogenesis while choosing different ways and forms of its prevention, correction and physical rehabilitation.

2. Difficult exercise forms, unreasonable muscle loading and manipulations on a curvature spine may cause the scoliosis progression.

3. The analyze of general physiological and biomechanical regularities of curvature spine mobility helps to reestimate the existing traditional ideas on the use of symmetrical and asymmetrical exercises during physical culture classes of children suffering from this pathology.

14:15 - 15:15

Poster presentations

PP-SA02 Sport Statistics and Analyses 2

DEVELOPMENT OF THE 3-POINT FIELD GOAL IN BASKETBALL: A DESCRIPTIVE STATISTICAL ANALYSIS OF PARTICIPATING NATIONAL TEAMS OF EUROPEAN CHAMPIONSHIPS FROM 1985 TO 2007

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Introduction: The international governing body of basketball (FIBA) introduced the three-point line in 1984. The purpose of this study was to investigate the development of the 3-point field goal (3FG) at the European Championships (EC) from 1985 to 2007.

Methods: The shooting performance of 166 teams (530 games) which participated in the EC from 1985 to 2007 was evaluated to discover the development of the 3FG. The statistics were taken from official resources (FIBA Europe).

The detailed 3-point shooting quotas of all teams were compared to the total shooting performances of all teams for each investigated tournament.

Descriptive statistics were used for data analyses.

Results: The lowest number of attempted (3PA) and made 3-point shoots (3PM) was found in 1985 (10.8 ± 5.2; 4.2 ± 2.4). 2007 almost two times more 3PA (21.8 ± 4.7) were found than 1985. Great increases of 3PA and 3PM were detected in 1987 (4.3; 1.6) and 2001 (4.8 and 1.1).

From 1985 to 1993 the 3-point shoot percentage (3P%) was on a high level (38.0%-43.0%), with the maximum of 43% in 1991. From 1993 to 1997 a decrease to 33.8% was shown. Since then the 3P% was on a lower level (32.7%-37.3%).

The least percentage of points from 3PM/total points (3PP/TP) was observed in 1985 (13.7%) and the highest value in 2007 (30.3%). Great rises of 3PP/TP were recognized in 1987 (5.6%) and 1999 (4.9%).

Discussion: The low number of 3PA and 3PM at the EC 1985 may be a consequence of the 3-point rule introduction in 1984. At this point players and teams weren't well enough trained technically and tactically. The high increases of 3PA and 3PM in 1987 was a precondition for the rise of 3PP/TP at the same time and could be considered as a result of the training progress. The rise of these values from 1985 to 1987 can be interpreted as a fast integration of the 3FG in the offensive tactics. The fact that the 3P% raised until 1991 emphasised this assumption.

Different strategic directions on defence and offence should be considered as a reason for the decrease of the 3P% from 1993 to 1997. They could also be responsible for the increased 3PP/TP in 1999 and the fact that in 1999 25% of the total points and in 2005 28% of the total points were made by 3FG.

The rise of 3PA and 3PM in 2001 can be explained by the increased number of total field goal attempts and number of total 3PA in consequence of the reduced possession time in offence to 24 sec.

Further studies should be conducted examining the effects of the development of the 3FG on other events and after the introduction of the new distance between basket and 3-point line in October 2010.

References

Büker, C. (2008). DBB-Journal 1(3), 70-71.

Clausmeyer, A., Schmidt, G.-J. (1995). Leistungssport 15(3), 21-25.

FIBA Europe (2008). http://www.fibaeurope.com

Schmidt, G.-J., Clausmeyer, A., (1998). Forschung Innovation Technologie (1), 19-27.

SERVE EFFICIENCY IN MEN'S VOLLEYBALL

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The importance of the serve is high in men's international top volleyball. The players use mainly six different serve techniques: jump serve (JS), short jump serve (SJS), jump float (JF), short jump float (SJF), float (F) and short float (SF). The purpose of this study was to evaluate the efficiency of different serve techniques in men's volleyball at three different levels: boy's youth national teams, Finnish men's league teams and men's national teams.

Serve efficiency was analyzed in nineteen matches. Eight were boy's youth national team matches (G1, 1089 serves), five men's Finnish League matches (G2, 1033 serves) and six men's World League matches (G3, 1016 serves). A six-point assessment scale was used to evaluate the efficiency of the serves (5 = ace, 4 = no attack from the opponent team, 3 = opponent can use only high ball attack, 2 = opponent can use first tempo attack with a small risk, 1 = opponent can use all attack options, 0 = error).

The serve technique distribution and the means and S.D. for serve efficiency for different serve techniques and groups were calculated. T-test for independent samples was used for statistical analysis. Also ace-error ratios, ace, positive (proportion of level 3-5 serves) and error percentages for every serve technique were calculated.

The proportions of different serve techniques for G1 were JS 42.1 %, SJS 2.7 %, JF 49.7 %, SJF 3.3 %, F 2.0 % and SF 0.2 %, for G2 53.5 %, 4.6 %, 29.6 %, 3.8 %, 7.5 % and 1.0 % and for G3 64.7 %, 4.2 %, 23.0 %, 5.5 %, 2.6 % and 0.0 %, respectively.

The serve efficiency for JS was G1 1.78±1.50, G2 1.68±1.49 and G3 1.81±1.47, for SJS G1 1.72±1.28, G2 1.65±1.26 and G3 2.02±1.42, for JF G1 2.14±1.33, G2 1.85±1.10 and G3 1.85±1.04, for SJF G1 1.64±1.27, G2 1.69±1.17 and G3 1.57±1.06 and for F G1 1.73±1.20, G2 1.97±1.25 and G3 1.77±0.86. The efficiency of JF was significantly ($p<0.01$) higher for G1 than for G2 and G3. In G1 JF was significantly more efficient than JS ($p<0.001$) and SJF ($p<0.05$).

The two highest ace-error ratios were for G1 F 1.00 and JF 0.83, for G2 F 1.33 and JF 0.47 and for G3 SJS 0.75 and JF 0.50. JS and SJS had the two highest ace percentages in every group, G1 5.7 % and 3.4 %, G2 6.7 % and 4.2 % and G3 5.3 % and 7.0 % and also the two highest error percentages, G1 23 % and 17 %, G2 26 % and 17 % and G3 22 % and 9 %. The two best positive percentages were for G1 JF 43 % and JS 35 %, for G2 F 35 % and JS 31 % and for G3 JS 36 % and SJS 33 %.

JS and JF were two most used serve techniques. Nevertheless the use of different serve techniques differs between these three groups so that JS was used more and JF less when the level of the game was higher. JF was the proportionally most used and most efficient serve technique in G1. In G2 and G3 JS was the most used technique and it was also quite effective, but it had highest error percentage. So the high use of JS can be explained partly by the target to score direct points by ace serves.

ADJUSTING REGRESSION STATISTICS TO ASSESS VALIDITY OF MEASURES IN DIFFERENT POPULATIONS

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AUT UNIVERSITY

All concurrent validity studies and most method-comparison studies have a criterion (gold-standard or high-quality) measure for assessment of another measure, but there is widespread lack of understanding about the best approach to such assessment. The limits-of-agreement approach assesses interchangeability of two measures, but it provides no rationale for choosing the better measure; moreover, the systematic lack of agreement known as proportional bias that is often apparent in the Bland-Altman plot (of difference vs mean of the measures) can be artifactual. Amongst regression approaches, least-squares analysis with the criterion as dependent variable provides the most useful statistics: the calibration (regression) equation and standard error of the estimate help practitioners interpret individual measurements taken with the other measure, and researchers can use the correlation coefficient to adjust the magnitude of effects involving the measure. However, values of the regression statistics can be used directly in these ways only when the sample in the validity study is representative of the population in the clinical, practical or research setting. I have now derived formulae to adjust the values for other populations.

I based my approach on the following assumptions: there is a linear relationship between the criterion and other measure; uniform random error in the other measure contributes to scatter in the relationship between the measure and the criterion; and any random error in the criterion is uniform and known. The data from a validity study of one population then allow estimation of the random error in the other measure, from which one can derive the calibration equation, standard error of the estimate and correlation coefficient that would apply to a population with a different mean and standard deviation of the criterion or the other measure.

One can also derive the standard error of the estimate that would apply to a population with the widest possible range of values (infinite standard deviation). This error is appropriate for comparing validity of measures studied with samples from different populations, especially when the measures are in different units (e.g., body fat from a criterion four-compartment model regressed against measures of skinfolds, body density, or bioimpedance). The calibration equation for this imaginary population is appropriate for assessing proportional bias when the criterion and other measure are in the same units. Researchers can also adjust the regression statistics to a real reference population to compare measures.

I simulated validity studies with a spreadsheet to check that the formulae for all adjusted statistics are correct. The formulae are too complex for analytical derivation of confidence limits, but bootstrapping will provide robust estimates. Use of these adjusted statistics and their confidence limits should improve understanding and application of validity in research and practice.

CONTENT VALIDITY AND INTERNAL CONSISTENCY OF SELF-ASSESSMENT QUESTIONNAIRE FOR CLIMBING ABILITIES

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1,3,4. THE CHINESE UNIVERSITY OF HONG KONG, 2. MILLERSVILLE UNIVERSITY , USA

Content validity and internal consistency of self-assessment questionnaire for climbing abilities

Introduction: The questionnaire of Self-assessment for climbing abilities was designed by Eric, J. Horst (Horst, 2008) in which eight components are included, they are climbing experience, technical skills, mental skills, general conditioning, sport-specific conditioning, injury risk, nutritional habits, and lifestyle and discipline. There is no measurement tool to evaluate sports climbers' climbing abilities in Asia. This study investigated the content validity and internal consistency, reliability of Eric's Self-assessment for climbing abilities questionnaire for Hong Kong sports climbing participants regarding their perception on their climbing abilities.

Research Methods: The Chinese version of the questionnaire was translated by the research team and which has been assessed by five climbing coaches in order to check the validity. Only some wordings of the questionnaires have been amended after the assessment. The questionnaire was distributed to Hong Kong sports climbing participants in different climbing association and sports climbing athletes in Hong Kong Youth team and the 2008 interschool competition participants. 106 questionnaires have been collected.

Results: 1) This research invited five experienced climbing coaches evaluated the meaning of the translated questions, in order to conduct a content validity analysis. One of the questions which related to the perception on participants' bouldering scale level has been set to answer one more question which made sure that the participant knowing the meaning of bouldering scale.

2) The internal consistency for reliability test as revealed from Cronbach's Alpha indicated that the eight skill components received poor to acceptable internal consistencies (r=0.17 – 0.77).

3) Only scores from two subscales had acceptable internal consistencies: Climbing experience = .77, Technical skills = .75. Scores for other subscales had rather weak internal consistencies: Mental skills = .36, General conditioning = .54, Sport-specific conditioning = .61, Injury risk = .17, Nutritional habits = .45, Lifestyle and discipline = .46. The low alpha values provide preliminary evidence that some items in these subscales might be problematic.

Conclusions: It is concluded that some of the components in the Self-assessment for climbing abilities questionnaire demonstrated statistic and problematic design by the use of Hong Kong climbing participants by the finding of this pilot research. This research has suggestions for questionnaire modification.

Reference

Horst, E.J (2008). Conditioning for climbers: The compete exercise guide. Connecticut: Falcon.

This study was funded by the Hong Kong Physical Education Assessment Association, Hong Kong SAR.

SOMATOTYPING OF BODY MEASUREMENTS OF 13–15-YEAR-OLD ESTONIAN ADOLESCENT MALE VOLLEYBALLERS FOR COMPARATIVE ASSESSMENT OF THEIR PERFORMANCE IN THE GAME

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TALLINN UNIVERSITY

Introduction: The subjects of the study were 198 male volleyballers, aged 13–15 years, whose teams participated in Estonian championships between the eight best teams in 2005, 2006 and 2008.

Methods: Thirteen body measurements were taken: height, weight, suprasternal height, xiphoidal height; chest, waist, hip, wrist, upper thigh and lower leg circumferences, arm circumference flexed and tensed and wrist breadth.

As a classification representing the body as a whole, we applied a classification that was based on the mean height and weight of boys of different ages and the respective standard deviations. At first, a bivariate 3×3=9 SD classification of height and weight was created; later the number of classes was reduced to five SD classes.

During all the matches, the boys' individual performance was recorded by the computer program Game (Stamm et al., 2000). The assessment of players´ proficiency proceeded as follows: during the match, the expert registered each case when a technical element (serve, reception, block, feint, attack or dig) was performed by a player.

Results: The principle for forming the classes was to differentiate between the boys according to concordance or disconcordance between height and weight. The following classes were created: (1) small – small weight and small height; (2) medium – medium weight and medium height; (3) big – big weight and big height; (4) pycnomorphs – big weight, small height; (5) leptomorphs – small weight, big height. Boys were placed into classes according to their individual heights and weights. All the other body measurements showed essential systematic differences between the classes. This classification has been acknowledged in C. Raschka's monograph Sportanthropologie (2006) as an innovative Estonian system in sports and constitutional typology (Raschka 2006). The boys´ proficiency in the game was assessed in the same body build classes. For each class the mean index of proficiency was calculated for serve, reception, attack and block performances.

Discussion: There are significant differences in proficiency between body-build classes. Big and leptosomic boys were found to be the most successful. The least successful were the boys of the small class. The boys in class 3 (big) were the most successful in block and attack. Leptosomic boys were the most successful in serve.

References

Raschka C. (2006). Sportanthropologie. Köln: Sportverlag Strauss, 219–220.

Stamm R., Stamm M., Oja A. (2000). A system of recording volleyball games and their analysis. Int. J. Volleyball Res. 2 (1): 18–22.

MEASUREMENT ERROR ASSOCIATED WITH PERFORMANCE TESTING IN WELL-TRAINED CYCLISTS; APPLICATION TO THE PRECISION OF MONITORING CHANGES IN TRAINING STATUS.

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UNIVERSITY OF CAPE TOWN

Background: Small changes in performance, as low as 1%, are regarded as meaningful in well-trained cyclists (1,2). Being able to detect these relatively small changes is necessary to accurately prescribe training and optimize performance. The typical error of measurement (TEM) in common performance cycle tests is about 2-3% (3). It is not known whether this TEM is lower in well-trained cyclists and therefore whether small changes in performance parameters are detectable.

Methods: After familiarisation, 17 well-trained cyclists were recruited for the study. They were required to complete three Peak Power Output (PPO) tests (including VO2max) and three 40km time trials (40km TT). All tests were performed after a standardized warm-up at the same relative intensity (LSCT) and under a strict testing-protocol.

Results: Fifteen cyclists successfully competed the study and the data of 2 cyclists had to be excluded because of violated the protocol by using a potential performance enhancing drugs (4) and not completing the study. The TEM within the PPO-test was 2.2% for VO2max and 0.9% for PPO, while TEM for the 40km TT was 0.9%.

Conclusion: This study shows that the measurement of PPO and 40km TT time, after a standardized warm-up (LSCT), has sufficient precision in well-trained cyclists to detect small meaningful changes. In contrast the TEM associated with VO2max was too high to be of practical value for tracking performance, and should therefore be interpreted with caution when monitoring cyclists. The findings of this study contribute to a more accurate determination of what should be regarded as a meaningful change in already well-trained cyclists. This will allow a more accurate assessment of the effectiveness of training programs, and possibly narrows the discrepancy between what trainers, coaches and elite cyclists belief to be effective and what scientists can proof to support this conviction.

References

1.Paton CD, Hopkins WG. Ergometer error and biologicalvariation in power output in a performance test with three cycle ergometers. Int.J Sports Med. 2006;27, 444-447.

2.Currell K, Jeukendrup AE. Validity, reliability and sensitivity of measures of sporting performance. Sports Med. 2008;38, 297-316.

3.Paton CD, Hopkins WG. Tests of cycling performance. Sports Med. 2001;31, 489-496.

4.Swart J, Lamberts RP, Lambert MI, et al. Exercising with reserve: Evidence that the CNS regulates prolonged exercise performance. Br.J Sports Med 2008, (Ahead of publication)

VIDEO BASED AUTOMATED DETERMINATION OF SPRINTS AND JUMPS IN BEACH VOLLEYBALL

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INSTITUTE OF SPORTS SCIENCE

Introduction: Detailed analyses of game situations are necessary for the planning and controlling of training and the development of successful game tactics. The aim of the present study is to minimize manual effort in the analysis of sprint and jumping movements. Automated action recognition is exemplarily applied in beach volleyball. Modern video analysis methods are used to generate position data from which sprints and jumps can be detected automatically.

Methods: To test the determination of sprints and jumps from professional beach volleyball athletes, action paths from 22 rallies at the World Tour Tournament 2007 in Klagenfurt were analyzed. By using a tracker based on particle filters the position of the athlete's upper bodies was calculated from video. A further calculation step allowed determining the lower body segments to get the athlete's position at the court (Mauthner & Bischof, 2007; Mauthner et al., 2007). Jumping movements could be detected automatically from calculated movement velocities and their variations in time. Errors in the position data due to jumping movements were automatically corrected by linear interpolation. Sprints (defined as movement velocities > 4.16 m/s) were then detected from the corrected data.

Results: Preliminary results show, that the players execute 0.75 ± 0.64 jumps and 0.27 ± 0.45 sprints per rally. These automated detected jump actions exceed the manual counted by 2.6%, whereas 5.9% false positives and 8.8% false negatives occurred. The detected sprint actions exceed the manual data by 10% derived from 23.1% false positives and 38.5% false negatives.

Discussion: The tests of the described method show the principal possible application of video based techniques for automatic detection of movements like sprints and jumps. However, the amount of tested data still lacks of representative quantity to describe the game structure in beach volleyball. Differences to manually determined values in jump detection are due to inaccuracy of the tracking method, especially from game scenes which are occluded by the net. In the future, improved tracking algorithms combined with adequate filters may significantly improve results. The substantial differences in sprint detection were mainly due to subjective manual assessment of sprint action. The automated sprint detection may objectify results.

References

Mauthner T, Bischof H. (2007). Performance Evaluation for Computer Vision, 31st AAPR/OAGM Workshop 2007, 81-89.

Mauthner T, Koch C, Tilp M, Bischof H. (2007). J Comp Sci Sports, 6(2), 21-35.

MONITORING ACUTE EFFECTS ON ATHLETIC PERFORMANCE WITH MIXED LINEAR MODELING

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AUT UNIVERSITY

There is a need for a sophisticated approach to track athletic performance and to quantify factors affecting it in practical settings. PURPOSE: To demonstrate the utility of mixed linear modeling for monitoring athletic performance. METHODS: Elite swimmers (3 females and 6 males; age 21-26 y) performed 2-8 time-trials in training and 2-7 in competition in the 9 wk prior to and including Olympic-qualifying trials, all in the stroke and distance of the athlete's main event. We included a double-blind, randomized, diet-controlled crossover intervention in which the swimmers consumed caffeine (5 mg/kg body mass) or placebo 75 min before two training trials ≤2 wk apart. The swimmers also knowingly consumed varying doses of caffeine in some other trials and in competitive swims. We used mixed linear modeling of log-transformed swim time to quantify performance in training vs competition, in morning vs evening swims, and with caffeine vs placebo. Predictor variables were coded as 0 or 1 to represent absence or presence of each condition and included as fixed effects. Date of each performance test was included as a continuous linear fixed effect and interacted with the random effect for athlete to represent individual differences in linear trends in performance. Outcomes were deemed unclear if the 90% confidence interval included substantial enhancement and impairment (0.3%). RESULTS: Performance times in the time-trials and competitions were highly reliable (typical errors both 0.8%). Performance time improved linearly by 0.8% (90% confidence interval 0.3% to 1.2%) per 4 wk of training, with individual differences (standard deviation) in the trend of 0.5% (0.4 to 1.2%) per 4 wk. The swimmers performed better in evenings vs mornings by 0.6% (0.1 to 1.1%) and in competition vs training by 1.4% (0.9 to 1.9%). A 100-mg dose of caffeine enhanced performance in time trials by 1.2% (-0.1 to 2.4%) and in competitions by 1.4% (0.3 to 2.5%); each additional 100 mg reduced the benefit slightly by an unclear 0.1% (-0.3 to 0.5%), and the placebo effect was also a slight but unclear impairment of 0.2% (-0.6 to 0.9%). CONCLUSION: Mixed linear modeling is a successful approach for quantifying small changes in performance in a squad of elite athletes whose performance is monitored regularly over a period of several months.

14:15 - 15:15

Poster presentations

PP-PS02 Psychology 2

DEVELOPMENT AND STABILITY OF SPORT PARTICIPATION IN MIDDLE AGE

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Introduction: In order to explain sport participation in middle age, there is a dominance of social cogni-tive models which try to explain short-term changes in behaviour (e.g. for several weeks or months). In contrast, Levinson's (1986) developmental model represents a productive theoretical framework to describe long-term changes in behaviour. At the centre of this theory is a concept of a life structure which is formed by the individual's environment. The fundamental components of the life structure in middle age are the individual family and work situation (Levinson, p. 6). In this theory, sport activity can be considered as a special form of leisure time which vies for time resources with family, work, and other forms of lei-sure time activities. According to Levinson's theory, changes in life structure cause changes in the constitution of leisure time. The central question of this paper is to investi-gate the hypothesis that life structure has an influence on participation in sport activity.

Methods: To examine this hypothesis, longitudinal data were collected from 726 persons aged be-tween 33 and 56 years (M = 45.0; SD = 7.5). Three measurements were taken in five year intervals (1992, 1997, 2002). In addition to a comprehensive diagnosis of the sport activity behaviour using a self questionnaire, socio-demographic variables, subjective health, in-tentions, family, and work environment were assessed.

Results: The results of the study suggest that on the one hand, sport participation is a stable char-acteristic of human behaviour. The analysis of the finite Markov chains in discrete time shows that the probability for staying active is 91% for the transition from 1992 to 1997 and 89% from 1997 to 2002. On the other hand, the sport participation is unstable because the chance for staying inactive is 59% for the period 1992-1997 and 42% for the period 1997-2002. The results of the logistic regression show that in the process of the adoption of

sport activity, the variables gender, work load, and the number of people living in the household have a significant influence on sport participation. In the process of mainte-nance, work load, health and social status have a significant effect on sport participation.

Discussion: The results of this study support Levinson's (1986) theory which states that the compo-nents of life structure, such as work load and the number of persons in the household, have an impact on sport participation behaviour.

Literature

Levinson, D.J. (1986). A conception of adult development. American Psychologist, 41, 3-13.

EFFECT OF EXPECTED EXERCISE DURATION ON PHYSIOLOGICAL AND PSYCHOLOGICAL VARIABLES

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Introduction: Consideration of the end-point of exercise may influence exercise function. Research has shown that runners expecting a longer exercise duration report lower RPE at the same time point as compared to when they expect a shorter duration at the same intensity (Rejeski & Ribisl, 1980; Baden et al,. 2004). This study examined the effect of expected exercise duration on physiological and psychological variables during cycling.

Methods: Twenty trained male cyclists completed a maximal aerobic cycling test and two 20 min bouts at the same submaximal power output (mean=69% VO2max). Subjects were told they would cycle for 20 min in the first bout (short condition) and for 40 min in the second (long condition). This involved deception as the second bout was only 20 min long. Cardiorespiratory variables, lactate, cadence, RPE, % associative thoughts, and affect (Feeling Scale, FS) were measured. Analysis was by Pearson correlations and a repeated-measures ANOVA at 2, 5, 8, 11, 14, 17, 20 min.

Results: The psychological and physiological variables showed no differences between conditions. Physiological response was consistent with non-steady state exercise. RPE increased linearly ($p<0.05$) and ranged from about 12 to 14 in both bouts. Significant correlations between RPE and FS occurred at all time points in the short condition ($r= -0.61$ to -0.79), but in the long condition, correlations were only significant at 2, 5, and 8 min ($r= -0.50$ to -0.68). There were no significant correlations between RPE and any physiological variable or associative thoughts.

Discussion: Expected duration did not alter RPE, which is inconsistent with Rejeski & Ribisl (1980) and Baden et al. (2004). This may be due to a different subject sample using different mental strategies. The significant RPE-FS correlations during the short condition were higher than reported by Rejeski & Ribisl (1980), who found a moderate but significant correlation of -0.45 at a similar intensity and RPE. In the long condition, the RPE-FS relationship ceased to be significant from 11 min onward. Hardy & Rejeski (1989) proposed that ambiguity in physiological cues during moderate exercise lessens the relationship, although it is not clear why this would emerge in one condition only. This may indicate a coping mechanism in response to a greater exercise challenge. As well, the data are consistent with the notion that RPE represents the progression toward absolute fatigue, which may happen independently of the progression of physiological variables (Noakes, 2008). In conclusion, RPE is not always affected by a change in anticipated exercise duration and seems to function as a stable measure of the progression toward exhaustion.

References

Baden DA, Warwick-Evans L, Lakomy J (2004). J Sport Exerc Psychol, 27, 215-231.

Hardy CJ, Rejeski WJ (1989). J Sport Exerc Psychol, 11, 304-317.

Noakes TD (2008). Br J Sports Med, 42, 623-624.

Rejeski WJ, Ribisl PM (1980). J Sport Psychol, 39, 249-254.

THE EFFECT OF AEROBIC TRAINING AND SELF AS EPISTEMIC AUTHORITY ON BODY IMAGE OF FEMALE STUDENTS

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Study's purpose: to determine the psychological impact of cardiovascular training on body-image in relation with self as cognitive epistemic-authority among adolescent females.

Hypothesis: Generally, improvement in cardiovascular fitness will cause improvement in body-image; however the improvement in body-image will be more significant among subjects whose self-epistemic authority is high, than subjects whose self-epistemic authority is low.

Rationale: Bandura's theory of self-efficacy (1977, 2000) emphasizes personal performance-based experiences, as the most important factor in creating the desirable cognitive and behavioral change. However, experimental findings point to individual differences in the level of behavioral change, achieved by those enactive mastery experiences. The Lay-Epistemology theory (Kruglanski & Jaffe,1988, 2000) suggests a conceptual explanatory schema to individual differences.

Method: After measuring each participant's (N=60) level of self as epistemic-authority we randomly assigned those above/below the median level into one of the three different groups:a full-training running, a half-training walking, and a no-training control group.

The independent variables:1 Self as epistemic-authority (high/low), measured by a questionnaire assessing level of self as epistemic-authority.2.Aerobic physical-fitness training. Full training: running group , half level :walking group.

The study examined the relationship between the independent variables and the dependent variable -a psychological change, a change in body-image.(Conscious & unconscious).

Variables were measured before and after the program.

Main Results: The conscious and unconscious body-image of subjects in the full-training running group, was significantly higher than that of subjects in the half-training walking and the control groups, and the body-image of subjects in the walking group was higher than that of the control group; it also found that conscious and unconscious body-image of the subjects with high self epistemic authority was significantly higher than that of subjects with low self-epistemic-authority.

Conclusion: An improvement in physical fitness brings along an improvement in psychological dimensions. This reinforced Bandura`s statement about the priority of self-actual experiencing in order to attain psychological changes. However, the degree of improvement is dependent on the extent of the subject's reliance on a source, which she perceives as of sufficient epistemic-authority to cause cognitive change.

This support the lay epistemology theory, which deals with the rules governing cognitive change.

References:

• Bandura, A. (2000). Self-efficacy: the foundation of agency. In WJ Perring (Ed.),Control of human behavior, mental processes, and consciousness. Elbaum.
• Kruglanski, A. and Jaffe, Y. (1988), Lay Epistemology: A theory for cognitive therapy. In L.Y. Abramson (ed) An Attributional Perspective in Clinical Psychology. Guilford Press.

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EFFECT OF WORKING IN HOT ENVIRONMENT ON COGNITIVE FUNCTION: AN OIL AND GAS INDUSTRY STUDY

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Introduction: Acute exposure to extreme heat can adversely affect safety-related behavior in workers and complex cognitive task performance. Although many studies explored the acute effect of heat on cognitive functions, results remain equivocal. Moreover, little is known of the effect of chronic heat exposure.
Aim: To investigate acute and chronic alterations in cognitive function in outdoor workers during the summer of a Middle Eastern country (Qatar).
Methods: 39 oil and gas workers (32 ± 6 years) volunteered for cognitive testing before and after their daily work shift on two occasions: during summer (August – average daytime temperature: 41°C) and winter (January – average daytime temperature: 22°C). Pattern Recognition memory (PRM), Spatial Span (SSP) and Stocking Of Cambridge (SOC) tests were performed.
Results: Average core temperatures during work shift were higher ($P < 0.001$) in August (37.4 ± 0.2 °C) than in January (37.2 ± 0.2 °C). However, our data showed no significant difference in any of the cognitive tests between summer and winter independent of testing time (PRM: 78.2 ± 17.8 vs 78.8 ± 17.3%, SSP: 6.2 ± 1.2 vs 6.1 ± 1.4, SOC: 8.5 ± 1.4 vs 8.9 ± 1.7 for average values in August and January, respectively). In addition, activity in summer (average normalised acceleration: 0.10 ± 0.01 g) was significantly lower ($P < 0.02$) than winter (average normalised acceleration: 0.11 ± 0.01 g).
Discussion: The reduction of activity during summer (safety rules of the company) can partly explain the absence of alterations in cognitive functions despite a higher central temperature. Consequently, 38.3°C was the highest central temperature observed during a work shift. The fact that none of the workers was hyperthermic during the course of the day could explain the absence of acute effect of heat exposure on cognitive function.
Conclusion: While acute hyperthermia can alter cognitive function, our data suggest that chronic exposure (i.e., living and working) to a hot environment doesn't alter cognitive functions in the absence of hyperthermia.

SHAPING A POSITIVE BODY IMAGE WITH THE OBJECTIVE OF PREVENTING EATING DISORDERS IN FEMALE ATHLETES

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UNIVERSITY OF VIENNA

Disordered eating may have harmful consequences on athletes' health and performance. Especially athletes participating in aesthetic or lean sports have a higher risk of suffering from eating-related problems (Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). They believe that losing weight is necessary for aesthetic beauty ideals valued in certain sports (Dosil, 2008). Prevalence of disordered eating in sports is estimated and range as high as 62% among female and 33% among male athletes (Bonci et al., 2008). It is known that athletes are affected due to different reasons, also to sport specific ones. Athletes have a body ideal that is related to improved performances in their sports. Depending to their sport, they could get closer to the societal-prescribed thin ideal (Smith & Petrie, 2008). Hence it can be assumed that a negative self concept and body image are one of the crucial determinants of developing disordered eating. Enforcing a positive body image should be the ambition of programs preventing disordered eating in athletes. Thereto one unit of a six-unit prevention program deals with the development of a positive body image. This section is taking out of a program for preventing eating disorders in young female athletes aged 12 - 16. The body image unit à 90 minutes starts with a warm-up game which is called "Here comes the sun" and continues with a practical exercise called "body landscape". The warm-up game is a back massage that comes along with a story about a tree and the weather going down on it. For the exercise the athletes copy their body contour on a large piece of paper and figure a landscape. Questions like "Where is the capital of your body?" or "Where are recreation areas?" should help them performing the exercise. Afterwards the images will be discussed. Currently, a pilot study with six athletes is carried out in order to test practicability and validity of program content. Results of the pilot study concerning a positive body image are presented and discussed at the conference.

References

Bonci, C. M., Bonci, L. J., Granger, L. R., Johnson, C. L., Malina, R. M., Milne, L. W., et al. (2008). National athletic trainers' association position statement: Preventing, detecting, and managing disordered eating in athletes. Journal of Athletic Training, 43(1), 80-108.
Dosil, J. (2008). Eating Disorders in Athletes. West Sussex: Wiley.
Smith, A., & Petrie, T. (2008). Reducing the Risk of Disorderd Eating Among Female Athletes: A Test of Alternative Interventions. Journal of Applied Sport Psychology, 20(4), 392-407.
Torstveit, M. K., Rosenvinge, J. H., & Sundgot-Borgen, J. (2008). Prevalence of eating disorders and the predictive power of risk models in female elite athletes: a controlled study. Scandinavian Journal of Medicine & Science in Sports, 18(1), 108-118.

COMPARISON OF HEART RATE VARIABILITY RECORDINGS MEASURED WITH DIFFERENT DEVICES IN CHILDREN

FINKENZELLER, T., AMESBERGER, G.
UNIVERSITY OF SALZBURG

In the field of sport psychology, psychophysiological recordings address the importance to assess athletes' psychophysiological regulation status. In this context, heart rate variability (HRV) as an indicator of sympathetic-vagal balance is supposed to be the most promising tool in the diagnostic process. Besides the recording of parameters like skin conductance, temperature, electromyogram, electroencephalogram and respiration, several biofeedback devices offer the opportunity to record electrocardiograms, and to calculate HRV-parameters. Whereas wireless heart rate monitoring with elastic electrode belts appears to be reliable (Vanderlei, Silva, Pastre, Azevedo, & Godoy, 2008), empirical data on the reliability of biofeedback devices are still missing.

Aim of the study was to compare two simultaneously recorded R-R intervals and the subsequent analysis of HRV, one obtained from the Polar S810i heart rate monitor (co. polar electro), and one deriving from the nexus-4 biofeedback device (co. mindmedia). The R-R intervals of both measurement systems were analyzed with the software kubios HRV version 2.0 (Niskanen, Tarvainen, Ranta-Aho, & Karjalainen, 2004). A total of 25 male pupils (age: 12.24 ± 0.72 yr; height: 1.57 ± 0.07 m; mass: 47.2 ± 9.84 kg) completed a test series which started with a five minute relaxation phase in sitting position, followed by a seven minute ergometer test (2.5W/kg mass), and concluded by another five minute relaxation phase at the end.

For both relaxation phases, satisfactory time-domain correlations between Polar S810i and nexus-4 HRV-data were obtained (r= .80 to .97), whereas the intercorrelations of frequency-domain data display a wide range (r=.17 to .95). HRV-parameters recorded during the ergometer test, and hence reflecting physiological stress, demonstrate low correlations concerning time-domain (r=.09 to .40) and frequency-domain (r=-.02 to -.60). Kubios HRV-software analyses confirm these results with moderate to high time-domain correlations (r=.71 to .99), and low to high frequency-domain correlations (r=.46 to .97) between polar and nexus-4 data during relaxation. Additionally, HRV-parameters during physiological stress show low to moderate correlation values (r=.05 to.73).

In sum, the Nexus-4 biofeedback device seems not to be appropriate for the recording of R-R intervals, and the subsequent analysis of HRV in physical stress conditions. It is recommended to use scientific software for the analysis of HRV, such as kubios HRV.

REFERENCES

Niskanen, J. P., Tarvainen, M. P., Ranta-Aho, P. O., & Karjalainen, P. A. (2004). Biomed, 76(1), 73-81.

Vanderlei, L. C. M., Silva, R. A., Pastre, C. M., Azevedo, F. M., & Godoy, M. F. (2008). Brazilian Journal of Medical and Biological Research, 41(10), 854-859.

BODY IMAGE PERCEPTION OF BRAZILIAN SAILORS' ATHLETES

OLIVEIRA, F., RENAN, R.C., AMEXOEIRA, M.F., SILVA, D.S.

FEDERAL UNIVERSITY OF RIO DE JANEIRO

Introduction: Social pressures and/or the search for a better physical performance in sports may cause the dissatisfaction with body image (BI). In some sports where the beauty, the lightness or a low body weight may contribute to the best performance, the perception of the BI can be change. Objective: The main of this study is analyzing the sailor's athletes BI satisfaction and the perceptual of Body Fat. Material and Method: Seventeen sailors athletes were evaluated (18.3±7.4years) and 12 young non-athletes (control, 19.50±1.78years). The body composition was measured by the anthropometric method (International Society for Advancement in Kinanthropometry - ISAK). The items measured were: skinfold thickness (Cescorf calipers, 0,1mm); height (stadiometer, 1mm) and total body mass (electronic scale, 50g). The body density was obtained by the Withers et al. (1956), and the relative body fat was estimated by the Siri equation (1961). The degree of satisfaction with the BI was obtained by the Body Shape Questionnaire (BSQ) with a version translated and validated to Portuguese langue. The statistical analysis was done on Microsoft Excel 2000. Data is expressed by occurrence percentage, averages, standard deviation. The Pearson correlation test was applied to check the relation among BI and %BF and the group similarity was done by t-Student test. The Ethics Committee of the Clementino Fraga Filho Hospital-UFRJ approved this study and all the parents signed an informed consent from agreeing to the procedures to be adopted and authorizing the scientific use of the study results, as required by the Brazilian Health National Board regulation nº 196/96. Results and Discussions: The athletes showed similar results (p>0.05) to the non-athletes for, age (p=0.53), total body weight (p=0.29), height (p=0.11) and body fat (%BF, p=0.79). One should highlight the significant number of interviewees that presents no BI dissatisfaction, fact that does not prevents a concern with the existence of results showing light dissatisfaction (athletes=24% control=33%), mild dissatisfaction (athletes=6% control=8%), and severe dissatisfaction (athletes=6% control=0%). There was a positive correlation between the result of BI dissatisfaction and the higher %BF (athletes=0.65; non-athletes=0.58), which might not be explain changes in BSQ because the %BF levels was classified as the expected standard in terms of gender and age. Conclusions: The normal %BF presented in the tow groups analyzed is not a justification of the BI dysfunctions detected. The BI dissatisfactions needs to be fighting off in the sports environment and among young people because, in general, it is precursor of the eat disease.

14:15 - 15:15

Poster presentations

PP-PS03 Psychology 3

THE ROAD TO EXCELLENCE: EXPERT PERFORMANCES IN TENNIS AND ALPINE SKIING

MARCONI, M., CONZELMANN, A.

UNIVERSITY OF BERN

Introduction: Within different domains (e.g. music) Ericsson (1996) described the „road to excellence". Taking this expertise research into consideration, the career path of top-performance ath-letes in tennis and alpine skiing were analysed in two different studies with a retro-spective approach. The career in sports is viewed as part of the entire life-course (Mayer, 1990) that embraces various careers in (individual) fields of life. The sports career is em-bedded in the top-performance sports system but also involves a certain dependency on other aspects of life (e.g. family, profession).

Methods: The data was collected by postal enquiry. The questionnaires, adapted to the different characteristics of tennis and alpine skiing, were sent to active and former athletes (tennis: n=70; alpine skiing: n=51). These include questions concerning activities and incidents in various areas of life, particularly sports, but also family and education / profession.

Results: Certain steps from one to the other period in a career in sports can vary considerably, for example 'age at the beginning with sports' (tennis/alpine skiing: mean=6.9/3.4, range=3-12/2-7) or 'age at the beginning with adult competition' (tennis and alpine skiing: mean=15.4, range=13-18). The individual career paths show partly distinct differences compared to the career path intended in the talent development programmes, diverse chronological sequences in performance development and gender-specific charac-teristics. Com-

pared to less successful athletes, top athletes have a higher rate of development and, from the beginning of their career, increased training units close to competition.

Discussion: The talent development programmes should consider the individuality of the career paths as well as the gender-specific aspects. Furthermore, it is recommended that the rate of development is determined by testing the athletes over time. Finally, the specialisation in the specific kind of sport should start as early as possible.

References

Conzelmann, A., Blank, M. & Künstle, C. (2006). Karriereverläufe im Spitzentennis. In K. Weber, D. Augustin, P. Maier & K. Roth (Hrsg.), Wissenschaftlicher Transfer für die Praxis der Sportspiele. Wissen-schaftliche Berichte und Materialien des Bundesinstituts für Sportwissenschaft, 09/2006 (S. 280-285). Köln: Sport und Buch Strauss.

Marconi, M. (2008). Sportliche Karrieren im alpinen Skirennsport. Unveröffentlichte Lizentiatsarbeit, Universität Bern, Institut für Sportwissenschaft.

Mayer, K. U. (1990). Lebensläufe und sozialer Wandel. Anmerkungen zu einem Forschungsprogramm. In K. U. Mayer (Hrsg.), Lebensverläufe und sozialer Wandel (S. 7-21). Opladen: Westdeutscher Verlag.

Ericsson, K. A. (1996). The Acquisition of Expert Performance: An Introduction to Some of the Issues. In K. A. Ericsson (Ed.), The road to Excellence. The Acquisition of Expert Performance in the Arts and Sciences, Sports and Games (p. 1-50). Mahwah: Lawrence Erlbaum Associates.

THE MODERATING EFFECTS OF GENDER AND SPORT TYPE ON THE RELATIONSHIP BETWEEN CONFIDENCE TO AVOID DRINKING AND BINGE DRINKING IN SPORTS SCIENCE STUDENTS

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UNIVERSITY OF EXETER

Introduction: Binge drinking (ie, ≥ 5 drinks per occasion) is a major health issue among student populations, particularly for males in team sports (Brenner & Swanick, 2007). Confidence to inhibit drinking in different situations is negatively related to excessive drinking (Oei & Morawska, 2004), and alcohol awareness campaigns seek to build avoidance self-efficacy (A-SE). However, it is not known if this relationship is consistent for male and females, and athletes in different sports. In this study we examined the moderating effects of gender and sport type (team, individual and non sport participation) on the relationship between A-SE and binge drinking.

Methods

First year undergraduate sports science students (N=354; 54% male), completed questionnaires to assess sport participation, A-SE, using the revised (multi-scale) Drinking Refusal SE Questionnaire (in different situations)(DRSEQ-R)(Oei et al., 2005), confidence to avoid alcohol (CTAA)(0-100% over 1-2, 3-4,…13-14 days)(Bandura, 2006) and binge drinking.

Results: Multiple regression analysis indicated that DRSE under social pressure scale (β=-.13, R^2=.21, p<.01) was the main predictor of binge drinking and was not moderated by gender and sport type. However, the DRSE in opportunistic situations scale (β=-.01, R^2=.31, p<.05) and confidence to go without drinking for 13-14 days (β=-.05, R^2=.33, p<.05) were found to be significant predictors of binge drinking for male, but not for female students. CTAA for 13-14 days predicted binge drinking for team sport and non-sport participating students, but didn't for those in individual sports.

Discussion: This is the first study to exam the moderating role of gender and sport type on the relationship confidence to restrain from drinking in different situations and binge drinking. Male sports science students with low A-SE to avoid drinking, particularly with others, and also when it is readily available, are more likely to binge drink. Interventions could be targeted at increasing A-SE in social and opportunistic situations to prevent binge drinking. In contrast there was only support for targeting interventions at increasing A-SE in social situations for females. Interventions targeted at increasing A-SE in social situations appear as relevant for team, individual and non sport students. Males, and team and non-sport participants, appear more susceptible to binge drink if they have less confidence in prolonged abstinence.

References

Brenner J., & Swanik, K. (2007). Journal of American College Health, 56, 267-272.

Oei TPS Morawska A. (2004). Addict Behav, 29, 159-179.

Oei TPS, Hasking PA, Young RM. (2005). Drug Alc Depend, 78, 297-307.

Bandura A (2006). Self-Efficacy Beliefs of Adolescents, 307-338. Information Age Pubs, Charlotte, NC.

EFFECTS OF A COGNITIVE-BEHAVIOURAL INTERVENTION PROGRAMME ON THE ANXIETY LEVEL AND PERFORMANCE OF GYMNASTS IN A COMPETITIVE ENVIRONMENT

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UNIVERSITY OF LIMERICK

Introduction: This study arouse out of the concern of a gymnastics coach that her gymnasts were underperforming in competition due to anxiety. The purpose of the study was to assess the effects of a cognitive-behavioral intervention programme on performance, anxiety and confidence in the competitive sport environment.

Methods: Ten female gymnasts aged 12-17 yrs were pre-tested in a competitive sport environment for state anxiety and self confidence on the CSAI-2 test (Martens et al., 1990) and on balance beam performance. The competitive environment included an audience made up of parents, gymnasts, "march on" music and two qualified judges who scored performances. At a gymnastic camp on the following week all gymnasts underwent training which included practice on the balance beam. In addition half of the group underwent cognitive-behavioral training based on Suinn's (1994) visual motor behavior rehearsal (VMBR) programme. The other half of the group did not undergo this training and acted as a control. VMBR combines muscle relaxation, controlled breathing and use of mental imagery to visualise a relaxed scene, a successful competition scene previously experienced and an upcoming competition scene. As manipulation checks, gymnasts were asked to rate clarity of images, levels of relaxation and the feel of imaged movements. They were also asked to practice the procedures at home and to record comments in a log which would be discussed at the beginning of the next session. Participants were retested at the end of the week and again one week later (retention) in the same competitive environment as the pre-test.

Results: The intervention group showed significant improvements in performance on the balance beam along with reduced cognitive and somatic anxiety and increased confidence. The control group showed no improvements in performance and no changes in anxiety and confidence.

Discussion: The findings provide support for the effectiveness of a psychological intervention programme for controlling anxiety and enhancing confidence and performance in competitive sport situations. There is also support for incorporating psychological training into the physical practice of skills and for involving young performers more intimately in their psychological training. One limitation of the study however is that the possibility of a placebo effect was not controlled for.

References

Martens, R., Vealey, R., Burton, D. (1990). Competitive Anxiety in Sport, Human Kinetics, Champaign, Il.

Suinn, R . (1994). Visualizaton in Sports, in A Scheikh & E Korn, Imagery in Sports adn Human Performance, Baywood Pub. pp.23-41

THE EFFECTS OF GENDER AND SPORT PARTICIPATION ON CONFIDENCE TO AVOID DRINKING AND BINGE DRINKING

OH, H.J., TAYLOR, A.H.

UNIVERSITY OF EXETER

Introduction: Binge drinking (≥5 drinks per occasion) is common among students (Ham & Hope, 2003), and particularly team sportsmen (Brenner & Swanick, 2007), from mostly North American evidence. Although avoidance self-efficacy (A-SE) is an important determinant of drinking behaviour (Oei & Morawska, 2004) less is known about if gender and sport type influence A-SE. Our aim is to examine if binge drinking and A-SE differ by gender and sport type (team, individual and non sport participation) in a UK sample.

Methods

First year undergraduate sports science students (N=354; 54% male; 48%, 17% & 35% in team, individual and no sport), completed questionnaires to assess sport participation, A-SE, using the revised (multi-scale) Drinking Refusal Self-Efficacy Questionnaire (in different situations)(DRSEQ-R)(Oei et al., 2005), and binge drinking.

Results: Chi2 analysis revealed no differences between males (62%) v females (55%), or team (59%) v individual (53%) v non (62%) sport participants binge drank on 4 sessions in the past 30 days. A 2-way ANOVA revealed a significant interaction effect of sport type and gender on binge drinking, $F(2, 348) = 3.31$, $p<.05$.and main effect of sport type $F(2, 348) = 3.59$, $p<.05$. Non-sport students had more binge drinking sessions than the other groups. Team sportsmen reported more binge drinking sessions than those in individual sports, but female binge drinking was consistent across sport type. Across sport types, females in individual sports were more likely to binge drink than males. A 2-way ANOVA also revealed a significant interaction effect of sport type and gender on DRSEQ for emotional relief, $F (2, 348) = 3.06$, $p<.05$, and a main effect of sport type, $F (2, 348) = 6.98$, $p<.01$. Overall, the non-sport group (particularly males) had the least A-SE for emotional relief and the team athletes had the highest.

Discussion: The findings differ from previous studies (Brenner & Swanick, 2007) and indicate a worryingly similar prevalence of binge drinking for males and females, which may be specific to the UK and sample. Only male (not female) team sport participants binge drink more than those in individual sport. Overall, sport participants appear to do less binge drinking than non sport students, especially among males. In situations in which drinking may provide emotional relief, non sport males students had least confidence to avoid alcohol, and those in team sports had the highest. The findings add to our understanding of how sport impacts on binge drinking.

References

Brenner J., & Swanik, K. (2007). Journal of American College Health, 56, 267-272.

Ham LS, Hope DA. (2003). Clin Psych Review, 23, 719-759.

Oei TPS Morawska A. (2004). Addict Behav, 29, 159-179.

Oei TPS, Hasking PA, Young RM. (2005). Drug Alc Depend, 78, 297-307.

TEAM COHESION AND USE OF MENTAL IMAGERY IN A GROUP OF TURKISH SOCCER PLAYERS

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There has been intense body of literature on team cohesion and its relationship with different variables. However, the relationship between team cohesion and use of mental imagery on soccer players has drawn less attention in the literature. Although team cohesion and use of mental imagery have been seen critical for successful psychological performance for athletes; these two concepts have generally been studied separately in most of the studies. Therefore, purpose of the present study was to investigate the relationship between team cohesion and use of mental imagery in a group of Turkish soccer players.

Group Environment Questionnaire (GEO, Carron, Widmeyer, & Brawley, 1985) and Sport Imagery Questionnaire (SIQ, Hall, Mark, Paivio, & Hausenblas, 1998) were administered to a sample of 199 Turkish male soccer players.

Mean age of participants and their sporting year were 25.62 (SD=2.44) and 6.78 (SD=2.67) respectively. Descriptive statistics was used for the GEO & SIQ subscales of the participants. Pearson product moment correlations and multiple regression analysis were used to assess correlations among subscales of GEQ namely; individual attractions to the group as task, individual attractions to the group as social, group integration as task, and group integration as social and SIQ namely; cognitive specific, cognitive general, motivation specific, motivation general-arousal, and motivation general-mastery.

Results revealed that means of individual attractions to group-task, individual attractions to group-social, group integration-task, and group integration were 23.05 (SD=5.9), 22.97 (SD=4.71), 22.82 (SD=6.77), and 20.26 (SD=5.58), respectively. Moreover, the means of cognitive specific, cognitive general, motivation specific, motivation general-arousal and motivation general-mastery subscales of SIQ were 49.35 (SD=8.95), 28.11 (SD=6.66), 18.72 (SD=5.54) and 18.06 (SD=3.13) respectively. Results of correlation analysis revealed no significant relationships among team cohesion and use of mental imaginary subscales

Results were discussed in relation to studies conducted in Turkey and in other countries.

Carron, Widmeyer, & Brawley, 1985. The development of an instrument to assess cohesion in sport teams: The group environment questionnaire. Journal of sport psychology, 7, 244-266.

Hall, Mack, Paivio, & Hausenblas (1998). Imagery use by athletes: Development of the Sport Imagery Questionnaire, International Journal of Sport Psychology 29, 73–89

HORSE-RIDING, EMOTIONAL INTELLIGENCE AND FIELD-DEPENDENCE

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Horse-riding, emotional intelligence and field-dependence

Introduction: Intelligence (EI), representing the way people manage their own emotions and others' emotions, may be moderated by the perceptive style, as measured by the degree of field-dependence. This relationship was investigated in horse-riding, an activity in which emotions are predominant, especially concerning the affectivity between the rider and the horse; and where the perceptive style is a key to understand rider's behavior.

Objectives: This study is aimed to know if near-expert horse riders with high trait EI rely more on external or internal cues to process information, which can be measured by field-dependence.

Methods: First EI of French near-expert horse riders (N=50) was assessed by the French version of the TEIQue (Trait Emotional Intelligence Questionnaire, Mikolajczak, Luminet, Leroy, & Roy, 2007). Extreme scores were selected, and two groups were constituted, high trait EI (n=18) and low trait EI (n=18). Field-dependence of these participants was then assessed by the Rod-and-Frame Task (Witkin & Asch, 1948).

Results: An ANOVA was performed with 2 independent variables, gender and EI, and one dependent variable, field-dependence score. A gender effect was found: female horse riders are significantly more field-independent than male horse riders ($F(1; 32) = 20.058$; $p<.0001$). The interaction effect between gender and EI was significant ($F(1, 32) = 6,075$; $p<.05$). Further mean comparisons were processed; high trait EI male horse riders are significantly more field-independent than low trait EI male horse-riders ($F(1; 14) = 4.63$; $p < .05$); whereas high trait EI female horse-riders have a tendency to be more field-dependent than low trait EI female horse-riders ($F(1; 18) = 1.66$; $p < .25$).

Discussion: The relationship between EI and field-dependence in horse-riding appears to be gender specific; high trait EI male relying more on bodily cues, and high trait EI female having a tendency to rely more on contextual cues. These findings can explain the differences in managing horse's emotions, and one's own emotions in competition. Further research is needed to explore the influence of EI and field-dependence in horse-riding performance, with the necessity to take into account gender differences, as underlined by this study.

References

Mikolajczak, M., Luminet, O., Leroy, C., & Roy, E. (2007). Psychometric properties of the Trait Emotional Intelligence Questionnaire: Factor structure, reliability, construct, and incremental validity in a French-Speaking population. Journal of Personality Assessment, 88(3), 338-353.

Witkin, H. A., & Asch, S. E. (1948). Studies in space orientation. IV. Further experiments on perception of the upright with displaced visual fields. Journal of Experimental Psychology, 38, 762-782.

THE EXAMINATION OF THE EFFECT OF CHANGES IN PRACTICE VOLUME ON THE PROFILE OF MOOD STATE AND PHYSICAL FUNCTIONING IN ADOLESCENT GIRLS WHO PLAY KARATE

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Purpose:The present study aimed at examination of the effect of changes in practice volume on the profile of mood state and physical functioning in adolescent girls who play karate

Material and method:45 adolescent girls who played karate with the average of age 13.05+3.21,height 150.92+11.31 and weight 44.12+10.57 who had constant practice for at least 2 years, after initial test and receiving letter of satisfaction were selected as testees for this research. First,during a session,goals and total measures which will be performed were elucidated for testees and while receiving the written letter of satisfaction from testees' parents,in the beginning mood were measuredThese statistics of the course,factors of speed,agility,aerobic power,technical functioning and mood were measured.These statistics were considered as witnesses.During the first week,the testees with approximate pressure of 20% for 3 days a week were practicing.Then during the second week,the pressure of practice volume increased to 40% and for 4 days a week,practicing continued.During the third week,the pressure of practice volume reached 70% and for 5 days a week practice was prolonged.In the forth week,the pressure of practice volume was 100% and practice was conducted for the 7 days of the week.

At the end of this stage , various tests of augmentation of practice volume were performed.During the fifth week,the pressure of practice volume was decreased to 30% and practice continued within a period of 2 days a week.At the end of this stage ,diminution of practice volume was tested.During the sixth week,practice discontinued completely.After 2 weeks of stopping practices,examinations were redone at this stage.For hypotheses testing and answer finding,statistical model of analyzing of variance variable (ANOVA) with repeated measurements was used.

A significant level existed in the whole stages($p<0.05$).

Results:The first finding indicated that changes in practice volume leads to meaningful change in anaerobic power.This alteration at the time of augmenting practice volume was significant.

Agility was influenced by alterations in practice volume and after the period of augmenting practice volume,agility decreased significantly.This diminution continued to the end of this period but the most diminution was related to the period of augmentation of practice volume.Only after increasing practice volume,was aerobic power of testees increased significantly.But technical functioning of testees' hands had meaningful augmentation from the beginning to the end of this period and the most rate of alteration was observed during diminution of practice volume and during stopping practices.only after the period of alterations,was technical functioning of feet increased and this alteration was meaningful after the period of increasing practice volume.In spite of the observed alterations in six mood elements and total mood disorders,any meaningful difference was not observed in none of elements and measurement times.

SUBJECTIVITY IN SPORT: THE IMPACT OF THE COACH'S SUBJECTIVITY IN ONE TRIATHLON TEAM CONSTITUTION

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The Sport Psychology researches have been analyzing the process of group communication on a one-way direction, not considering the athlete as an active individual, where his/her behavior is a direct result of the incentives presented by the environment. It is believed that understanding the productions of the subjective senses and how the communication processes in a sporting team are organized is relevant to comprehend the subjective configurations - both of the group subjectivity and of the athletes individually. Both subjectivity forms go through processes of constant transformation striving for a balance that considers the individual and group needs simultaneously. The present study has as objective analyzing the relation and the production processes of subjective sense between coach and athletes of a triathlon team considering 1) the organization of the team communication processes, i.e. to understand the athlete-team, athlete-athlete, coach-team, coach-athlete relationships; 2) the understanding of the group climate and how it affects the athletes' subjectivity; 3) and how these processes influence the sporting performance. This study emphasizes the constructive-interpretative and dialogical character of the knowledge, based on González Rey's interpretation of qualitative research. The field research comprised a five-month follow-up of 8 athletes of a triathlon team and their coach in a countryside town of the state of São Paulo that participate in regional, national and international competitions. For the accomplishment of this study the tools used were: conversational dynamics, term used to emphasize the procedural and open character of the relationships with the participant; complement of sentences, which allowed acquiring information about the production of sense of the individual; and a field diary. The tools supplied subjective sense indicators which, in our analysis, led us to the construction of the following subjective senses nuclei: 1) the impact of the coach's subjectivity on the team constitution; 2) the competitive moment and its influence on the team subjective configuration; and 3) the interference of the family on the athlete's subjective formation. The impact of each one of those subjective sense nuclei on the athlete and the team were the main results of this research, which mainly concluded that the coach's production of subjective sense had strong influence in the communication process among him and the athlete, the team, and the athlete's family. The coach's dispute for the attention and recognition of the direct and indirect participants created an atmosphere of intra-personal competition that generates individualism, jealousy and envy. When those indicators are associated with others present in the competitive atmosphere, such as the winner's exaltation, the depreciation of the defeated and the promptness they configure a social subjectivity which represents the contemporary society.

14:15 - 15:15

Poster presentations

PP-SM05 Sports Medicine 5

THE INFLUENCE OF EFFORT TYPE ON THE PLASMATIC CHOLESTEROL LEVELS FOR ELITE ATHLETES

ALEXANDRESCU, L., BUHOCIU, E.
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Introduction: During the longer term effort (anaerobic type of effort, with preponderant isotonic component), the muscle mostly uses fatty acids. Consequently, the concentration of fatty acids in the blood, decreases during the effort, and starts increasing right after the effort's cessation, in order to prepare the energetic background of later efforts. The purpose the present work is to study the total cholesterol variations in the blood of athletes who perform the isometric type of effort, effort limited in time by its maximal intensity, the muscular metabolism being mainly anaerobic.

Methods: The analyzed groups of athletes were selected based on the type of effort required by various sports. This selection was justified by the characteristics of sports with a predominant isometric component, which determine a specific body composition, influencing the plasmatic values of total cholesterol. These values are also determined by the structure of the training sessions and the feeding of the athletes, with the purpose to increase the force and/or muscular mass.

Results and Discussions

Based on this study on professional athletes, we can draw a few conclusions applicable to the general population, regarding the best fitted type of effort for each individual, depending on the functional parameters, age, body type and possible associated diseases:

- effort must be sustained by a proper diet: in sports with significant body development and muscular mass increase, the effort has to be supported with protein and glucidic aport, whereas in sports with a mainly aerobic effort, we recommend a predominant glucidic support.
- athletics with a predominant aerobic component, performed at a moderated or sub maximal intensity, with cardiac frequency monitored, are recommended to anyone irrespective of age, if there are no particular medical restrictions.
- for hypercholesterolemia prevention, continuous efforts are recommended, with a duration of 30-40 minutes, adapting their intensity to the training level and effort tolerance of each individual.

References

Brown, R.L., The LEAP – Lifetime Exercice Adherence Plan, ReganBooks, New York, 1999

Buhociu, E., Contribuţii la studiul unor parametri cardiovasculari în efortul predominant izometric la sportivi de performanţă, Teză de doctorat, Bucureşti, 2007

Dragan, I., Medicină Sportivă, Ed. Medicală, Bucureşti, 2002

Nenciu, G., Fiziologia generală a efortului fizic, Ed. Fundaţiei Romãnia de Mãine, Bucureşti, 2002

COMPLEMENTARY OR CO-ACTIVATIVE SYNERGISM AMONG THE TRICEPS SURAE MUSCLES DURING PROLONGED PLANTAR FLEXION

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Introduction: During prolonged isometric contractions at low workloads, a unique kind of neuromuscular regulation activity called, "alternative activity," is known to dramatically increase and decrease activity levels among synergistic muscles, almost throughout the whole muscle unit (Tamaki et al, 1998, Kirimoto et al, 2006). Although the complementary activity among such synergistic muscles is believed to be purposive neuromuscular regulation for maintaining uniform joint torque over a long period of time, the mechanism of occurrence is not well understood. Therefore, the aim of this study was to investigate the relationship between "common drive" (De Luca and Erim, 1994) from the central nervous system (CNS) and the synergistic behavior of the triceps surae muscles during sustained isometric contraction.

Methods: Nine human subjects performed isometric sustained contraction at an ankle joint angle of 110° plantar flexion under constant load (10% of maximal voluntary contraction) for 60 min. Simultaneously, surface electromyographic (EMG) data were obtained from the lateral gastrocnemius (LG), medial gastrocnemius (MG), and soleus (SOL) muscles. The surface EMG signals ware recorded with active parallel-bar (1 by 10mm in size and located 10mm apart) differential electrodes. The synergistic behavior of the triseps surae muscles were assessed cross-correlations of the mean EMG between three muscle combinations: LG-MG, LG-SOL and MG-SOL.

Results: When the data were divided into 1-min blocks, the partial correlation data revealed that LG-SOL correlated over the period of the contraction, suggesting the presence of co-activation synergism. In contrast, LG-MG demonstrated a tendency toward the complementary synergism (Rxy (0) < -0.7). The short duration central peaks in the cross-correlogram were seen in approximately 80% of co-activation synergism period (Rxy (0) > 0.7), however, central peaks were seen in only 8% of complementary synergism period (Rxy (0) < -0.7).

Discussion: These results suggest that the motoneuron pool of LG and SOL are modulated by common drive from the CNS in the co-activation synergism period. The finding that few central peaks were seen the complementary synergism period mainly in LG-MG suggests that complementary activities of synergists are related to the modulation from peripheral afferents rather than the CNS.

References

Tamaki H, Kitada K, Akamine T, Murata F, Sakou T, & Kurata H: Alternate activity in the synergistic muscles during prolonged low-level contractions. J Appl Physiol 84: 1943 - 1951, 1998.

Kirimoto H, Goto Y, Kotake N, Kitada K, Ogita F, & Tamaki H: Electromyogram patterns during sustained low-level plantar flexions and changes in blood flow for "Alternate activity" among the triceps surae muscles. Jpn J Phys Fitness Sports Med 55: 393 -402, 2006.

DeLuca CJ & Erim Z. Common drive of motor units in regulation of muscle force. Trends Neurosci 17(7): 299-304, 1994.

EUCAPNIC VOLUNTARY HYPERPNOEA TESTING WITH THE NEW EUCAPSYS DEVICE IN TRAINED AND UNTRAINED FEMALES

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The eucapnic voluntary hyperpnoea (EVH) test is the bronchial provocation challenge currently recommended by the International Olympic Committee – Medical Commission (IOC-MC) for laboratory -based asthma diagnosis in athletes (1). This test requires athletes to hyperventilate dry air with 5% CO2 for 6-8min at 30 times their baseline forced expiratory flow in one second (FEV1) (2). So far, most of the diagnostic centres for asthma have developed their own EVH set-up following previous recommendations (2). The main drawback of home-made EVH set-ups is that they require the use of expensive gas tanks containing the specific inspiratory gas mixture. Recently, a new device for EVH challenge – EucapSys (SMTEC.SA, Nyon, Suisse) – has been made commercially available. This device acts as a mixing chamber and produces adjustable hypercapnic mixtures at a reduced running cost.

The aim of this study is to assess the effectiveness and reliability of EucapSys and whether it is a safe alternative to the established system for EVH testing, both in athletes and in untrained individuals.

Twenty eight trained (31.1+/- 1.7yr (SEM); 9.0+/- 1.1h of training per week) and 22 untrained females (23.3+/- 1.4yr) performed an 8-min EVH test on the EucapSys. Inspired fraction of CO2 (FICO2), end-tidal CO2 (PETCO2) and ventilation (VE) values were continuously monitored using a breath-by-breath gas analyser (CPX-Ultima, MedGraphics). Recovery from the challenge was spontaneous with spirometry measured in duplicate at 2, 5, 10, 15 and 20min after the challenge.

All subjects were able to successfully complete the 8min test. Athletes reached a ventilatory level of 88.6 +/- 2.4L.min-1 and untrained subjects of 81.3+/-2.2L.min-1 (P=0.029). FICO2 was stable around 4.8+/- 0.0% in both groups throughout the test. PETCO2 was kept within the normal range of 35-45mmHg in all participants (mean for both groups was 40.1+/-0.3mmHg). Ten athletes and nine untrained subjects had a positive response to the EVH challenge (defined by a 10% fall or more from baseline FEV1 during two successive recovery time intervals). No significant difference in FICO2 or PETCO2 were found in those subjects with a positive and a negative response (P=0.256 and 0.225, respectively).

In conclusion, the EucapSys can safely and effectively be used for asthma testing, in both athletes and untrained female subjects.

1. Beta2 adrenoceptor agonists and the Olympic Games in Beijing. http://www.olympic.org/uk/medical/intro_uk.pdf (accessed 29/01/09)

2. Anderson SD, Argyros GJ, Magnussen H, Holzer K. Provocation by eucapnic voluntary hyperpnoea to identify exercise induced bronchoconstriction. Br J Sports Med. 35(5): 344 (2001)

CHANGES IN GUT HORMONE LEVELS AND NEGATIVE ENERGY BALANCE DURING AEROBIC EXERCISE IN OBESE YOUNG MALES

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OSAKA CITY UNIVERSITY GRADUATE SCHOOL OF MEDICINE

We examined whether changes in gut hormone levels due to a single bout of aerobic exercise differ between obese young males and normal controls, and attempted to determine the involvement of hormonal changes during exercise in the regulation of energy balance in these obese subjects. Seven obese and seven age-matched subjects of normal weight participated in exercise and rest sessions. Subjects consumed a standardized breakfast, which was followed by constant cycling exercise at 50% VO2max or rest for 60 min. At lunch, a test meal was presented, and energy intake (EI) and relative energy intake (REI) were calculated. Blood samples were obtained at

30 min intervals during both sessions for measurement of glucose, insulin, glucagon, ghrelin, peptide YY (PYY), and glucagon-like peptide-1 (GLP-1). Plasma levels of PYY and GLP-1 were increased by exercise, whereas plasma ghrelin levels were unaffected by exercise. The areas under the curve (AUC) of the time courses of PYY and GLP-1 levels did not significantly differ between the two groups. In contrast, EI and REI were decreased by exercise in both groups, and energy deficit was significantly larger in obese subjects than in normal controls. The present findings suggest that short-term energy balance during a single exercise session might be regulated not by increased amounts of these gut hormones per se.

DETERMINING OPTIMAL HANDBALL PLAYER RATES OF BODY SIZE: A PHANTOM ALTERNATIVE?

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TECHNICAL UNIVERSITY OF LISBON

A range of relevant anthropometric factors can be considered which are subject to strong genetic influences (e.g. stature) or are largely environmentally determined and susceptible to training effects (see Reilly, Bangsbo and Franks, 2000). However, in the throwing events like handball, the anthropometric profile of elite players is first based in height and weight, followed by span and hand measures (Blanco, 2004).

The aim of the current study were (i) to make a conditional characterization and to describe the relation between height and weight of male handball players of different levels, (ii) to assess its ability to distinguish different level adult players and (iii) to test Phantom and Lentini Combined Methods: 561 male handball players (WC 2007, n = 395; LPA 2007-08, n = 184) were studied (mean age = 25.99 years, s = 4.64; height = 188.46 cm, s = 7.11; body mass = 89.07 kg, s = 9.97). WC 2007 was classed as those who had participated in the XXTH Men's Handball World Championship 2007 (in Germany). LPA 2007-08 players were classed as those who were signed for a Portuguese Professional Handball Club in season 2007-08. Two anthropometric measurements for each participant were taken during year 2007. These included height and body mass. To study the sportsmen proportionality were used (i) height and weight relation, (ii) body mass index, (iii) optimal weight, (iv) Phantom Method and (v) Lentini Combined Method. Statistical analysis involved variables description, though mean and standard deviation. The t-test for equality of means was performed to compare level groups (Independent Sample Test) and to compare results of Phantom and Lentini Methods (Paired Sample Test). For all analyses, 5% was adopted as the significance level and analyses were carried out with SPSS (Statistical Package for the Social Sciences) 15.0 software for Windows.

The results showed: (i) significant difference in body size (height and weight, all $p < 0.01$) and no significant differences in body mass index and optimal weight (all $p > 0.05$) variables between groups, (ii) significant difference between groups in Phantom Z value of height ($p < 0.01$) and no significant differences when considered the Phantom Z value of weight ($p > 0.05$), (iii) that Lentini combined method normalize the data pulling the results to the mean Z value (height and weight, all $p < 0.01$) comparing with Phantom method, and allows similar statistical results than original data. The results suggest that the use of Lentini combined method seems to be useful to study the sportsmen proportionality, and the body size of handball players participated in the XXTH Men's Handball World Championship 2007 (mean height = 189.13 cm, s = 7.20; body mass = 90.05 kg, s = 9.60) can be used as male reference data.

RESPONSES OF CYTOKINES TO INFLUENZA VACCINATION IN ELITE BOYS GYMNASTS

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Introduction: Decreases in immune responsiveness with exercise contribute to the increased incidence and severity of infectious disease among elites athelets (Murphy et al., 2008). The efficacy of this adjuvant strategy for vaccination in humans requires investigation (Edwards et al., 2007) .The objective of this study was to determine whether exercise were associated with altered immune response [IL-2, IL-6and IFN-gamma] to influenza vaccine.

METHODS: Therthy boy gymnasts (aged 9.8±0.88 years, heigh 139.19 ±4 cm,weight 33.79± 7.15kg ,and Vo2max=39.82 ±4 ml/kg/min)were categorized into two groups: (1)triaining,vaccine[TVG],(2) training[TG], and third groups : (3) vaccine[VG]. Then gymnasts performed gymnastic training for of eight weeks and were vaccinated pre and four weeks after training. Cytokines concentrations were measured pre-vaccination and at 4- and 8-week follow-ups. Then Serum was frozen on -70 until analysis cytokines production. Cytokines were measured by enzyme-linked immunosorbent assay(ELISA).

RESULTS: The results demonstrated that , IL-6and IFN-gamma decrease among three groups ,but IL-2 were not affected by vaccination and training ,also were not significantly different in the three groups.

Discussion: Othere studies have been shorter term (12 weeks-6months) and at lower intessities (50-60% Vo2max)atrend towards improwed immune response has been observed (Kohut et al.,2007).During exercise,the neuroendocrine milieu is altered resulting in increased sympathetic nervous system activation,and increase in plasma levels of othere hormones(cortisol)(Bruunsgaard et al.,1997).These results suggest that exercise,vaccine maynot influence immune response to influenza immunization. The practice of regular, vigorous exercise was associated with decrease immune response following influenza vaccination in prepubertal gymnasts.

References

Bruunsgaard,H.,Harthopp,A.,Mohr,T.,Konradsen,H.,Heron,I.,Mordhoest,C.H.,Pedersen,B.K.(1997).Medicine and Science in Sport and Exercise,29(9),1176-1181.

Edwards, K.M., Victoria, E.B., Louise, M.A., Jamie, S.M ., Jos, A.B., Douglas, C., Mark, D., Christopher, R. (2007). Brain BehavE Immun. 21(2):209-17.

Kohut,M.L., A.A., Arntson, wonglok, L., Kayla, R., kyoung- Jin, y., Joan, E.C., Janet M. (2007). Vaccine. 22(17-18):2298-2306.

Murphy, E.A., Davis, J.M., Carmichael ,M.D., Gangemi ,J.D., Ghaffar, A., Mayer, E.P .(2008) . Brain Behav Immun. Jun 21

14:15 - 15:15

Poster presentations

PP-TT07 Training and Testing 7

SKILL DIFFERENCES OF FREESTYLE COMPETITIVE SWIMMERS DETECTED BY MEANS OF A SPEED METER

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A speed meter that measures a subject's moving velocity by pulling a fine wire over a generator (Maglischo, 2003) for a distance of 25m was developed for use with competitive swimmers. In our previous study, the authors used the speed meter to check for skill differences between competitive swimmers of international achievement and collegiate breaststroke swimmers. The results showed that this method was useful for identifying skill differences among a group of swimmers as well as reasons for improvement for each swimmer. In the present study, the authors used the speed meter and an underwater video analysis system to determine the skill differences between short distance freestyle competitive swimmers of national achievement and collegiate swimmers. The speed meter recorded their intracyclic velocity changes during a 25m maximum effort freestyle swimming. The underwater video analysis system was also used to check their stroke techniques during these maximum efforts. Based on the video data, the authors divided the stroke cycle into three phases, i.e., 1) downsweep phase, 2) insweep phase, and 3) upsweep phase. Average velocities during each phase, based on the speed meter data, were compared individually among four swimmers. In consequence, no statistical differences were observed among all swimmers for the insweep phase (Test of contrasts, p=0.0628) and upsweep phase (p=0.8707). However, the mean velocities of national achievement swimmer showed significantly higher value for the downsweep phase (p=0.0287). It was suggested that improvements in freestyle swimming were dependent mostly upon improving downsweep phase.

Reference

Maglischo EW (2003) Swimming Fastest. Human Kinetics

SALIVARY AND PLASMA CORTISOL AND FREE TESTOSTERONE DURING A WINTER SWIMMING TRAINING SEASON

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Objectives

Studies on the impact of training load on endocrine response have led to inconclusive findings. The aim of this study was to measure the response of salivary and plasma cortisol and free testosterone during a swimming winter season, in order to test the sensibility of these markers to training variation, fatigue and adaptation.

Methods: 19 well-trained swimmers, 13 men (17,2±1,3 years, 174,9±5,8 height, and 65,8±6,8 mass) and 6 women (15,8±0,8 years, 163,0±9,4 height, 54,6±5,0 mass), were recruited for this study. The training load, volume, intensity and participation in competition events, were monitored during 29 weeks of a winter swimming season. Blood and saliva samples were taken at rest, at the same time of day, before the first afternoon workout of the week (16:00 h), at four testing moments: before the beginning of training season (t1) after the first 7 weeks of incremental training load(t2), after 6 weeks of an intermediate intense training mesocycle (t3) after a major competition (t4). Salivary cortisol and testorone were determined by Elisa and plasma values were determined by Chemiluminescence. At t2, t3 and t4 the swimmers completed a graded swimming protocol (7x200), in order to determine the lactate velocity curve and the associated parameters. In this study we adopted a single group repeated measures design in which athletes served as their own control subjects. All ethical presuppositions that a study of this scope compels have been verified.

Results: Training volume was significantly higher at t2 and t4 and intensity increased significantly at t4 ($p<0,05$). Plasmatic and salivary cortisol showed significant correlation (r=0,505, to r=0,902; $p<0,01$) in all testing moments. Male swimmers had higher plasma and salivary cortisol values in harder training phases when compared to t1 ($p<0,05$). The salivary and free plasmatic testosterone were also significantly correlated (r=0,703 to 0,747) at the 4 testing moments but showed no variation during the training season. When compared to the beginning of the season, salivary T/C only decreased significantly in t4 ($p<0,05$), but in the case of plasmatic T/C we found significant lower values in all intermediate moments of the season when compared to the initial one. The results of the graded swimming protocol revealed that the highest maximal and DMax swimming velocity were observed at t3 which coincided with the highest salivary cortisol and lowest T/C values.

Conclusion

Free Testosterone levels at rest do not seem to be affected by training during the swimming season. High Cortisol levels did not impair the maximal and submaximal performance capacity. The stress induced by hard training phases increased the cortisol values both in plasma and saliva, but a real increased in the magnitude of training load is needed to have a significant impact in salivary cortisol content. In conclusion, salivary cortisol alone, at rest, could be a useful marker of the stress induced by training load.

TECHNICAL-COORDINATIVE SKILLS AND PERFORMANCE: IMPROVEMENTS AND CORRELATIONS IN SWIMMING

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INTRODUCTION: The improvement of the swimming performance is certainly related to the physiological responses to training, but a very important role is also played by the technical-coordinative components and by the kinesthetic awareness. These abilities, basics during the learning process, are essentials in competitive swimmers in order to better feel and optimize the movements, increasing propulsion and reducing resistance [1-2].

The aim of this study was to assess the improvements of the technical-coordinative skills in young swimmers over a sport season, as well as their correlations to the performance.

METHODS: 10 young female swimmers (Mean±SD; age 8.4±0.5 years; height 132.5±5.6 cm; weight 33.3±6.1 kg; BMI 18.8±2.1) participate in the study. They practiced a traditional swim training. In order to assess their kinesthetic awareness and their technical-coordinative skills, subjects underwent a few representative tests three times over the sport season (T1=November, T2=February and T3=May) such as: i. diving and gliding underwater in a streamline position (DG); ii. pushing off from the wall and gliding underwater in a streamline position (PG); iii. diving, gliding and swimming front crawl for 15m (DGC); iv. diving, gliding and swimming breaststroke for 15m (DGBR); v. diving, gliding and swimming backstroke for 15m (DGBK). The best race performance (BRP) in the 50m front crawl was collected in the meantime. Data have been compared and the correlations between the technical-coordinative skill tests and BRP have been investigated.

RESULTS: In the within-test analysis, significant improvements were found among all T1, T2 and T3 ($p<.05$).

In the comparison between each test and BRP in the 50m front crawl, no significant correlations were found in DG and PG ($r=-0.58$ and $r=-0.59$ respectively, $p>.05$), whereas significant correlations ($p<.05$) were found in DGC ($r=0.77$), DGBR ($r=0.74$) and DGBK ($r=0.87$).

CONCLUSION

The repeated measure comparison at T1, T2 and T3 shows that a non-specific swimming training may contribute in obtaining adequate improvements of the technical-coordinative skills and the kinesthetic awareness.

The poor correlation between both DG and PG with BRP could be due to the fact that in very young swimmers (like our subjects were) the starting phase in a 50m event is little significant with respect to the swim phase, considering the total time needed to complete the competition.

Moreover, in very young swimmers, the training is not focused on the early specialization. That could be the reason of high correlations found between BRP in the 50m front crawl with DGC, as well as DGBR and DGBK.

REFERENCES

[1] Invernizzi PL, Del Bianco R, Scurati R, Caporaso G, La Torre A (2007). Analisi delle capacità tecnico-coordinative e senso-percettive nel nuoto. SDS/Rivista di cultura sportiva, Anno XXVI, (73)45-52, (74)53-61.

[2] Starosta W (1991). Alcuni problemi della tecnica sportiva. SDS/Rivista di cultura sportiva, 10, 1991 suppl. 22, 15-26.

THE INFLUENCE OF AGE AND WATER POLO CRAWL TECHNIQUES ON HEART RATE IN WATER POLO PLAYERS

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INTRODUCTION. The swimming techniques adopted by water polo players usually do not reflect the classic swimming techniques. Additionally this sport is a highly energy demanding activity (1,2). Therefore heart rate, that reflects energy demand, may be different when measured during crawl or some of its water polo adaptations. For this reason attention is given to improve these adaptations during water polo training sessions; however these techniques could elicit different responses in terms of heart rate.

PURPOSE. The purpose of this study was to look at the influence of age and water polo crawl techniques on heart rate in water polo (WP) players.

MATERIAL AND METHODS. Ten under 20 (U20, mean±SD, age 18.2±0.4 years, height 176±7 cm, body mass 73.1±12 kg) and ten under 13 (U13, mean±SD, age 11.8±0.4 years, height 154±9 cm, body mass 48.5±8.6 kg) WP swimmers volunteered for this study. Each participant performed four 25m trials at a constant speed of 1m/s in four different crawl techniques used in WP: crawl (C), crawl head up (CU), crawl head up with ball between arms (CA), crawl head up pushing a ball (CP). Heart rate (HR) was monitored during each trial with a Polar® Team System heart rate monitor and used for further analysed.

RESULTS. Between groups: HR was significantly lower in U20 than U13 for all four techniques (C: 104±13 vs 122±11 bpm $p<0.05$; CU: 117±13 vs 132±13 bpm $p<0.05$; CA: 123±9 vs 137±8 bpm $p<0.05$; CP: 125±8 vs 145±10 bpm $p<0.05$; U20 and U13 respectively). Within each group, for U20 HR values were 104±13 (C), 117±13 (CU), 123±9 (CA) and 125±8 (CP) bpm and have been found to significantly differ between each other ($p<0.05$) except for CA and CP ($p>0.05$). For U13 HR values were 122±11 (C), 132±13 (CU), 137±8 (CA) and 145±10 (CP) bpm and have been found to be significantly different between each other ($p<0.05$) except for CU and CA ($p>0.05$).

CONCLUSIONS. The between groups comparison showed that age affects HR in the four different stroke techniques analysed, revealing that young WP swimmers spend more energy than the older ones in spite of the technique used. The within group comparison pointed out that the differences between each technique may be related to the age and the specificity of training in the two groups. U13 matches are characterised by static positions and ball control therefore this could be the explanation why we did not find any differences between CU and CA. On the other hand U20 matches due to their higher performance level are characterised by rapid movements of the players and the ball (pushing and throwing), thus the training focuses on more specific WP techniques, possibly explaining the lack of differences between CA and CP.

REFERENCES

1) Smith HK. Applied physiology of water polo, Sports Medicine, 1998 26(5):317-34.

2) Pavlik G, Kemény D, Kneffel Z, Petrekanits M, Horváth P, Sidó Z. Echocardiographic data in hungarian top-level water polo players. Medicine and Science in Sports and Exercise. 2005 37(2):323-328.

IMPROVEMENT OF KINESTHETIC AWARENESS IN SYNCHRONISED SWIMMING

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INTRODUCTION: Kinesthetic awareness is very important in swimming in order to better "feel the water", improving the propulsive actions and reducing the drag forces [1]. Synchronized swimming requires flexibility, aerobic as well as anaerobic conditioning and abilities [2]. In particular kinesthetic awareness allows to maintain a fine body control and to better operate the actions of propulsion based on lift forces.

Improvements of the kinesthetic awareness and the conditional capacities subsequent to a classic synchronized swimming training program have been investigated in this study.

METHODS: Twelve 11 to 17 years old subjects practicing synchronized swimming participate in the study. Before and after a traditional six-months synchronized swimming training, subjects underwent a series of tests (in order to assess kinesthetic awareness, technical and coordinative abilities, strength and power) such as: i. diving and gliding underwater in a streamline position (DG); ii. pushing off from the wall and gliding underwater in a streamline position (PG); iii. sculling while floating on the back for 15m (SC); iv. swimming the front crawl

stroke at 90% of the maximum for 25m (CR90%); v. swimming front crawl stroke only with legs for 25m (LCR); vi. swimming front crawl stroke with close hands for 25m (CHCR); vii. swimming breaststroke for 25m in modified coordination (MBRST), viii. swimming front crawl stroke only with arms for 25m (ACR). Pre and post training results were then compared.

RESULTS: No differences were found in PG, LCR and CHCR (p>.05).

Significant improvements were found in DG (pre vs. post, 7.7±2.4 vs. 8.9±1.7 m, p<.05), SC (29.4±4.0 vs. 28.3±4.1 sec, p<.05), CR90% (the gap in percentage to the attended performance have been considered, 6.2±2.8 vs. 3.2±1.6 %, p<.05) and MBRST (30.2±5.2 vs. 28.9±5.4 sec, p<.05).

In ACR no differences were found in the performance (22.9±3.5 vs. 22.0±2.7 sec, p>.05), whereas improvements were found in counting the number of the arm strokes needed to swim the distance (34.9±5.1 vs. 32.8±5.1 n, p<.05).

CONCLUSION: The results suggest that six-months of traditional training in synchronized swimming would not significantly affect the conditional capacities such as strength and power (PG, LCR, CHCR and even ACR did not differ between pre- and post- training). On the contrary, training would mostly improve the kinesthetic awareness and the coordinative abilities. The significant improvements in ACR's number of arm strokes (although the performance did not differ) and in DG could mainly depend on the progress of the technical actions related to the kinesthetic awareness evolution.

REFERENCES

[1] Invernizzi PL, Del Bianco R, Scurati R, Caporaso G, La Torre A (2007). Analisi delle capacità tecnico-coordinative e senso-percettive nel nuoto. SDS/Rivista di cultura sportiva, Anno XXVI, (73)45-52, (74)53-61.

[2] Weinberg SK (1986). Medical aspects of synchronized swimming. Clin Sports Med. 5(1):159-67.

INVESTIGATION OF SELECTED PHYSIOLOGICAL PARAMETERS OF TURKISH MALE MASTERCLASS SWIMMERS

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The purpose of this study is investigating the relationship between the age related categories of male master class swimmers in accordance with height (cm), weight (kg), body mass index (BMI), basal metabolic rate (BMR), body fat percentage (BFP), fat mass (FM), fat-free mass (FFM) and total body water (TBW).

In the study, 29 male master class swimmer, from 8 categories (C1 to C8), with an average age of 41,9 (±11,1), are included. The data is collected on 2nd International Masters Swimming Cup, October 28-29, 2008 in Istanbul with Tanita BC 418 Segmental Body Composition Analyzer with Bioimpedance analyze (BIA) method. Minitab 15.1 statistics software package programme is used to analyze the data.

Variance analysis method is applied to the male masters swimmers' age, height, weight, BMI, BMI, BMR, BFP, FM, FFM and TBW data according to age group factor. Duncan's multiple range test (MRT) is applied to the group means if necessary. It is found that the mean height value of the age category C6 is statistically significantly correlated with the mean height values of age categories C7 and C8 (p≤0,01). Also, mean BMR, FFM, TBW values of C1 and C7 are found to be statistically significantly correlated (p≤0,01). No relationship between the mean VA, BMI, BFP and FM values of age groups are found.

REFERENCES:

BEHNKE, A.R., WILMORE, H., (1974). Evaluation and Regulation of Body Composition Prentice-Hall, Inc, New Jersey, p. 38-52.

CARTER, J.E.L., HEATH, B.H., (1990). Somatotyping Development and Applications, Cambridge University Pres, p. 1-14.

COSTILL, D., MAGLISCHO, E., RICHARDSON, A., (1992). Handbook of Sport Medicine and Science, p. 24-30.

DONELLY, E. J., et al, (2009). Appropriate Physical Activity Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults, Position Stand, Medicine & Science in Sports & Exercise, February, 2009.

LUCASKI, H. C., BOLONCHUK, W., (1993). Relationship Among Swimming Performance, Body Composition and Somatotype in Competitive Collegiate Swimmers, The Journal of Sport Medicine, January, p.166-171.

MALİNA, R. M., (1994). Physical Activity and Training: Effects on Stature and the Adolescent Growth Spurt. Med Sci and Sports and Exerc. Jun; 26(6):759-766.

MAZZEO, R. S., et al, (1998). Exercise and Physical Activity for Older Adults, Position Stand, Medicine & Science in Sports & Exercise, Volume 30, Number 6,

ROBERT, M., (1988). Young Athletes, USA, Human Kinetics Books, p. 119-203.

ROCHE, A., HEYMSFİELD, S., LOHMAN, T., (1996). Human Body Composition, USA, Human Kinetics Books, p. 257-269.

SHARP, R.L., (2002). Swimming, Nutrition in Sport Chapter 46, Edited by MAUGHAN, J.R., Volume VII of The Encyclopedia of Sports Medicine an IOC Medical Commission Publication, Blackwell Publishing, p.610-611. SIDERS, W. A.,

SOLER, R., ECHEGARAY, M., RIVERA, M. A., (2003). Thermal Responses and Body Fluid Balance of Competitive Male Swimmers During a Training Season, Journal of Strength and Conditioning Research, 17(2), p.362-367.

INFLUENCE OF TWO DIFFERENT REST INTERVALS ON FATIGUE DURING MAXIMAL SWIMMING

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INTRODUCTION: Performance in repeated sprints is affected by recovery duration (2). A recent study has shown that fatigue (as a means of drop in power output) during eight 6 sec cycling sprints with short rest intervals, was significantly greater than with longer rest intervals (1). Similar findings were presented in another study held in swimming (3). However, the rest intervals used were much longer than what can be found in a typical swimming training (10-30 sec). The purpose of the present study was to examine the influence of two different rest intervals on performance and fatigue during repeated sprint swimming.

METHODS: Sixteen swimmers (9 boys & 7 girls) age: 15.6 ± 0.7yrs, performed 3x66 m sprint swimming in two different conditions and in a random order. During the first condition, the rest period between sprints was 10 sec (S), while on the second condition the rest period was 30 sec (L). Differences between the two conditions in performance time and fatigue index (percent increase of performance time from the first to the third sprint) were analyzed using T-Test. Results are presented as mean ± SE.

RESULTS: Total performance time was significantly different between the two conditions (S=144.0 ± 4.0 vs L=138.7 ± 3.7 sec, p<0.0001). Despite the difference in performance time, fatigue index did not differ significantly between the two conditions (S=9.6 ± 1.6% vs L=7.4 ± 1.5%, p=0.25).

DISCUSSION: The results of the present study suggest that different recovery periods influence performance time, as it was expected (3). The fact that fatigue index did not differ between the conditions suggest that even a rest period as short as 10 seconds might induce almost the same fatigue as a longer interval despite its important impair in performance. The relatively low number of repeated sprints may have contributed to the non-significant difference in fatigue between the two conditions and therefore further research is needed.

REFERENCES

1. Baker JS, Van Praagh E, Gelsei M, Thomas M, Davies B. High-intensity intermittent cycle ergometer exercise: effect of recovery duration and resistive force selection on performance. Res Sports Med., 15(2):77-92, 2007.

2. Ratel, S., Bedu, M., Hennegrave, A., Doré, E., Duché, P. Effects of age and recovery duration on peak power output during repeated cycling sprints Int J Sports Med., 23(6):397-402, 2002.

3. Toubekis, A.G., Douda, H.T., Tokmakidis, S.P. Influence of different rest intervals during active or passive recovery on repeated sprint swimming performance. Eur. J. Appl. Physiol., 93: 694-700, 2005.

EFFECTS OF WEIGHTED ROPE JUMP TRAINING ON ANAEROBIC POWER, SPEED, FLEXIBILITY AND AGILITY IN ADOLESCENT VOLLEYBALL PLAYERS

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Introduction: The aim of this study was to investigate the effect of a 12-week rope jumping and weighted rope jumping exercise programme on anaerobic power, speed, flexibility and agility performance of female adolescent volleyball players.

Methods

Twenty-five female volleyball players (mean age: 14,66±1,16yrs) who had at least 2 years volleyball experience participated in this study and were divided into there groups. Group 1 took on the weighted rope jumping (WRJ; (n=8)) programme as well as volleyball training, Group 2 on rope jumping (RJ; (n=9)) programme as well as volleyball training and Group 3, the control (C; (n=8)) participated only volleyball training. The exercise sessions were carried out 3 times each week for 12 weeks. The anaerobic power of the subjects was measured by using vertical jump test. 30 m. sprint test, seat and reach test, hexagonal obstacle and zigzag tests were applied to the subjects as described in the literature. Data indicating the effects of these exercise programs on the performance parameters and somatotype was statistically analyzed by ANOVA and Kruskal-Wallis test.

Results: There was a significant difference a considerable increase in the values of flexibility and anaerobic power at the end of training of the two groups (p<0,01). Also speed and agility performance of two groups were significantly different at the end of training (p<0,01). Compared to control and training groups, the values of WRJ group were highly increased for the mean of anaerobic power and zig-zag test (p<0,01).

Discussion: As a result; we showed that performance parameters of the groups taking 12-week weighted rope jump exercise programme would be considerable improved. Therefore, the results of this study indicate that a weighted rope jumping exercise programme has a potential improvement anaerobic power and agility of volleyball players.

EFFECTS OF VOLLEYBALL TRAINING ON JUNIOR ATHLETES IN PREPARATION FOR THE WORLD CHAMPIONSHIP

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Introduction: The Brazilian volleyball teams have obtained great performances at international level. Recently Brazil won The Junior World Championship for Male Volleyball held in Morocco. The athletes follow and very strong program of training for this competition. During this period and according to the macrocycle, a battery of test is applied in order to verify the level of training-induced adaptations on variables important to perform this game. The main objective of this study was to verify how the athletes adapted after 8 weeks of training developed before the world championship.

Methods: The sample was composed of 10 male athletes (Age: 19.4±0.6 years; Height: 1.97±0.9 m; Weight: 93.9±1.4 kg). The study was approved by the university human ethics committee and all subjects signed an informed consent document. The battery of tests was applied 8 weeks apart (Test 1 and Test 2) and included Anthropometric measures, medicine-ball Throw, shuttle-run test, squat jump, contermovement jump and two specific tests for height of spike and block reach. The data was analyzed by descriptive statistics and a Paired t test was used to compare all the group of means. The significance level was set at p≤0.05.

Results: The results showed that SJ (T1: 41.1±3.8 cm-T2: 36.7±3.4 cm – p=0.00) and CMJ (T1: 44.2±4.0-T2: 40.8±3.9 cm – p=0.02) presented means that were statistically significant but with a decrease of performance. On the hand, the medicine-ball throw (T1: 7.09±0.8 m-T2: 7.09±0.6 m – p=.993), the shuttle-run test (T1: 6.77±0.28 s-T2: 6.90±0.13 s – p=.159), the height of spike reach (T1: 3.37±0.20 m-T2: 3.35±0.20 m – p=.132) and the height of block reach (T1: 3.13±0.17 m-T2: 3.12±0.16 m – p=.435) did not present any statistical significance.

Discussion: The importance on testing elite athletes is that the results not always are according to those verified in the literature. The way human body adapts to the training loads requires frequent studies. Particularly, these results may infer that 8 weeks of training did not influence the performance of the athletes. But some aspects must be considered: First: the moment that the battery of test was applied (one day before departure to Morocco) when some athletes performed the tests with excessive care trying to prevent any injury and Second: The week before the test 8 athletes of the team was under a strong cold which probably have affected their performance during the test. Thus, when evaluating athletes there are some aspects that can not be controlled by the researcher such as health and psychological status that affects them at specific moments of the macrocycle.

THE EFFECTS OF DIFFERENT MUSCULAR TRAINING MODES IN VOLLEYBALL STRENGTH TRAINING

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Introduction: The muscular training is one of the most important factors and in some cases the most important admixture of sport training, with a view to reaching high performances, influencing the way the preparation is undergone. This training must be completed on a uniformly and balanced basis for each of the physical aptitudes solicited by the performance sport. The purpose of this paper is that of improving the muscular preparation by introducing alternate contraction regimes inside the training of the junior volley players (16-18

years). For the performance level (juniors), the strategic objective is centered on: improvement of the game actions which are integrated to the collective tactics and subordinated to the efficiency requests of competitions, doubled by the necessity of accomplishing a high level of specific physical and psychical training.

Methods and Instruments

In order to evaluate the junior female sport performances, the tests method was used, by making use of the Bosco Protocol, applied on the force measuring platform Quattro Jump tip Kistler 9290AD.

Results and discussions:

The height indicator (h)

The jump height indicator registered significant increases for la SJ, CMJ and CJb at t = 8,504 la SJ, 10,385 la CMJ and 9,403 at CJb for p < 0.001. In the final CJs the evolution is significant, t = 2,373 p < 0.05. The power indicator (P)The average of the power indicator for SJ raises significantly t = 2,876, p < 0.05 For CMJ the average of the power indicator increases significantly t = 2,564, p < 0.05. The Pre-stretch Effect (Re-Use Elastic Energy) (EP) indicates the importance of the benefit produced by the pre-stretch (CMJ compared to SJ). The test results show insignificant evolutions at the level of the experimental group: t = 1,536, p > 0.05.

The leg Equilibrium Index Equilibrium of the functional structure of the leg including three joints (hip, knee, ankle) and the upper and lower leg (thigh, calf) The average values of 1,85 and 1,84 in the two testings do not go through significant changes t = 0,067, p > 0.05, but show that the neuromuscular function of the knee, ankle and lower limbs are weaker than the hip and thigh.

CONCLUSIONS:

Applying programsal

mes of muscular training inside the preparation of young female volley players I, has contributed to improving the level of the technical executions and of their tactical behavior, a fact confirmed by the fulfillment of the game tasks and performance objectives, and it has also helped to decrease the number of accidents, thus creating premises for prolonging the sporting career.

Bibliography:

1. Bosco Carmelo Ph.D.,(1999)– Strength assessment with the bosco, tests, Italian Society of Sport Science Rome.

2. Cometti, G., (1988) – La pliometrie, IUFUR STAPS, Dijon.

3. Dyon, N., Gaden, Y., (2005) – Musculation et renforcement musculaire du spotif, Amphora, Paris

4. Niculescu, M., Mateescu, A., Creţu, M., Trăilă, H., (2006) – Bazele ştiinţifice şi aplicative ale pregătirii musculare, Editura Universitaria, Craiova.

SEASONAL IMPROVEMENTS AMONG WOMEN'S COLLEGIATE SOCCER PLAYERS USING A ONE DAY PER WEEK AEROBIC INTERVAL TRAINING MODEL.

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UNIVERSITY OF PORTLAND

Introduction: In the United States, the women's collegiate soccer season is 14 weeks long followed by 4 weeks of playoffs. Teams regularly compete twice per week leaving little time for technical and tactical training or physical training and recovery. One recent report showed a significant decline in VO2max among women soccer players despite 3 cardiovascular training sessions per week (Miller et al.). The aim of this study is to test the efficacy of a 1-day per week conditioning program that combines aerobic and interval training (Helgerud et al and Dupont e al).

Methods: Sixteen female division I soccer athletes (age 19.43 years) agreed to participate in a study passed by the Universities Human Subjects committee. Athletes were evaluated just prior to and following the competitive season. Athletes were assessed for body weight, % fat mass and aerobic capacity using a incremental treadmill VO2max test. The one day per week training program was administered every Tuesday following a rest day on Monday. Competitions are typically Friday and Sunday. The training program consisted of repeat intervals at paces between 80-120% VO2max. Total time for interval work (# intervals x interval time) was not less than 16 minutes per session. Elevated Heart rate time was typically no less than 45 minutes which included active recovery.

Results: There were no changes in body mass (60.30 +/- 5.93 vs. 60.52 +/- 5.59) or % body fat (15.46 +/- 2.64 vs 15.16 +/- 2.70) when comparing pre season to post season tests. Aerobic capacity increased significantly from 50.89 +/- 3.04 to 52.46 +/- 3.01 from pre-season to post season (p < 0.05). Maximum heart rate and maximum ventilation (VE) remained unchanged during the season.

Discussion: Conditioning for soccer remains varied and complex given the strength, speed, agility, aerobic and technical requirements of the game. Compared to most professional or club soccer leagues, the U.S. collegiate competitive season is short and the number of contests average 1.8 per week. Athletes are expected to have one day off per week and have an easy recovery day between games. Time for physical training is typically limited during the competitive season. We demonstrate that a one-day per week conditioning program based upon aerobic development as described by Helgerud et al and implemented using an interval model similar to that described by Dupont is sufficient to improve the aerobic capacity of a women's collegiate team. Our result suggests that a thoughtfully designed one- day per week training program can improve team aerobic fitness during a short competitive season.

References

Dupont, G., Akakpo, K., Berthoin, J. Strength Cond. Res. 18, 584–589.

Helgerud, J., Engen, L., Wisloff, U., Hoff, J. (2001) Med. Sci. Sports Exerc., Vol. 33, 1925-1931.

Miller, T., et al. (2007) J. Strength Cond. Res., 21, 48-51.

14:15 - 15:15

Poster presentations

PP-TT08 Training and Testing 8

THE EFFECTS OF A SHORT-TERM ISOMETRIC TRAINING PROGRAM ON THE NEUROMUSCULAR FUNCTION OF ELITE GREEK JUMPERS AND LONG DISTANCE RUNNERS

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Introduction: The improvement of performance in track and field sports requires specific training, depending on the features of the event. Rate of force development (RFD) is crucial for jumpers, whereas long distance runners' RFD is expected as less developed. Short-term effects of training may influence performance. However, it is still unknown how such athletes respond to a short-term training protocol. The aim of the present study was to examine the effect of a two days strength training protocol on the neuromuscular function and especially on the RFD of the plantar flexor muscles in elite jumpers and long distance runners.

Methods: Two groups of elite Greek track field jumpers (n=9, age: 24.8±3.1 years, height: 182.3±7.4 cm, body mass: 74.3±2.7 kg) and long distance runners (n=9, age: 22.1±2.8 years, height: 177.9±6.7 cm, body mass: 64.8±7.3 kg) participated in the study. The participants were tested 48 h before and after an isometric, ballistic type, strength training protocol consisted of 2 sessions with 48 hours interval in between. Testing and training were conducted on the plantar flexor muscles of the ankle. Torque and EMG amplitude as well as frequency component using spike analysis for the gastrocnemius, soleus and tibialis anterior were measured during the maximal voluntary contraction. Additionally, the maximal M-wave (Mmax) and the twitch torque properties were measured after a supramaximal electrical nerve stimulation over the tibial nerve.

Results: Maximal voluntary isometric torque remained unchanged, while, the voluntary maximal RFD recorded 100 ms after the onset of contraction improved in the long distance runners only. This was accompanied by an increase in the gastrocnemius EMG frequency as well.

The peak twitch torque, contraction time, half relaxation time and Mmax remained unchanged in both groups. However, before training jumpers presented higher twitch torque, shorter contraction time and shorter half relaxation time, compared to the values of the long distance runners.

Discussion: Our findings indicate that RFD is enhanced after 2 sessions of strength training program, with no parallel increase in maximal strength, only in persons with low level of strength (Blazevitz et al., 2008). Considering the examined muscles, it seems that such adaptations are evident in muscles with larger proportion of fast motor units, such as gastrocnemius (Paasuke et al., 1999). This supports the notion that spinal and supraspinal centers may contribute to the adaptations observed after a short-term, ballistic, isometric training.

Reference

Blazevich A, Horne S, Cannavan D, Coleman D, Aagaard P. (2008). Muscle & Nerve, 38(3), 1133-1046.

Paasuke M, Ereline J, Gapeyeva H. (1999). Eur J Appl Physiol, 80(5), 448-451.

THE EFFECT OF HIGH VS. LOW INTENSITY TRAINING ON AEROBIC CAPACITY IN WELL TRAINED MALE MIDDLE- DISTANCE RUNNERS

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Introduction: Research show that the inter-individual variance and strongest predictors of middle- and long-distance running performance depend on; VO2max, % of VO2max, VO2max velocity, running economy (RE), lactate threshold (LT) and LT velocity (Saltin et al. 1995; Bassett, and Howley 2000; di Prampero 2003). A review of literature show that the development of training methods have traditionally been based on short-term studies among untrained or moderate trained individuals coupled with anecdotal evidence from experienced coaches and successful athletes. Therefore, the purpose of the present study was to examine the effect of two different intervention training regimes on VO2max, VO2max velocity, RE, LT velocity and running performance on a group of well-trained male middle-distance runners. Methods: Twenty-six well-trained male middle-distance runners participated in the present study. The subjects were all highly committed to training, running 90 ± 14 km per week. All participants were tested on VO2max, VO2max velocity, RE, LT, LT velocity and a performance test on treadmill. The participants were matched according to their pre-test results, then randomly assigned into one of two groups, a high volume (60 km) low intensity training group (HVLI-group); and a high-intensity low volume (40 km) training group (HILV-group). The training volume and distribution of intensity in the intervention period (10 weeks) was by performing 33 % of the total workout at 82-92 % of HR max and 67 % performed at 65-82 % of HR max for the HILV-group, and 13 % of the total workout at 82-92 % of HR max and 87 % was performed at 65-82 % HR max for the HVLI-group. Results: No marked differences were found between groups in all measures made in this study. Furthermore, the HILV-group had a marked increased in VO2max velocity and LT velocity after the training period when compared to pre-test. Both groups had a marked improvement in RE. The performance test showed that the HILV-group made 456 m (1.38 min) and the HVLI-group 273 m (54 sec) in progress. The production of lactic acid (La) was notably higher in the HILV-group (0.9 mmol) when compared to pre-test. Conclusion: The findings in this study show that male middle-distance runners improves in VO2max velocity and LT velocity better when they train around anaerobic threshold than training with low intensity for a short period of 10 weeks.

Reference:

Bassett, D. R., Jr., and E. T. Howley. 2000. Limiting factors for maximum oxygen uptake and determinants of endurance performance. Med Sci Sports Exerc 32 (1): 70-84.

Di Prampero, P. E. 2003. Factors limiting maximal performance in humans. European Journal of Applied Physiology 90 (3-4): 420-429.

Saltin, B., H. Larsen, N. Terrados, J. Bangsbo, T. Bak, C. K. Kim, J. Svedenhag, and C. J. Rolf. 1995. Aerobic exercise capacity at sea level and at altitude in Kenyan boys, junior and senior runners compared with Scandinavian runners. Scand J Med Sci Sports 5 (4): 209-221.

LACTATE AND AMMONIA AFTER 150M SPRINT IN 200M AND 400M TRACK AND FIELD ATHLETES

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Introduction: Most of Taiwan's 200m and 400m track and field athletes focus on a training based on a 150m intervall training. During this distance athlete can increase and keep their speed. So it is a useful method to train speed. During the last 20 years studies analysed the behavior of NH3 and lactate during exercise using different study designs. On this basis the following research was done to examine if NH3 and lactate measurments can be used to examine athlete's anaerobic capacity. Additionally, repetition training was chosen to observe wheather the rest period does influence the NH3 outcome.

Method: 10 track and field male subjects age 17.00±1.325 volunteered to participate in this study. Each subject had to do a 5x150m max repetition training after a 30 minutes warm up. During repetitions a 5 minutes resting period was granted. La, NH3 was measured at rest and after the 5th repetition. During each repetition the speed was measured.

Result

Lactate rose from 1.31±0.33 mmol/l at rest (R) to 18.79±3.81 mmol/l after the 5th repetition (5x). The ammount of NH3 (μmol/l) rose from 31.60±16.03 (μmol/l) in (R) to 168.60±52.31 (μmol/l) in (5x). The speed steadily decreased on each stage from 8.38±0.60 (m/s) at the first repetition (1x) to 7.67±0.56 (m/s) at the last (5x). There was a linear relationship between NH3 and lactate output during training (r = 0,77). The p value was significant (p=0,016).

Discussion: Many studies have shown that with increasing intensity the NH3 value increases as well (1). This was interpreted as a matter of used muscle fibres (2).At higher workload more fast twitch fibres are recruited and hence, this results in a larger amount of NH3 due to the activation of the AMP deaminase (3). On the other hand the glyconeogenesis might also be responsible for the increase of NH3. Since ATP will be used up within the first 10s, 200m and 400m runners have to generate the energy by using proteins. Previous studies have found a correlation between NH3 and lactate in high intensity tests (1, 2, 3). A 150m running distance, however, has not been analysed yet. The finding of this study confirm that a correlation between this two parameters exist during max workload. If NH3 value after 150m sprint can be used as a predictor of 200m and 400m sprinters needs further studies.

Reference

(1) Schlicht, W. Naretz, W. Witt, D. and Rieckert, H.: Ammonia and Lactate: Differential Information on monitoring training load in sprint events Int. J. Sports Med. Suppl. (1990) 11:S85-S90.

(2) Urhaus, A. and Kindermann, W.: Blood ammonia and lactate concentrations during endurance exercise of differing intensities. Eur. J. Appl. Physiol. (1992) 65: 209-214

(3) Nazar K., Dobrzynski B., Lewicki R.: Relationship between plasma ammonia and blood lactate concentrations after maximal treadmill exercise in circumpubertal girls and boys. Eur. J. Appl. Physiol. (1992) 65:246–50

ACUTE EFFECTS OF WHOLE-BODY VIBRATION ON SPRINT RUNNING KINEMATICS IN SPRINT ATHLETES

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Introduction: Whole-body vibration (WBV) is a neuromuscular training method and has been promoted as an alternative or additional strength training method. The focus of many investigations was to determine the acute impact of a bout of whole-body vibration on athletic performance and the concerning parameters. Additionally, acute exposure to WBV, has been shown to induce transient increases in strength and power (Bosco et al, 1999) and has been suggested as a mode of warming up before practice, training and competition activities of athletes (Bazett-Jones et al., 2008). The aim of this study was to investigate the acute effects of WBV on sprint running kinematics in sprint athletes. The main hypothesis was that a single session of WBV would cause neuromuscular enhancement and improvement on sprint performance.

Methods: The participants were 35 sprint athletes (21.9 ± 4.3 yrs, 176.7 ± 5.1 cm, 72.3 ± 7.5 kg) (personal 100m best time: 11.00 – 11.50 s, training experience > 3 yrs). The participants were randomly assigned into the experimental (E – with vibration) and control (C – without vibration) group. Both groups performed a single session of WBV consisted of two dynamic exercises (half squat / lunge) for total duration time of 90 s (Power Plate platform - 50Hz, 2mm). Sprint performance tests were performed from both groups, before (pre) and after (post) the WBV session and measured during a 60 m sprint. The time and average velocity at distances of 10, 20, 30, 40, 50 and 60 m were obtained using the Brower timing systems (Brower, USA) where the step length and step rate of the distance interval 40–50 of each participant was recorded by a video camera (Sony–HDR SR10E) and calculated using the Peak Motus. Data were analyzed with descriptive statistics (mean, SD) and with t-test in order to examine the differences between the two groups (E & C) and between the pre-post performance tests. The significance level for the tests was set at 0.05 ($p < 0.05$).

Results: The results showed that a single session of WBV had no effect in both E & C groups on 60m sprint performance. Despite this, time in 50 m increased significantly 0.87% ($t = 2.116$, $p = 0.49$) (pre: 6.35 ± 0.24 s, post: 6.41 ± 0.24 s) and running speed decreased significantly 0.90% ($t= 2.202$, $p = 0.041$) (pre: 7.88 ± 0.31 m/s, post: 7.81 ± 0.30 m/s) for the E group. The step length and step rate in 40 – 50m interval did not affected for the E group, instead of the decreased running speed (pre: 2.34 ± 0.22 cm - 4.01 ± 0.32 Hz, post: 2.35 ± 0.18 cm - 3.95 ± 0.32 Hz).

Discussion: The results of this study, showed that 90 s of continuous WBV produced no improvement on sprint running performance of 60m sprint, although it produced significant changes in the time (0.87%) and the running speed (-0.90%) of 50m sprint. The step length and the step rate in 40-50m interval were not affected.

References

Bazett-Jones, D.M., Finch, H.W. & Dugan, E.L. (2008). Journal of Sport Science and Medicine, 7, 144-150.

Bosco, C., Cardinale, M. & Tsarpela, O. (1999). European Journal of Applied Physiology, 79, 306-311.

ANTHROPOMETRIC CHARACTERISTICS AND BASIC MOTOR ABILITIES DIFFERENTIATING YOUNG FEMALE SPRINTERS FROM THE GIRLS IN THE GENERAL POPULATION

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Introduction: Timely selection of talented children and early sports specialization are indispensable for achievement of top sports results. Identifying anthropometric and basic motor characteristics of sufficient predictive value to be used in selection of athletes most likely to succeed is necessary within the sports talent identification process.

Based upon a large-scale testing of the girls aged 11 to 13 years in the city of Zagreb, in which the girls most gifted for athletic training were identified and selected according to the results of the 60m run test, the aim of this study was to determine the differences in anthropometric characteristics and basic motor abilities between the talented girls and non-selected girls.

Methods

The study sample was drawn from the population of 8184 girls aged 11 to 13 years, all pupils of the 5th and 6th grades of elementary schools in Zagreb, which were previously tested by means of the 60m run test in order to identify and select the ones most gifted for athletic (sprint) disciplines.

Our final sample consisted of 189 girls, divided in two groups: selected/talented girls (N=85) and randomly picked non-selected girls (N=104). Six anthropometric measures (body height, body weight, leg length, shoulder width, upper arm circumference in relaxed position, upper arm skinfold) were taken, and 8 basic motor ability tests (agility, polygon backward, hand tapping, standing long jump, medicine ball throw, flexibility, 60' sit ups, bent arm hang) were performed.

Discriminant analysis was carried out to determine the differences in the measured variables between the two groups.

Results: The differences between the two groups were statistically significant ($p<0.001$). The anthropometric characteristic significantly negatively related to success in sprint running was upper arm skinfold (.30). The motor ability tests that most strongly differentiated the two subject groups were: standing long jump (.87), polygon backward (.48), agility (.45), medicine ball throw (.43) and bent arm hang (.40).

Discussion: The girls selected for athletic training based upon their successfulness in the 60m sprint test differed significantly from the non-selected girls. The most highly differentiating anthropometric measure was upper arm skinfold, accentuating the negative relationship between the body fat percentage and sprint running results. Motor ability tests representing speed and explosive power (standing long jump, polygon backward, agility, medicine ball throw, and bent arm hang) were good predictors of sprint results. It is suggested to consider these tests in the selection of 11 to 13-year old children potentially gifted for the sprint disciplines.

References

Babic V, Viskic-Stalec N. (2002). Zivot i skola [Life and school. In Croatian.], 7, 55-70.

Baxter-Jones AD, Thompson AM, Malina RM. (2002). Sports Med Arthrosc, 10, 42-49.

Battista RA, Pivarnik JM, Dummer GM, et al. (2007). J Sports Sci, 25, 651-7.

MORPHOLOGICAL CHARACTERISTICS AND SPECIFIC MOTOR ABILITIES DIFFERENTIATING YOUNG FEMALE SPRINTERS FROM THE GIRLS IN THE GENERAL POPULATION

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Introduction: Elite level sport is extremely selective and exclusive. Orientation, identification and selection of the individuals with potential to succeed start very early. Most of the children are usually discouraged in later years. Anthropometric measures and specific motor abilities should be among the predictive variables used in talent identification protocols to select athletes most likely to excel.

Based upon a large-scale testing of 8184 girls aged 11 to 13 years in the city of Zagreb, in which the girls most talented for athletic training were selected according to the results of the 60m run test, the aim of this study was to determine whether there are differences in anthropometric characteristics and specific motor abilities between the talented girls and non-selected girls.

Methods: The sample included 189 girls (a group of 85 selected/talented and 104 randomly picked non-selected girls from the population of 8184 girls previously tested by means of the 60m run test) aged 11 to 13, from a pupil population of the 5th and 6th grades of elementary schools in Zagreb. A set of 6 morphological measurements (body height, body weight, leg length, shoulder width, upper arm circumference in relaxed position, upper arm skin fold) and 8 specific motor ability tests (long jump, standing long jump, 20 m run, 2 kg medicine ball throw, 30 m single leg jumps evaluated as time needed to perform and as number of jumps (left and right leg)) were performed.

Discriminant analysis was carried out to establish whether there were statistically significant differences between the two groups.

Results: The differences between the two investigated group were significant ($p<0.001$). The tests contributing most highly to the successfulness in sprint running were: 20 m run (.80), standing long jump (.68), number of one leg jumps – left and right (.64), time in left leg jumps (.62), long jump (.61) and time in right leg jumps (.54). Upper arm skin fold showed a significant negative contribution (.23).

Discussion: It is well known that results in sprint depend on fast start reaction, ability to achieve speed and maintain it as long as possible until the finish line. According to different research findings, it is known that the motor abilities of explosive strength, coordination and quickness contribute mostly to successfulness in sprint. The results of our study show that all tests representing those motor abilities are statistically significant in discriminating girls successful in sprinting from the girls in the general population. Among the anthropometric measures, body fat tissue contributed negatively to sprint results. Mentioned tests could be used as predictors in protocols for identifying potential sprinters.

References

Babic, V., Viskic-Stalec, N. (2002). Zivot i skola, 7, 55-70.

Baxter-Jones A.D., Thompson A.M., Malina R.M. (2002). Sports Medicine and Arthoscopy Rewiew, 10, 42-49.

Snajder V. (1982). Kineziologija, 12, 43-48.

Zak S. (1994). Antropomotoryka, 11, 3-40.

THE RELATIONSHIP BETWEEN RUNNING SPEED AND MEASURES OF VERTICAL JUMP IN PROFESSIONAL BASKETBALL PLAYERS

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Objective: To examine the relationship between leg-power, jumping height, and reactive strength as measures of jumping performance with sprint speed over 10-m, 20-m, and 40-m. These distances are considered to be indicative of starting speed, initial acceleration, and maximum sprinting speed capabilities, respectively, of the athlete.[1,2]

Participants: Thirty three male professional basketball players who have been professionals for at least two years.

Design: The subjects were tested on 10-m, 20-m, and 40-m sprint, counter-movement jump (CMJ), and static vertical jump (SJ). Jumping height, peak power, and reactive strength were obtained from the measurements of CMJ and SJ. All participants have been involved in intensive resistance and sprint training three times a week, and were considered to be in peak condition at the time of testing. Tests were carried out in an inside court, which was 70-m in length and 40-m in width.

Results: The results indicate that there was a marked relationship between sprinting speed and measures of peak power relative to body mass ($P<0.05$), but no marked relationship with peak power in absolute terms. Measures of jumping height had a marked relationship with sprinting speed in both absolute terms and relative to body mass. None of the reactive strength measures had a notable relationship with sprinting performance. Furthermore, the results showed that concentric contraction is of greater importance for starting and acceleration speed from zero to 10-m than for acceleration and top speed through 20-m to 40-m. And the eccentric followed by concentric contraction was of greater importance for the top running speed from 20-m to 40-m than for start and acceleration speed. However, the results indicate that the more the athlete increases in acceleration speed, the more important relative power becomes to performance during acceleration.

Conclusions: The results of this study indicate that while there is a strong and marked relationship between 10-m, 20-m and 40-m sprint, there is also a considerable variation within the factors that contribute to performance over these distances. This may indicate that, separate training strategies could be implemented to improve running speed over these distances. Furthermore, it is recommended that when attempting to increase running speed, special attention should be paid to power per kilogram of body mass of the athlete. However, strength and conditioning coaches may need to implement a concentric only and stretch shortening cycle jump squat testing battery to better analyze and plan the sprint and resistance training.

1.YOUNG, W., B. MACLEAN, and J. ARDAGNA. Relationship between strength qualities and sprinting performance. J. Sports Med. Phys. Fitness, 35:13-19. 1995.

2.DELECLUSE, C. H., H. V. COPPENOLLE, E. WILLEMS, R. DIELS, M. GORIS, M. VAN LEEMPUTTE, and M. VUYLSTEKE. Analysis of 100 meter sprint performance as a multidimensional skill. J. Hum. Move. Stud., 28:87-101. 1995.

TRAINING CHARACTERISTICS OF NORWEGIAN JUNIOR CROSS COUNTRY- AND TRACK RUNNERS ON EUROPEAN TOP LEVEL

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Purpose: To describe training characteristics of the four 2008 Norwegian best cross country- and long distance junior runners (17,8 +/- 1 year). The subjects won the team competition in the Nordic Championship 2008. They were second in the team competition in the European Cross Country Championship 2008 (finishing no 2, 10, 16 and 20). These runners were also the best junior runners in Norway on distances from 1500m to 5000m. Their average time on 3000m was 8.19:01 +/- 4:99 sec. One of them was Junior World Champion in mountain running in 2008, and one was Norwegian Junior Champion in cross country skiing. Methods: The runners filled out questionnaires about their training habits, training history and training characteristics. They and their coaches were also interviewed. Results: During the build up period for the season 2008 they ran 130 +/- 32 km/week-1. This was done in 11 +/- 2 sessions. 80 +/- 3 % of their weekly training distance (km/week-1) was continuous running with a heart rate (HR) between 60-75 % of maximum. Two to four weekly sessions were done as interval sessions with a HR between 80 - 90 % of maximum. The total distance at these intensities in each interval session was between 8 and 14 km (26 to 47 min). During the competition season the total weekly running distance was 105 +/- 24 km/week-1. One to three sessions a week during the competition period were races or training at specific race paces. In the competition period they all ran from one to three interval sessions of the same kind as in the building up period. The training in the three last months before the European Cross Country Championship was very similar to the training in the building up period, although the volume was a little higher (140 +/- 37 km/week-1). They competed in 23,8 +/- 6,8 track and cross country competitions in 2008. Three competed in skiing during the winter. All the runners conducted general strength training. They have been trained for distance running for 4 +/- 2,2 years. Most of their training they did alone, but all preferred to do the interval sessions in a group. In 2008 three of four tested VO2max, and the average was 79,2 +/- 4,8 ml • kg-1 • min-1. All four have background from other sports. All have personal coaches. Conclusions: Among the best Norwegian junior runners and their coaches there is a consensus that a high weekly training volume based on continuous running combined with two, three or four interval sessions a week during the building up period is a success factor. The best Norwegian cross country junior runners were also the best track runners. The way these junior runners train are founded upon training principles which have been successful for outstanding Norwegian runners like Grete Waitz, Ingrid Kristiansen, Marius Bakken and Susanne Wigene.

ANALYSIS OF A SPRINT QUALIFICATION ROUND IN CROSS-COUNTRY SKIING USING A DIFFERENTIAL GLOBAL NAVIGATION SATELLITE SYSTEM

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Introduction: Cross-country (XC) skiing is a sport that comprises many different skiing techniques, between which skiers must continuously swap during a race, depending on the course topography (Holmberg, 2005). In freestyle XC skiing there are five different techniques, called gears (G1-5) (Rapp et al., 2009). A new opportunity for more specific performance analyses of the skier's speed, accelerations and positions is provided by the Differential Global Navigation Satellite System operating Real Time Kinematic corrections (DGNSS RTK).

At present, there are no studies that have analyzed sprint XC skiing in the field combined with the use of video cameras that are synchronized with a DGNSS. The aims of the present study were: 1) to make a descriptive analysis of skiing kinematics, frequency and duration at specific gears during a sprint qualification race in freestyle XC skiing, 2) to evaluate the influence of short sprint (Vmax) abilities versus overall performance in a sprint race.
Methods: Nine Swedish male elite XC skiers (four of them top world class skiers), specialized in the sprint or the distance events, volunteered as subjects in the study (mean ± SD: age 25.9 ± 3.5 yr, height 180.7 ± 5.4 cm, weight 74.5 ± 6.2 kg, VO2max 5.5 ± 0.6 l/min and 73.3 ± 5.8 ml/kg/min). The study started with a measurement of the subject's aerobic capacity in the laboratory, followed by specific sprint tests on snow. These were: 1) two 20-m Vmax tests performed in the G3-technique, 2) two 20-m Vmax tests performed in the double poling (DP) technique and finally 3) an individual race over 1425 m.
Results: The mean frequencies at specific gears were: G2 1.02 ± 0.05; G3 0.66 ± 0.04; G4 0.72 ± 0.07; G5 1.07 ± 0.08 Hz. The mean distributions (%) of total race time at specific gears were: G2 16.9 ± 9.3; G3 36.2 ± 7.7; G4 3.2 ± 2.9; G5 18.3 ± 3.2; "G6" (curve technique) 13.1 ± 1.1; "G7" (downhill standing) 9.9 ± 2.2%. There was a significant correlation between DP-Vmax and race time (r = -0.71, P = <0.05). DP-Vmax correlated positively with the skier's percent of race time at G3 and negatively with the skier's time at G2 (G2: r = - 0.83, P = <0.05, G3: r = 0.71 P = <0.05). Flying G3-Vmax correlated with the skier's sprint rank (FIS) (r = - 0.73, P = <0.05).
Conclusions
The main findings were 1) there was a great range in the choice of skiing technique, G3 or G2, between skiers in the uphill sections, 2) A high Vmax is of importance for success over sprint distances and the DP-Vmax correlations verifies the importance of the upper body in freestyle sprint XC skiing.
References
Holmberg H.C. (2005) Physiology of Cross-Country Skiing: with special emphasis on the role of the upper body. (Dissertation) Stockholm: Department of Physiology and Pharmacology, Karolinska Institutet, Stockholm, Sweden.
Rapp W., Lindinger, L., Holmberg, H.-C. (2009) Biomechanics in classical cross-country skiing – past, present and future. In Science in Skiing IV, pp- 630-640.

MAIN DIFFERENCES BETWEEN DISTANCE AND SPRINT WORLD-CLASS CROSS-COUNTRY SKIERS

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Introduction: The best predictors of a cross-country skiing sprint performance have already been studied (1,2). However and to our knowledge, specialists of sprint and distance races have never been compared. The purpose of this study was to determine the main physiological and biomechanical differences between distance and sprint cross-country skiers. Methods: Ten elite male skiers from the national Italian ski team [6 from the world-cup distance group (D) and 4 from the world-cup sprint group (S)] were evaluated on the basis of a roller-skiing test on treadmill using the double poling technique. The start speed was fixed at 10 km/h and increased by 0.5 km/h every 30-sec work period until exhaustion with a constant inclination of 6%. Oxygen uptake was continuously measured. Biomechanical data [maximal poling frequency and maximal poling force (Fmax)] were obtained using load cells inserted under the poles handgrips. The total power output was calculated across each speed as the power required to overcome rolling resistance and to lift the body against gravity. Results: Body-weight (BW) and Fmax were significantly higher (P<0.05) for the group S (78.5±5.8 kg and 156.0±9.8 N, respectively) compared to the group D (70.0±5.0 kg and 136.4±13.7 N, respectively). S and D groups did not significantly differ in peak oxygen uptake (4.4±0.4 L/min and 4.8±0.4 L/min, respectively), maximal power (328.4±21.2 W and 330.1±25.7 W, respectively), maximal poling frequency (63.9±4.4 cycles/min and 68.0±5.9 cycles/min, respectively) and Fmax/BW (2.0±0.1 N/kg and 2.0±0.1 N/kg, respectively). When peak oxygen uptake (VO2peak) and maximal power (Pmax) were expressed relatively to BW, values of the S group (56.3±4.3 mL/min/kg and 4.2±0.3 W/kg, respectively) were significantly lower (P<0.01) than the values of the D group (70.8±2.9 mL/min/kg and 4.7±0.1 W/kg, respectively). Finally, among the parameters measured during this test, Fmax appeared as the best predictor (irrespective to the S or D group) of sprint racing performance (estimated by means of the specific sprint International Ski Federation ranking). The correlation showed that 70% of the variability of the performance in sprint races could be explained by absolute Fmax (r2=0.70). Discussion: The higher BW and Fmax appeared to be the main different parameters (among those measured with this kind of test) between a sprint and a distance specialist in cross-country skiing. Moreover, BW-to-power (aerobic and mechanical) ratio was optimized in distance skiers. Expressed in absolute value, no difference was observed in VO2peak between sprint and distance skiers. Thus, as suggested by Stogll T. et al., the sprint performance seems to be mainly dependent of muscular factors but a high aerobic capacity is a prerequisite.
References:
1. Stoggl T. et al, 2007. Scand J Med Sci Sports. 17:362-372.
2. Stoggl T. et al., 2007. Med Sci Sports Exerc. 39:1160-1169.

POLING FORCES AND BREATHING INTERACTIONS DURING A DOUBLE-POLING TIME-TRIAL TEST

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Introduction: This study mainly aimed to assess the interactions between locomotion and ventilation during a roller-skiing time-trial on treadmill using the double poling technique, on a breath-by-breath and poling-by-poling basis. Methods: Six (2 women and 4 men) well trained cross-country skiers performed a time-trial test roller-skiing on a motor driven treadmill and using the double-poling technique. The treadmill slope was fixed at 4% and the speed corresponded to 90% of the maximal speed achieved during a previous incremental double-poling test to exhaustion. Ventilatory flow was continuously collected by directly acquiring the optoelectronic signal from the turbine flowmeter of a portable metabolic system. Poling signal were obtained using load cells inserted under the poles handgrips. Both signale were acquired at 100Hz and synchronized together. Instantaneous breathing frequency (IBF) for each breath was calculated as the inverse of the breath duration. Instantaneous poling frequency (IPF) was similarly calculated from the poling signal. Entrainment was assessed by calculating the ratio of each IBF to the corresponding IPF. Cycles were considered to be entrained when the computed ratio was ±10% of an integer value. The data were then divided into entrained and unentrained groups, irrespective of the subject. Results: A total number of around 1700 breathing and poling cycles were collected, of whom, 4% were considered unentrained. IBF/IPF ratio was always closed to the integer value one. An important variability (i.e., high standard-deviation value) in the difference between the time at the onset of expiration phase and the time at the peak poling force (PPF) has been observed for the unentrained cycles (0.07±0.37 sec) compared to the entrained cycles (0.07±0.12 sec). Non-parametric tests (Kruskal-Wallis followed by Dunn's multiple comparisons)

showed that the PPF, the mean poling force over the poling phase (MPF) and the tidal volume (VT) were significantly higher (P=0.014, P=0.004 and P=0.012, respectively) when breathing and poling rhythms were entrained (2.66±0.47 N/kg, 1.12±0.13 N/kg and 2.16±0.41 L, respectively) compared to when they were unentrained (2.49±0.57 N/kg, 1.07±0.17 N/kg and 1.99±0.57 L). IPF was not significantly different between the entrained and unentrained groups (0.87±0.13 Hz and 0.93±0.21 Hz, respectively, P=0.146) whereas IBF was lower (P=0.013) for the entrained group compared to the unentrained one (0.87±0.13 Hz and 0.96±0.30 Hz, respectively). Discussion: The evident coordination (i.e, IBF/IPF ratio closed to one and low % of unentrained cycles) observed between ventilation and locomotion rhythms in the present study confirmed the findings of a previous study with the skating technique (1). More interestingly, these results emphasized the negative influence of unlocked locomotor and ventilatory rhythms on both breathing and poling patterns.

Reference:
1.Fabre N. et al., 2007. Respir Physiol Neurobiol. 155:128-136.

EFFECTS OF GENERAL FORCE CHARACTERISTICS ON TOP SPEEDS IN CROSS-COUNTRY SKIING

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Due to high racing speeds in cross-country skiing sprint (XCSS) the proportional use of V2 technique in free technique XCSS competitions is stressed. When using V2 technique most of the propulsive force is produced by upper body (Smith 2003) and therefore, the neuromuscular characteristics, especially in the upper body, are emphasized. To test neuromuscular and anaerobic abilities in runners, Rusko et al. (1993) have developed maximal anaerobic running test (MART), which have been later modified to XCS (Mikkola et al. 2007). The purpose of this study was to investigate the relationships between general force-velocity characteristics and sport specific speed as well as anaerobic performance when using V2 technique in XCS. Sixteen high level male XC skiers performed two sport specific tests on roller skies using V2 technique on a flat indoor tartan track: 30 m maximal skiing speed test (v30) and maximal anaerobic skiing test (MAST, 10 x 150 m with increasing speed / 100-s recovery). In MAST, the maximal velocity (vMAST) and maximal blood lactate concentration (LAmax) were determined. In addition, power (at 50% of 1RM) and maximal (1 RM) force production of lower and upper body by leg press (LP) and bench press (BP) were determined. Maximal isometric trunk extension (FTE) and flexion (FTF) forces were measured using a specific dynamometer. vMAST correlated strongest with the v30 ($r = 0.84$), FTF ($r = 0.77$) and 1 RM BP ($r = 0.75$) ($p<0.001$). Also BP power ($r = 0.70$, $p<0.01$) and FTE ($r = 0.62$, $p<0.05$) correlated significantly with vMAST. Respectively, the strong correlations between v30 and FTF ($r = 0.84$) and FTE ($r = 0.83$) ($p<0.001$) were observed. In addition, v30 correlated significantly with BP power (0.78, $p<0.001$) and BP 1RM ($r = 0.64$, $p<0.01$). Only weak, non-significant correlations between vMAST and LAmax ($r = 0.15$) as well as between LP variables and vMAST or v30 ($r < 0.48$) were observed. This study suggests that not only specific, but also general force-velocity characteristics, especially in trunk and upper body, are important determinants of maximal speed and anaerobic performance in V2 technique on flat terrain. The present results are in line the study of Stöggl et al. (2007) indicating the strong connection between XCSS performance and specific explosive strength and maximal power. Thus, neuromuscular characteristics of the upper body may be crucial especially in XCS sprint which includes short sprints and skier against skier actions. In addition, the present correlations between v30 and vMAST (strong) and between vMAST and LAmax (weak) indicate that in XCS neuromuscular and technical aspects may limit the top velocities (in MAST) more than metabolic characteristics.

Mikkola et al. (2007) J Strength Cond Res 21(2):613-620
Rusko et al. (1993) Eur Appl Physiol 66:97-101
Stöggl et al. (2007) Med Sci Sports Exerc 39(7):1160-1169
Smith (2003) in XC Skiing (ed. by Rusko), IOC Medical Commission, Blackwell

STRAIGHT SPRINTING IS THE MOST DOMINANT ACTION IN GOAL SITUATIONS IN PROFESSIONAL FOOTBALL

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Speed and power abilities are considered important determinants of successful football players. However, this assumption is largely based on plausibility, because power and speed are suggested to be relevant in decisive situations in football games. Surprisingly, only scarce scientific data is available substantiating this view. The present study aimed at analysing the influence of speed and power in goal situations in professional football by means of video analyses.

During the second leg of the season 2007/08 videos of 397 goals in the first German national league were analysed by visual inspection. For the assisting as well as the scoring player the situations directly preceding the goal were evaluated by visual video analysis. The observed actions were categorised into the following main categories: no powerful action, rotation (around the body´s centre-line), straight sprint, change-in-direction sprint (> 50 degrees from straight sprint line), jump, or a combination of those categories (intra- and inter-rater-reliability: kappa coefficients between 0.67 and 1.00).

For 315 goals (79.3%) at least one powerful action of either the scoring or the assisting player was observed. 31 goals (7.8%) resulted directly from a standard situation. In 226 of 366 goals (61.7%) at least one powerful action (total N=262) of the scoring player was observed. The majority of those actions were straight sprints (N=161, Chi-square test: $p<0.001$ compared to other categories) followed by jumps (N=57) as well as rotations and change-in-direction sprints (N=22 each). Most straight sprints were conducted without an opponent (N=109, $p<0.001$) and without the ball (N=121, $p<0.001$). The most frequent combination of powerful actions was a sprint followed by a jump (N=18). Similar results were obtained for the assisting player. 38 goals (10.4%) were assisted by a standard situation. In 195 of 328 goals (59.5%) at least one powerful action (total N=227) of the assisting player was observed. Again, the most dominant actions were straight sprints (N=155, $p<0.001$) followed by rotations (N=30), jumps (N=24) and change-in-direction sprints (N=18). Most of the straight sprints were conducted with the ball (N=93, $p<0.01$).

The present results show that straight sprints are the most important powerful actions in goal situations in professional football. It might be speculated that other power abilities which are shown to be of minor importance when scoring goals (rotations, change-in-direction sprints or jumps) may be more important in defensive situations where players must react on the opponent´s behaviour. However, this issue should be content of future research.

In conclusion, the results of the present study show that power and speed abilities are important in decisive situations in professional football. In particular, straight sprinting seems the most dominant action and, hence, should be included in fitness testing and training.

14:15 - 15:15

Poster presentations

PP-TT09 Training and Testing 9

DOES PLYOMETRIC TRAINING IMPROVE STRENGTH PERFORMANCE? A META-ANALYSIS

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Plyometric training (PT) improves strength performance. However, the effectiveness of PT depends upon various factors. A meta-analysis of 15 studies with a total of 24 effect sizes (ES) was carried out to analyze the role of various factors on the effects of PT on strength performance. The inclusion criteria for the analysis were: a) studies using PT programs for lower limb muscles b) studies employing true experimental design and valid and reliable measurements; c) studies including enough data to calculate ES. When subjects can adequately follow plyometric exercises, the training gains are independent of fitness level. Subjects in either good or bad physical condition, benefit equally from plyometric work, although men obtain similar strength results with women following PT. With relation to the variables of performance, training volume for less than 10 weeks and with more than 15 sessions, as well as the implementation of high intensities programs- with more than 40 jumps per session-, were the strategies that seem to maximize the probability to obtain significant greater improvements in performance ($p < 0.05$). In order to optimize strength enhancement, the combination of different types of plyometrics with weight-training would be recommended, rather than utilizing only one form ($p < 0.05$). However, no extra benefits were found to be gained from doing plyometrics with added weight. The responses identified in this analysis are essential and should be considered by the strength and conditioning professional with regard to the most appropriate dose-response trends PT to optimized strength gains.

NEUROMUSCULAR AND METABOLIC FATIGUE WITH THE SAME ABSOLUTE AND RELATIVE INTENSITY AFTER STRENGTH TRAINING

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GOVERNMENT OF NAVARRA

Introduction: Muscle hypertrophy (1,3), increases in maximal strength and power output (2-3) and enhanced agonist EMG activity (1,3) are typical adaptations during short-term heavy resistance training (i.e. 7-10 weeks). However, the effects of resistance training on dynamic exercise-induced fatigue with the same absolute and relative loading as in pretraining remain to be elucidated. This study examined the effects of heavy resistance training on dynamic exercise-induced fatigue task (5X10RM leg-press) after two loading protocols with the same relative intensity (%)(5x10RMRel) and the same absolute load (kg)(5x10RMAbs) as in pretraining in men(n=12).

Methods: Maximal strength and muscle power, surface EMG changes [amplitude and spectral indices of muscle fatigue], and metabolic responses (i.e.blood lactate and ammonia concentrations) were measured before and after exercise.

Results and Discusion

The main findings of this study were that after short-term heavy resistance training, when the relative intensity of the fatiguing dynamic protocol was kept the same 1) the magnitude of exercise-induced loss in maximal strength was greater than that observed before training, 2) the peak power lost after 5x10RMRel (58-62%, before and after training) was greater than the corresponding exercise-induced decline observed in maximal dynamic (23-34%) and isometric strength (12-17%), but this was followed by a more rapid and complete recovery, 3) the magnitude of the exercise-induced neuromuscular changes were similar than before training, as well 4) higher accumulation of blood lactate and ammonia concentration after training were observed. After a short-term strength training period, the main mechanisms responsible for the increased capacity to work with the same relative intensity are mainly of a peripheral nature, since similar neural adjustments but higher accumulated fatigue and metabolic demand (i.e. blood lactate and ammonia accumulation) were observed after multiple sets of dynamic fatiguing high-power contractions with the same relative load as in pretraining. This result may indicate that rate of fatigue development (i.e. power and MVC) was faster and more profound after training despite using the same relative intensity. The fact that the same relative loading leads to increased rate of fatigue development after training has important practical implications. This may suggest that despite the enhanced ability to produce maximal strength and muscle power after a strength training program, it is important to note that when prescribing training programs a similar relative load as in pretraining could lead to a greater rate of fatigue development and, therefore, may induce different training effects.

References

1.Aagaard P, Simonsen EB, Andersen JL, et al. J Appl Physiol 2002; 93(4):1318-26.

2.Häkkinen K, Alén M and Komi PV. Acta Physiol Scand 1985; 125(4):573-585.

3.Izquierdo M, Ibañez J, González-Badillo JJ, et al. J Appl Physiol 2006; 100(5):1647-56.

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MAXIMAL DYNAMIC FORCE DEVELOPMENT IN THE SHOULDERS UNDER STABLE AND UNSTABLE CONDITIONS

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Purpose: The use of surface instability has gained popularity in strength training. However, the impact of unstable conditions during training on functional changes in force production is not well established and methods of isolating instability to specific joint complexes are lacking. In this study we have quantified the impact of surface instability on maximal force development of the shoulder complex during a weight bearing (closed kinetic chain) push-up task. In addition, the test-retest reliability of maximal dynamic force measurements was quantified under both conditions.

Methods: 20 physically active university students (14 males, 6 females) performed 2 maximal dynamic force tests under stable and unstable conditions. Maximally explosive push-ups were performed on a force platform while holding push-up bars (Stable condition). This

condition was compared with the same movement while holding hand grips hanging from to slings attached to the ceiling (Unstable condition). Body angle and hand width were identical under both conditions. The slings were equipped with force transducers and unilateral peak force production was summed. Movement was initiated from an outstretched position, lowering to 90 degrees elbow flexion and explosive extension. Subjects performed 3 series of 3 maximal efforts for each test, on two separate days separated by 48 hours or more. Pearson r were used to investigate test-retest correlation, Paired Samples T-test were used to evaluate potential learning effects, while Coefficient of Variation was used to estimate typical variation. The results from test day 2 were used to quantify the impact of instability on maximal force.

Results: Test-retest comparisons showed no systematic bias for either condition from day 1 to day 2. Test results were highly correlated (r= 0.94 and 0.90 for stable and unstable conditions respectively). Coefficient of variation was 8% for the stable test and 5% for the unstable test. Unstable conditions resulted in a 30% reduction in peak force compared to stable conditions (1061 ± 414 vs. 743 ± 148 N, $p<0.01$).

Conclusions: This study demonstrates that unilateral instability directly applied to the shoulder complex results in a loss of maximal force of approximately 30% during a dynamic maximally explosive push-up. The test methods employed are reliable and establish a model for quantifying the impact of specific training interventions on stable vs. unstable force production in the shoulder girdle.

ANALYSING TRAINING EFFECTS ON PERFORMANCE IN STRENGTH TRAINING BY MEANS OF TWO DIFFERENT ANTAGONISTIC MODELS

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Introduction: Initially, Banister et al. (1975) proposed describing the relationship between training and performance by means of two antagonistic functions: Fitness as a positive and Fatigue as a negative response to training (FF-Model). In the recent past another antagonistic model, the PerformancePotential-Model (PerPot), has been developed by Perl (2001). In an endurance training study, model fit and prediction accuracy of the models were satisfactory (Pfeiffer, 2008). However, the PerPot showed better results. To compare the two models with regard to some critical considerations a study in the field of strength training was carried out.

Methods: Two male and two female subjects volunteered for an 8-wk course of strength training (monolateral biceps-curls and leg extension). The training (input) was measured by force plate/sensor and quantified as force impulse (Ns). Before each training performance (output) was determined as peak power (N), generated in a Maximal Voluntary Contraction (MVC). Intraclass Correlation Coefficient (ICC) and mean relative deviation (RD, %) between modeled and real performances were calculated for each subject, exercise, and left/right extremity (16 data sets) to verify model adequacy. Based on the model parameters and the training load, the performances of the last two weeks were simulated individually. Prediction accuracy was estimated by mean relative deviation between predicted and real performances of the last (RDp1, %), and last two weeks (RDp2, %).

Results: A significantly better average model adequacy was achieved by PerPot (ICC: $M = .73$, $SD = .16$; RD: $M = 3.68$, $SD = 1.46$) in comparison to the FF-Model (ICC: $M = .67$, $SD = .28$; RD: $M = 4.29$, $SD = 1.96$), ICC: $t(15) = -2.2$, $p = .045$; RD: $t(15) = 3.3$, $p = .005$. The prediction accuracy for the final one and two weeks was also higher for PerPot (RDp1: $M = 3.93$, $SD = 2.86$; RDp2: $M = 4.67$, $SD = 2.93$) compared with the FF-Model (RDp1: $M = 5.97$, $SD = 3.53$; RDp2: $M = 5.96$, $SD = 3.98$), RDp1: $t(15) = 2.7$, $p = .015$; RDp2: $t(11) = 2.3$, $p = .040$.

Discussion: Our findings confirm better results for PerPot as reported by Pfeiffer (2008). They were not in line with Ganter et al. (2006), who in a field study (cycling) proposed a lower prediction quality for PerPot. Local delay optimizations suggest that in cases of lower model adequacy there are two different phases of time delay on training.

References

Banister, E. W., Calvert, I. W., Savage, M. V. & Bach, I. M. (1975). A system model of training for athletic performance. Australian Journal of Sports Medicine, 7 (3), 57-61.

Ganter, N., Witte, K. & Edelmann-Nusser, J. (2006). Performance Prediction in Cycling Using Antagonistic Models. Int J Comp Sci Sport, 5 (2), 56-59.

Perl, J. (2001). PerPot: A metamodel for simulation of load performance interaction. Europ J Sport Sci, 1 (2), 1-13.

Pfeiffer, M. (2008). Modeling the Relationship between Training and Performance - A Comparison of Two Antagonistic Concepts. Int J Comp Sci Sport, 7 (2), 13-32.

HORMONAL BALANCE AND ENERGY BALANCE IN BODYBUILDERS BEFORE COMPETITION

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HORMONAL BALANCE AND ENERGY BALANCE IN BODYBUILDERS BEFORE COMPETITION

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Most of the time of the year bodybuilders spend in the hypertrophy phase, where the aim is to gain and to increase the muscle mass. During the special preparatory period before the competitions bodybuilders aim to reduce their subcutaneous body fat to minimum in order to enhance muscular definition (Newton et al. 1993). This can be obtained by negative energy balance in the body through restricting energy intake and increasing energy expenditure. However, no studies have investigated the energy expenditure of a bodybuilder during the preparation for the competition. This would allow the calculation of the energy balance and the anabolic-catabolic hormonal balance that are critical for maintenance muscle mass during severe weight restriction period.

The aim of this study was to determine the simultaneous effect of caloric intake, energy expenditure and the biochemical parameters that affect the anabolic-catabolic balance in male bodybuilders during their preparation for a target competition.

Fourteen male bodybuilders took part in 11 week energy restricted study. The subjects were divided into the energy restricted group (EG) (n=7) who were preparing for the competition, aiming to reduce their body fat percent and into the control group (CG) (n=7) who continued to train regularly and did not change their dietary or training pattern. Participants were tested 11 weeks (T1), 5 weeks (T2) and 3 days (T3) before competition for diet, body composition and fasting hormonal assessment. Body mass and body fat percentage of EG were significantly ($P < 0.05$) decreased during the study period. In EG, IGF-1 and insulin decreased significantly during the 11 week weight reduction period ($P < 0.05$). Testosterone was decreased only from T1 to T2 (from 20.3±6.0 to 18.0±6.8 nmol/L). Changes in IGF-I concentration were significantly related to changes in insulin (r=0.741), fat mass (r=0.705), lean body mass (r=0.696) and body mass (r=0.652).

Changes in insulin concentrations were significantly related to changes in fat mass (r=0.630) and lean body mass (r=0.725). It was concluded that severe energy restriction to extremely low body energy reserves decreases significantly the concentrations of hormones of the three anabolic pathways despite relatively high protein intake. Monitoring of insulin and IGF-1 concentration is suggested in order to prevent losses in muscle mass in energy restricted conditions.

References

Newton, LE, Hunter, G, Bamman, M, Roney, R. Changes in psychological state and self-reported diet during various phases of training in competitional bodybuilders. J Strength Cond Res 7: 153-158, 1993

CHANGES IN MUSCLE POWER FATIGUE AND SEMG PARAMETERS DURING DYNAMIC FATIGUING CONTRACTIONS

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Introduction: Several surface electromyography (sEMG) techniques have been applied to assess muscle fatigue. Although dynamic contractions are more relevant to daily function, many of the studies have used isometric ones due to the technical limitations of sEMG (2). The purpose of this study was to examine changes on muscle power output and sEMG parameters during a dynamic fatiguing protocol.

Methods: 15 physically active males performed 5 sets consisting of 10 repetition maximum leg press, with 2 minutes of rest between sets. Mechanical power output and bipolar sEMG from vastus medialis (VM), and lateralis (VL) and biceps femoris (BF) were recorded. Different sEMG parameters were obtained: Mean average voltage (MAV), median spectral frequency (Fmed), Dimitrov's spectral index (FInsm5) (1), negentropy index to describe the non-gaussianity of a distribution and others obtained from a time-frequency analysis (Choi-Williams distributions) such as mean (MFM) and variance (MFV) of the instantaneous frequency and frequency variance (FV). FInsm5 was log-transformed because it did not follow a normal distribution.

Results: Significant (P<0.05) muscle power output and Fmed (averaged for VM and VL) decrements were found between the last 5 repetition of each set and the first 5 repetition of the protocol. In contrast, significantly (P=0.06) MAV (averaged for VM and VL) increments were found between the last 5 repetitions of each set as well as the first 5 repetitions of the 4th and 5th sets, and the first 5 contractions. Significantly (P<0.05) log-FInsm5 (averaged for VM and VL) increases were found between the last 5 repetitions of each set and the first 5 repetitions. However, the MAV of the BF significantly (P<0.05) increased only during the 5 repetitions of the last 1st, 2nd and 3rd sets compared to the neural activity recorded during the first 5 repetitions. The log-FInsm5 values of the BF recorded during repetitions of the 3rd, 4th and 5th sets were significantly higher (P=0.06) than those obtained from the first 5 repetitions of the 1st set. No significant differences were found between the Fmed values of the BF. A multiple regression analysis showed that the log-FInsm5 as a single parameter predictor accounted for 37% of the performance variance of changes in muscle power whereas the log-FInsm5 and MFM accounted for 44%.

Discussion: The main result of this study was that the log-FInsm5 provided an accurate and sensitive estimation of muscle fatigue during dynamic fatiguing contractions, more than the other sEMG parameters studied. According to the decrement obtained in BF neural activation, we can hypothesize that during fatiguing dynamic contractions, there was an inhibition of antagonist muscle activation to facilitate the development of muscle power output by agonist muscles.

References

1. Dimitrov GV et al. (2006) Med.Sci.Sports Exerc. 38(11), 1971-9

2. Farina D. (2006) Exerc.Sport Sci.Rev. 34(3), 121-7

Acknowledgments

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RELIABILTIY OF ECCENTRIC AND CONCENTRIC 1 RM BENCH PRESS TESTS WITH FREE WEIGHTS

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INTRODUCTION: Eccentric muscle contractions are important in sport. Eccentric strength training is very effective for athletes (2) and can be performed with free weights, but few scientific studies have investigated eccentric strength testing with free weights. Isokinetic testing of concentric and eccentric strength is reliable (1). Eccentric testing in the squat has been performed using a lowering duration of at least 3.5 s (2). The purpose of this pilot study was to compare 1RM in concentric and eccentric bench press and to determine if maximal concentric and eccentric bench press tests with free weights are reliable.

METHODS: 10 male members (23.5 ± 3.7 years, 105.6 ± 17.8 kg) of a semi-professional American football team were tested twice with 7 days between tests. The athletes performed concentric bench press (BPC) and eccentric bench press (BPE). BPC was performed with a 4 s lowering phase to the chest, followed by immediate (no bounce off the chest) pressing of the bar to a locked elbows position. EBP was performed with the bench attached to a force plate and the bar was lowered with constant speed for at least 4 s. If the measured force changed by more than 50 N during the BPE test, the trial was invalid. For all tests the buttocks were always in contact with the bench. Paired t-tests were used to determine if BPE was greater than BPC. To assess test-retest reliability of these tests, intraclass correlation coefficients (SPSS) were determined for BPC and BPE, comparing the values from the first test to those of the second.

RESULTS: BPE was 124% and 123% of BPC for tests 1 and 2, and significantly greater ($p < 0.01$). The BPC results (kg) were (mean ± SD) 123.0 ± 19.2 and 127.0 ± 19.2 for tests 1 and 2, respectively. The BPE values were 152.5 ± 22.8 and 156.5 ± 21.9. The ICC's for BPC and BPE were: r = 0.96 and 0.98.

DISCUSSION: Comparisons between concentric and eccentric 1RM in the literature vary, depending on the lift and the method of testing. The present study showed BPE was almost 25% higher than BPC. It should be noted that the lowering phase of 4 s duration in BPC reduced the stretch shortening cycle but did not eliminate it, so BPC was not purely concentric. Perhaps further investigations to develop a concentric test are needed. The ICC's would indicate that the eccentric bench press test is reliable. Further work in this direction includes eccentric 1RM squat tests with free weights, and the development of a relatively simple and safe method for maximal eccentric strength training with free weights.

REFERENCES

(1) Dauty et al., Isokin. Exerc. Sci. 9:129-132. 2001.

(2) Refsnes, Science in Elite Sport, (eds. E. Müller, et al.) 91-114, 1999.

TIME TO EXHAUSTION DURING SUBMAXIMAL ISOMETRIC FATIGUING EXERCISE IS INCREASED AFTER WHOLE BODY VIBRATION TRAINING

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Introduction: The acute effects of exhaustive whole body vibration (WBV) exercise have been examined (Rittweger et al., 2000; 2003), However, only one study reports that WBV training prevents increases in fatigability during bedrest (Mulder et al., 2007). Therefore, the aim of this study was to examined the effect of 6 weeks of WBV training on knee extensor muscles endurance time during a submaximal isometric fatiguing contraction and mechanisms (i.e., central and/or peripheral) contributing to task failure.

Methods: 11 active males performed a fatiguing isometric contraction with the knee extensor muscles at 50% of maximal voluntary contraction (MVC) until exhaustion before (PRE) and after (POST) 6 weeks of WBV training. At PRE and POST, the electromyographic (EMG) activity and muscle activation obtained under MVC were recorded before and after the fatiguing task to assess central fatigue. Torque and EMG responses obtained under electrically evoked contractions were examined to analyze the peripheral fatigue.

Results: Knee extensor MVC torque did not increase significantly between PRE and POST (+9.4%, $P>0.05$), which meant that the average target torque sustained during the fatiguing contraction did not increased either between the testing sessions. Endurance time increased significantly in between PRE and POST (+29.6%; $P<0.01$). At PRE, a significant torque decreased (-17.3%; $P<0.01$) was found during MVC after the fatiguing contraction whereas no significant difference was observed at POST. EMG values of agonist muscles were differently affected by the fatiguing contraction, whereas antagonist muscle coactivation and overall knee extensor muscles activation were not modified. Differential effects on single-twitch contractile properties were observed after the fatiguing contraction between the testing sessions.

Discussion: Before the training period (PRE), the decrease of MVC after the fatiguing exercise seemed ascribable to a complex association of central fatigue and potentiation mechanisms (Rassier and MacIntosh, 2000). In contrast, after the WBV training period (POST), although the endurance time increased significantly, the MVC was not decreased anymore. This result suggests that knee extensor muscles fatigability was reduced (Mulder et al., 07). Our results suggest that, although peripheral adaptations could partly contribute to task failure, ischemic mechanisms might have also occurred. In conclusion, our WBV training was effective to increase the endurance time and to reduce the amount of fatigue at exhaustion.

References

Mulder ER, Kuebler WM, Gerrits KH, Rittweger J, Felsenberg D, Stegeman DF, de Haan A. (2007). Muscle Nerve, 36(6), 798-806.

Rassier DE, MacIntosh BR. (2000). Braz J Med Biol Res, 33(5), 499-508.

Rittweger J, Beller G, Felsenberg D. (2000). Clin Physiol, 20(2), 134-142.

Rittweger J, Mutschelknauss M, Felsenberg D. (2003). Clin Physiol Funct Imaging, 23(2), 81-86.

LEG DOMINANCY, FAST ISOMETRIC TORQUE PRODUCTION AND SQUAT JUMP HEIGHT.

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Introduction: In publications involving knee extensor dynamometry testing, it is common practice to indicate whether the dominant or the non-dominant limb was investigated, which suggests that limb-dominancy is an important performance determining factor. However, there are several indications in the literature that strength is not consistently higher in the dominant compared to the non-dominant leg. In principle strength differences between legs may be due to differences in the muscles themselves and/or be due to side dependent differences in neural activation. We set out to investigate this using electrical stimulation and hypothesized that there would be no differences between the dominant and non-dominant leg for maximal unilateral isometric knee extensor torque, the rate of torque development during maximally fast isometric contractions and unilateral squat jump performance.

Methods: Limb dominancy was established using the step up, balance recovery and ball kick test. On two days, 8 males (21.5±2.2 years, mean±SD) performed unilateral maximal isometric knee extensions (120° knee angle) with superimposed maximal electrical stimulation (femoral nerve, 3 pulses at 300Hz) to determine voluntary activation (VA) during MVC for both limbs. In addition, maximally fast isometric contractions and unilateral squat jumps starting from 120° knee angles (SJ120) were performed. Torque time integral over the first 40 ms after torque onset (TTI40) during voluntary and maximal electrical nerve stimulation (eight pulses at 300 Hz) was used to quantify the steepness of isometric torque rise.

Results: Limb dominancy tests were very consistent: 6 subjects were clearly right-legged and 2 left-legged. ANOVA repeated measures revealed no significant ($p>0.05$) effect of test day and none of the parameters was (or tended to be) significantly different between the dominant and non-dominant limb. The averaged values of the best attempts of both days for dominant and non-dominant legs respectively were: 217±16 and 225±25 Nm (MVC), 87±5 and 89±3 % (VA), 0.52±0.12 and 0.49±0.08 Nm.s (stimulated TTI40), 0.09±0.05 and 0.09±0.05 Nm.s (voluntary TTI40), 21.0±3.2 and 21.3±2.6 cm (SJ120). Between both limbs there were significant relationships for voluntary TTI40 ($r2=0.94$) and SJ120 ($r2=0.88$). In addition TTI40 and SJ120 were significantly related to each other for both limbs ($r2=0.69$ and 0.75).

Discussion: It was concluded that unilateral (fast) torque generating capacity, muscle activation and squat jump performance were very similar between limbs, but differed substantially among subjects, with high correlations between fast voluntary isometric torque development and jump height. These findings further challenge the concept of limb dominancy in dynamometry testing in sports and rehabilitation.

DOES WHOLE-BODY EXERCISE AFFECT RESPIRATORY MUSCLE FUNCTION? A STUDY OF VARIOUS ATHLETIC POPULATIONS.

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Introduction: There is no conclusive evidence that lung function and respiratory muscle (RM) function are affected by regular land-based exercise. It appears that swimmers possess greater lung volumes than predicted, yet results on respiratory muscle strength and endurance are discrepant. It is also known that significant morphological differences exist between competitive athletes and non-athletes. However, the same reference equations, which are primarily based on morphological characteristics, are used for athletic and non-

athletic populations to predict RM strength and endurance. The aim of this study was to compare the RM strength and endurance of various athletic populations and to establish whether current reference values are adequate to predict RM function in athletes.

Methods: One hundred and sixty subjects (aged 18 to 30 years) from eight different sport codes participated in this study. All athletes were well-trained at the time of the study. Maximal inspiratory pressure (MIP) was measured as an indication of RM strength and maximal voluntary ventilation in 12 seconds (MVV) was measured as an index of RM endurance. Kinanthropometric variables, such as stature, body mass, and various circumferences and breadths were included in the assessments.

Results: There were no significant differences in MIP, MEP or MVV between endurance and non-endurance athletes (MIP: 122 + 36 cmH2O vs 126 + 28 cm H2O; MVV: 168 + 34 L/min vs 186 + 32 L/min). Although swimmers had slightly higher MIP and MVV values than land-based athletes, the differences were not statistically significant. In all cases, athletes had superior respiratory muscle strength and endurance compared to age-matched sedentary controls. Multiple regression analyses revealed that gender, mesomorphy and exercise sessions per week predicted 35% (SEE = 26.6 cmH2O) of the variance in MIP, while gender, relative sitting height, FEV1 and PEFR predicted 78% (SEE = 18.2 L.min-1) of the variance in RM endurance (MVV).

Discussion: This is the first study to show that there are little differences in the RM function of endurance and non-endurance athletes, but swimmers are likely to possess superior RM function compared to other athletes. However, evidence exist that whole-body training does affect RM function, provided that the exercise and training is of high intensity. Importantly, we developed reference equations that provide more suitable reference values for athletes than previously reported.

EFFECTS OF 8 WEEKS OF HEAVY RESISTANCE CIRCUIT TRAINING VS. TRADITIONAL STRENGTH TRAINING ON PHYSICAL PERFORMANCE AND BODY COMPOSITION

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INTRODUCTION: Circuit training effectively reduces the time devoted to strength training while allowing an adequate training volume to be achieved. Nonetheless, circuit training has traditionally been performed using relatively low loads for a relatively high number of repetitions, which is not conducive to maximal muscle size and strength gain. PURPOSE: To compare the effects of 8 weeks of heavy resistance circuit training (HRC) vs. traditional strength training (RT) on physical performance parameters, cardiovascular response and body composition. METHODS: Twenty-six healthy subjects with strength training experience were randomly assigned to a HRC (n = 15) (23.4 ± 4.0 years; 76.9 ± 9.5 kg; 177.5 ± 4.0 cm) or to a RT (n = 11) (22.8 ± 2.7 years; 73.1 ± 7.0 kg; 175.0 ± 6.9 cm). Training consisted of weight lifting 3 times a week during eight weeks. Prior to and at the end of the training program, maximum dynamic strength(1RM) on bench press and half squat exercises, peak power output in both exercises using resistances of 30%, 45%, 60%, 70%, and 80% of 1RM and body composition (DXA) were determined. In addition, a shuttle run was carried out. T-tests for dependent and independent samples were used (P ≤ 0.05). RESULTS: There were no between-group differences. The data confirm that upper limb (UL) and lower limb (LL) 1RM significantly increased in both groups (HRC = 19.5 ± 10.6 kg, and 44.2 ± 24.1 kg; and RT = 17.7 ± 9.0 kg, and 45.0 ± 21.3 kg, respectively). In addition, UL peak power at 30% and 45% of 1RM was significantly higher in post-test for the groups, and significantly higher at 70% and 80% of 1RM in RT group, while LL peak power was not increased significantly at none analyzed loads. Shuttle run test was significantly higher after the training in both the HRC and the RT groups (HRC = 29.6 ± 44.6 s vs. RT = 36.7 ± 48.8 s). Regarding body composition, significant decreases were found in the % body fat in the HRC group (1.53 ± 1.60%), and a tendency to signification (p = 0.082) was established in the RT (1.09 ± 1.87%). HRC also increased lean mass by 1.456 ± 1.945 kg (p=0.002), and RT increased lean mass by 1.179 ± 1.619 kg (p=0.036). CONCLUSION: The HRC and RT were effective methods to improve 1RM, peak power output, cardiovascular response and lean mass, while the HRC seemed to be more appropriate than RT for reducing % Body fat. REFERENCES: 1. Alcaraz, P. E., Sánchez-Lorente, J., & Blazevich, A. J. (2008). Physical performance and cardiovascular responses to an acute bout of heavy resistance circuit training vs. traditional strength training. J. Strength Cond. Res., 22, 667-671. 2. Fry, A. C. (2005). The role of resistance exercise intensity on muscle fibre adaptations. Review article. Sports Med., 34, 663-679. 3.Harber, M. P., Fry, A. C., Rubin, M. R., Smith, J. C., & Weiss, L. W. (2004). Skeletal muscle and hormonal adaptations to circuit weight training in untrained men. Scand. J. Med. Sci. Sports., 14, 176-185.

ISOKINETIC PROFILE OF KNEE EXTENSORS AND FLEXORS AMONG PORTUGUESE ADOLESCENT ROLLER-SKATE [RS] HOCKEY PLAYERS BY LEVEL OF PRACTICE

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Introduction: The ability to perform RS hockey specific skills is highly dependent of lower limb strength. The dynamic functionality of hamstrings and quadriceps muscles estimates the stability of the knee and is believed to be related with high performance levels (Aagaard et al., 2000). Isokinetic dynamometer provides a large number of parameters and is being used as one of the most informative and reliable assessments of muscle strength. The current study examines the effect of competitive level in the hamstrings-to-quadriceps ratio in adolescent RS hockey players.

Material and methods

The sample is composed by 63 subjects representing two distinct groups: Elite (n=32; 15.3±0.6 yrs, 6.6±0.9 yrs of practice), Local (n=31, 15.6±0.5 yrs, 6.2±1.2 years of practice). Muscle strength was assessed using a Biodex System 3Pro® isokinetic dynamometer. After a 8-min warm-up in a cycle-ergometer and stretching exercises, subjects performed 5 trials at 60°/s for hamstrings and quadriceps, concentric and eccentric modes, and the best peak torques of knee extensors [KE] and knee flexors [KF] were retained for analysis. Descriptive statistics and ANOVA were used to examine the isokinetic profile of elite and local players. Alpha level was set at 5%.

Results: When compared to their local peers, elite players attained better peak torque values, in the concentric modes of left KE [F=5.715, p<0.05], and of left KF [F=5.364, p<0.05]. H:Q ratio in the eccentric mode of the left lower limb was significantly higher for the local group [F=4.565, p<0.05]. No differences were found in the other isokinetic parameters.

Discussion/Conclusion

The results of the present analysis suggested that the elite RS hockey players perform higher absolute values in all strength variables of knee extensors and knee flexors under concentric and eccentric conditions. Results did not support evidence of muscular unbalances in both groups.

References

Aagaard P, Simonsen EB, Andersen JL et al. (2000). Scand J Med Sci Sports, 10, 58-67.

Franco MI, Ermano R, Nicola M, Samuele MM. (2007). Med Sci Sports Exerc, 2044-2050.

Zakas A (2006). J Sports Med Phys Fitness, 46, 28-35.

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14:15 - 15:15

Poster presentations

PP-TT10 Training and Testing 10

CHARACTERISTICS OF JUNIOR BASKETBALL TALENTS

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The aim of our project "Basketball-Talents" is to evaluate and optimize the U16 German basketball talent program. To analyze the output of the talent system a multidimensional performance assessment was designed. This assessment includes a physical condition testing, a psychological diagnostic, a sociological questionnaire, regularly training documentation and a questionnaire for coaches to evaluate the tactical and technical skills of the players.

The present study is focused on the results of the physical condition testing. In this study we compare the results of male (m) and female (w) players of the under 15 (U15) and under 16 (U16) age groups. Players are divided into two performance groups of regional selected (RS) and national selected players (NS). The sample sizes were: U15m (RS 127, NS 66); U16m (RS 57, NS 93); U15w (RS 68, NS 93); U16w (RS 39, NS 82). Additionally we highlight the results of a small elite sample of players selected for the national team (NT).

The following characteristics were analyzed: body height (bh), body weight (bw), range of arms (ra), 20 m sprint time (20 m), 20 m agility-run (20 ar), 20 m agility dribbling (20 ad), jump & reach (jr), chest pass (cp), mid distance shot precision (sp) and the multistage fitness test (mf). Selected results (mean values, standard deviation) of RS and NS were calculated and compared by using a t-test for independent groups.

NS players were significantly ($p<0.05$) taller and heavier and had a higher ra than RS players (U15m, U15w, U16w). NT players were even taller than NS players in boys (196±11 cm vs. 187±10 cm) and girls (183±7 cm vs. 175±7 cm). NS compared to RS players reached significantly better results in the basketball specific tests cp (U15m, U16m, U15w), sp (U15m, U16m, U15w) and ad (U16m, U15w). 20 m sprint and agility run performance did not differ clearly between RS and NS and showed a striking decrease in NT. Endurance performance in NT tended to be lower compared to NS.

We conclude that body height, body weight and range of arms in combination with the basketball specific skills seem to be important criteria for the selection of junior basketball players. General sprint and endurance capacity are of lower importance. On the other hand both factors are offering a further potential for an athletic improvement.

AN ANTHROPOMETRIC AND PHYSICAL COMPARISON BETWEEN MALE CHILDREN OF PRE-DURING-POST PEAK HEIGHT VELOCITY.

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ASPIRE

PURPOSE: Research has shown that inter-individual differences in performance and anthropometric measurements are present when boys of contrasting maturity status are compared (Beunen & Milana, 1988). The primary purpose of this study were to examine the differences between early to late maturing children in anthropometric and physical parameters by using age at peak height velocity (PHV) as a reference. PHV is the most commonly used indicator of somatic maturity during the adolescent growth spurt in height. METHODS: Measurements were collected during the first phase of ASPIRE's annual Talent Identification program in 2007 (128 males, age 14.5 + 0.3yr). All children were assessed on four anthropometrical (stature, sitting height, body mass and arm span), five physical tests (counter movement jump (CMJ), 40m sprint, medicine ball throw, distance throw, and the 20m MSFT). Self assessed training experience including years of training and amount of training per week were also collected. Children were grouped according to their current stage at PHV during the time of test. Groupings were constructed using 1 year intervals, pre PHV = -1.5 to -0.5yrs from PHV, during PHV =-0.5 to 0.5yrs from PHV and post PHV = 0.5 to 1.5yrs from PHV. Ages at PHV were predicted using a sex-specific regression equation as described in Mirwald, et al. RESULTS: Anthropometric differences between all PHV groups were found in stature, body mass and sitting height ($p<0.05$). When comparing leg length between pre- and during- PHV no differences were found, while post-PHV were significantly different to both groups ($p<0.05$). No differences were found between groups in counter movement jump, 40m sprint, distance throw and 20m MSFT. However, differences were found between all groups in the medicine ball throw ($p<0.05$). No differences were found between groups in years of training and amount of weekly training. CONCLUSION: Differences in stature, body mass and sitting height are in line with attained growth and velocities on a time axis relative to PHV. While assumed leg length could occur closer to PHV. The estimation for age at PHV formula was developed from longitudinal data of Canadian children and may not be of practical use for Middle Eastern children. Genetics, training experience, physical activity levels and nutrition status could be some of the primary reasons why little or no differences were found when comparing physical parameters.

References:

Beunen, G. P., & Milana R. M. (1988). Growth and physical performance relative to the timing of the adolescent spurt. Exercise and Sport Science Reviews, 16, 503-540.

Mirwald, R. L., Baxter-Jones, A. D., Bailey, D. A., & Beunen, G. (2002). An assessment of maturity from anthropometric measurements. Medicine & Science in Sports & Exercise, 34(4), 689-694.

Keywords: Peak height velocity, maturity, TID, Middle East, children, adolescence.

THE EFFECTS OF BODY SIZE AND MATURATION ON AEROBIC POWER AMONG PORTUGUESE ADOLESCENT ROLLER-SKATE [RS] HOCKEY PLAYERS

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Introduction: Research with Portuguese young athletes from team sports showed that mean heights and body masses of adolescent basketball players exceeded the age specific 75th percentiles of reference data (Coelho e Silva et al., 2008). More recently and based on a sample of 13- to 14-years-old soccer players, Figueiredo et al. (2009) noted a potential interaction between growth, maturation and success in sports. The current study examines the effect of maturation on multiple aerobic measurements in a sample of adolescent RS hockey players.

Material and methods

Anthropometry (stature and body weight), aerobic performance (20-meter shuttle run, SR) and aerobic power (Peak VO2 assessments provided by a direct, maximal and progressive treadmill exercise test and following the criteria defined by Armstrong & Welsman, 2001) were measured. Stage of pubic hair [PH] development was assessed at clinical examination (Tanner, 1962). Players were grouped by chronological age [CA]: CA1: 14.5-15.4 years (n=25); CA2: 15.5-16.4 years (n=38). The effects of CA and PH were tested using t-student while ANCOVAs were used to examine the effect of sexual maturation controlling for CA and for CA and body size simultaneously. Alpha level was set at 0.05.

Results: During late adolescent years, body size, aerobic performance and aerobic power parameters were not sensitive to variation in CA. When compared to players at stage 4 of PH, those classified at PH5 were significantly taller [t=-3.419, p<0.01], heavier [t=-2.650, p<0.01] and attain higher values of Peak VO2 when expressed in L.min-1 [t=-3.140, p<0.01], although they did not perform better in the 20-m SR. After controlling for CA, results persisted [height: F=10.845, p<0.01; weight: F=6.060, p<0.05; Peak VO2: F=8.832, p<0.01; 20-m SR: F=0.178, n.s.]. The effect of sexual maturation is not anymore significant when controlling for CA and body mass [20-m SR: F=0.001, n.s.; Peak VO2: F=3.491, n.s.], CA and height [20-m SR: F=0.915, n.s.; Peak VO2: F=3.055, n.s.], CA, weight and height [20-m SR: F=0.568, n.s.; Peak VO2: F=2.441, n.s.].

Discussion/Conclusion

The interpretation of aerobic power in young people is confounded by the need of properly partition out body size variation. Research focused in the merits and pitfalls of various scaling techniques is needed. The current study suggested that the influence of sexual maturation on aerobic power expressed in L.min-1 is a consequence of maturity-related variation of body size, which challenges conventional interpretation of changes in aerobic power with growth and maturation.

References

Armstrong N, Welsman J. (2001). Eur J Appl Physiol, 85, 546-551.

Coelho e Silva M, Figueiredo A, Moreira Carvalho H, Malina RM. (2008). Eur J Sport Sci, 8 (5), 277-285.

Figueiredo A, Gonçalves CE, Coelho e Silva MJ, Malina RM (2009). Annals Hum Biol, 36 (1), 60-73.

Tanner JM (1962). Growth at adolescence. Oxford. Blackwell Scientific.

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EVOLUTION OF EXPLOSIVE STRENGTH AND MAXIMUM OXYGEN CONSUMPTION IN HIGH AND MEDIUM LEVEL BASKETBALL PLAYERS

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Introduction: Basketball players' performance strongly depends on explosive strength and maximal oxygen consumption (VO2-MAX) [1]. Some authors have found that these assets proportionally increase with players' qualification [2].The aim of this research was to monitor the improvements due to training programs in two different qualification level players: medium and high. A test of explosive strength and the estimation of VO2-MAX were considered.

Methods: 43 basketball players were assigned to 2 groups. Group A consisted of 22 high level athletes (1st and 2nd division, 27.2±5.2 y, 1.94±0.08 m; 88.3±8.90 kg, BMI 23.4±1.5). Group B was made up of 21 medium level players (3rd and 4th division, 23.9±4.6 y, 1.92±0.06 m; 88.5±8.90 kg, BMI 23.8±1.5). Within each group, all subjects performed the same program of technical and physical conditioning (8 training sessions a week for A, 3 for B). The explosive strength and VO2-MAX of each athlete were measured at the beginning (t0) and at the half (t1) of the competitive season. The explosive force was assessed by measuring the height (H) of the jump (Optojump, Microgate, Bolzano, Italy) in countermovement vertical jump test (CMJ). Each athlete performed 3 trials and their best attempt was taken into account. The VO2-MAX was indirectly estimated following the protocol proposed by Leger et al [3]. Significant differences between pre and post tests within groups were evaluated through Wilcoxon tests (P<0.05). The comparison between A and B concerning the increase of H and VO2-MAX was performed by using the Mann-Whitney test (P<0.05).

Results: Group A had a significant increase of both H and VO2-MAX, who passed respectively from (median and IQR) 48.0 (14.7) cm and 56.9 (3.5) ml/min/kg in t0, to 49.5 (13.4) cm and 60.5 (4.6) ml/min/kg in t1. Group B did not evidence significant changes between the pre (48.3 (4.3) m and 56.3 (3.6) ml/min/kg) and post (48.2 (7.4) m and 55.4 (4.8) ml/min/kg) session.

Discussion: Results suggested that in high level basketball players the number of 8 training section during the week appears effective for increasing the performance of CMJ and VO2-MAX. In contrast, training programs of group B were not enough to enhance explosive force and maximal oxygen consumption. This may be related to the lack of physical conditioning within weekly workouts.

References

[1] Faina M, De Angelis M, Evangelista M,Squadrone R, Solai R, Matteoli ML (1995) Physiologic Profile of Basketball Player, Proceedings of the 7th National Medicine Congress, Jesi 3-4 November 1995

[2] Del Monte A, Faina M(1999) Valutazione dell'atleta, Utet Torino, 457-458
[3] Leger LA, Lambert J (1982) J Appl Physiol, 49, 1-12

RELATIONSHIPS BETWEEN ANTHROPOMETRIC PARAMETERS AND BONE DENSITY IN 7-8-YEAR-OLD RHYTHMIC GYMNASTS

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Introduction: Better bone density in childhood might prevent osteoporosis in later life (Baxter-Jones et.al., 2008). Prepubertal years are an opportune time to increase bone mineral density (BMD) through exercise (Bass et.al., 1998). High-impact exercise has strong impact to BMD and bone mineral content (BMC). Rhythmic gymnasts perform a lot of jumps and is known as high-impact bone loading sport. The aim of the study was to investigate the influence of anthropometric (skinfolds, girths, lengths and breadths) and body composition (fat %, fat mass, lean body mass - LBM) parameters to the BMD and BMC in young rhythmic gymnasts and same age controls.

Methods: Participants of this study were 89 7-9 year-old girls from different schools and sport clubs. They were devided to the rhythmic gymnasts (n=46) and controls (n=43). Body height and body mass were measured and BMI was calculated (kg/m²). All anthropometric parameters were measured according to the protocol recommended by the International Society for Advancement of Kinanthropometry. BMI (g/cm³) and BMC (g) were determined by DXA. BMD and BMC were measured at lumbar spine (L2-L4) and femoral neck area.

Results: Gymnasts have significantly higher values in L2-L4 and femoral neck BMD compared to controls. Gymnasts have also higher BMC values in L2-L4 and femoral neck compared to controls. Gymnasts had significantly lower values in skinfolds. Anthropometric values and bone parameters have significantly more relationships in controls compared to gymnasts.

Discussion: Our results suggest that young rhythmic gymnasts body height, LBM and BMI are the same as in controls. However, in controls body fat mass and fat % are significantly higher and BMD and BMC in L2-L4 and femoral neck have lower values than gymnasts. From the anthropometric parameters skinfold thicknesses are thicker in controls, on the girths, lengths and breadths there are very few significant differences between rhythmic gymnasts and controls.

References

Bass S, Pearce G, Bradney M, Hendrich E, Delmas PD, Harding A, Seeman E. (1998). J Bone Miner Res, 13, 500-7.
Baxter-Jones ADG, Kontulainen SA, Faulkner RA, Bailey DA. (2008). Bone, 43(6), 1101-1107.

GENDER EFFECTS ON VASTUS LATERALIS MUSCLE ARCHITECTURE IN PRE-PUBERTAL CHILDREN

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INTRODUCTION: Muscle force production is affected by architectural arrangements of fibers within the muscle (1). Many studies have examined the relationship between architectural arrangement and muscle force (1). To our knowledge, there are no data on differences in muscle architectural properties and force production in children, between boys and girls (2). Morse et al. (2) have been shown that children display different pennation angle as well as fascicle length compared with adults. The determination of the relationship between level of force and architectural characteristics may assist in identifying the mechanisms underlying growth effects on strength capacity in relation to gender. The purpose of this study was to examine the effects of gender on pennation angle, fascicle length and thickness values during isometric force production in pre-pubertal children.

METHODS: Twenty boys and girls (age= 11,2 ± 0,26 years, mass= 48,78 ± 9,15kg, height= 156,7 ± 7,28cm) participated in this study. All tests were performed on a Kin Com dynamometer. In vivo muscle architecture was assessed using B-mode ultrasonography. Isometric torque of the knee extensors was assessed at angles of 0° (full extension), 45° and 90°. The subjects performed three efforts at 100%, 0%, 40%, 60% and 80% of MVC. The total duration of each effort was 5 seconds. Subsequently pennation angle, thickness and fascicle length were evaluated.

RESULTS: Analysis of variance with repeated measures showed that, fascicle length in point of gender changed as the level of muscle effort and knee angle were altered ($p < 0.05$). Particularly, fascicle length ranged from 2.7 cm to 2.1 cm and from 2.6 cm to 1.9cm, for 0°, 45, 90° knee angles and for girls and boys respectively. The results showed a higher fascicle length in girls for all knee angles compared with boys ($p < 0.05$). There were not significant differences in pennation angle and thickness between boys and girls as the level of muscle effort and knee angle were altered.

DISCUSSION/CONCLUSION: To our knowledge, this is the first study which examined the relationship between different level of isometric force production and three important factors of muscle architecture in pre-pubertal boys and girls. Absolute fascicle length of the VL was smaller for boys compared with girls. The relationship between fascicle length and force was semi-linear and it is consistent with previous findings in adults (1, 2). The above results suggest that any gender differences in strength in pre-pubertal stage of maturation might be due to small differences in muscle architecture.

REFERENCES:

1:Narici M. et al. (1996) J Electrom. & Kinesiol.
2. Morse, C., et al. (2007) J. Appl. Physiol

INVESTIGATION OF SELECTED PHYSICAL PARAMETERS OF JUNIOR <11-12 YEARS OLD> MALE BASKETBALL PLAYERS AND SEDENTARY COUNTERPARTS

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The purpose of this study is, to compare the height (in cm), weight (in kg), vertical jump test score (in cm), standing long jump test score (in cm), overhead medicine ball (2kg) throw (in cm) and 30 meters (approximately 100 feet or 33 yards) run (in sec) parameters' mean values of male junior basketball players and sedentary counterparts.

17 basketball players (playing basketball for 1 year) and 17 sedentary boys, totally 34 subjects, are included to the research. Mean age (A), height (h), weight (w), vertical jump test score (VJTS), standing long jump test score (SLJTS), overhead medicine ball throw (OMBT) and 30 meters run values (30 m) of, all the boys included to the research (N=34), are 11,59 ± 0,49 years, 147,15 ± 8,84 cm, 35,67 ± 4,78 kg, 26,09 ± 5,84 cm, 139,94 ± 14,98 cm, 398,09 ± 99,89 cm and 6,25 ± 1,23 secs respectively (Table 1). For the training group (TG), these values are

11,59 ± 0,50 years, 140,58 ± 5,25, 37,26 ± 3,16, 27,88 ± 5,96 cm, 140,35 ± 14,14 cm, 469,41 ± 88,98 cm and 5,65 ± 0,36 secs and for the sedentary group (SG) 11,59 ± 0,70 years, 153,70 ± 6,47 cm, 34,07 ± 5,62 kg, 24,29 ± 5,27 cm, 139,50 ± 16,20 cm, 326.70 ± 43,04 cm and 6.84 ± 1.50 secs respectively.

It is found that all the descriptive data of the TG and SG are normally distributed. According to the independent sample test (p≤0,05), no statistically significance between the w, VJTS and SLJTS of TG and SG have been found. On the other hand, statistically significant difference between TG and SG is found for the OMBT and 30 m run tests (p≤0,05). As a result of the research, it is concluded that, after a 1-year-basketball-training program, total body power, anaerobic power and sprint characteristics of the boys are developed.

References

Kozel, J., "Talent Identification and Development in Germany" Coaching Focus, Spring 1996.

JONES, M.," Talent Selection in Throwing Events" Track Coach, p.4530-4535, Great Britain, Spring, 1997

SANTOS, E.J., JANEIRA, M.A., "Effects of Complex Training on Explosive Strength in Adolescent Male Basketball Players" J Strength Cond Res. 2008 May;22(3):903-9.

CHARACTERISTICS OF FITNESS PARAMETERS IN BASKETBALL PLAYERS OF DIFFERENT DIVISIONS

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Abstract

For playing basketball, pronounced skills in physical endurance, acceleration and vertical jumping are required (Foran & Pound, 2007). Commonly, it is assumed that these fitness parameters in basketball increase in higher divisions and reach highest level in professionals. Thus, the present study compared selected fitness parameters of basketball players from different german divisions.

The overall number of 27 subjects consisted of nine subjects from the divisions Pro-A (25.2 ± 4.1 years, 197.3 ± 7.6 cm, 94.6 ± 11.1 kg) 2nd regional division (19.3 ± 3.5 years, 187.3 ± 9.0 cm, 82.3 ± 14.9 kg) und district division (18.6 ± 2.2 years, 187.3 ± 9.1 cm, 80.0 ± 11.8 kg) respectively. The nine subjects of each team consisted of three centers, forwards and guards, respectively.

All subjects were tested regarding their physical endurance capacity and anaerobic threshold at 3.5mmol/l blood lactate (maximum treadmill test), their acceleration capacity (20m agility drill) and their vertical jump capacity (jump and reach test) at the same specific date of the season.

Subjects of Pro-A achieved peak values in endurance capacity (14.6 km/h at 3.5 mmol/l), acceleration capacity (4.76 s) and vertical jump capacity (66.1 cm), followed by subjects of 2nd regional division (14.4 km/h, 5.05 s, 58.0 cm) and subjects of district division (13.7 km/h, 5.19 s, 53.9 cm). Wilcoxon signed-rank test solely revealed a significant difference in acceleration capacity between Pro-A and district division. The different player's positions were compared with each other in endurance capacity (Center: 14.2 km/h, Forward: 14.0 km/h, Guard: 14.5 km/h), acceleration capacity (5.1 s, 4.96 s, 4.91 s) and vertical jump capacity (57.2 cm, 62.3 cm, 58.4 cm). The differences did not reach the level of significance.

The findings prove that fitness parameters of basketball players in higher divisions are pronounced compared to players of lower divisions. However, the fact that only the difference in acceleration capacity reached statistical significance suggests that the fitness characteristics do not determine the division in basketball. In contrast, Kalapotharakos et al. (2006) did not reveal significant differences in soccer teams of the first Greek league but significant differences between teams of the bottom and midrange of the league. Furthermore, differences were found between the top teams and both other teams.

In conclusion, technical and tactical skills might have a greater influence on the division in basketball and similar games than presumed.

References

Foran, B., & Pound, R. (2007). Complete Conditioning for Basketball. (NBCCA, Ed.) Champaign, IL : Human Kinetics.

Kalapotharakos, V. I., Strimpakos, N., Vithoulka, I., Karvounidis, C., Diamantopoulos, K., & Kapreli, E. (2006). Physiological characteristics of elite professional soccer teams of different ranking. The Journal of Sports Medicine and Physical Fitness , 46, pp. 515-519.

LONGITUDINAL ASSESSMENT OF PERFORMANCE IN YOUNG MALE BASKETBALL PLAYERS DURING A WHOLE SEASON

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Basketball is a sport with many complex demands that require a combination of fitness, skills, team strategies and motivational aspects. However key areas that are likely to play an important role in a basketball player´s success are muscular strength, fitness and body size. Purpose. The aim of the present study was to evaluate seasonal variation in anthropometric and physiological variables, and identify differences between the first and reserve team in elite young male basketball players. Methods. 15 top-level male players (Spanish team) guards (n=2), forwards (n=7), centers (n=6) (mean ± SD), age (14 years), height (189.1 ± 6.3 cm), body mass (74.6 ± 9.3 kg) participated in this study. The subjects were divided into two different categories: first team player (FT) (n=7) and reserve team player (RT) (n=8). All the players participated in the same training program (5 h per day). Four times during the season (September, December, March and June), each player performed various tests including countermovement jump (CMJ), Abalakov (ABK), horizontal jump (HJ), course Navette test (CN), and strength explosive arm test (SEAT). In addition anthropometrical data were recorded. Results. At the end of the training program the values were (Mean ± SD): [Height: 188.2 ± 5.4 vs. 190.6 ± 4.5 cm; 190.1 ± 7.6 vs. 192.1 ± 6.6 cm]; [Weight: 74.1 ± 12.0 vs. 77.8 ± 11.0 kg; 75.1 ± 6.0 vs. 81.6 ± 5.5 kg]; [Body fat: 8.2 ± 1.2 vs. 8.0 ± 1.1 %; 7.6 ± 0.6 vs. 7.5 ± 0.4 %]; [ABK: 39.0 ± 4.5 vs. 43.6 ± 4.4 cm; 38.8 ± 5.9 vs. 47.3 ± 6.0 cm]; [HJ: 1.46 ± 0.3 vs. 1.76 ± 0.4 m; 1.38 ± 0.3 vs. 1.81 ± 0.4 m]; [CN: 9.8 ± 2.1 vs. 11.7 ± 2.0 paliers; 10.3 ± 2.4 vs. 12.0 ± 2.0 paliers]; [SEAT: 5.8 ± 0.8 vs. 6.5 ± 0.4 m; 5.5 ± 0.6 vs. 6.4 ± 1.0 m], FT and RT respectively. Pre and post training intra-group increased in both groups their height, max. speed, strength explosive arm, leg power and aerobic performance significantly (P<0.05).

Conclusions. The progression of the both groups along the season was quite similar, with no significant differences in any anthropometric or physiological variables between them. At the end of the season and close to the international championship players presented the best Results.

AN INTERNATIONAL COMPARATIVE STUDY OF FITNESS AND SKILL IN ELITE MALE U16 BASKETBALL PLAYERS

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Introduction: Fitness and skill are considered key components of basketball game play and eventual team success, with tests related to key performance indicators (KPI) validated through their ability to discriminate between levels of performance. Purpose: To compare group performance on sport specific fitness tests and KPI-related skill tests in elite male youth basketball players from one high ranked and one low ranked basketball nation. Method: Thirty three male U16-year-old elite and/or national representative players from a high ranked basketball nation (in top five of Division A at the 2005 World Championships, n=16) and a low ranked basketball nation (between 6-10th place in Division B at the 2005 World Championships, n=17) completed four sport specific fitness tests: 20 metre sprint (Sprint); countermovement standing vertical jump (CMJ); standing vertical jump from 90 degree squat (SVJ); Abalakov jump (AJ); and three KPI-related skill tests: ball dribbling (BD); jump shot (JS); and free throws (FT) using protocols adapted from Balciunas et al., (2006). The best score or time from three attempts was used for group comparison using paired samples t-tests ($p<.05$). Results: There were no significant group differences found between the Division A and Division B teams for height (1.92±.07m vs 1.86±.09m, p=.07), weight (72.6±5.4kg; Div B 74.2±9.1kg, p=.55), 20m sprint time (3.13±.20secs vs 3.15±.09secs, p=.66), CMJ (40.4±3.1cm vs 40.5±4.8cm, p=.93), SVJ (38.5±3.3cm vs 38.9±4.7cm, p=.79) and BD (7.79±.49secs vs 7.82±.51secs). Significant group differences between the Division A and Division B nations were apparent for BMI (19.8±1.2 kg.m2 vs 21.3±1.3kg.m2, t=3.32, $p<.01$, eta2=.26), AJ (50.4±3.7cms vs 45.1±5.0cms, t=3.42, $p<.01$, eta2=.27), JS (12.2±2.7 vs 8.5±3.6, t=3.31, $p<.01$, eta2=.26) and FT (22.8±3.4 vs 18.8±6.6, t=2.25, $p<.05$, eta2=.14). Conclusions: As a group, and being similar in positional representation, the higher ranked nation demonstrated a lower weight to height ratio, suggesting a taller and leaner player profile, although more accurate body composition measurement is recommended in future studies. The higher-ranking nation were also found to perform better at arguably the most game specific vertical jump (the Abalakov jump) and the two most 'score-outcome related' skill tests. Relative body composition and these three tests may therefore be the most useful for discrimination between levels of performance in elite male youth basketball. Without suggestion of causality, specific physical training and technique/skill practice are recommended for less successful basketball teams in order to improve these seemingly performance related fitness and skill attributes.

Balciunas. M., Stonkus, S., Abrantes, C. & Sampaio, J. (2006). Long term effects of different training modalities on power, speed, skill and anaerobic capacity in young male basketball players. JSSM, 5, 163-170.

COMPARISON BETWEEN DIRECT AND PREDICTED MAXIMAL OXYGEN UPTAKE MEASUREMENTS

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Introduction: It is wellknown that maximal oxygen uptake (VO2max) plays an important role in the performance level of soldiers daily physical activities. Direct bicycle ergometer or treadmill running tests have been used as golden standard measurements of VO2max. In addition, several predicted VO2max measurements, which are based on the assumption that there is a linear relationship between heart rate and oxygen consumption during various intensities, have been developed since the 1950s (Åstrand et al. 1954). The aim of the present study was to compare the results of the direct measurement of VO2max to the respective predicted values during a bicycle ergometer test.

Methods: A total of 68 male soldiers participated in the study. Their mean age was 19.2±0.9 yrs., height 1.79±0.06 m, body mass 73.8±12.4 kg and body mass index 23.0±3.8%. The subjects gave signed informed consent before the testing. Aerobic performance (VO2max) of the same subjects was tested twice within two months intervals by a bicycle ergometer. The initial work load was 50W, and it was increased by 25W every second minute until exhaustion (MILFIT/FitWare, AinoActive, Helsinki, Finland). Oxygen uptake was measured continuously using a gas analyzer (SensorMedics, Yorba Linda, California, USA). Heart rate was recorded continuously by heart rate monitor (Polar Electro, Kempele, Finland). Volitional exhaustion was the main criterion indicating that VO2max was achieved, and the highest mean VO2 over one minute was set as VO2max. Exhaustion was ensured by a respiratory exchange ratio above 1.05 and the ratio of perceived exertion more than 17.

Results: In the first tests, the predicted mean (±SD) VO2max value was 45.2±7.7 ml-1kg-1min-1 and the direct value 44.8±8.5 ml-1kg-1min-1, which correlated significantly ($r=0.84$, $p<0.001$) with each other. The absolute and relative differences between the methods were -0.42 ml-1kg-1min-1 (p=0.46) and 0.9%, respectively. Thereafter, in the second test the predicted and direct VO2max values were 47.4±6.7 ml-1kg-1min-1 and 48.7±7.3 ml-1kg-1min-1 ($r=0.80$, $p<0.001$). The absolute and relative differences between the methods were 1.28 ml-1kg-1min-1 ($p<0.05$) and 2.7%, respectively. The mean values of the predicted VO2max values and direct VO2max values were inside the 95% confidence interval for the mean values of the variables for both tests (test1 43.2- 46.9 and test2 46.4-49.7 ml-1kg-1min-1). The mean values and differences of the predicted and direct VO2max values were not significantly correlated at week 0 ($r=0.14$, p=0.24) or week 8 ($r=0.11$, p=0.36). Both of these indicate that the measurements were statistically very similar.

Discussion: The present predicted VO2max measurements only slightly overestimated or underestimated the VO2max values of the direct measurements. Based the data we can conclude that the present protocol is fairly accurate and valid to predict VO2max values in male subjects.

References

Åstrand PO, Ryhming I. J Appl Physiol;1954;7:218-221.

SPINE AND ARMS FLEXIBILITY IN ELDERLY: PART OF THENAPA II. PROJECT

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Introduction: Insufficient muscle load influences negatively also bone system and in higher age can support osteoporosis and arthrosis. By increasing age many body changes can appear, like salt is contain in joints, degenerate muscles, ligaments and tendons are losing its flexibility. That limits range of movements in different joints, including spine and arms. Also motor performance in elderly is affected,

where all motor abilities are decreasing, including flexibility. Long-term regular participation in physical activities can slow down this negative progress. Research was supported by project "THENAPA II – Dissemination and exploitation of results 142475-LLP-1-2008-1-BE-ERASMUS-EAM".

Methods: 65 elderly (14 men and 51 women) participated in research. We provided measurements of flexibility using two tests for spine flexibility (sagittal flexion and left, right lateral flexion) and one test for arm flexibility (left and right shoulder). We compared the level of flexibility between two groups of respondents (active n=45 and inactive n=20) using t–test (test for independent samples). Active elderly participated in physical activity once per week. Average age of target group was 69 years.

Results: Active group of elderly people demonstrated better results in all tests comparing inactive elderly. Two from five flexibility indicators were statistically significant ($p<0.05$), concretely left lateral flexion and sagittal flexion.

Discussion: By our research we can confirm, that regular participation in physical activities influences flexibility progress in elderly people. Results presents differences between active and inactive elderly in all tests. Average value of difference in sagittal flexion was 6.2 cm; right lateral flexion 0.8 cm; left lateral flexion 3.05 cm; right arm flexibility 1.8 cm; left arm flexibility 1.7 cm. Regular exercises aimed to bending, twisting, and stretching are appropriate to improve spine flexibility. More frequent participation in exercise of active elderly (at least two times per week) would bring more significant differences between groups. We recommend, that each physical activity for elderly people should include exercises for whole body flexibility development. Elderly, even those with disability should participate at least 5 days per week in physical activity or exercise to maintaine or improve their good health and well-being.

14:15 - 15:15

Poster presentations

PP-PP04 Physical Education and Pedagogics 4

INQUIRY EXAMINING THE TRAINING NEEDS OF PHYSICAL EDUCATION TEACHERS FROM THE LOMBARDY REGION

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Introduction: The aim of this inquiry is to find out the training needs of Physical Education teachers.

The objective of this inquiry is to find out:

- to what extent the PE teachers feel the need for training
- what are the most appealing themes for the training courses
- when to carry out the training courses

Methodology: The inquiry has been carried out via means of a questionnaire. The teachers have expressed their choice by putting a cross on the Likert scale, where 1 means of little importance and 7 of great importance; there were also 2 open questions.

Sample examined

181 teachers were interviewed, 86 Male and 95 Female, 57 teaching in secondary schools with students aged 11-14 years, 124 teaching in secondary schools with students aged 14-19. The interviewees were between 26 and 62 years.

The questions were subdivided into 3 groups

1. Need for training (1)
2. Most relevant areas for training
3. Favoured instruments for the training

Results: From our data we can see that:

1. 74.78% of the interviewed felt a strong need for training

2. The interest for training in sport, dance, expressivity and fitness was 64.27%; 50.58% want training in cross-sectional assessment, disability and coping with adolescent problems(2); 71.19% teachers prefer to have training during the school year, 59.39% want it organized by the state and 59.80% want increased salary after training and near the place of work.(3)

3. 80.66% had attended a training course, 76.8% consulted books or magazines, and 11.51% the internet.

Conclusion

There is a great deal of interest for specific training; it's necessary to divulge computer use; the State and the University should take care of this need.

References

(1)Gatti R.,(2002) Saper Sapere. La Motivazione come obiettivo educativo. Carocci Roma

(2)Cavalli A., (2000) Gli insegnanti nella scuola che cambia. R. Cortina Milano

(3)Cattaneo P., (2004) Guida alla professione docente. La Tecnica della Scuola. Catania

TEACHER EVALUATIONS OF ICT IMPLEMENTATION IN PHYSICAL EDUCATION

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Introduction: In the Norwegian national curriculum implemented in -06(Lk06) ICT-competence is described as one of five basic competences in every curriculum subject. In all subjects, there are specific goals intended to improve ICT-competence within the framework of the subject in question. Physical Education(PE) teachers have questioned to what extent ICT can provide efficient learning environments for important aspects of the subject, and whether the requirements in Lk06 are grounded in experience and research.

An important focus has been to investigate the relationship between the use of ICT and important PE characteristics as learning and experiencing bodily movement. This is considered to be crucial for a high quality PE practice.

The aim of this presentation is to present teacher evaluations of the use and effectiveness of ICT in PE. How do teachers evaluate ICT usage with regard to learning outcomes and learning environments in PE?

Methods: The presentation is based on results of a national teacher survey,

"Skolefagundersøkelsen 08" (National School Subject Survey 08). The objective of this survey was to map curriculum teachers' evaluations and usage of ICT in the context of their own lower secondary classroom practices in their respective schools. Of the 991 teachers responding, 89 of them were PE teachers.

Results: Findings from the survey show substantial differences between teachers' evaluations in different curriculum subjects as well as individual differences within one particular subject. PE stands out as the curriculum subject with the highest degree of consensus.

ICT is not practised nor regarded as an important and generic tool for achievement in PE. Attitudes to ICT are more negative in PE than in any other curriculum subject.

While in PE exist a negative consensus view on ICT, this view is also found in other subjects like Arts and Crafts, but teachers in this subject also regard ICT as an efficient tool for learning in certain aspects of the subject, e.g. artistic inspiration and documentation of creative processes. No aspects with the same dimension are found in PE.

Discussion: Less use of ICT and a negative attitude towards ICT is found more among PE teachers than among teachers in other subjects. This reflects PE teachers' views on what are the essential and core subject values and goals for learning. They do not identify learning goals that best and uniquely can be served by ICT usage and express at the same time a fear that ICT intensive activities in PE may direct pupils' foci from essential and core subject values and goals for learning.

With regard to the relationship between ICT and PE, this study tells us that we need future qualitative case studies to see if we can indeed identify parts of PE that best and uniquely can be served by what kind of ICT usage. If we can't, then we must ask ourselves if PE supports the acquisition of ICT competence to a relevant extent or if this could better be accomplished in other subjects.

VOCATIONAL PERSONALITY AND PROFESSIONAL BURNOUT IN PHYSICAL EDUCATION <PE> TEACHERS

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INTRODUCTION: Professional development of man consists of three strata: objective, constituted by a given contents of the job to be performed, social, or the social environment, and personal, associated with autoperception, a sense of value and life accomplishment. The intertwined spheres form a harmonious entity called by John L. Holland the vocational personality. A profession that does not correspond to the predispositions of an employee may cause chronic stress, a sense of defeat and also convince him of his low value. A mismatch between an employee and his professional environment often contributes to the development of burnout syndrome (Banka 1995).

Using a macro-path of professional burnout in PE teachers plotted in a four-phase typological model (Brudnik 2008), the author analyzed burnout in teachers working in accordance with their vocational personality as well as those not matched to their professional environment.

METHOD: The survey was carried out in May 2006-June 2007 among male PE teachers N=771. The employed tools were: Maslach Burnout Inventory and Holland's Self Direct Search; the statistical methods included data clustering (K-mean method) and U Mann Whitney test.

RESULTS: Of 771 investigated subjects, males characterized by good and lacking match to practice their profession: N=664 (86.1%) and N=107 (13.9%). Burnout of professionally matched and mismatched PE teachers is illustrated using a four-phase typological model.

The macro-path of professional burnout of PE teachers bifurcates at Phase F1 (Brudnik 2008). The results suggest that a decisive factor in the macro-path bifurcation is the degree of match between the investigated teachers and their professional environment.

Matched teachers experience burnout in keeping with path I, reacting to stress with emotional exhaustion (the Maslach's path). In the mismatched group, stress primarily triggers depersonalization of pupils (F1) – the Golembiewski's path, what is indicated by cluster II. (N=31), which illustrates disillusionment with one's work associated with increasing depersonalization of pupils at a low level of emotional exhaustion. The subsequent cluster (IV, N=23), Phase (F2) represents emotionally exhausted teachers, who treat their pupils as objects (IV, N=23).

While undergoing burnout, mismatched teachers (F3) lose the sense of their work ($Z=-5.191$, $p<0.001$) (III, N=11), while matched teachers experience painful emotional exhaustion ($Z= -4.872$, $p<0.001$) (I, N=74).

Banka A., (in Polish) Quality of life in psychological experiencing everyday life associated with professional development, work and unemployment. In: A. Banka, R. Derbis (ed.), Measurement and sense of quality of life in the professionally active and unemployed. CECBE, Poznań Lublin 1995, 9-26. Brudnik M. (2008), Professional burnout of female and male physical education teachers: a four-phase typological model, Book of Abstracts, 13thAnnual ECSS Congress, 622.

Key words: PE teacher, burnout, vocational personality.

PRIMARY SCHOOL: THE OPINIONS OF GENERALIST PHYSICAL EDUCATION TEACHER'S TOWARD INCLUSION OF STUDENTS WITH DISABILITIES IN THE REGULAR SCHOOLS AND REGULAR PE CLASSES

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In the compulsory syllabus of the primary school (students aged 3-11 years), the physical education (PE) subject is included, in Italy. All the students with disabilities are included and integrated in the

regular schools from '80. The teachers in the Italian primary school are generalistic (they are

teaching all the subjects) and they attend semester in Physical Education course in the University curricula. The data about the generalistic PE teachers in the primary school attitude towards disabilities students in the regular Pysical Education setting aren't investigated.

PURPOSE: The survey aims is to investigate the Primary Physical Education Italian teachers' attitude towards inclusion of students with disabilities in regular education settings, after 30 years from the firt law on integration in the Italian schools. It is preliminary study.

METHODS: The Teacher Integration Attitudes Questionnaire (TIAQ)(Sideris&Chandler, 1997) was given to 51 (N1=51) pre-service generalistic Physical Education Teachers primary school. Descriptive statistics were at first derived for the total sample.Cronbach's alpha co-efficient was

used in order to determine internal consistency of the questionnaire. ANOVA was used for the analysis regarding gender, years of experience, training in special pedagogy for support teaching, with 4 subscale of the questionnaire: skill, benefit, acceptance, support. The level of statistical significance was set at $p < 0.05$

RESULTS: The means and the standard deviation of skill, benefit, acceptance, support subscale are respectively 8,4±2,2; 2,4±1; 7±1,5; 8,5±2. T-test data for independent simples didn't give difference between statistical significative means. The ANOVA shows the only statistical significant result is between the acceptance subscale and training in special pedagogy for support teaching ($F= 4,46$ $p<0.04$)

Discussion: The integration and inclusion of all Italian students with disabilities in the regular Primary Schools date back to thirty years in Italy, but the t-test and ANOVA analysis address limitated significative difference and only in the acceptance dimension analysis. The results give idea that Teachers' attitude is not to much oriented towards the other dimension (skill, benefit, support), maybe the causes are the teachers are in traning and they are thinking no up date in the professional training. Further surveys are necessary on great simple for generalization of the results and with teascher in-service for the increase of best quality of integration and inclusion in the present and in the future of the PE regular classes .

References

Siderisis G & Chandler J (1997). Adapted Physical Activity, Quarterly, 14, 51-64

Stainback W. Stainback S. (1990) Support Netwrks for inclusive schooling, Paul H. Bookes Publishing

Ianes D., Cramerotti S. (2005) Il piano educativo individualizzato. Progetto di vita. 2005-2007, Erickson

FEMALE AND MALE STEREOTYPES OF SCHOOL SPORTS

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1. CIAFEL, 2. CIFI2D, 3. BASIC SCHOOL OF BRANCA

Introduction: Sport is a defining aspect and an essential part in a child's or youths' education. But sport doesn't seem "neutral" when associated with gender: our representations of the sexual identities influence the way we see males and females in sport1.

Available data suggest that school sport can provide participation for approximately 110,000 young people2, which only 24% are girls. Currently, in Portugal, the specific recommendation to promote female participation in school sports is scarce. An understanding of how young/adolescent people perceived certain sports to be masculine, feminine or not culturally associated to one specific sex is important to developers of social and sports policy, as well as to physical education teachers.

Therefore, the aim of this research is to analyse how adolescents of both sexes at 7th, 8th and 9th grades of Portuguese Public Schools perceived gender appropriateness of school sports, as more suitable for girls, for boys or for both equally.

Methods: A sample of 551 students (260 boys and 291 girls) from 7th, 8th and 9th grades completed an online questionnaire including a checklist with 41 sports from the School Sport Programme. Participants were instructed to designate each activity as more suitable "for girls", "for boys" or "for both equally", in the computer classrooms. Descriptive statistics were used in order to characterize de sample. Qui-square test was used to analyze the prevalence of perceived gender appropriateness (p≤0.05).

Results: Some sports were perceived by students as more appropriate for a certain gender. Boys and girls pointed out Basebol, BTT and Rugby as more suitable "for boys". On the other hand, Aerobic Dance was considered "for girls" by both. Rhythmic Gymnastic was mainly perceived as "for both equally" by girls, but boys perceived it as more suitable "for girls". All the other sports were not perceived in a gender-stereotyped way, but as "for both equally".

Statistically significant differences were observed in perceived gender appropriateness of some school sports: Badminton, Korfball, Social Dances, Traditional Dances, Urban Dances, Climbing, Futsal, Group Gymnastic, Adventure Activities, Orienteering, Skating and Rugby.

Discussion: Although the gender perception for the 41 sports is nearly coincident between boys and girls, these results also suggest a slight genderdization3 of certain sports in this context.

References

1) Hargreaves, J. (1994). Sporting females. New York: Routlege.

2) Sousa, J.; Magalhães, J. (2006). Desporto Escolar: um retrato. DGDIC. Ministério da Educação.

3) Silva, P.; Botelho Gomes, P.; Queirós, P. (2004): Sport and gender: how girls and boys see it concerning stereotypes. In M. Valeiro; J. Molina; J. Varela (Eds), Preparación Profesional y Necesidades Sociales, INEF da Galiza; Universidade da Coruña, CD-Rom, 396-398.

COMPARISON BETWEEN SLOVENIAN AND CROATIAN STUDENTS IN THEIR KNOWLEDGE ABOUT HEALTHY FOOD AND THEIR EATING HABITS

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Nowadays great importance is laid on healthy food due to great number of overweighed children and adolescent and diseases caused by being obesity (Conker & Tishler, 1992; Robbins, Powers, Burgess, 2005; Pokorn, 2005; Matković, Knjaz, Cigrovski, 2006; Zupančič, Hoyer, 2006). Primary school teachers and physical education teachers play a big role in the pupils' lives. Therefore it is vital to find out what their eating habits are and what they know about healthy food. For the research purpose two questionnaires were used. Results were analyzed by using descriptive statistics, discriminant analyse and T-test for independent samples.

The results show that students from Slovenia have better eating habits while students from Croatia have better knowledge about healthy food. There should be more education about healthy food in primary and secondary schools and also at higher education. It can't be expected that teachers will teach children about the healthy way of life and proper eating habits, if they do not posses enough knowledge themselves. Nowadays healthy food and proper lifestyle are very important because of peoples' health, their quality of life and expected longer lifetime. Another reason for educating primary school teacher and physical education teacher about healthy food and proper eating habits is that there are too many inappropriate commercials which advertise unhealthy food, in particular sweets and fast food.

1) CONKLE, T.H. & TISHLER, A.G. (1992). Sports nutrition knowledge assessment of physical educators and coaches. Annual meeting of the Mid-South Educational Research Association, November 11-13, 1992; Knoxville, Tennessee.

2) MATKOVIĆ, B., KNJAZ, D. AND CIGROVSKI, V. (2006). Znanje trenera o sportskoj prehrani. (Sport nutrition knowledge of coaches). Hrvatski športsko medicinski vjesnik, 21(1):3-8.

3) POKORN, D. (2005). Prehrana v različnih življenjskih obdobjih. Prehranska dopolnila v prehrani. Ljubljana: Marbona. Str. 9 – 168.
4) ROBBINS, G., POWERS, D., BURGESS, S. (2005). A Wellness Way of Life. 6th edition. Ball State University: McGraw Hill.
5) ZUPANČIČ, A., HOYER, S. (2006). Prehranjevalne navade študentov. Obzor. Zdr. N., 40, str. 157 – 163.

ANALYSIS OF THE USE OF FREE TIME BY THE STUDENTS FROM TEACHING PHYSICAL EDUCATION

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UNIVERSITY OF JAEN

Introduction: There is a high demand for students from teaching physical education from University of Jaen to study subjects that prepare them to educate in the proper use of leisure time and specific subjects of physical education and sport. Therefore, this research has been conducted to verify how much time the devoted to physical and recreational activities demand actually.

The aims of this work are: to check if the studied population spends his free time to physical activity and sport; to know the relationship between the choice of those activities and university studies, to examine which other activities occupy their free time.

Methods: 180 students from teaching physical education responded to the questionnaire. It included 25 items to assess the following dimensions:

A) Practice of physical and sports activities during leisure time and its relation to studies.

B) Type of physical and sports activities practiced during leisure time.

C) Justifications about the choice to practice sport during leisure time.

D) Other activities during leisure time

Results: 78% performed between 1 and 2 h of physical activity per day and 71% do so between 3 and 5 days for week. 70% has changed little or nothing of their habits in terms of leisure time physical activity when they enter to university. 61% indicate that the studies that are studying at university with little or no influence on their decision to choose to practice physical activity in their free time. 81% play collective sports always or fairly during their physical activities. 12% do it only sometimos. Also, 12% practiced in their free time individual sports always. The reason that they gave more importance to physical and sport activity during their free time has been associated with positive effects on health. Of the other activities they do during their free time highlights going out with friends with practice sports over other activities

Discussion: The physical and sporting activities occupy much of his free time, there is a relation between physical activity and sport practiced and university Studies elected, and not vice versa; activities like going out with friends or watching television are also part of the time free, but others like reading is done on an occasional or non-existent.

References

Céspedes R and Lara AJ. (2006). Programa de mejora del rendimiento deportivo mediante la utilización de la música. Int J Med Sci Phys Educ Sport, 7(2), 77-93.

Dumazeider J. (1968). Hacia una civilización del ocio. Barcelona: Estela.

Tinning RC. (1996). Discursos que orientan el campo del movimiento humano y el problema de formación del profesorado. Rev Educación, 311:123-134.

Zagalaz ML, Latorre PA and Cachón J. (2003). Intervención del profesorado de EF en el turismo activo. Retos, 3:17-24.

ACTUAL TECHNOLOGIES IN HIGH SCHOOL EDUCATION

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Introduction. Actual scientific research in the field of physical culture and sport all over the world proves the necessity of use of innovative achievements to develop informatics and qualimetry. Knowledge-consumptive high-tech information concerning process and equipment are used to achieve these goals.

The present research offers the attempt to apply actual technologies based on high-tech information concerning process, equipment and distance education in non-physical education high school students' self-directed learning.

Many researchers share the idea that at the present moment the introduction of new kinds and methods of actual technologies in high school educational process is possible only if a wide range of high-tech information concerning process and equipment are used.

It is a matter of common observation, that the most effective means contributing to the rise in high school modern students learning motivation are computer-aided technologies. They help to form the research activity skills and develop the lifeware.

Research objective is to improve academically physical education with the help of theoretical justification and technological information concerning process and equipment designing during distance education in non-physical education high school students' self-directed learning.

Research methods and management. The following research methods were applied: theoretical study and generalizations of existing scientific sources, of progressive and advanced practical experience, different psychologist and pedagogical techniques, mathematical statistics procedures. To realize this objective we worked out high-tech information concerning process and equipment applied during distance education students' self-directed learning to study the theoretical basis of "Physical culture" educational program in high school, including courseware and computer-based study-guide "Physical culture and sport theory and methods", numerous multi-media teaching programs, computer tests, etc.

Research results and their discussion. The analyze of actual technologies under-utilization in the academic activity showed that the main reasons are low level of students computer skills (36,0 – 43,8%) and lack of possibility to apply them in the physical culture academic activity (22,0-21,3%).

Theoretical physical culture self-directed learning with the use high-tech information concerning process and equipment and new methods of distance education contributed to the rise in students motivation, activeness and interest in the academic process through actual technological distance educational techniques using.

As the result of this innovation, positive changes in students attitude towards the academic subject "Physical culture" were observed: in the experimental group self-motivation increase was 65,3%, in the control group this index corresponded to 57,1 % and was explained only by students desire to pass the exam.

SCHOOL SPORTS IN ELEMENTARY EDUCATION IN CITIES IN SÃO PAULO STATE/BRAZIL

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OBJECTIVE: The objective of the current research project is to analyze the elementary school sports conditions in cities of Sao Paulo/Brazil, regarding the following: a) description of the financial and equipment resources; b) the coach's characterization; c) the program planning. METHODOLOGY: The sample was composed of 25 coaches who participated in the Handball Technical School Congress in April 2008. The participants answered a closed questionnaire developed by researchers and validated by specialists. RESULTS: Regarding the financial and equipment resources, it has been noticed that 52% of the coaches considered the equipment to be in good condition, 84% to be genuine, 62.5% to have its maintenance at the appropriate time.; 33.3% of the schools that were evaluated charge some kind of fees from students (weekly, monthly or annual). As regards coach's characterization: their average age is 35,7±8,8; they are mainly male (72%), they had not practiced or played the sports they teach (54.5%), their average experience is of 32.8 months and 68,4% of them work with School Physical Education. The coaches are licensed (43.5%), and 52.2% of them are also Graduates. Over 72% of the coaches have stated they have taken refresher coursers or post graduation ones. As far as planning is concerned, it has been noticed that 68% of the coaches actually do some planning, in an annual basis (37,5%), monthly basis (31,3%) and weekly basis (31,3%). However, they do not follow the policy or program established by the school (68.2%) or its theoretical basis (62.5%); 59.1% of them do not carry out any evaluation and 31.8% have stated that the sport is not linked to the school's Pedagogical Political Project. CONCLUSIONS: It has been concluded that coaches have satisfactory equipment conditions. In spite of the evaluated coaches have stated they worked with School Physical Education, what would immensely help the school's knowledge and consequently the its pedagogical practice, the school Program and its Pedagogical Political Project are not taken into consideration in the School Sporting Practices. Besides that, few coaches carry out evaluation. Something which stands out is the need of other studies that would aim evaluate the study variables in different school origins (private and public), and, the opinion of other participants of the school micro social system, for instance, the coordinator or the director.

INCIDENCE OF INITIATION SPORTS BOOKS IN SPAIN

HERRADOR COLMENERO, M., HUERTAS HERRADOR, J.A., RUIZ VALDERAS, I., LÓPEZ GÓMEZ, S.

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Introduction: The book has a great importance in teaching in Spain, but in PE has a secondary role. The Organic Law on Education introduced a fifth block of content with the launch sports focused on the third cycle of primary education. It is important to know whether the textbooks are adapted to the implementation of this block, and if so, whether it is appropriate to the educational stage.

Methods: We used a sample of 5 editorial impact on our country, focusing on the fifth and sixth courses of primary school. Qualitatively analyzing the initiation of sports through various elements in the publishing and the adequacy of those elements of the age to which they are designed. The factors to consider are: multi-sports, driver availability, cooperation, environment and percentage of pages.

Results: In relation to multi-sports, 5 publishers try 9 different sports. In addition, sports that are working along the publishers are football, basketball, volleyball and handball. If we look at the power plant availability, as well as cooperation, we can show that 4 out of 5 publishers in adapting their content, activities, proposals, etc., Andalusia evolutionary level of the students.

Referring to the sports environment, 1 editorial does not address this issue, and the sport is more work guidance. Finally, the percentage of pages devoted to the sport by launching each book, we see that the sixth books have a higher percentage than the fifth.

Discussion: As can be seen in the results, working a variety of sports in the last cycle of primary education. In addition, four dealt with most sports, are those that are more entrenched in the social culture of the country. All these activities are properly targeted to the age at which they are designed, taking into account the developmental levels of students.

Cooperation will be integrated into the books looking to create a joint work among children, even if a publisher does not provide for this work. Given the sport in the natural environment, sport is more developed and the guidance which allows you to work from an interdisciplinary approach that other sports do not allow the natural environment. We can be seen from the results that most publishers choose to work with this content.

Finally, the percentage of pages devoted to the sport initiation is higher in the sixth because of primary cognitive and motor development of children is greater in this course.

References:

-Castejón Oliva, F. J. (1997). La iniciación deportiva en la Educación Primaria: lo que opinan los profesores de Educación Física. Apunts. Nº 48. Barcelona.

-Chinchilla, J. L. and Zagalaz, M. L. (2002). Didáctica de la Educación Física. Editorial CCS. Madrid.

-Viciana Ramírez, J. (1999). La programación e intervención didáctica en el deporte escolar (I) y (II). La técnica de enseñanza. Apunts. Nº56. Barcelona.

-Zagalaz Sánchez, M. L. and Cepero González, M. (2000). Educación Física y su didáctica, manual para el maestro generalista. Jabalcuz. Jaén

14:15 - 15:15

Poster presentations

PP-SO01 Sociology

SPORT+ FOR SOCIALLY VULNERABLE YOUTH: A QUALITATIVE ANALYSIS OF COACHING PRACTICES

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Introduction: From the beginning of the 90's, so called 'neighbourhood sport' has gained popularity in Flanders (Belgium). Most of the initiatives are primarily aimed at socially vulnerable youth in urban deprived areas. The main intention is to reach youth that are by a combination of causes not being reached by the more traditional organized sports services, and include them on a sustained basis in a sports provision. It is in this context that policy makers, practitioners and researchers refer to the social integrating functions and outcomes that are inherent to sport. Recently, this approach has been labelled as 'sport+', because of the proclaimed added value beyond 'mere' participation. However, literature on the social dimensions and guiding principles of coaches working with socially vulnerable youth within a sporting context remain scarce (Seippel, 2008). We will focus our attention on the specific methodological and didactical conditions of coaching practices that are deemed necessary and desirable in facilitating beneficial and sustainable outcomes on the individual, group and community level.

Methods: The leading question throughout this research can be put as followed: How does a coach, within a sport initiative for socially vulnerable youth, develop his/her specific coaching practices in order to facilitate broader social outcomes, and which contextual factors influence these practices? Semi-structured in-depth interviews were held with coaches within initiatives defined as sport+ (N= 30). In order to constitute a conceptual framework, six dimension were distinguished: sport teaching methods, authority, competences, knowledge, functions, and guidance approach.

Discussion & Results: Research in Flanders showed that a difference in approach is perceived by local sport administrators, in how coaching would have to be done in 'neighbourhood sport' initiatives as compared to coaching within a more regular sports organization (Theeboom & De Maesschalk, 2006). Yet not much is know what these differences actually are. Studies on specific coaching and organization modalities for socially vulnerable youth remain limited and are at best beacon lights for further research (Janssens et al. 2004). Results seems to indicate that coaching practices for socially vulnerable youth are closely correlated with the generated motivational climate, the intra-group communication, the function and integration of the coach within the organization, the characteristics and programming of the activities, the locus of authority, and the specific background and competences of the coach.

References

Janssens, J et al. (eds.) (2004) Education through Sport: An overview of good practices in Europe. Arko Sports Media, The Netherlands.

Seippel, O. (2008). The fine art of coaching: Instructions, social support or democratic participation. European Journal for Sport and Society, 5 (2) , 169-185.

Theeboom, M., De Measschalck, P. (2006) Sporten om de hoek: Een brede kijk op buurtsport in Vlaanderen. ISB

THE NEW SPORTS INSTRUCTORS IN FINNISH CERTIFICATE SPORTS CLUBS

HAKAMÄKI, M.

LIKES RESEARCH CENTER

Introduction: In Finland there are 500 sports clubs that have a quality certificate (Seal Clubs) granted by Young Finland Association. Essential criteria in quality system is that the sports instructors and coaches have attended some course in instructing sports for children, they are tutored in clubs and are aware of the Young Finland -ideology.

Methods

To find out how this goal is achieved a web-based survey was conducted to all new instructors that had a valid e-mail account. Information was gathered on 186 new sports instructors that had been in the position less than a year. Their background, motives and future plans as instructors were asked. Also amount and forms of tutoring in the clubs are reported. In addition the needs of the new instructors are examined.

Results: There were more girls than boys as young new instructors. Their main motive was that sports or coaching was a hobby for them. Adult instructors were usually fathers, whose children were in the club. Half of the instructors said they had been given tutoring, some material or a course. the respondents opinion on courses and tutoring was that they are important.

Discussion: Although the respondents represented the quality certified sports clubs in Finland and there are many courses and training available, many of them thought that tutoring practises in clubs are still insufficent and support is needed.

NON-WESTERN ETHNIC BACKGROUND, GENDER AND SPORT PARTICIPATION AMONG NORWEGIAN ADOLESCENTS

SAND, T.S., SISJORD, M.K., FASTING, K., OMMUNDSEN, Y., ROBERTS, G., SØRENSEN, M.

NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: Both Norwegian and international studies have revealed that adolescents with a non-western ethnic background have a weaker tie to organized sport (e.g., through higher drop-out rates (Strandbu & Bakken, 2007). Research has also uncovered larger gender differences among adolescents with a non-western ethnic background, where girls are less involved than boys. However, little is known to what characterizes adolescents with a non-western ethnic background who are involved in organized sport. This paper therefore, explores whether there are gender differences between adolescent athletes with a non-western ethnic background and majority adolescent athletes in terms of frequency of how much they participate in their sport, involvement in other sports, exercise outside of organized sport, and anticipation of withdrawal from their sport.

Methods

The sample consisted of 1514 athletes aged 12-16 involved in eight different sports. The method of data gathering was the use of a questionnaire. Non-western ethnic background was measured through two questions about mother's and father's birthplace respectively. Both parents born in a non-western country implied categorization as non-western ethnic background, while the remaining were categorized as majority adolescents.

Results: Significantly fewer athletes with a non-western ethnic background than majority adolescents were involved in other organized sports, and/or were doing other kind(s) of exercise in addition to their sport. Additionally, more adolescents with a non-western ethnic background anticipated they would withdraw from their sport the following season. There was also a tendency for athletes with a non-western ethnic background to take part in fewer practices a week in their sport. These differences are due to the boys' sport participation. Boys with a non-western ethnic background participated in fewer other organized sports, did less other kind(s) of exercise in addition to their sport, and more anticipated they would withdraw from their sport the following season, compared to majority boys. There were no significant differences between girls with a non-western ethnic background and girls from the majority.

Discussion: The findings will be discussed in relation to gender theory and Strandbu's (2006) four main explanations for under-representation of athletes with non-western ethnic background in sport; (1) religion, (2) culture, (3) resources, and (4) discrimination.

References

Strandbu, Å. (2006). Sport, gender, body and culture: minority girls' meeting with Norwegian sport [Idrett, kjønn, kropp og kultur: minoritetsjenters møte med norsk idrett]. Oslo: Norsk institutt for forskning om oppvekst, velferd og aldring.

Strandbu, Å. & Bakken, A. (2007). Active adolescents in Oslo – A study of sport, minority background and gender [Aktiv Oslo-ungdom – En studie av idrett, minoritetsbakgrunn og kjønn]. Oslo: Norsk institutt for forskning om oppvekst, velferd og aldring.

SPORT PARTICIPATION, SOCIAL CLASS AND GENDER. A STUDY OF NORWEGIAN ADOLESCENTS.

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THE NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: The relationship between sport and social class has been extensively examined. Research on adult populations give strong empirical support for the view that sport preference and social class are closely related (e.g. Sudgen & Tomlinson, 2000), however, studies on youths (in Norway) are less convincing (Grue, 1985; Krange & Strandbu, 2004). This paper, which is part of a larger study exploring socio-cultural and psycho-social dimensions in youth sport, addresses the relationship between social class, gender, and participation in organized sport, both in general terms and looking at a sample of sport disciplines.

Theoretically, the paper draws on Bourdieu's conceptualization of social class, emphasizing economic and cultural capital as vital predictors for lifestyle choices and social distinction (Bourdieu, 1984).

Methods: The sample consists of 1514 athletes aged 12-16 years (41% females and 59% males) from eight different sports; fotball, track and field, handball, basketball, volleyball, floor-ball, cross country skiing, and alpine skiing. Data collection was made by means of questionnaire conducted in connection with team practice. To measure social class we used 'number of books at home' as indicator of cultural capital (similar measurement is used in national investigations). The variable consists of three values: 1) less than 100 books, 2) 101-500 books, and 3) more than 501 books.

Results and Discussion: The results show a strong relationship between sport participation and social class, with 26% in category 1, 33% in category 2, and 41% in category 3. In relation to gender, the results reveal evidence for a stronger class component for females (18%, 35%, 47%) than for males (31%, 31%, 38%).

When divided by sport discipline, the results show relationships on each sport except for floor-ball which shows the opposite pattern (highest percentage in category 1 and lowest in category 3). When divided on gender, female participants follow the positive class-relationship for all sports except for volleyball; whereas males diverge on the following sports: Track and field, handball, and basketball. The findings will be discussed in relation to previous research and Bourdieu's conceptualization of social class and cultural capital.

References

Bourdieu, P. (1984). Distinction. A Social Critique of the Judgement of Taste. Routledge & Kegan Paul

Grue, L. (1985). Bedre enn sitt rykte. En undersøkelse om ungdoms fritidsbruk. Fase 2 av Foreningsundersøkelsen. Oslo: Kultur og Vitenskapsdepartementet

Krange, O. & Strandbu, Å. (2005). Ungdom, idrett og friluftsliv. Skillelinjer i ungdomsbefolkningen og endringer fra 1992 til 2002. Norsk institutt for forskning om oppvekst, velferd og aldring. Oslo: NOVA Rapport 16/2004

Sudgen, J. & Tomlinson, A. (2000). Theorizing Sport, Social Class and Status. In J. Coakley & E. Dunning (Eds.) Handbook of Sports Studies. Sage Publications, p.309-321

MAIN RESULTS OF THE FINNISH PROGRAM FOR CHILDREN'S AND YOUNG PEOPLE'S SPORT

HAKAMÄKI, M., LAAKSO, N., LAINE, K., LEHTONEN, K., SAARI, A.

LIKES RESEARCH CENTER

Finland has a program for children's and young people's sport comprising various supportive and development measures to encourage young Finns to engage in sports daily. The aim is to increase young people's physical activity.

Among others, the program supports after-school sports development projects, sports clubs which arrange physical activities for children, and inclusive practises in sport. Special focus is on physically inactive children and teenagers.

The program has been evaluated continuously by LIKES Research Center. The evaluation is based on interviews, observations, surveys and analyses of the documents produced during the program.

In this presentation the key results are summarised.

POPULARITY AND ASSERTIVENESS OF ATHLETIC ADOLESCENT PUPILS IN THE CLASSROOM

HOTTER, B., KORNEXL, E., RÖSER, D.

UNIVERSITY OF INNSBRUCK

Introduction: Popularity and social acceptance are important values for youth. Research shows a close connection between sport performance, self-esteem and social status of adolescents (1,2). Sport participation in adolescents is positively associated with indices of

adjustment such as self-esteem. The aim of this study was to compare popularity and assertiveness of athletic pupils with non-athletic pupils.

Method: To determine which pupils were most liked and qualified to act as class representative a sociometric questionnaire was used. Sociometry is a quantitative method for measuring social relationships developed by Moreno (3). He developed methods to analyse interpersonal emotional relationships within a group. His methods can be used to identify informal leaders and social rankings. Pupils ranked their favourite classmates in the following: neighbour in class, leisure companion, and spokesperson in conflict situations. The five best and worst athletes in each class were ranked by the respective physical education teachers. The nominations for best or worst athletes were tabulated (3 points for first ranking, 2 points for second, and so on). The study was conducted in January 2007 in two schools (one girls' school, one boys' school) in western Austria. Data from a sample of 174 adolescents (93 male, 81 female), aged between 12 and 17 in seven different classes were examined.

Results: There was a significant preference of athletic pupils as neighbours ($p<0.05$) and as leisure companions ($p<0.01$). Trends were evident that athletic pupils were favoured as spokespersons. Athletic pupils achieved higher ranks in all categories.

Discussion: Humans often believe that behaviour is influenced by stable personality traits rather than by situational influencing factors (4). The present study shows a good correlation between athleticism and popularity but less correlation between athleticism and assertiveness.

It is evident in this sample that adolescents positively associated athleticism with social acceptance. Research shows a link between sport participation and better behaviour in school. Sport can teach children social skills such as how to communicate, commit and collaborate.

1 Alfermann D (1998). Selbstkonzept und Körperkonzept. In: K Bös, W Brehm (Hg.). Gesundheitssport (212-220). Schorndorf

2 Späth U, Schlicht W (2000). Sportliche Aktivität und Selbst- und Körperkonzept in der Phase der Pubeszenz. Psych und Sport, 7, 51-66

3 Moreno JL (1967). Die Grundlagen der Soziometrie. 2.,erw. Aufl., Köln und Opladen

4 Hartung J (2006). Sozialpsychologie. 2.,erw. Aufl., Stuttgart

EVOLUTION OF COEDUCATION IN PHYSICAL EDUCATION IN SPAIN: SCHOOLS WITH THE PLAN OF COEDUCATION.

HUERTAS, J.A., HERRADOR, M., LARA, A.J., PEINADO, O.

UNIVERSITY OF JAÉN

Introduction: In this study, we show the relationship that has existed throughout history between women and Physical Education. We analyze the most influential in this regard, referring to the spatial distribution, language, effort and discrimination, found after a historical review, which followed focused on the historical development of Physical Education, they are watching relationships that the woman had with her. Finally, we sought to compare the centres that have the Plan of Co-education and those who do not possess.

Methods: To obtain an update on these four elements, a semi-structured interview of 15 questions for teachers in service, about the impact of these agents in the classrooms.

Results: The results of the study are:

- Spatial distribution: the 42.85% of respondents indicated that boys and girls sharing the space in the classroom, while 57.15% say that they do not. Among those indicating that if they share the space, we can state that in these school is Coeducation Plan implemented.
- Language: 28.57% of the teachers accept the use of sexist language on occasion. On the other hand, 71.43% do not use it, being inside all the teachers who are in a school with the Plan of Coeducation.
- Effort: The 42.85% of teachers surveyed say that there are differences in the assessment effort, using different scales for boys and girls. By contrast, 57.15%, not making distinctions.
- Discrimination: the 85.71% of teachers observed discrimination between boys and girls, while 14.29% did not observe.

Discussion: When comparing the data obtained with the historical suffering, we can see many similarities and developments that have occurred in these 4 areas of study:

- Spatial distribution: until the introduction of mixed schools, boys and girls doing physical education in various space environments. When these spaces are shared, problems occur sometimes by the occupation of the city, not going with the Plan of Coeducation.
- Language: This type of discrimination has been used throughout history, especially recently, but is now being eradicated. This problem does not occur in places with the Plan of Coeducation.
- Effort: in general, the evaluation effort is the same mode for both sexes, which has school in both Plan and non Coeducation.
- Discrimination: throughout history, discrimination has always been in benefit of males, and now can be seen in high percentages, which are both in the school of Coeducation Plan as in those who do not possess.

References:

- García M. y Asins C. (1994): La coeducación en educación física. Institut de Ciències de l'educació, Universitat Autónoma de Barcelona, Barcelona.
- Rodríguez López, J. (2000): Historia del deporte. INDE publicaciones, Zaragoza.
- Zagalaz Sánchez, M.L. (2001): Bases teóricas de la educación física y el deporte. Universidad de Jaén, Jaén.
- Zagalaz Sánchez, M.L. (1998): La educación física femenina en España. Universidad de Jaén, Jaén.

SOCIAL-DEMOGRAPHIC DETERMINATS OF SPORT PRACTICE FOR THE POPULATION OF THE METROPOLITAN AREA OF MADRID

GARRIDO-MUÑOZ, M., RODRÍGUEZ-ROMO, G., FERNÁNDEZ DEL VALLE, M., MERINO, A., LÓPEZ-DÍAZ, A.

EUROPEAN UNIVERSITY OF MADRID (UEM)

Introduction: Numerous studies have analyzed the influence of different social-demographic variables on the levels of sports participation (García, 2006; Sports England, 2004). In the region of Madrid, the only recent study which analyzed the sports habits of its population was Rodríguez-Romo et al. (2005, 2006). In the present work we analyze the possible relationships amongst some sociodemographic characteristics of the population (gender, age and social status) and certain indicators of sporting interest and behaviour.

Methods: A descriptive study with cross sectional design was used for data collection, utilizing a questionnaire administered through personal interview. Residents of the metropolitan area of Madrid aged from 15 to 69 years comprised the study population. 625 people was selected, with a margin of error of the + 4% and a confidence interval of 95.5% for the whole population. Multistage sampling was used with an ad hoc questionnaire and a descriptive analysis and a non-parametric Chi-Square test was performed on the data.

Results: The results obtained showed that the perception of the population of Madrid regarding the need to practice physical activity and/or sport was related to the social status of those polled [X2 (2) = 9.764; p<.01]. Also significant differences were found in the global rate of sports practice according to the gender [X2 (1) = 17.345; p<.001], the age [X2 (4) = 32.798; p<.001] and the social status [X2 (2) = 16.335; p<.001] of the participants. On the other hand, the frequency of sports practice only seemed to be related to the age [X2 (4) = 11.671; p<.05].

Discussion: The majority of the population of Madrid is conscious of the benefits of the regular practice of physical activity and/or sport. However differences can be observed with the social status. The rate of sports practice is 55.7%, this is 15.7% more than that of the Spanish population (Garcia, 2006). This rate of practice is greater in men than in women; in the youngest participants (from 15 to 34 years) than in those of more advanced age (from 55 to 69 years) and in the people of middle and upper class than in those of lower social status. Approximately 90% of sport participants carry out physical activity and/or sport at least once a week. These figures barely differ according to the gender, although this is not so with age.

References

García M (2006). Encuesta sobre hábitos deportivos de los españoles 2005. CSD-CIS, Madrid.

Rodríguez-Romo G, Mayorga JI, Merino A, Garrido M, Fernández M (2005). Hábitos deportivos de la población de la Comunidad de Madrid. Consejería de Cultura y Deportes, Madrid.

Rodríguez-Romo G, Mayorga JI, Merino A, Garrido M, Fernández M (2006). Kronos, 9, 54-66.

Sport England (2004). Driving up participation. The challenge for sport. Sport England, London.

PUBLIC HEALTH THROUGH PHYSICAL ACTIVITY AND HEALTHY NUTRITION IN NORWEGIAN SCHOOL

SKOGVANG, B., STORBERGET, A., NORHEIM, T., SALSTEN, C.

HEDMARK UNIVERSITY COLLEGE

A lot of focus has been put on public health and the need for daily physical activity and healthy nutrition for children both in Norway and in other European countries. The Norwegian Government has published research, strategies and policy documents (Departementene, 2005, Departementene 2007, Helsedepartementet 2003). Several research projects are done in this field in Norway like for instance Andersen et. al. (2004), Andersen, L. B. (2006), and Kjønniksen (2008). This poster discuss if and how daily physical activity and focus on healthy nutrition among school children effect public health, exemplified through the on-going project "Daily physical activity and nutrition in primary school" in Norway (Skogvang, et.al.2008, Storberget et.al. 2008).

Methods used in the research project are; surveys, observations and in-depth interviews. A survey is done among PE-students at Hedmark University College (HUC). Observations are done in PE-classes and also through watching the children's physical activity when they play in the breaks. In-depth interviews are done among employers at the primary school (PE teachers, headmaster etc.), and in-depth interviews with pupils and parents are going on now.

Results from the survey with the students show that PE-students state that daily physical activity is positive for the pupil's future health. Also the employers at the primary school state that daily physical activity and more focus on healthy nutrition among school children is crucial for the public health. Data from the observations and in-depth interviews with the parents and pupils will be presented at the congress poster, but they are not analysed yet.

Refrences:

Andersen, L. B. (2006) Fysisk aktivitet og barn/unge, overvekt og metabolsk syndrom. Foredrag på 'Barn si helse-fysisk aktivitet, kroppsøving og måltid i skulen'. Førde.

Andersen, S. et.al. (2004) Overweight and obesity among Norwegain school children: Changes from 1993-2000. Scandinavian Journal of Public Health.

Departementene (2005). Handlingsplan for fysisk aktivitet 2005-2009. Sammen for fysisk aktivitet. Oslo.

Departementene (2007). Oppskrift for et sunnere kosthold: Handlingsplan for bedre kosthold i befolkningen (2007-2011). Oslo.

Helsedepartementet (2003) Resept for et sunnere Norge. Departementene, Oslo. (St.melding. (nr. 16 (2002-2003).

Kjønniksen, L. (2008) The Association Between Adolescent Experiences of Physical Activity and Leisure-time Physical Activity in Adulthood: A 10-year Longitudinal Study. Dissertation for the degree of philosophiae doctor (PhD), University of Bergen, Norway.

Skogvang, B. et.al. (2008) Fysisk aktivitet på mellomtrinnet i grunnskolen. Et studentinvolvert samarbeidsprosjekt mellom Høgskolen i Hedmark og Søbakken skole. Høgskolen i Hedmark Rapport nr.4-2008, Elverum.

Storberget, A. et.al. (2008) Friluftsliv og dans på mellomtrinnet. Et studentinvolvert samarbeidsprosjekt mellom Høgskolen i Hedmark og Søbakken skole. Høgskolen i Hedmark Notat nr.7-2008, Elverum.

THE <RE>CONSTRUCTION OF NATIONAL IDENTITY THROUGH ENTERTAINMENT IN CASE OF THE EUROPEAN FOOTBALL CHAMPIONSHIP <EURO> 2008: THE ONLINE OPTION

DIMITRIOU, M., SATTLECKER, G., HOFFMANN, F., MÜLLER, E.

UNIVERSITY OF SALZBURG

New technologies, in particular their applications in the field of Internet, digital television and mobile telephony, are also producing new distribution platforms and services for the delivery of sports content. Online media have grabbed the attention of communication researchers in the second half of the 1990s, but the focus to date has been primarily on media audiences and their use of these new forms. Regarding the penetration of nationality in the media sport coverage a number of studies illustrated the impact of representation of national identity in newspaper and TV-coverage of sport events (Blain et al. 1993, Billings/Eastman 2002).

The purpose of this study was to analyse the relationship between content of the online sport portals and national or international orientation during the European Football Championship (EURO) in June 2008. More specifically the research will seek to identify the contribution of the new information technologies in the reconstruction of the national identity.

The survey employed content analysis of six online sport portals – Kicker.de and Sport1.de (GER), Nzz.ch/sport and Sport1.ch (SWI), Laola1.at and Sport.orf.at (AUT) – during the EURO. In order to select the sport sites to be coded, the Nielsen/NetRatings top 20 sport news list (GER), the Austrian Web Analysis (AUT) and the Netreport.net-metrix.ch (SWI) were consulted to determine the most prominent sport news sites. The analysis focused on the first three navigation levels of the homepages. To explore this more systematically, the contents of the websites were coded by two principle dimensions (communication interactivity and information transparency). The communication interactivity included four categories: social interaction, integration, research and multimedia. On the other side, the content transparency

was evaluated by measuring the appearance of sports reporting, the presence or absence of the types of sports reporting and the focus on the national or international coverage regarding topics and personalities.

Concerning the communication interactivity the analysis illustrated that all online sport portals have adopted interactive innovations to produce spectacular entertainment. In concrete, the study found that the commercial portals Kicker.de, Sport1.de, Sport1.ch and Laola1.at have used more integration and multimedia elements than the Nzz.ch/sport and Sport.orf.at. In view of the national or international orientation of the sport coverage, the analysis showed that all online portals focused on the national topics and athletes. Further, national media representation was often characterised by stereotyping of other nations - for example Germany at Laola1.at (AUT). The main result of this study was that the construction of national identity can find expression in online sport coverage.

References

Billings/Eastman (2002). Int. Re. Sociology Sport, 2, 157-165.

Blain et al. (1993). Sport and national identity in the European media, Leicester.

15:15 - 16:45

Invited symposia

IS-SS08 Young people, school sport and physical education

YOUTH SPORT IN NORWAY: THE FINDINGS FROM STATISTICS NORWAY

VAAGE, O.F.

STATISTICS NORWAY

Interview surveys of Norwegians' living condition made by Statistics Norway did in 2004 and 2007 contain questions about sports activities. The data cover persons from 6 to 79 years. The surveys cover a wide range of activities, but a general question of physical activities in people's leasure time is included.

In the paper we shall most of all look at young people's sports activities, covering persons from 13 to 19 years: What kinds of activities do they prefer and what do they not prefer? Are there differences between boys and girls? Do the young teenagers prefer other activities than the older teenagers? How does their general physical activity differ? We shall also look at young persons' activities compared to activities of children and adult persons.

SPECULATING ON THE RELATIONSHIP BETWEEN PHYSICAL EDUCATION, YOUTH SPORT AND LIFELONG PARTICIPATION

GREEN, K.

UNIVERSITY OF CHESTER & NORWEGIAN SCHOOL OF SPORT SCIENCES

The central concern of this paper is the long-standing issue of whether it is possible to identify a 'causal' link between school PE and youth sport that might implicate PE in promoting increased engagement with sport and active recreation among young people.

There is a body of research – exploring among other things the so-called 'determinants' and 'correlates' of participation in sport over the life course – which purports to show that active participation in sport during childhood and youth is an important prerequisite for involvement in later life. However, the findings from such studies typically leave the question 'What specifically does PE contribute to any "carry-over" effect?' unanswered.

It is entirely plausible that for some young people, the effects of PE on their leisure-sport participation are causal in a necessary sense; that is, without the impact of PE they simply would not take part in any sport in their spare time. PE may, therefore, be important for those youngsters for whom it provides the only opportunity to engage with sport and active recreation or particular activities. It is equally feasible that without the intervention of PE, some youngsters would not take part in particular sports in their leisure to which they are introduced by their PE teachers via curricular or extra-curricular PE. In such cases, PE may be sufficient in itself to result in the desired effect. The evidence for a 'PE effect' on youth and adult sports participation more generally, however, is indirect at best. All-in-all, it seems that school interventions (via PE) appear likely only to impact upon youth sport around the margins; that is to say, they may only be effective within what Birchwood, Roberts and Pollock (2008) refer to as a 'mini.-max. range' to which young people are already predisposed by virtue of their socialization (in the family setting in particular) into or away from sport.

Ongoing attempts to identify conditions in which PE may have an effect, however slight, on participation in sport and active recreation among young people in the here and now (as well as adults in the future) stand to benefit from studies which add a qualitative dimension to the growing list of quantitative studies. That said if research into the sporting careers of those locked into sport as adults provides a barometer of the impact of PE, then improvements in participation levels are more likely among those already engaging with in sport and active recreation in their leisure. Even where interventions such as PE do boost levels of sports participation during school time these levels are likely to be unsustainable beyond school in so far as they exceed the proportions of young people genuinely motivated to take part.

Reference

Birchwood, D., Roberts, K. and Pollock, G. (2008) 'Explaining differences in sport participation rates among young adults: Evidence from the South Caucasus', European Physical Education Review, 14(3): 283-300.

PHYSICAL EDUCATION AND YOUTH SPORT IN SCANDINAVIA

ANNERSTEDT, C.

NORWEGIAN SCHOOL OF SPORT SCIENCES

The purpose of this session is to give an overview of physical education and youth sport in Scandinavia: The focus is on Sweden.

A comparative analysis reveals many similarities between the school systems as well as between PE in the Scandinavian countries. It even seems possible to talk about a Scandinavian model for PE, characterized by a broad content area, where pupils choose from a kind of smorgasbord of physical activities. Although these take the form of multi-activity programs in practice ballgames, gymnastics, fitness training and track and field dominate the subject. On the other hand, typical activities for Scandinavian culture like skiing, skating, orienteering and outdoor education also form part of a PE program. Further, health is a central proficiency area in PE in especially Sweden and Finland. However, what a health perspective means in practice is seldom discussed and the teachers have difficulty defining the concept.

In the Scandinavian countries sports are also offered either as specific programmes or as available options. Schools in Sweden can have either an elite approach, developing talents in different sports, or a sports-for-all approach, where the focus of sporting activities is on the health benefits. In 2007, 17% of elementary schools (grade 1-6) and 34% of secondary compulsory schools (grades 7-9) in Sweden offered a certain sports profile at their school. In upper secondary the figures were much higher; 51% of the Swedish state schools and 45% of the independent schools (private schools) stated that they had a sports profile. These sporting profiles are probably the most surprising changes regarding PE in Sweden in recent years.

There used to be a tradition of school teams and competitive sport in Scandinavian schools. Nowadays, there seems to be a resistance due to two reasons: a general negative attitude towards competitiveness at school and the tradition of having all sorts of sport activities easily accessible during leisure time. This has led to a decreasing interest in school sport, even though there are still extra-curricular school sports available.

However, organized sport is highly valued in Scandinavia during leisure time and attract major parts of its citizens in one way or another. In Sweden about two thirds of all children and youth are members of some of the 22.000 sports clubs all over the country and almost 80% of their parents are, in some way, voluntary involved in the daily work in the clubs. The Swedish government has during the last years also introduced a big program called the Handshake in order to stimulate physical activity and sport. This is a huge investment of 50 million Euros per year during 8 years and includes cooperation between the sport federations and the schools.

15:15 - 16:45

Oral presentations

OP-PP02 Physical Education and Pedagogics 2

BODY CULTURE WITHIN THE EU'S COMPETENCE SYSTEM

HAMAR, P., SZILVA, Z.S., SOÓS, I.

1. SEMMELWEIS UNIVERSITY, 2. BUDAPEST AMERICAN INTERNATIONAL SCHOOL OF BUDAPEST, 3. UNIVERSITY OF SUNDERLAND, UK

Introduction: Proficiency and customs in body culture are essential in drawing the picture of 21st century education and civilization; it is even more important when sketching key knowledge competencies and life in schools. Despite the significance of body culture, it was not included in EU's framework of key competencies. This paper addresses reasons for the necessity of the key competency that represents the values of body culture.

Competence

The word "competence" originates from the Latin "competentia", which means skilfulness. It is mostly embedded in cognitive features but motivation elements, abilities and emotional factors also have important parts in it. Another interpretation implies that competencies comprise basic knowledge that reveals the individual's competitive abilities in life. In competencies-based education, competence means possession of knowledge of something. Curricula based on competencies emphasize abilities that need to be developed as opposed to curricula based on content that emphasise arranging syllabuses.

Competence systems of Hungarian curricula

Recent political changes in Hungary have brought changes in preferences of values, but the former approach of a nation only having a future that is healthy and physically active has remained; this persisting approach retains the value of health and physical active. Thus, the following aim was emphasized: "Development of understanding of the importance of health as a value throughout all areas in social and economic life is our highest common interest" (Program of National Revival, 1990). All-round improvement of physical and mental abilities was, in the outlined future perspective, a task to be completed in order to meet requirements that were set by the environment in the fields of health, lifestyle and behaviour. The common standards of teaching different cultural domains, so-called key competencies, were established in this spirit in the 1995 National Curriculum.

Necessity of key competencies in body culture

The key competence that involves all kinds of values of body culture should not be omitted from the EU's framework of key competencies and from basic pedagogical and educational goals. "Body cultural" should be employed as a terminus technicus. Development of the key competencies of body culture can happen in early childhood, in elementary, in high school, in university and in adult education. Different levels of education can only achieve the required life long development effect together with conscious practice of sport activities. Collectively family, school and sport institutions can provide the educational spheres of developing the competencies of body culture.

References

Program of National Revival. First Three Years of the Republic. (A nemzeti megújhodás programja. A Köztársaság első három éve.) Budapest, 1990. www.eski.hu

Hungarian National Core Curriculum (1995). Ministry of Culture and Education, Budapest. 3-24; 247-259.

PEDAGOGICAL REPRESENTATIONS AND PRACTICES OF PHYSICAL EDUCATION UNIVERSITY PROFESSORS

STADNIK, A., CAMILO-CUNHA, A., PEREIRA, B.

UNIVERSIDADE TECNOLÓGICA FEDERAL DO PARANÁ; UNIVERSIDADE DO MINHO

Introduction: Within this study about university professors of Physical Education and their reality we have taken two paths: on the one hand, a more cognitive one based on the professors' thoughts (representations); and on the other, their actual practice which is based on

their actions. The approach we have opted for relates straightly to the significance the professors themselves give to their daily professional lives.

Methods: We have chosen a qualitative approach. The rationale behind this study underlies an interpretative nature whose focus of interest and methodological analysis lay on observation and interviews. It is based on diagnosing observed facts: we have collected, described, interpreted, and presented a given reality data without interfering in it (Gil, 1994). The sample for accomplishing this research is: two men and two women professors who have been teaching for more than ten years, who have either a master or a doctor degree, and are considered competent within their working environment – considering the importance of good models for students, specially because of modeling learning. As learned from Ferraroti (1979), we have pondered that a small and deliberate chosen sample, when deeply dealt with, could meet our goal needs, after all, "if each individual represents a single re-appropriation of the social historical universe surrounding us we can come to know its social aspect from the irreducible specificity of an individual praxis" (p. 51).

Results: Their lives history illustrate the plurality of meanings each professor attributes to their life, which somehow brings, by means of integrating their thoughts and action, what their professional life is like in that given moment.

Discussion: The reflection upon the lives history led the study to present a possible profile of "the good Physical Education university professor", by means of disclosing and reflecting on their personal characteristics as well as scientific and social features, which we believe can be entailed within their attitude, their thoughts and curricular action towards the Physical Education teachers-to-be. We came to find, among other facts, that the professors we have analyzed show a great coherence between their speech and their actions and we have concluded that those are constantly diligent professors and that despite being deemed to be good professionals within their social environment and being self-confident, they go through numberless difficulties in several aspects of their lives, particularly when it concerns applying, transforming and innovating their pedagogical actions. Notwithstanding, they are tenacious and resilient. And finally we can state that those professors love what they do and they try to do their best.

References

Ferrarotti, F. (1979). Sobre a autonomia do método biográfico. In A. Nóvoa & M. Finger (1988). O método (auto)biográfico e a formação. Lisboa: Ministério da Saúde, pp. 17-34.

Gil, A. C. (1994). Métodos e técnicas de pesquisa social. São Paulo: Atlas.

"SENSITIVITY TOWARDS STRANGENESS": MEASUREMENT AND PRACTICAL IMPLICATIONS WITHIN THE FIELD OF PHYSICAL EDUCATION

ESSER-NOETHLICHS, M.

OSLO UNIVERSITY COLLEGE

Introduction: The objective of this paper is to present a conceptualization of "sensitivity towards strangeness", its measurement, and practical implications within the field of physical education. Long term goals are intended to develop training programs which will develop and/or improve sensitivity towards strangeness - in particular through the medium of sport and physical activity. The evaluation of the intended training program, however, requires measuring instruments. As a result, the sensitivity towards strangeness questionnaire (STSQ) is developed in order to measure effects of intervention activities in a quasi-experimental design.

Strangeness appears to be a central construct within the field of intercultural education (Auernheimer 2005; Erdmann 1999; Gieß-Stüber 2005). In this context, strangeness is basically understood as a social construction (Simmel 1994; Hahn 2000). Terms such as "xenophobia" and "hatred against strangers" illustrate problematic consequences related to this phenomenon.

However, sensitivity towards strangeness also means learning to deal with perceived differences and strangeness constructively. The insight that strangeness is not an attribute of a person or social group but a socially constructed perception is a crucial element when intending to improve mutual understanding. In addition, knowledge about the structures and mechanisms leading to strangeness is compulsory in order to meet these situations with a certain degree of open-mindedness and being capable of dealing with implicit uncertainty as well.

Method and Results: As a result, sensitivity towards strangeness questionnaire (STSQ) is developed theory-based and with a number of related field studies and quasi-experimental design.

In addition, practical situations were experienced within P.E. school classes and on-the-job-training with teachers and P.E. students in order to examine the options of improving a STS through the medium of sport and various types of physical activities.

Conclusion and outlook: Thus, these practical experiences seem to be fruitful in terms of the theoretical assumed direction, but further research is required in order to examine the effects of such interventions under more scientifically controlled circumstances. The STSQ is consequently supposed to be one central indicator in order to evaluate training programs with respect to increasing sensitivity towards strangeness.

References

Auernheimer, G. (2003). Einführung in die interkulturelle Pädagogik. Wissenschaftliche Buchgesellschaft.

Erdmann, R. (1999). Interkulturelle Bewegungserziehung. St. Augustin: Akademia.

Gieß-Stüber, P. (Ed.) (2005). Interkulturelle Erziehung im und durch Sport (Reihe: Sport und Soziale Arbeit). Münster, Hamburg, Berlin: LIT-Verlag.

Hahn, A. (2000). The social construction of the stranger. Alexander von Humboldt-Mitteilungen 75, 11-23.

Simmel, G. (1992). Exkurs Über Den Fremden. Ed. A. Loycke. Frankfurt, New York: Campus Verlag,. 9-16.

ASSESSMENT IN PE - DIFFICULTIES AND CONSEQUENCES OF A CRITERION-REFERENCED SYSTEM.

ANNERSTEDT, C., LARSSON, S.

NORWEGIAN SCHOOL OF SPORT SCIENCES AND UNIVERSITY OF GOTHENBURG

Background: A new national assessment system was introduced in Sweden in 1994 – a criterion-referenced system instead of the former norm-referenced system – which meant other ways of assessing and that teachers at every school were to discuss, develop and formulate local criteria for assessment.

Purpose: The study is about how PE teachers' experience the criterion-referenced grading system and what consequences one can see. It aims specifically at investigating which aspects teachers discern in grading students in PE.

Method: The study is divided in two parts; one quantitative looking at the development of grades in PE over a seven years period and comparing grades given in the municipal schools with those given in the independent schools, and one qualitative in which we conducted semi-structured interviews with 20 PE teachers about which aspects they discern in assessing students.

Findings: The study shows significant changes towards giving higher grades in PE. However, this slide towards higher grades can also be seen in other subjects and it seems as if assessment in PE is not significantly different from assessment in other subjects. Furthermore, grades given in the independent schools are significantly higher than those given in the municipal schools.

There is also considerable discrepancy between schools. This can partly be explained by differences in socio-cultural capital, but there are also great differences between teachers in the same school that can only be explained by different approaches to grading and to what and how they assess their students.

The teachers mean that they were not properly informed about why they should formulate assessment criteria and how to do it and they were given very little in-service training regarding assessment. They also claim that guidance given from the national authorities were indistinct, unclear and somewhat difficult to understand.

Due to the lack of guidance and support, other ways of assessing have been developed locally, sometimes concealed and contrary to the national directions. Furthermore, there seems to be combinations of norm-referenced and criterion-referenced principles in use. Even personal criteria, or what can be labelled as "gut-feeling", sometimes determine the outcome of assessment in PE. The data also indicate that the teachers make judgements about students´ level of achievement without explicit reference to the national criteria in PE or even to the schools´ "local work plans" and "local grading criteria". The following is assessed in PE: presence, effort, social capability, leadership skills, skill in physical activities and sport as well as knowledge about PE.

Many years after the change in grading systems, assessment of students does not seem to occur in line with the intentions of the reform. The criteria are not always openly stated by the teachers and therefore not accessible to the students. Thus, there still seems to be many problems in reaching fair and equivalent grading of students in Swedish PE.

PHYSICAL EDUCATION TEACHERS ATTITUDES TOWARDS STUDENTS WITH DISABILITIES

HERNÁNDEZ VÁZQUEZ, J., BOFILL RÓDENAS, A., NIORT, J.

INSTITUT NACIONAL D'EDUCACIÓ FÍSICA DE CATALUNYA

Introduction: The political model of educative inclusion in Spain emphasizes the external resources and ignores the training of the ordinary teaching staff dealing with special educative needs students, being the teaching staff formation an aspect that needs improvement.

Methods: The final purpose of this study is to develop the degree formation and lifelong learning of the teaching staff in physical education dealing with attention to the diversity by having the physical education teachers (n=59) at secondary school, in Barcelona, to answer and complete a questionnaire as regards the intervention of the teaching staff in the classroom with this kind of students. Concretely, the self-perception of the teachers with special educative needs students regarding their performance as professors.

Results: The results show a complex situation among the teaching staff, perceiving a lack of resources to optimize their competence with the pupils with special educational needs. Also an improvement of the formation and the attitudes of the teaching staff of physical education is required in order to take care of the attention at the diversity.

Discussion: The study describes a social and educational profile as regards the situation of the teaching staff related to the pupils with special educational needs. It is necessary to stand out that one of the objectives of the current educative legislation is the attention to the students with special educational needs. More resources and a training of the teaching staff working at the ordinary educative schools focused a initial formation but also a longlife learning to take care of the diversity is needed. From the knowledge and the data obtained we can improve the programs of degree formation and longlife learning.

References

Bryant, L. G., & Curtner-Smith, M. D. (2008), Impact of a physical education teacher's disability on elementary pupils' perceptions of effectiveness and learning. Adapted Physical Activity Quarterly, 25, 118.

Dunn, N., Shields, N., Taylor, N. F., & Dodd, K. J. (2007). A systematic review of the self-concept of children with cerebral palsy and perceptions of parents and teachers. Physical & Occupational Therapy in Pediatrics, 27(3), 55-71.

Folsom-Meek, S. L., & Rizzo, T. L. (2002), Validating the physical educators' attitude toward teaching individuals with disabilities III (PEATID III). Adapted Physical Activity Quarterly, 19, 141-154.

Koka, A., Hein, V. S., Meegan, A., MacPhail, A., & Avramidis, E. (2006). Perceptions of teachers' positive feedback and perceived threat to sense of self in physical education: A longitudinal study. European Physical Education Review, 12(2), 165-179.

Kudláèek, M., Válková, H., Sherrill, C., Myers, B., & French, R. (2002), An inclusion instrument based on planned behavior theory for prospective physical educators. Adapted Physical Activity Quarterly, 19, 280-299.

15:15 - 16:45

Oral presentations

OP-SO03 Sociology 3

SPORTS PARTICIPATION FROM ADOLESCENCE TO MIDDLE AGE - A 38-YEAR FOLLOW-UP STUDY

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Many studies have found that there is a low to moderate association between exercise during adolescence and exercise habits in adulthood. A question that arises from these earlier studies, with a follow-up period of about 5 to 20 years, is how children's and adolescents' physical activity affects their inclination to exercise later in life, after the age of 50, e.g. after a follow-up period of almost 40 years.

The main objective of this study is to illustrate whether, and in that case how, differences in sports experiences during childhood and adolescence and differences in cultural capital are reflected in exercise habits in middle age. The specific research questions are: (i) How does sport habitus formed during childhood, in physical education lessons at school and through leisure time sports during leisure time, relate to exercise habits in middle age? (ii) How does the cultural capital acquired during childhood relate to exercise habits in middle? The analysis takes its starting point in Pierre Bourdieu's conceptual framework.
The individuals included in this follow-up study were first contacted in 1968 when they were 15 years old. Follow-up contact and information gathering has been conducted on six additional occasions, primarily via questionnaires sent by post. In 2007 the highest possible number of responses was 1,979. A total of 1,518 responses were received, which corresponds to 77 per cent of the total reachable group.

Neither membership of a sports club nor the amount of time spent on sports activities at the age of 15 had any significant association with the exercise habits displayed in middle age when the individual's breadth of sport experience was used as a simultaneous control. As indicators of sport habitus both the breadth of sport experience during leisure time and grades in Physical Education had a significant association with later exercise habits. There was also an almost five times greater chance that an individual with a very high cultural capital at the age of 15, as defined by their social background and grades in theoretical subjects, was still an active exerciser 38 years later in comparison to an individual with a very low culture capital.
Conclusions: A middle-aged individual's level of exercise is closely linked to that person's social position and, accordingly, to his or her educational capital. The children and adolescents with the greatest chance of achieving this middle-class position were those coming from backgrounds with a relatively high social positions and/or high grades in school. If they had a strong sport habitus as well, their inclination to exercise was strengthened.
Bourdieu, P. (1984) Distinction. A social critique of the judgement of taste (London, Routledge & Kegan).
Engström, L.-M. (2008) Who is physically active? Cultural capital and sports participation from adolescence to middle age – a 38-year follow-up study. Physical Education and Sport Pedagogy, 4, 319-343.

PHYSICAL ACTIVITY AND OLDER ADULTS. A CHARACTERIZATION OF THE NORTH INTERIOR OF PORTUGAL

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Introduction: Scientific research has highlighted the effects of regular physical activity for the health and well-being of older adults (Buckly, 2007). Among various benefits, it reduces the risk of various chronic situations namely coronary heart disease, hypertension and it has a high positive impact on decreasing illnesses and possibly mortality (Mota et al., 2006). On the other hand, it promotes psychological well-being and it has a positive causal effect on the older adults' self esteem (Stathi, Fox, & McKenna, 2002).
In spite of the benefits that physical activity has on the older adults' autonomy, in Portugal only 3% of this population does physical activity and it is mostly women (Marivoet, 2001; INE, 2003). We therefore consider it important to know the representations that the elderly population in the north interior of Portugal has in relation to physical activity, to enquire about their practices and to know their aspirations at this level.
Methods: This study was carried out on 75 older adults (45 women and 30 men), physically and mentally autonomous and residing in Douro Sul. Semi-structured interviews were carried out (Ghiglione & Matalon, 2001).The technique used for data analysis was content analysis (Bardin, 1977). The elaboration of the categories had been defined à priori and à posteriori. The computer programme of qualitative data analysis QSR NVivo 7 was used in coding the transcripts of the interviews.
Results and Discussion: The majority of the older adults interviewed state that they do not do any physical activity because of health problems, low income, little time available and the fact that they find no pleasure in doing physical activities. The most popular leisure activities are watching television, walking, being with friends and reading. If possible they would like to do dancing and swimming in the future.
The older adults that are physically active prefer walking, gymnastics and swimming / hydro-gymnastics; they do these activities for health reasons, for fun, to socialise, to be with their friends, to occupy their free time and to become physically fit.
References
Bardin, L. (1977). Análise de conteúdo. Lisboa: Edições 70.
Buckley, J. (Ed.) (2007). Exercise physiology in special populations. Edinburgh: Churchill Livingstone.
Ghiglione, R., & Matalon, B. (2001). O Inquérito. Teoria e prática (4ªed.). Oeiras: Celta Editora.
INE (2003). Portugal Social 1991-2001. Lisboa: Instituto Nacional de Estatística.
Marivoet, S. (2001). Hábitos desportivos da população portuguesa. Lisboa: Novicópia.
Mota, J.; Ribeiro, J.; Carabalho, J. & Matos, M. (2006) Atividade física e qualidade de vida associada à saúde em idosos participantes e não participantes em programas regulares de atividade física. Revista Brasileira de Educação Física e Esporte, v.20, n.3, Jul./Set., p.219-225.
Stathi, A.; Fox, K. and McKenna, J. (2002). Physical Activity and dimensions of subjective well-being in older adults. Journal of Aging and Physical Activity, 10, 76-92.

'EVIDENCE. WHAT EVIDENCE?': A STUDY OF SCHOOL SPORT PARTNERSHIPS IN NORTH-WEST ENGLAND

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Introduction: Since the late 1990s, increasing political and policy emphasis has come to be placed on the alleged role that physical education and school sport (PESS) can play in the achievement of government's (non-)sports objectives. This increasing government support for PESS has been accompanied by a potential threat – evidence-based policy. In Britain, the focus on outcomes and effectiveness was further enhanced by the emphasis that New Labour has placed on the need to provide evidence of policy effectiveness and base policy and practice on robust evidence to ensure the delivery of government's policy goals. However, despite this alleged concern with basing policy and practice on outcomes and effectiveness, the systematic monitoring and evaluation of sports programmes are in their infancy.
Methods: The central objective of this paper is to examine aspects of the monitoring and evaluation of the School Sport Partnership (SSP) programme, a school-based initiative that was launched in England in 2006 as part of the Physical Education, School Sport and Club Links (PESSCL) strategy. The SSP programme is expected to help contribute towards the achievement of non-sports objectives related,

among other things, to young people's health, behaviour, attainment and attendance. This paper reports on data generated by semi-structured interviews conducted in June and July 2008 with 14 Partnership workers from a SSP in north-west England.

Results: The findings of the study reveal that while there is some evidence of the effectiveness of the programme in relation to the achievement of some sporting objectives, evidence of the extent to which those who deliver the programme are successful in achieving other policy outcomes is considerably more variable and limited. In particular, although those working within SSPs made a range of claims about their ability to use PESS as a tool for achieving a range of desired social outcomes, the presumed benefits of the SSP programme were often accepted uncritically and perceived as almost inevitable outcomes of participation in the programme. Few attempts were also made to systematically monitor and evaluate (beyond the generation of basic quantitative outcome data) SSPs for their desired impacts. This was not especially surprising because monitoring observed changes in pupil behaviour and attainment, for example, is further compounded by the difficulties of identifying the presumed impacts on these complex aspects of young people's educational experiences.

Discussion: Despite the rhetoric that surrounds the need for Partnership workers to provide evidence of the effectiveness of the SSP programme, there are few signs that the programme is being monitored and evaluated effectively, if at all. Like many other areas of policy, the programme appears to be indicative of wider government concern with encouraging the 'take offs' of new PESS strategies than ensuring the 'safe landing' and enhancing the effectiveness of existing ones.

INCLUSION AND NATIONAL CURRICULUM PHYSICAL EDUCATION IN ENGLAND: A STUDY OF UNPLANNED OUTCOMES

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UNIVERSITY OF CHESTER

Introduction: Since the mid-1990s, physical education (PE) has been seen as an important vehicle of social policy targeted at promoting the inclusion of young disabled people in mainstream schools. But to what extent has government been able to achieve its stated objective of greater inclusion in schools? Has the inclusion of disabled pupils in NCPE helped enhance the educational experiences of these pupils? Or have these policies also resulted in consequences that are the very reverse of what was intended?

Methods: This paper sets out to examine these issues by drawing upon data from focus groups conducted with 12 PE teachers from five secondary schools in north-west England during July 2008. The focus groups were designed to generate data on teachers' experiences of inclusion and were concerned with examining the extent to which government have been able to bring about desired change in pupils' experiences of National Curriculum Physical Education (NCPE).

Results: While government has increasingly constrained teachers to include disabled pupils in PE, the outcomes of the increasingly complex interweaving of the actions of the many different groups have made it more difficult for teachers to achieve the government's goals in relation to enhancing pupils' experiences, an outcome which it is fair to assume was neither intended nor desired by government. Teachers suggested that the process of inclusion has created the opportunity for experiences of PE to become more unequal. When disabled pupils are educated in the same class as their age-peers, there is a tendency for them to be taught separately from one another in what amounts to de facto integration. The existence of integration in PE has meant these pupils' often receive a narrowly focused PE curriculum comprising more individualized physical activities and adapted versions of team sports. Pupils are also often not assessed in the same manner and according to the same criteria as other pupils and for some, perhaps even a majority, both these things impact negatively on self-esteem and confidence, isolate them from other members of the class, and reinforce, rather than break down, barriers between them and other pupils.

Discussion: The growing complexity of the networks of relations involved in PE has had unplanned outcomes that are indicative of the inability of any one group – even a group as powerful as central government – to retain control over the policy process so that they are able, within closely defined limits, to pursue effectively their inclusion policy goals. This has had the effect of undermining the extent to which government are able to achieve its other priorities related to the subject. It also reveals that whilst government has a greater capacity to make crucial decisions over policy priorities, the nature and complexity of the relationships in which they are involved means that the extent to which they are able to achieve their objectives is very dependent on the actions of other, seemingly less powerful, groups like teachers.

SPORT AND SOCIAL CAPITAL AMONG ETHNIC MINORITIES IN FLANDERS (BELGIUM)

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Introduction: It is often assumed that organized sport involvement can contribute to the development of social capital. This assumption is based on a number of specific characteristics of the organized sport context, namely the creation and maintenance of social relations and cohesion between members as a result of a regularity in membership, voluntary work, etc.. It is also indicated that members of sport associations have systematically more exogenous friendships in comparison with non-members and that they are more trustworthy. It is even stated that sport participation enhances more feelings of trust and civic engagement in comparison with other leisure activities. Moreover, membership in sport associations is believed to encourage group cohesion and that sport organizations can contribute to the (re)construction of social cohesion in today's individualized societies.

In light of the assumed social integrative potential of organized sport, there is a tendency among policy makers in Flanders (Belgium), to advocate mixed organized sport involvement as one of the answers in dealing with tensions among different ethnic groups in today's Flemish multicultural society. The present study, using Putnam's theory on bridging and bonding social capital, attempts to analyze this potential of organized sport involvement among ethnic minorities in Flanders by looking at experiences of members actively involved in either 'separate' or 'mixed' sport organizations.

Methods: A face-to-face survey was conducted among 262 adult ethnic minority members (171 males - 91 females) from 20 sport organizations (7 separate - 13 mixed sport context)(10 sport clubs, 1 fitness club, 9 specific youth initiatives). Also, 35 in-depth interviews were conducted (26 females - 9 males) (18 separate - 17 mixed). Questions related, among other things, to social interactions, mutual support, inter-ethnic relations, trust and racism.

Results: Specific differences were reported with regard to age, gender and organizational context. For example, mixed members indicated more that they have learned to make contact with others, become more self-confident and learn more about other ethnic groups. However, separate members appeared to have more in-depth conversations with other members and consulted each other more often for advice outside the sporting context.

Discussion: This study provides some evidence that a number of variables exist that can alter the experience of organized sport involvement. However, findings of the present study cannot support the general notion that a mixed organized sport context offers more opportunities for increased social capital among its members compared to a separate sport context. Moreover, the results do neither provide evidence for the assumed social integrative potential of an organized sport context as the direction of this causal relation is still to be firmly determined.

ORGANIZATIONAL REQUIREMENTS FOR INCLUDING LOW-ACTIVE GROUPS IN WORKPLACE EXERCISE PROGRAMS

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Project description: Organizational requirements for including low-active groups in workplace exercise programs

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In resent years we have witnessed an increasing concern regarding workplace health issues. A driving contextual force is the consensual political ambitions aimed at stopping the ongoing trend of more and more people leaving the workforce. In this regard the political initiative put forward by the Minister of Government Administration and Reform, in collaboration with the Confederation of Norwegian Enterprise (NHO) and the Norwegian Confederation of Trade Unions (LO), has intensified the focus on health related to the workplace environment . The economically motivated concerns have increased funding to research , besides having reintroduced and revitalized exercise as a preventive measure at work. Although the traditional gymnastics is abandoned for more sophisticated exercise, like aerobics, golf or yoga, the overall intention still is to include the majority of the workforce. However, exercise as a preventive measure is first and foremost targeted at the inactive part of the population.

Within this context, my project focuses on the work carried out by the Norwegian Federation for Company Sports (Norges Bedriftsidrettsforbund: NBF), as I follow their intervention in three different organizations. The NBF is part of The Norwegian Olympic Committee and Confederation of Sports (NIF) and has 310,000 members divided into 4,691 teams. As their primary goal is to motivate people to exercise in a work place context they provide workplace exercise programs to companies in both private and public sectors. These programs aim at getting people who do not normally exercise to get in physical shape in accordance with their own preferences. The programs are developed in close cooperation with each company, assisting the company, drawing up action plans, implementing and evaluating initiatives through project groups where representatives from the NBF is working together with company representatives.

The central research question will address: What kind of organizational prerequisites influence on the implementation process of a workplace exercise program for including low-active employees?

The intention is to observe and analyze the processes these kinds of interventions generate, identifying the possible consequences for including low-active groups in a work place exercise program. The research question addresses various potential influential organizational levels: as individual preferences to health and exercise, socioeconomic background, the implementation as a working process and possible prerequisites external to the organization. The ambition is to locate the required conditions for getting inactive people to get fit, beyond mere individual factors, but also including the social environment at their workplace.

15:15 - 16:45

Oral presentations

OP-RE02 Rehabilitation 2

FUNCTIONAL WEAK LINK TESTING AND ITS RELATIONSHIP WITH LOWER EXTREMITY INJURY HISTORY: A STUDY ON FEMALE TEENAGE ATHLETES

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Introduction: The lumbo-pelvic (core) muscles are important for optimal energy transfer through the kinetic chain. It is hypothesized that core stability plays a major role in musculoskeletal injury prevention. The aim of this study was to determine the prevalence of diminished core muscle capacity in young female athletes, and to quantify the relationship between results from 3 rotational "weak link tests" and lower extremity injury history.

Methods: Female athletes (n= 90, 17.3 ± 1.0 yrs), participating in a variety of competitive sports (football, team handball, martial arts, running, etc.) performed three weak link tests and completed a questionnaire regarding their lower extremity and lower back injury history. Weak links were defined as 1) >6mm depression of the navicular bone from seated to standing, 2) > 2.5 degree pelvic rotation during 30 deg abduction from a supine bridge position (performed in slings, with instrumented visual feedback), and 3) clinically visible inward rotation and/or adduction of the femur, and/or failure to achieve 90 degree knee angle during a one legged squat.

Results: Navicular drop was not an independent predictor for lower extremity injury risk. Only 5 of 90 subjects had >6mm depression in either foot. While 41% failed the supine abduction test (one or both sides), test failure was not significantly related to injury history. Only 7 of 41 subjects who passed the one- legged squat test on both legs (1LS PASS) reported previous acute knee injury compared to 24 of 48 subjects (RR 2.92, $p<0.01$) who failed on one or both legs (1LS FAIL). Both knee (1.0 ± 1.3 vs 0.24 ± 0.6, $p=0.001$) and ankle injuries (2.8 ± 3.3 vs. 1.6 ± 2, $p=0.04$) were more frequently reported in 1LS FAIL, while previous back problems also tended to be more prevalent (44% vs 27%, $p=0.09$).

Conclusions: Excessive navicular drop (inward foot/ankle rotation) was infrequent and not associated with increased lower extremity injury history. The supine abduction test revealed a high prevalence of poor pelvic rotational stability, but this was not directly associated with higher lower extremity injury prevalence. In contrast, past knee injuries were nearly 3 times more frequently reported among female athletes who failed the one legged squat test on one or both legs. These results suggest that the one legged squat is strongly predictive of lower extremity injury risk. The one legged squat test may be a simple, useful screening tool for targeting female athletes for intensive knee injury prevention programs designed to strengthen hip and pelvic musculature.

HOW SHOULD CORE STABILITY BE EVALUATED? A COMPARISON OF INTEGRATED AND ISOLATED METHODS

JOHANSEN, K., JOHNSEN, M., SEILER, S.

UNIVERSITY OF AGDER

Purpose

Lumbo-pelvic (core) stability and strength is determined by the integrated function of multiple deep and global muscles working in three dimensions. In contrast, the most popular quantitative tests of core function are one dimensional and isolated in nature. The purpose of this study was to compare the results of several common isolated muscle tests for the core region with results from two integrated, 3-dimensional "weak link" tests.

Methods: 30 sports active females (18 ± 1 yrs, 167±7 cm, 60 ± 5 kg) who trained regularly (13 ± 5 hrs/wk) participating in the study. About 75% reported performing specific training for improved core stability. Between day test-retest reliability was evaluated for the one legged squat (pass-fail based on 90 degree hip angle and absence of inward knee rotation and/or adduction, 3 attempts) and a 30 degree leg abduction test from a supine bridge performed with one leg in an unstable sling hanging from the ceiling (pass-fail based on ability to maintain less than 2.5 degrees pelvic rotation with instrumented visual feedback). Subjects also performed a side bridge test to failure (holding time in s), a 60 degree isometric sit-up to failure (holding time), the Biering-Sørensen back extension test (holding time), and a 10 degree isometric hip abduction test (maximal force in N).

Results: Combined right and left leg test-retest agreement for the one legged squat was 93%. Agreement for the supine 30 degree abduction test was 84%. 50% of the subjects failed the one legged squat test on one or both legs. 12 of 30 (40%) subjects failed the supine abduction test on one or both sides. Performance on the 4 isolated muscle tests was compared in 8 females who passed both left and right sides of the 2 integrated tests and 7 subjects who failed on at least 3 out of 4 side-specific tests. Biering-Sørensen (117 ± 47 vs 104 ±26 s, p=0.5), 60 degree flexion (206 ± 122 vs 215 ± 111 s, p= 0.89), side bridge (101 ± 27 vs 97 ±39, p= 0.82), and 10 degree abduction force (212 ± 32 vs 195 ± 49 N, p= 0.42) were all similar in the two groups.

Conclusions: The 1-legged squat and 30 degree supine bridge abduction test both showed good test-retest agreement However, when clinical findings from these two functional tests were compared with results from 4 established muscle performance tests, we observed no relationship. Given the one-dimensional nature of the isolated muscle tests, we question their validity as integrated measures of lumbo-pelvic stability. We also observed that females who reported a combination of strength training exercises on stabile and unstable surfaces had fewer "weak links" based on functional testing.

EFFECT OF KINESIO TAPING ON QUADRICEPS MUSCLE STRENGTH IN HEALTHY, NON–ATHLETES ADULTS. A PILOT STUDY.

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Introduction: In recent years, the use of Kinesio Tape (KT) has become increasingly popular. One of the proposed benefits (2) is the alignment of the fascia tissue and therefore improvement of muscle activity. However, only few studies have measured its effectiveness in quadriceps strength and these studies have obtained inconsistent results (1,4,5). The purpose of this RCT double blind pilot study is to investigate the effect of Kinesio taping on quadriceps muscle strength compared to sham taping in healthy non-athletes adults.

Methods: 20 healthy adults, (age: mean=22.65y±2.39, weight: 68.6 Kg±13.4, height: 1.71m±0.08), were enrolled in this study. The isokinetic dynamometer (Human Norm CSMI 770) was adopted to assess concentric and eccentric exercise in the quadriceps muscle strength while contracting at a speed of 60 ◦/s, (peak torque, five repetitions). Subjects were randomly allocated in two groups. In the experimental group a Y-shaped Kinesio tape was applied parallel to quadriceps fibers which placed in a stretched position (KT) (according to Kenzo Kase) (3). In the control group an I-shaped Kinesio tape was applied perpendicular to quadriceps fibers in their normal length (sham taping-ST). The subjects were measured under two conditions 1. without tape, 2. immediately after taping.

Results: ANOVA repeated measures were shown that there was no statistical significant effect of Kinesio-tape on quadriceps concentric and eccentric strength at both legs. Statistical significant result was revealed on quadriceps concentric contraction at right leg, F (1,18)=6.634, p=0.019, p<0,05, but no difference was shown between the experimental (KT) and the control (ST) group, F (1,18)=0,044, p=0,836 >0,05.

Discussion: These findings suggest that Kinesio taping does not enhance quadriceps muscle strength of healthy non-athletes individuals. The limitation of this pilot study was that the measurements of quadriceps strength were done immediately after the application of the tape, when the propose literature suggest that the optimal effect of KT is shown 12h after taping (3). These results can not been generalized in an injured population and therefore the need of future research in this area is imperative.

References

1. Fu TC, Wong AM, Pei YC, Wu KP, Chou SW, Lin YC.(2008). Effect of Kinesio taping on muscle strength in athletes-a pilot study. Journal of Science and Medicine in Sport Apr;11(2):198-201.

2. Kase, K., Tatsuyuki, H. and Tomoki, O. (1996). Development of KinesioTM tape. KinesioTM Taping Perfect Manual. Kinesio Taping Association 6-10, 117-118.

3. Kenzo Kase , D. C , (1997)Illustrated kinesio-taping second edition.,Tokyo

4. Murray, H. (2000). Kinesio Taping, Muscle Strength and ROM after ACL Repair. Journal of Orthopedic and Sports Physical Therapy, 30, 1.

5. Słupik A, Dwornik M, Białoszewski D, Zych E. (2007). Effect of Kinesio Taping on bioelectrical activity of vastus medialis muscle. Preliminary report. Ortop Traumatol Rehabil. Nov-Dec;9(6):634-43

EFFECT OF TAPING ON FUNCTIONAL ANKLE INSTABILITY IN FEMALE ELITE HANDBALL PLAYERS

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Introduction: 20% of all sports injuries are related to the ankle joint (Bahr, 2002); in handball the ankle is involved in 40% of all injuries, and females are considerably more injury prone than males (Lindblad et al., 1992). Self reported functional ankle instability (FAI) has been linked to increased injury risk (Ross & Guskiewicz, 2004). Likewise, FAI has been linked to reduced postural stability (PS) quantified from force plate data (Noronha et al., 2006). Taping is frequently used to prevent ankle injuries. The effect has not been investigated directly, but the effect on PS has been tested with equivocal results in studies using static, one legged stance (Bennel & Goldie, 1994; Leanderson

et al., 1996). Recently, more functional methods for testing dynamic PS has been developed and validated (Ross & Guskiewicz., 2004), but hitherto not employed to study the effect of taping in players with FAI. Thus, the purpose of this study is to assess the effect of taping on dynamic PS in elite female handball players, and to detect a possible relation between the effect of taping and the severity of FAI.

Methods: Fourteen female elite handball players with FAI performed standardised horizontal jumps with and without tape in randomised order. The subjects were required to stabilize as fast as possible after a one legged landing on a force plate. Time to stabilization (TTS) was calculated and used as a quantitative measure of dynamic PS. The jump, data acquisition and TTS calculation were slightly modified from Ross & Guskiewicz (2004).

Results: We found no significant (p=0.075) difference in TTS values obtained with and without tape. The values were actually (non-significantly) higher (i.e. less stability) with tape, in agreement with Ross et al. (personal communication). Further, we found no correlation (r=0.008, p=0.979) between the effect of tape (TTS difference with and without tape) and severity of FAI (TTS value without tape).

Discussion: Without prospective studies directly investigating taping's effect on injury risk, we only have studies linking PS to injury risk and studies like the present investigating taping's effect on PS. Since we found no reduction in TTS, the widespread use of taping among athletes might not be warranted. A possible stability reduction might even suggest that taping interferes negatively with sensori-motor functions necessary for stability.

References

Bahr R. (2002). Can we prevent ankle sprains? In MacAuley D, Best T (eds.): Evidence-based Sports Medicine. London, UK: BMJ Books, pp. 470-491.

Bennell KL, Goldie PA. (1994). J Orthop Sports Phys Therapy, 20(6), 287-295.

Leanderson J, Ekstam S, Salomonsson C. (1996). Knee Surg, Sports Traumatol Arthroscopy, 4(1), 53-56.

Lindblad BE, Høy K, Terkelsen CJ, Helleland HE, Terkelsen CJ. (1992). Am J Sports Med, 20(4), 441-444.

Noronha M, Refshauge KM, Herbert RD, Kilbreath SL. (2006). Br J Sports Med, 40, 824-828.

Ross SE, Guskiewicz KM. (2004). Clin J Sport Med, 14(6), 332-338.

THE ADAPTATIVE COMPORTMENT OF ADOLESCENT IDIOPATHIC SCOLIOSIS ON THE DYNAMICAL BEHAVIOUR.

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Introduction: Adolescent Idiopathic Scoliosis (AIS) is characterized by morphological trunk modifications acting on the body masse distribution. Consequently, specific biomechanical strategies during the postural regulation are reported (Allard et al, 2004). Considering that the deformation is three-dimensional, the analysis of strategies resulting from different stepping directions may lead to a better understanding of the behavioural dynamical adaptation. The scoliosis deformation induced dynamical postural perturbations that enlarge asymmetry between lower limbs in terms of ground reaction forces during different normal gait phases.

Methods: Twenty-five adolescent girls participated in this study (13.18 years). The average Cobb angle was 33.4±18° for right thoracic or thoraco-lumbar without compensatory curve. The control group consisted in 15 able-bodied adolescent girls. Two forceplates at the floor level provided the GRF. The set up experimental paradigm consist to do an initiation step in two directions. Specific Fx, Fy and Fz GRF parameters (magnitude and occurrence) were extracted to characterize step dynamics. Impulse of GRF components was computed.

Results: Our results showed differences inter-groups and inter-limbs for both movements. The Anterior step was characterized by a dominant initiation side with CPx and Cpy increased amplitudes for AIS group compared to control group. For the Lateral step, only AIS group had asymmetry with a CPx and Cpy amplitudes significantly increased for non dominant side compared to dominant side. The analysed correlations highlight an inverse dynamic behaviour in the 2 groups only in the Lateral step. The asymmetry Index comparison between groups, whatever the direction was, revealed increased variability of the overall parameters computed for scoliotic patients.

Discussion: This study demonstrates the interest to focus on movement initiation following orthogonal directions for a pathological population presenting a three dimensional trunk deformity. Whatever the stepping direction was, GRF are asymmetrical to control balance for AIS patients. Forward stepping is associated with a permanent learning that results in a systematic adaptative strategy by a daily use. This contrasts with lateral stepping which allows analysing short-term strategy adaptation (Bruyneel et al. 2009). The originality of our study resides in the kind of used movement paradigm which is not posture neither gait but stepping as the transition between both. This suggests that lateral step better proves the scoliosis adaptive strategies associated to the three dimensional deformity and to the neurophysiological asymmetry. To understand the dynamics of an adaptive behaviour, a dynamical movement must be analyzed in the different planes to consider the mechanical modification and the influence of the training.

References

Allard et al. Am J Phys Med Rehab 2004;83(9):689-97.

Bruyneel et al. Eur Spine J. 2009 Feb;18(2):188-95.

INTER-RATER RELIABILITY OF THE VISUAL ESTIMATION OF SHOULDER ABDUCTION ANGLES AND THE AGREEMENT OF MEASUREMENTS WITH AN ACELEROMETER

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INTRODUCTION: In clinical context, the evaluation of joint angular amplitudes is usually done by visual estimation (VE).

METHODS: In this study, six independent observers made, simultaneously, the VE of the shoulder position on the frontal plane for a set of 140 repetitions. The angles of the arm were monitored by a Biodex electro-goniometer.

At the same time, the arm acceleration measurements were recorded using a tridimensional xyzPlux accelerometer. The accelerometer was fixed with a Velcro tape to the anterior face of the subject's forearm. The 3D components of the acceleration signal were transmitted via Bluetooth to the processing unit which computed the abduction angle of the shoulder. The accelerometer data was taken as reference to validate the agreement analysis.

The VE error was determined by analysis of the variance of the six observers' VEs. The interclass correlation coefficient was determined with formula 2.1 from [1] after the verification of the statistic model's assumptions.

The correlation between VE from observers and xyzPlux measurements was established using Pearson's Coefficients (0.01 significance level; 2 tailed). The limits of agreement between both measurements was estimated using the standard error of the differences (SDdiff) [2].

RESULTS: The correlation obtained between the observers VE's is high (0.92), although the standard error of the method is 6.4°. The minimum detectable difference (MDD) (95% confidence level) is 17.6°. The correlation between the data from the observers and from xyzPlux is also high (0.986 to 0.996) and SDdiff is between 4.98° and 7.92°.

DISCUSSION: The high level of agreement between the VE of the six independent observers assures that the clinical evaluation of the shoulder joint angular amplitudes can be done by any of the six observers without a clinically significant increase of the measurement error.

We may accept that the VE method is appropriate if we assume that the identification of a difference of around 20° between the two measurements is acceptable and does not introduce problems in clinical interpretation.

If a MDD of 20° (more precisely, 17.6°) is not adequate but we still want to use the VE method, we have to lower the confidence levels.

For a higher precision of the measurements the VE method is not adequate and it is necessary to the use more sophisticated instruments like the xyzPlux used in this study.

The data from xyzPlux and the electrogoniometer obtained in this study showed a very good level of agreement (0,757° Typical error ; SDdiff = 1,069 determined according to [3]; MDD of 2.10°).

REFERENCES

[1] Shrout P, FleissJL. (1977). Biometrics, 33; 159-174.

[2] Hopkins WG. A new view of Statistics. Available from: 'http://sportsci.org/resource/stats' [Acessed 11 Feb. 2009] .

[3] Bland J M, Altman D G, (1999). Statistical Methods in Medical Research, 8.

15:15 - 16:45

Invited symposia

IS-SS07 Sport, skills and knowledge

HUMAN ACTION, TACIT KNOWLEDGE AND EMBODIED SKILLS

BRUEMMER, K.

UNIVERSITY OF OLDENBURG

Skillful performance in sports requires the ability to master uncertain situations by means of body techniques often under time constraints. It appears obvious that this kind of competence does not only owe to time-consuming planning processes and knowledge-based rationalizations governed by the conscious mind, but also involves the 'intelligence' of an experienced body. Yet, many hegemonic approaches to human action or movement provided in the field of sport sciences focus almost exclusively on those underlying mental processes. Especially in the last couple of years, however, these theories have come under criticism for their intellectualistic stance and reductionist understanding of human action and being. Against the background of this critique, several frameworks have been formulated, claiming that the faculty to react to uncertain situations in a quick and flexible manner constitutively depends on incorporated knowledge and subjective sensations, which are largely tacit and hence difficult to objectify.

In the course of a paradigm shift labeled 'practice turn' [1], in the field of social sciences as well, concepts of tacit knowledge and embodied skills have started to enjoy an increasing popularity with regard to the explanation of dexterous practice. Sociological practice theories maintain that versed action is not only to be attributed to cognitive processes, but draws on incorporated dispositions, too, which had been acquired in collective practices during socialization. Under certain conditions, these dispositions function as a 'practical sense' [2], an intuitive feeling and tacit knowledge for what is to be done, allowing for an immediate, i.e. pre-reflective understanding and flexible coping with a situation. According to the premises of practice theory, this sort of intelligence is not stored in an individual's mind as a subjective possession, but is rather to be regarded as a relational and situational phenomenon emerging in between different (human and non-human) 'actants' [3].

So far, attempts to establish interdisciplinary linkages between the different approaches from sport and social sciences have been rare. Thus, I intend to correlate them in order not only to identify parallels but also to uncover blind spots and shortcomings in the particular concepts and to correct them mutually. It is my prior concern to integrate insights from social practice theory into concepts of motor control and vice versa in order to achieve a more adequate understanding of human activity, which accounts for both sports and everyday situations.

[1] Schatzki, T., Knorr Cetina, K., v.Savigny, E. (eds.) (2001): The Practice Turn in Contemporary Theory. London, New York.

[2] Bourdieu, P. (1987): Sozialer Sinn. Kritik der theoretischen Vernunft. Frankfurt/M., p. 122.

[3] Latour, B. (1996): On Actor-Network-Theory. A few clarifications. In: Soziale Welt, 47, pp. 369-381.

CONSCIOUSNESS IN SPORT

BIRCH, J.

NORWEGIAN SCHOOL OF SPORT SCIENCES

The talk argues there is an explanatory gap between theories in neuroscience and our conscious experience. Theories in neuroscience are reductions to events at the neuronal level. Our conscious experiences are subjective mental states of qualia. Neuroscience may explain how the visual system works, how memory is possible and which parts of the brain are necessary to perform motor actions. Although parts of conscious experience, the explanatory gap is between what the brain does (psychological consciousness) and how an experience feels (phenomenal consciousness) (Chalmers). How an experience feels is usually described as what it is like (Nagel). The problem then, is to account for how non-conscious matter like neurons can give rise to conscious experience.

Identity theories try to do this by reducing conscious states to brain states by claiming they are identical. Brain states do not produce, realize or correlate with conscious states, there is only one state. Even if this seems counterintuitive, we just have to accept this is so, and these days it is the neurosciences that are going to convince us. If identity theories are right, there is no explanatory gap, and phenomenal consciousness is no more mysterious than how neurotransmission is done in synaptic clefts. Could it be that reductive sciences like

chemistry, biology, mechanics and (neuro)physiology are able to give a full blown account of sport? If so, they must also account for some problems of reductive physicalism, like The Knowledge Argument (Jackson).

The knowledge argument asks: suppose I know all that physical science could possibly teach me about football, would we say I know what it is like to play the game even though I have never done so? The intuitive response is "no". If this is correct, what's left out is phenomenal consciousness. If you were to say "yes", the answer must go something like: brain state F is identical to conscious state C. If I have all the knowledge there is about brain state F, I could obtain brain state F. Since F is identical to C, I must know what C is like.

If you can obtain any knowledge there is about football by knowing all the physical descriptions of football, you are also saying knowing how is completely reducible to knowing that (Perry). That is: not only would you get an experience by knowing the perfect physical description, you also obtain the skill involved. If you are an identity theorist then, you must conclude that simply by knowing armchair science, you could become the next Maradona. The talk denies this and suggests sport provides good examples of why reduction by identity is not promising when it comes to phenomenal consciousness and skill.

References:

Chalmers, D. The Conscious Mind. Oxford: Oxford University Press, 1996

Jackson, F. What Mary Didn't Know. Journal of Philosoph, 83, 1986

Nagel, T. What Is It Like to Be a Bat? Philosophical Review, 83, 1974

Perry, J. Knowledge, Possibility, and Consciousness. Cambridge: MIT Press, 2001

WHAT IT IS ALIKE TO LEARN A MOTOR ACTION

KROMER, M.

ELLY-HEUSS-KNAPP-SCHULE

Experts and novices organize and experience their motor actions very differently. Merleau-Ponty's (1945, 1964) theory of body and human movement helps to better understand the learning processes and offers as well chances to integrate different approaches to motor organization (self-organization and representation).

According to Merleau-Ponty implicit and explicit ways of motor organization work together interdependently. Learning leads to important changes in the way a motor action is organized. The implicit way of motor organization is prereflective and based on a "motor intentionality" that structures the perception of a situation. There is a stable and flexible "intentional arc" between the skilled person and the situation. This sort of knowledge is largely tacit and embodied. The implicit way of organizing motor actions is typical for experts acting in complex situations and under time restraints. In early stages of a learning process however there is no reliable "intentional arc". The person has to organize the motor action using explicit planning processes and explicit internal representations. Simondon's theory of individuation (1995) helps to understand the development of "Gestalten". They are developed in a repetitive and sudden transductional process in the system of a human and the world. This point of view may explain why the learning process is not linear but consists in alternating periods of rapid progression and of apparent stagnation or even regression.

A pilot interview-study (Kromer, 2007) focuses the early stages in learning in unicycling. The participants start first with a static view on keeping the balance, but then change to a dynamic view, which is necessary for further learning. The study shows the importance of specific feelings in motor organization. A specific feeling appears suddenly and with it the change from explicit to implicit organizing has taken place. Therefore beginners can't tell much about unicycling, because they don't go the straight way to organize it, but make a detour. After the decisive transduction the now advanced learners or experts take the straight way, but they do it in an implicit way. It is as if the situation tells them what is to be done and how it is to be done. They can't report much about the motor oganization as well. The findings of the study seem to support the theoretical approaches by Merleau-Ponty and Simondon.

References

Kromer, M. (2007). Veränderungen von Gedächtnisrepräsentationen im motorischen Lernprozess: Theoretische Überlegungen und eine Pilotstudie zum Konzept impliziter Bewegungsrepräsentation. Köln. Internetdokument. URL: http://zb-sport.dshs-koeln.de/ Dissertationen/2007/Matthias-Kromer.html

Merleau-Ponty, M. (1945). Phénoménologie de la perception. Paris: Gallimard.

Merleau-Ponty, M. (1964). Le Visible et l'Invisible. (éd. par C. Lefort). Paris: Gallimard.

Simondon, G. (1995). L'individu et sa genèse physico-biologique. (réédition, original 1964). Grenoble: Million.

SKILLED BEHAVIOR IN SPORT AND THE PHENOMENOLOGY OF MOTOR INTENTIONALITY

MOE, V.F.

SOGN OG FJORDANE UNIVERSITY COLLEGE

Introduction: Skilled motor behavior has been widely discussed in sport science from the information processing, expertise and ecological/dynamical systems approach (Williams and Hodges, 2004). Even though phenomenological approaches to skilled behavior are underrepresented, they are beginning to emerge more frequently. This paper takes a phenomenological turn on skilled behavior. Its aim is to reveal the role of motor intentionality in skilled behavior in sport.

Research on novice-expert differences provides a clear approach to the varieties of skilled motor behavior. Normally, a novice tends to perform in a slow, rigid and reflective way, whereas the expert performs fast, flexible and unreflective. To account for these behavioral characteristics, this paper applies the concept of intentionality. It means that consciousness and our mental and bodily attitudes are object-directed, that is, meaningfully directed at objects and states of affairs in the environment.

Method: Conceptual analysis (e.g., Searle, 1983) and phenomenological description (e.g., Merleau-Ponty, 1962) is used to account for the intentionality of skilled motor behavior (Moe, 2007).

Analysis/Discussion: Kelly (2002) has distinguished between cognitive and motor intentionality. Cognitive intentionality is characterized by its representational or propositional content, whereas motor intentionality, a term coined by Merleau-Ponty (1962), is characterized by its non-representational nature (i.e., the body's holistic and direct understanding of tasks).

The paper begins to discuss the cognitive-motor intentionality distinction in relation to skilled behavior performed by novices and experts. Arguably, the representational content of cognitive intentionality fits the reflective attitude towards problem solving often experienced by novices, whereas the non-representational nature of motor intentionality illuminates the unreflective and immediate way experts are normally coping with their environment.

Furthermore, it is argued that the non-representational character of motor intentionality is often overlooked in sport research, and that it marks a bodily competence that is tacit and thus difficult to account for. Hence, a phenomenological description of skilled behavior in sport is established in order to provide an accurate description of several essential characteristics of motor intentionality.

The paper closes with some remarks on how this understanding of cognitive and motor intentionality can be used by practitioners to facilitate skill learning in sport.

References

Kelly, S.D. (2002). Ratio, 15, 376-391.

Merleau-Ponty, M. (1962). Phenomenology of perception. Routledge, London.

Moe, V.F. (2007). Understanding intentional movement in sport. Doctoral dissertation from the Norwegian School of Sport Sciences, Oslo.

Searle, J.R. (1983). Intentionality. Cambridge University Press, New York.

Williams, A.M., & Hodges N.J. (Eds.). (2004). Skill acquisition in sport. Routledge, London.

15:15 - 16:45

Invited symposia

IS-SS11 How can we change the exercise behaviour in the population? (ECSS Position Statement Symposium)

PHYSICAL ACTIVITY BEHAVIOUR CHANGE FOR OLDER ADULTS (60+ AND 75+)

HOPMAN-ROCK, M.

TNO QUALITY OF LIFE AND BODY@WORK RESEARCHCENTER TNO VU UNIVERSITY MEDICAL CENTER

It is known from European figures that physical activity (PA) decreases with higher age. Also sedentary behaviour is relatively higher in older adults. Sufficient PA (including exercise and sports) as given in standards from the ACSM and in national European standards is important to enhance the health of the ageing population and to decrease care demands. Evidence based intervention components to stimulate the PA of the old age and the old-old age group will be briefly reviewed. Attention will also be paid to the relationship between PA and falling, as it is relevant in the aged population. Also, existing European networks and projects on ageing, falling and PA will be reviewed. First steps will be made to come to a European position statement in the area of physical activity stimulation, resulting in behavioural change. Perspectives in this presentation are from individual factors as well as from social and environmental factors.

PHYSICAL ACTIVITY BEHAVIOUR CHANGE FOR ADULTS (20 – 60+)

BREHM, W.

UNIVERSITÄT BAYREUTH

PHYSICAL ACTIVITY BEHAVIOUR CHANGE FOR ADULTS (20 – 60+)

Brehm, W.

Institute of Sport-Science, University Bayreuth, Germany

Introduction: According to recommendations of the ACSM or the WHO-Europe, adults should accumulate structured physical activities and sports of at least two hours a week (in 2 – 4 units), stimulating all relevant fitness factors (endurance, strength, flexibility, coordination). "Everyday physical activities" (e.g. walking around, stair climbing, household, gardening) should be added. At least two third of the European population is not undertaking sufficient activity to meet such recommendations. But over 90% of the adults in Europe believe that physical activity has numerous health benefits. For enhancing physical activity in the adult population intervention components and concepts meanwhile concentrate on changing the individual behaviour as well as changing social and environmental factors.

Method

System of intervention factors

Systematic study review

Results & Discussion: This presentation will (a) give a short overview of the recommendations for physical activities for adults and the extent of sedentary behaviour in adulthood, (b) summarise evidence of intervention factors and strategies during the process of behaviour change to an active lifestyle. This summary will feed into an ECSS Position Statement concerning physical activity behaviour change.

PHYSICAL ACTIVITY BEHAVIOUR CHANGE FOR CHILDREN AND ADOLESCENTS

BIDDLE, S.J.H.

LOUGHBOROUGH UNIVERSITY

Introduction: Much has been written about young people and physical activity, with extensive research concerning the correlates of activity, and more recent evidence concerning intervention efficacy. International data, including Europe, shows that physical activity (PA) in this population is the highest for any age group, but declines particularly across the teenage years. Also, new sedentary behaviours are attractive to many and can take up large amounts of time.

Method

Review-level data summary

Results & Discussion: This presentation will summarise review-level evidence on a). socio-demographic, psychological, behavioural, social, and environmental correlates of PA and sedentary behaviour, and b). how successful interventions have been to change PA and sedentary behaviours in young people. This summary will feed into a ECSS Position Statement concerning physical activity behaviour change.

15:15 - 16:45

Invited symposia

IS-BC02 Molecular mechanism controlling mitochondrial biogenesis and function

MITOCHONDRIAL SUBSTRATE OXIDATION: EFFECT OF TRAINING AND TYPE 2 DIABETES.

SAHLIN, K.

GIH, THE SWEDISH SCHOOL OF SPORT AND HEALTH SCIENCES

There is a reciprocal dependency between carbohydrate (CHO) and lipid oxidation and the relative fuel utilization is influenced by a number of factors including exercise intensity, training status and substrate availability. Control of lipid oxidation occurs at several sites with mitochondria being one of the most important. A high rate of CHO catabolism may interfere with both the transport of long-chain fatty acids (LCFA) into mitochondria and with β-oxidation. The supply of lipids is increased in Type 2 diabetes (T2D) due to elevated blood fatty acid levels and increased intramyocellular contents of triglycerides. Combined with a reduced capacity to oxidize lipids this leads to accumulation of lipid intermediates, which has been suggested to cause insulin resistance. This presentation will discuss the interaction between carbohydrate and lipid oxidation at the mitochondrial level, the effect of training and the implication in T2D.

MECHANISMS OF MITOCHONDRIAL BIOGENESIS IN HUMAN SKELETAL MUSCLE

PILEGAARD, H.

UNIVERSITY OF COPENHAGEN

Introduction: Peroxisome proliferator activated receptor gamma (PGC)-1alpha is a transcriptional co-activator regulating the expression of proteins in many cellular processes including mitochondrial biogenesis and the anti-oxidant defence (Lin et al. 2005). Exercise-induced regulation of PGC-1alpha expression and activity is suggested to be a key event in training-induced mitochondrial biogenesis.

PGC-1alpha gene regulation

PGC-1alpha transcription and mRNA is increased in human skeletal muscle in response to both short, high-intensity and prolonged low-intensity exercise, and PGC-1alpha mRNA is markedly induced in both the glycolytic triceps muscle and the more oxidative vastus lateralis muscle. The exercise-induced PGC-1alpha mRNA increase in human skeletal muscle is determined by the relative rather than the absolute exercise intensity. The PGC-1alpha mRNA response to a single exercise bout does not seem to be influenced by muscle glycogen levels prior to exercise, but to be modulated by the metabolic status in recovery from exercise.

Cell culture studies indicate that calcium signalling through both CAMK and calcineurin as well as ROS-induced signalling may play a major role in regulating the expression of PGC-1alpha in skeletal muscle.

PGC-1alpha protein

PGC-1alpha protein is in western blotting detected at a molecular weight of about 115 kD. But analyses of endogenous PGC-1alpha protein should be done with utmost caution, as the amount of endogenous PGC-1a in skeletal muscle is very low.

PGC-1alpha mediated regulation of mitochondrial proteins

The late mRNA responses to exercise for genes encoding mitochondrial proteins in human skeletal muscle are in accordance with the suggestion that exercise-induced regulation of PGC-1alpa expression and/or activity may mediate the induction of genes encoding mitochondrial proteins.

In mice skeletal muscle, PGC-1alpha is required for the beneficial effect of exercise in preventing an age-associated decline in cytochrome c and superoxide dismutase 2 protein expression. In addition, findings in mice suggest that although AMPK is not needed for exercise-induced PGC-1alpha gene regulation, AMPK mediated regulation of PGC-1alpha seems to play an important role in regulating the expression of mitochondrial proteins.

Reference

Lin J, Handschin C, Spiegelman BM. Metabolic control through the PGC-1 family of transcription coactivators. Cell Metab 1: 361-370, 2005.

MECHANISMS OF MITOCHONDRIAL BIOGENESIS IN AGING MUSCLE

HOOD, D.

YORK UNIVERSITY

It is well known that mitochondrial biogenesis in muscle can occur as a result of regular exercise. However, the mechanisms underlying organelle biogenesis are not fully established. In addition, whether similar mechanisms exist in aging muscle remains controversial. Evidence suggests that the initial signals generated by exercising muscle which provoke gene expression leading to mitochondrial biogenesis are related to changes in intracellular calcium, reactive oxygen species, and AMP kinase activity. Activation of AMP kinase leads to the transcription of PGC-1α, an important regulator of the expression of many nuclear genes encoding mitochondrial proteins. In addition, chronic exercise increases the import of proteins into the organelle. This is a result of an increased expression of protein import machinery components. During the aging process, mitochondrial content in muscle declines, and this is reflected in a reduced endurance performance. The decrease in mitochondrial content is due in part to a reduced transcriptional drive, since PGC-1α levels are markedly reduced, particularly in slow-twitch muscle fibers. In addition, in response to a standardized acute contractile activity paradigm, signaling kinase activation is increased to a lesser degree than in muscle from young animals. This contributes to the reduced adaptation of aged muscle to regular exercise, consisting of attenuated increases in the expression of biogenesis regulatory proteins of transcription and protein import, reduced increases in mitochondrial enzymes, and lesser improvements in endurance performance. These data suggest that activation of the mitochondrial biogenesis pathway by exercise is down-regulated with age. Despite this, adaptive responses to exercise can still occur in aging muscle, leading to reduced fatiguability and improved quality of life. Further studies are required to determine the underlying basis for the attenuated adaptive response of aging muscle to exercise.

15:15 - 16:45

Invited symposia

IS-NU02 Nutritional strategies to increase muscle mass

NUTRITIONAL STRATEGIES TO AUGMENT MUSCLE MASS AND FUNCTION IN THE ELDERLY

VAN LOON, L.

MAASTRICHT UNIVERSITY

Aging is accompanied by a progressive loss of skeletal muscle mass and strength, leading to the loss of functional capacity and an increased risk of developing chronic metabolic disease. The age-related loss of skeletal muscle mass is attributed to a disruption in the regulation of skeletal muscle protein turnover, resulting in an imbalance between muscle protein synthesis and degradation. As basal (fasting) muscle protein synthesis rates do not seem to differ substantially between the young and elderly, many research groups have started to focus on the muscle protein synthetic response to the main anabolic stimuli, i.e. food intake and physical activity. Recent studies suggest that the muscle protein synthetic response to food intake is blunted in the elderly. The latter is now believed to represent a key factor responsible for the age-related decline in skeletal muscle mass. Physical activity and/or exercise stimulate post-exercise muscle protein accretion in both the young and elderly. However, the latter largely depends on the timed administration of amino acids and/or protein prior to, during, and/or after exercise. Prolonged resistance type exercise training represents an effective therapeutic strategy to augment skeletal muscle mass and improve functional performance in the elderly. The latter shows that the ability of the muscle protein synthetic machinery to respond to anabolic stimuli is preserved up to very old age. Research is warranted to elucidate the interaction between nutrition, exercise and the skeletal muscle adaptive response. The latter is needed to define more effective strategies that will maximize the therapeutic benefits of lifestyle intervention in the elderly.

NUTRITIONAL STRATEGIES TO INCREASE MUSCLE MASS AND FUNCTION IN ATHLETES

TIPTON, K.

UNIV OF BIRMINGHAM

Appropriate muscle mass and function are critical for athletes. Nutrition influences the impact of training on muscle mass and function. In particular, protein intake is often considered to be the most important nutritional factor. The metabolic basis for changes in muscle mass is the balance between protein synthesis and breakdown of muscle contractile proteins. The net balance (NBAL) between synthesis and breakdown over any given time determines changes in muscle mass. Accretion of muscle proteins occurs during periods of positive balance, i.e. when synthesis exceeds breakdown, and muscle proteins are lost during periods of negative balance. Exercise and nutrition influence muscle mass through changes in muscle protein synthesis and breakdown that will increase (or decrease) NBAL. On a daily, or even hourly, basis NBAL can be either positive or negative, depending on feeding and exercise situations. The length and duration of these periods of positive and negative balance determine the net loss or gain of muscle mass. Nutritional influences on muscle mass have received a great deal of attention lately. It is clear that protein ingestion is critical for increased muscle mass. Muscle protein balance can be improved by exercise alone, but without a source of amino acid NBAL does not reach positive levels. Thus, protein and amino acids in various forms are generally thought to be the most important nutrient for muscle building. However, the optimal amount of dietary protein for optimization of muscle mass remains unclear. Furthermore, it is clear that factors other than the total amount of protein in the diet influence muscle mass and function. The latter include energy intake, intake of other nutrients, timing of nutrient intake and the interaction of these factors. In particular, energy balance seems crucial for gains in muscle mass. Carbohydrate intake is often overlooked by those desiring increased muscle mass. However, carbohydrate intake must be sufficient to support appropriate training. Recent evidence suggests that glycogen levels may help determine the response of muscle to exercise. Whereas most of the attention on muscle mass has been given to gaining muscle, athletes in many situations may want to maintain or even lose muscle mass. Nutritional interventions may help to influence the adaptations to particular situations. Furthermore, muscles that are immobilized due to injury will atrophy. Minimizing the atrophy during forced disuse and optimizing regain of muscle during recovery are crucial for returning an athlete to competition as quickly as possible. Metabolic changes during disuse atrophy may influence the nutritional strategy to optimize recovery. Protein is important, but energy intake must be carefully considered. Finally, use of particular amino acids, such as leucine may be a method to help reduce muscle loss during immobilization.

THE IMPACT OF NUTRITION AND EXERCISE ON THE SYNTHESIS OF MYOFIBRILLAR AND SARCOPLASMIC PROTEINS

PHILLIPS, S.

MCMASTER UNIVERSITY

Day-to-day regulation of muscle protein mass is accomplished by the ingestion of complete sources of protein. The subsequent hyperaminoacidemia stimulates muscle protein synthesis (MPS) and also, along with insulin, suppresses muscle protein breakdown (MPB). Eating throughout the day thus provides periods of feeding and fasting during which muscle protein balance (MPS minus MPB) is positive and negative, respectively. We are now beginning to understand how different protein sources (animal versus plant) can affect MPS and MPB to differentially affect protein balance. We also know that resistive exercise can markedly, and independent of feeding, stimulate MPS. Thus when feeding and resistance exercise are combined a synergistic stimulation of MPS occurs, MPB is inhibited and muscle protein balance becomes even more positive. Such small periods of positive protein balance summate to yield hypertrophy. We now know that proteins such as whey, casein, and soy are hierarchically effective in their ability to stimulate MPS both at rest and post resistance exercise. Thus, it should be evident that training studies in which whey is used as a supplement might yield greater hypertrophy; this appears to be the case. We have also begun to define contractile intensities and their effects of protein balance. These data will be discussed and inferences for optimal models of training to promote hypertrophy will also be discussed.

15:15 - 16:45

Oral presentations

OP-PH02 Physiology 2

MUSCLE METABOLIC DEMAND IN ELECTRICALLY EVOKED MAXIMAL ISOMETRIC CONTRACTIONS OF THE ELBOW FLEXORS INVESTIGATED BY NEAR-INFRARED SPECTROSCOPY

MUTHALIB, M., JUBEAU, M., MILLET, G.Y., MAFFIULETTI, N.A., NOSAKA, K.

EDITH COWAN UNIVERSITY

INTRODUCTION: Previous studies (1,2) reported that muscle oxidative metabolic demand in isometric contractions induced by electrical muscle stimulation (EMS) was greater than voluntary isometric contractions (VOL) at the same force level. Our previous study (ECSS-2008) showed that the metabolic demand of the biceps brachii assessed by near-infrared spectroscopy (NIRS) during EMS (30 Hz) was similar to VOL, when repeated isometric contractions (1-s contraction, 1-s relaxation) were performed at maximal intensity for VOL and at maximally tolerable current intensity for EMS. Since higher stimulation frequency (>50 Hz) and contraction duration (>4 s) are often used to improve strength in EMS training, this study compared EMS (75 Hz) and VOL for changes in biceps brachii muscle oxidative metabolism during intermittent 4-s maximal isometric contractions.

METHODS: Ten men (23-39 yrs) performed EMS with one arm and VOL with the other arm separated by 2-3 weeks in a counterbalanced order. EMS and VOL consisted of 50 maximal isometric contractions (4-s contraction, 15-s relaxation) of the elbow flexors at an elbow joint angle of 160°. For EMS, the biceps brachii and brachioradialis muscles were stimulated at maximal tolerated current (36-64 mA) via surface electrodes (frequency: 75 Hz, pulse duration: 0.2 ms). Maximal voluntary isometric contraction (MVC) torque was measured before and after exercise, and torque produced during exercise was recorded. A NIRS probe was placed on the mid-biceps brachii of the exercise arm and NIRS signals were sampled at 6 Hz using a NIRO200-NIRS system. Changes in muscle oxygenation (TOI), oxygen extraction (HHb) and blood volume (cHb) over 50 contractions (contraction and relaxation phases) were compared between EMS and VOL by a two-way repeated measures ANOVA with Bonferoni post-hoc test. Significance was set at $P<0.05$.

RESULTS: MVC decreased ~30% immediately after both protocols with no significant difference. The average peak torque produced during VOL (33 ± 3 Nm) was significantly greater than EMS (17 ± 2 Nm). All NIRS variables showed significant changes, and the changes in TOI and HHb during contraction and relaxation phases were not significantly different between EMS and VOL. However, cHb was significantly greater during both contraction and relaxation phases for VOL compared with EMS.

DISCUSSION: These results confirmed our previous study showing no significant difference between EMS and VOL at maximal intensity for changes in TOI and HHb of the biceps brachii. The greater increases in cHb for VOL than EMS were also found in the previous study, but the difference in cHb may not necessarily represent a difference in metabolic demand (3). It is concluded that muscle oxidative metabolic demand in EMS is similar to VOL at the respective maximal intensity.

REFERENCES

1. McNeil CJ et al. (2006) J Appl Physiol, 100:890-5
2. Vanderthommen M et al. (2003) J Appl Physiol, 94:1012-24
3. Usaj A et al. (2007) Eur J Appl Physiol, 100:685-92

TISSUE OXYGENATION DURING EXERCISE MEASURED WITH NIRS: A QUALITY CONTROL STUDY

PLATEN, P., GERZ, E., GERASKIN, D., NEARY, P., FRANKE, J., KOHL-BAREIS, M.

1. INSTITUTE OF SPORTS MEDICINE AND SPORTS NUTRITION, RUHR-UNIVERSITY BOCHUM, GERMANY; 2. UNIVERSITY OF APPLIED SCIENCES KOBLENZ, GERMANY; 3. FACULTY OF KINESIOLOGY, UNIVERSITY OF REGINA, CANADA

Introduction: Near infrared spectroscopy (NIRS) is widely used to observe muscle metabolism, however, some of the most basic questions regarding errors, reproducibility and data quality have not been answered or asked. The purpose here is to shed some light on: 1. Reproducibility and 2. Comparison of Modified-Lambert Beer (MLB) and Spatially Resolved Spectroscopy (SRS).

Methods: Nine volunteers (5 females; age: 29.4 ± 7.6 years; body mass = 69.0 ± 9.5 kg; height: 178 ± 13 cm) performed an incremental cycling exercise increasing the exercise power stepwise every 3 minutes by 40 W. A 10 minute cycling recovery period at 30 W followed the maximal step. This protocol was repeated three times separated by rest periods of 60 min. Optical fibres were kept in place during the whole period. The exercise protocol (one of the three repetitions) was repeated at a second day 27 ± 18 days after D1. The spectroscopy system is based on a Peltier-cooled slow-scan Charged Coupled Device-camera in combination with a spectrometer. From the slope of attenuation with respect to tissue absorption spectra and subsequently haemoglobin concentrations (oxyHb, deoxyHb) and oxygen saturation values (SO2 = oxyHb/(oxyHb + deoxyHb)) were calculated.

Results and Discussion: When comparing the SO2 vs. power traces for the different exercises, there were variations smaller than 2 %. OxyHb was markedly different for the two days and with differences much larger than for deoxyHb. Absolute SO2 values revealed a large inter-subject variability but similarities in the slope with exercise power output. Likely explanations for this are the heterogeneity of the muscle tissue and the influence of the subcutaneous lipid (adipose tissue thickness). Analysis of inter-subject variability and reproducibility (R) for all parameters can be summarized as follows: 1. R of SO2 is around 1.5 % both for same-day and different-day trials; 2. R of deoxyHb and oxyHb is somewhat poorer (R < 3 % and < 8 % for same-day and different-day comparison); 3. When changes with respect to the lowest exercise power are considered, the reproducibility of SO2 is about 0.4 % and 0.9 % for same-day and different testing; 4. There is no indication for fatigue for the three same-day tests; and 5. R based on SRS-method is considerably better than for MLB-method. The likely explanation is the larger depth penetration of SRS limiting the influences of haemoglobin in the skin and the adipose tissue thickness. A vindication for this is the correlation of the adipose tissue thickness as measured by ultrasound with the haemoglobin parameters.

Conclusion

The reproducibility of the haemoglobin parameters is high. The finding of large differences between MLB- and SRS-analysis is surprising and needs to be taken into account when comparing data acquired with different instrumentation.

OXYGEN KINETICS IS NOT DETERMINANT FOR DELAYING FATIGUE IN SEVERE EXERCISE: ATHLETIC WALKING VERSUS

MILLE-HAMARD, L., GARCIN, M., BILLAT, V.L.

INSERM U 902

Introduction: Previous studies have showed that the type and intensity of exercise as well as the physical fitness of subjects influences the slow component of oxygen uptake (VO2) during severe exercise. As athletic walking elicits less strength at each step than running, we hypothesized that the lowered strength could reduce the slow component of VO2. Therefore the purpose of the present study was to compare the kinetics of VO2 during severe walking and runs performed at the same relative intensity, until exhaustion.

Methods: In subjects of the same physical fitness, VO2 was measured breath by breath using a portable gas analyser (K4b2, Cosmed) during severe exhaustive exercise performed on a running track, in the severe intensity domain The VO2 response was fit with mathematical models to determine the slow component of VO2.

Results: Results on athletic walking demonstrated the absence of a slow component of VO2. Furthermore, there was no association between the time to exhaustion and the slow component phenomena given that the delaying of fatigue was not different (769 ±241 vs. 769 ± 510 s, p = 0.858) in contrast with the slow component.

Discussion: These results confirmed that the slow component is not responsible for fatigue. However the nature of the link between Time to exhaustion and the slow component of VO2 remains unclear (Zoladz et al., 2008, Malek et al. 2008). Furthermore, the slow component of VO2 seems to be related with force production during severe exercise, and percentage of type I fibres recruited (Garland et al., 2004, Pringle et al. 2003, Saunders et al. 2000). Thus, the recruitment of lower proportion of type II muscles fibers during walking, a consequence of the lower force requirement compared with running, could contribute to the lack of a slow component of VO2. Furthermore, as fatigue occurs, running but not walking has been associated with alterations in pace (Borrani et al. 2003, Derrick et al. 2002, Brisswalter et al., 1998) that increase the energy expenditure during the run. It is may therefore be possible that this lack of alteration with fatigue also explain to the absence of the slow component during athletic walking.

Borrani F, Candau R, Perrey S, Millet GY, Millet GP, Rouillon JD (2003) Does the mechanical work in running change during the V O2 slow component? Med Sci Sports Exerc 35: 50-57

Brisswalter J, Fougeron B, Legros P (1998) Variability in energy cost and walking gait during race walking in competitive race walkers. Med Sci Sports Exerc 30: 1451-1455

Derrick TR, Dereu D, McLean SP (2002) Impacts and kinematic adjustments during an exhaustive run. Med Sci Sports Exerc 34: 998-1002

Garland SW, Newham DJ, Turner DL (2004) The amplitude of the slow component of oxygen uptake is related to muscle contractile properties. Eur J Appl Physiol 91: 192-198

Malek MH, Housh TJ, Crouch LD, Johnson GO, Hendrix CR, Beck TW, Mielke M, Schmidt RJ, Housh DJ. 2008 Plasma ammonia concentrations and the slow component of oxygen uptake kinetics during cycle ergometry. J Strength Cond Res. 22:2018-26.

THE EFFECT OF PHYSICAL STATUS ON PHOSPHOCREATINE AND PULMONARY OXYGEN CONSUMPTION KINETICS DURING EXERCISE: A COMBINED PULMONARY GAS EXCHANGE AND 31P-MRS STUDY

LAYEC, G., BRINGARD, A., YASHIRO, K., VILMEN, C., LE FUR, Y., MICALLEF, J.P., PERREY, S., COZZONE, P.J., BENDAHAN, D.

UMR CNRS 6612

Introduction: A number of models have been proposed to explain the control of O2p which can be schematically classified into parallel activation mechanism by calcium or feed-back mechanisms through numerous factors e.g. PCr, ADP, Pi and pH. The model proposed by Meyer et al. (Meyer, 1988), which postulates that creatine kinase reaction plays a key role in the regulation of O2 has recently received considerable attention. Although animal and in vitro studies provided support for this model, data relating PCr and O2p kinetics in human are sparse. Recently, Francescato et al. (2008) reported that the time constant (τ) of PCr kinetics was linearly related to the PCr concentration measured at rest (Francescato et al., 2008). Given that a lower resting [PCr] concentration has been reported in endurance trained subjects (Bernus et al., 1993), one could wonder whether the kinetics of O2p and [PCr] are correspondingly modulated. The purpose of the present study was to compare the kinetics of O2p and [PCr] during moderate (MOD) and heavy (HEAV) exercises between sedentary and endurance-trained subjects.

Method: Six sedentary (SED) and seven endurance trained (TRA) subjects performed a dynamic standardized rest-exercise-recovery protocol at an exercise intensity corresponding to either 25 or 35% of maximal voluntary contraction while 31P-MRS, and breath-by-breath measurements of pulmonary oxygen uptake were obtained simultaneously.

Results and Discussion: Endurance trained subjects exhibited a faster O2p (τ = 26 ± 10 for TRA vs. 51 ± 17 s for SED; $P < 0.01$) and PCr kinetics (22 ± 5 for TRA and 45 ± 16 s for SED; $P < 0.01$) during moderate exercise. In contrast, O2p (31 ± 3 for TRA and 38 ± 9 s for SED) and PCr kinetics (29 ± 14 for TRA and 41 ± 9 s for SED) were similar in both groups during the heavy-intensity exercise. For both exercises, neither O2p nor PCr time-constants were related to the PCr concentration at rest. However, both time constants recorded during the moderate exercise were linked through a linear relationship ($r = 0.59$; $P < 0.05$).We failed to observe this relationship during the heavy-intensity exercise. Overall, our results illustrate a complex relationship between [PCr] and VO2 which is not consistent with a linear control model (Meyer, 1988) but rather suggest that other factors (O2, phosphate potential, pH and [ADP]) would be involved in the control of oxidative phosphorylation.

Reference

Bernus G, Gonzalez de Suso JM, Alonso J, Martin PA, Prat JA & Arus C (1993). 31P-MRS of quadriceps reveals quantitative differences between sprinters and long-distance runners. Med Sci Sports Exerc 25, 479-484.

Francescato MP, Cettolo V & di Prampero PE (2008). Influence of phosphagens concentration on phosphocreatine breakdown kinetics. Data from human gastrocnemius muscle. J Appl Physiol.

Meyer RA (1988). A linear model of muscle respiration explains monoexponential phosphocreatine changes. Am J Physiol 254, C548-553.

ELECTROMYOGRAPHIC ALTERATIONS ARE EVIDENT DURING HEAVY INTENSITY TREADMILL RUNNING

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BACKGROUND: The development of an "additional" slow component on the oxygen cost of submaximal exercise performed above the lactate threshold may be attributable to altered motor unit recruitment patterns, that is, the recruitment of lower efficiency fast-twitch fibers [1, 2]. Enhanced fast-twitch fiber recruitment may result in increased EMG amplitude and shift of the power spectrum to higher frequencies [3].

PURPOSE: To examine the effect of heavy intensity exercise on VO2 and electromyographic variables response over time during treadmill running.

METHODS: Fourteen soccer players underwent an incremental test to volitional exhaustion and two 10-min bouts, one at a moderate (80%LT) and one at a heavy intensity (40%D). During the bouts electromyographic activity was recorded at minutes 3, 5, 7 and 10 for muscles vastus lateralis and biceps femoris bilaterally. Blood lactate was measured before the bouts and at end-exercise. The dependent variables were mean peak EMG amplitude and the total energy of the high frequency components (>90Hz, HE) of the power spectrum [4].

RESULTS: There was a significant time x intensity interaction for VO2 ($F=29.6$, $p<0.001$). VO2 values for heavy exercise were increasing until the 8th minute of exercise. The magnitude of the VO2 slow component averaged 0.4 (0.12) lt/min. End-exercise blood lactate values averaged 7.9 (1.6) mM and 2.5 (0.6) mM for heavy and moderate exercise respectively. There was a significant time x intensity interaction for EMG amplitude of the vastus lateralis muscle ($F=5.85$, $p=0.002$). EMG amplitude did not change for biceps femoris muscle ($F=1.99$, $p=0.131$). There was a significant time x intensity interaction for the HE of the vastus lateralis ($F=5.632$, $p=0.003$) and biceps femoris ($F=7.493$, $p<0.001$) muscle. However there was no correlation between the relative increase of the VO2 and the relative increases in any of the electromyographic variables.

CONCLUSION: Heavy intensity treadmill running results in a significant VO2 slow component and also in significant electromyographic alterations in both vastus lateralis and biceps femoris muscles. These results may indicate that the slow component is at least partly attributed to additional recruitment of motor units and/or recruitment of type II muscle fibers.

REFERENCES

1.Jones AM and Poole DC (Eds). Oxygen uptake kinetics in sport, exercise and medicine.

2.Gaesser and Poole. Exerc Sport Sci Rev 24: 35-70, 1996.

3.Borrani et al. J Appl Physiol 90:2212-2220, 2001.

4.Hug et al. Clin Physiol Funct Imaging 23 :208-214, 2003.

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EFFECTS OF PROLONGED EXERCISE WITH VOLUNTARY HYPOVENTILATION ON MUSCLE OXYGENATION AND BLOOD LACTATE CONCENTRATION

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LABORATOIRE

Intro

It has recently been reported that training with voluntary hypoventilation (VH) may induce muscular adaptations that could delay metabolic acidosis (Woorons et al., 2008). This study aimed first to determine whether a prolonged exercise with VH could decrease muscle oxygenation and raise blood lactate concentration and second to evaluate the respective effects of hypoxia and hypercapnia.

Methods: Eight healthy active men (VO2max = 53.2 ± 3.7 ml/min/kg) performed three series of 5-min exercise on a cycle ergometer at 65% of normoxic VO2max under the following conditions: 1) Voluntary hypoventilation in normoxia (VHnx) 2) Voluntary hypoventilation in hyperoxia (VHhpr) (inspired oxygen fraction [FIO2] = 0.29) 3) Normal breathing (NB) in hypoxia (NBhpo) (FIO2=0.15) 4) NB in normoxia (NBnx). Between series, subjects kept on cycling for one minute at the same exercise intensity in NBnx. Using near infrared spectroscopy (NIRS), concentration changes of oxy- and deoxyhemoglobin (Δ[O2Hb], Δ[HHb]) were measured in the left vastus lateralis muscle. Δ[O2Hb -HHb] and change in total Hb (Δ[THb]= Δ[O2Hb + HHb] were calculated and used as oxygenation index and change in regional blood volume respectively. All NIRS values were averaged and compared over the last 15 sec of each series. Blood gases were taken at the end of 1st (S1) and 3rd (S3) series, and at two-minute recovery (R2).

Results: In the four tests, Δ[O2Hb], Δ[HHb] and Δ[THb] increased from the beginning to the end of exercise. However, while there was no difference in Δ[THb] between testing conditions, Δ[O2Hb - HHb] was lower and Δ[HHb] higher at the end of each series in VHnx than both NBnx and VHhpr. Δ[O2Hb] in VHnx was lower than in NBnx and was not different from VHhpr. We did not find any difference in all NIRS values between VHnx and NBhpo.

In VHnx, arterial oxygen saturation (SaO2) at S1 (87.0 ± 2.7%) and S3 (86.9 ± 3.1%) were lower than in NBnx and VHhpr, whereas there was no difference with NBhpo. During series, P50 and arterial CO2 pressure (PaCO2) in VHnx were higher than in NBnx and NBhx and not different (P50) or lower (PaCO2) than VHhpr. From S1 to R2, lactate concentration in VHnx was higher than both NBnx and VHhpr but not different from NBhpo.

Discussion: These results show that a prolonged exercise with VH increases blood lactate concentration, as a consequence of a hypoxic effect, and therefore probably leads to a greater contribution of anaerobic glycolysis. The lower muscle oxygenation during VH is probably due to the drop of SaO2 as well as a rightshift of the oxyhemoglobin dissociation curve under the effect of both metabolic and respiratory acidosis. A greater O2 extraction may also occur during exercise with VH. These acute responses could lead to interesting adaptations at the muscular level after VH training.

References

Woorons X, Mollard P, Pichon A, Duvallet A, Richalet JP, Lamberto C. (2008). Respir Physiol Neurobiol, 160(2), 123-30.

15:15 - 16:45

Oral presentations

OP-PH10 Physiology 10

THE EFFECT OF TERRAIN TYPE AND TIME OF YEAR ON MUSCULAR, CARDIAC AND ENERGETIC STRAIN: TERRAIN FACTOR

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Introduction: Terrain type and time of year modifies muscular, cardiac and energetic responses to a given exercise. This study was conducted to evaluate the effect of six different terrain types (road, footpath, easy and rough going forest, hilly terrain and swamp) and three different walking velocities (2, 4 and 6 km/h) on muscular, cardiac and energetic strain during summer (no snow) and winter condition (snow).

Methods

Nine healthy male subjects participated in the study. During walking their oxygen consumption (energetic strain, Metamax 3 B, Cortex Gmbh, Germany), heart rate (cardiac strain, Actiheart, Cambridge Neurotechnology Ltd, UK) and EMG activity from m. tibialis anterior, m. gastrocnemius medialis, m. rectus femoris and m. biceps femoris (muscular strain, ME6000, Mega Electronics Ltd, Finland) was measured continuously. They also performed maximal oxygen consumption test (maxVO2) and maximal voluntary contraction (MVC) for each muscle studied in order to define the percentual level of strain. Based on the results a terrain factor was formulated indicating the level of strain in different functions.

Results: Depending on the walking velocity and time of year the muscular strain varied between 2-44 %MVC, cardiac strain between 51-73 %maxHR and energetic strain between 21-58 %maxVO2. In relation to strain during summer condition winter increased the strain by 2-12%, 3-14% and 3-10% in muscular, cardiac and energetic functions, respectively.

Taking the walking velocity of 2 km/h in summer condition as baseline (terrain factor = 1), terrain factor for muscular strain varied between 1.2-2.4 and 1.5-3.6 during summer and winter condition, respectively. For cardiac strain the values were 1.1-1.4 in both conditions and for energetic strain 1.1-2.8 and 1.3-2.6 during summer and winter condition, respectively.

Discussion: The terrain factor for muscular and energetic strain seems to be more sensitive than terrain factor for cardiac strain. The results of the study can be utilised when predicting the changes in physical strain during summer and winter conditions, especially in military context.

EFFECTS OF LOW INTENSITY ENDURANCE TRAINING ON SMALL AIRWAYS OF MDX MICE

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UNIVERSITY OF PALERMO; ITALIAN NATIONAL RESEARCH COUNCIL (CNR)

Introduction: Duchenne muscular dystrophy (DMD) is characterized by a progressive weakness of skeletal muscles including respiratory muscles which lead to respiratory failure. Dystrophin-deficient (mdx) mice have been used to investigate the effect of exercise in DMD patients. However, whether exercise is beneficial or detrimental in mdx mice it is not currently clear. In small airways of wild-type (WT) exercised mice we previously showed increased bronchiolar epithelium thickness induced by low intensity endurance training (Chimenti et al, 2007). No study to date has examined whether bronchiolar epithelium of mdx mice show any structural differences compared to WT mice and whether low intensity endurance training affect small airways of mdx mice.

Methods: 31 male mdx adult (C57BL/10ScSn-Dmdmdx/J; 10wk old) and 35 male adult WT mice (C57BL/10ScSn; 14wk old) were used and randomly assigned to sedentary or trained groups. Training was performed 5 days/wk for 6 wks at progressively increasing loads. Mice were also observed after 2 wks of cessation of training (Recovery, R). Formalin-fixed, paraffin-embedded lung sections were obtained from all mice groups and bronchiolar epithelium thickness was examined by measuring the Epithelial Area/Basement Membrane (EA/BM) ratio (BM length <1mm).

Results: In sedentary control animal, both WT and mdx, no significant difference was found between wk 0 and subsequent time points (6 wks, R), and pooled data were used for comparisons vs trained mice. At 6 wks EA/BM increased in exercised WT compared to sedentary WT (WT-EX: 20.5±3.9μm, WT-SD: 17.2±2.3μm, respectively; p<0.0001), while there was no significant difference between exercised and sedentary mdx (MDX-EX: 20.7±3.5μm, MDX-SD: 21.0±2.7μm, respectively). At R, EA/BM in WT-EX reverted to baseline values (WT-EX R: 17.4±1.8μm; p<0.005 vs WT-EX), while in mdx EA/BM did not differ significantly among all groups. Irrespective of the effect of training EA/BM was greater in mdx than in WT (MDX: 21.1±3.8μm, WT: 18.6±3.4μm; p<0.0001).

Discussion: Bronchioles of mdx mice showed structural differences compared to WT mice at all time points irrespectively of the effect of training. We previously demonstrated that cellular proliferation and cell death of bronchiolar epithelium might partially explain the structural changes observed in WT trained mice. To evaluate whether proliferation and apoptosis of bronchiolar epithelial cells may also contribute to the thickened epithelium observed in mdx mice further studies are needed. However, the novel finding of this work was that interruption of training reverted the increased epithelial thickeness observed in exercised WT mice, suggesting that this may represent a physiological response to increased ventilation during exercise.

References

Chimenti L, Morici G, Paterno' A, Bonanno A, Siena L, Licciardi A, Veca M, Guccione W, Macaluso F, Bonsignore G, Bonsignore MR. (2007) Am J Respir Crit Care Med, 175, 442-449.

THE MELATONIN RESPONSES TO EXERCISE ARE MODERATED BY TIME OF DAY

MARRIN, K.., DRUST, B., GREGSON, W., MORRIS, C., CHESTER, N., ATKINSON, G.

1. EDGE HILL UNIVERSITY, 2. LIVERPOOL JOHN MOORES UNIVERSITY

Introduction: Melatonin (MEL) is important for the human circadian system, via its soporific and hypothermic actions (Atkinson et al., 2005). The circadian rhythm of MEL is believed to be mainly endogenous, peaking at 03:00-04:00 h. (Atkinson et al., 2003). Exercise may be a synchronizer of circadian rhythms, possibly via direct thermoregulatory, or MEL-mediated, pathways. The responses of MEL to exercise have, therefore, been examined, but there are conflicting findings possibly because participants have exercised at different times of day (Atkinson et al., 2003). Thus, the aims of the present study were to compare salivary MEL levels during, and after, steady state exercise between the morning and afternoon, and explore relations between exercise-mediated changes in MEL and body temperatures.

Methods: At two times of day (08:00 h and 17:00 h), 7 male subjects (mean±SD age: 27±5 y) completed 30 min of cycling at 70% peak oxygen uptake followed by 30 min of rest. Salivary MEL levels were measured (ELISA immunoassay) at baseline, 15 min during exercise, immediately post-exercise and following 30 min recovery. Oesophageal (Tes), rectal (Trec), intestinal (Tint), and skin (Tskin) temperatures were also measured. Data were analysed using factorial within-subjects general linear models. Within-subjects correlation coefficients were calculated (Bland and Altman, 1995) to explore relations between MEL and body temperatures. Data are described as mean±SD.

Results: Averaged over all 4 time-points, MEL was 15.6±17.7 pg/ml higher at 08:00 than at 17:00 h (P=0.059). Exercise generally increased (P=0.006) MEL during (14.8±5.1 pg/ml), and after, exercise (18.7±5.9 pg/ml) compared with baseline (10.7±3.8 pg/ml). The change from baseline to post-exercise was 11.1±8.7 pg/ml in the morning compared with 5.1±5.7 pg/ml in the afternoon (P=0.024). All core temperatures were lower in the morning, with diurnal variation being greatest for Tint (P=0.019). Tskin was not different between morning (33.71±1.09°C) and afternoon (33.62±1.26°C). At 08:00 h, changes in MEL were positively correlated with Tes (P=0.001), but not Tint, Trec or Tskin. At 17:00 h, MEL correlated positively with changes in all body temperature measurements (P<0.01).

Conclusions

These findings indicate that 30 min of moderate-intensity exercise mediates an increase in MEL that is greatest in the morning when resting MEL is higher and core temperature is lower. Relations between MEL and body temperature changes during exercise are positive and appear more robust in the afternoon than in the morning, irrespective of whether core or skin temperature was considered, supporting the notion that MEL may have both central and peripheral influences during exercise (Aoki et al., 2006).

References

Aoki K, et al. (2006). Am J Physiol Regul Integr Comp Physiol 291: R619–R624

Atkinson G, et al. (2003) Sports Med, 33, 809-831

Atkinson G, et al. (2005). J Pineal Res 39, 353-359

Bland, J.M., Altman D.J. (1995) BMJ, 310, 446

EFFECT OF VOLUNTARY WHEEL RUNNING ON LIPID PEROXIDATION IN <I>SNARK</I>-DEFICIENT MICE

ICHINOSEKI-SEKINE, N., UMETSU, Y., KAKIGI, R., NAITO, H.

JUNTENDO UNIVERSITY

This study investigated the effect of voluntary wheel running on lipid peroxidation in Snark-deficient (Snark^{+/–}) mice. Snark^{+/–} mice exhibit mature-onset obesity and related metabolic disorders under sedentary conditions, although they show no significant differences in body weight according to genotype at the time of weaning. Sedentary Snark^{+/–} mice consume less oxygen than their wild-type counterparts, but Snark^{+/–} mice exposed to an environment that allows for voluntary exercise will run greater distances than their wild-type counterparts. It is hypothesized that Snark deficiency may alter antioxidant capacity and that this may contribute to increased running distance.

Two-month-old Snark^{+/–} mice (n = 10) and their wild-type counterparts (Snark^{+/+}; n = 10) were assigned to sedentary or exercise (4-month voluntary wheel running) groups. The mice were maintained under a 12-h light/dark cycle at 23 ± 1°C and 55 ± 5% humidity; water and standard chow were provided ad libitum. After a 1-week acclimation period, the running distance was recorded every 6 s for each animal, throughout the duration of the exercise period. Food intake was also determined and recorded weekly. Mice in the exercise group were euthanized after the last exercise period. Sedentary control mice of the same age were also euthanized. The heart, liver, kidney, and white adipose tissue (WAT; gonadal fat) as well as the extensor digitorum longus, tibialis anterior, soleus, gastrocnemius, and plantaris muscles on the left side were dissected and weighed. Tissue samples were frozen in liquid nitrogen and stored at –85°C until analysis. Liver thiobarbituric reactive substances (TBARS) were measured using a TBARS assay kit (Cayman Chemical, Ann Arbor, MI).

Consistent with our previous study, exercised Snark^{+/–} mice ran 1.4-fold the distance run by their wild-type counterparts. Sedentary Snark^{+/–} mice exhibited heavy fat deposition; body and WAT weights were significantly lower in the exercised group ($P < 0.01$). In particular, WAT weight was decreased by more than 50% in the exercised group compared with the sedentary group. In addition, exercise resulted in lower muscle and liver weights in the mice. The liver TBARS value was significantly lower in the exercise group compared with the sedentary group ($P < 0.01$); however, no significant differences were found between the genotypes. Liver TBARS negatively correlated significantly with running distance ($P < 0.01$). These findings suggest that SNARK may not be involved in changes of oxidative stress and lipid peroxidation in the liver.

EFFECTS OF THE GENETIC VARIATION ON MUSCULOSKELETAL, CARDIAC TRAITS AND ADAPTATION TO ENDURANCE TRAINING IN MICE

VENCKUNAS, T., KILIKEVICIUS, A., ZELNIENE, R., RATKEVICIUS, A., LIONIKAS, A.

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Identifying the genetic factors modulating the adaptation to exercise training can contribute to the insight into the prevention and treatment of many chronic diseases, since exercise training is generally a well-known powerful tool to improve health-related fitness. Genetic factors also do play a substantial role in musculoskeletal and cardiac size and function and their adaptability to chronic exercise training among individuals (Bray et al., 2009). However, the specific genes underlying these effects and the mechanisms of this variation are not well understood. We have chosen a mouse model to explore how the genetic variation influences morphological musculoskeletal and cardiac characteristics, endurance capacity and their adaptation to training. The goal of this study is to identify a suitable model capable

to elucidate the genetic factors relevant to variation in several phenotypes important for health and physical performance. It is an important first step in selection of research tools for further elucidation of the genetic mechanisms underlying variation in relevant traits.

Methods. To investigate effect of endurance swimming training on morphological parameters and endurance capacity (as a time of swimming to exhaustion) depending on genetic background, 11-14 week old male mice from six inbred strains (A/J, BALB/cByJ, DBA/2J, C3H/HeJ, C57BL/6J, and PWD/PhJ) were studied. Littermates were allocated into sedentary and trained groups (n=92 each) balanced by strain, age and body weight. Skeletal muscle, cardiac ventricular mass, femur length, and the endurance capacity were measured at the end of the five-week progressive endurance swimming training programme.

Results. Significant variation among inbred strains was observed in all tested phenotypes.

In conclusion, we identified a mouse model, which can be successfully used to shed light on the genetic mechanisms underlying variation in musculoskeletal and cardiac characteristics and adaptation to endurance training.

References

Bray MS, Hagberg JM, Pérusse L, Rankinen T, Roth SM, Wolfarth B, Bouchard C. The human gene map for performance and health-related fitness phenotypes: the 2006-2007 update. Med Sci Sports Exerc. 2009;41(1):35-73.

PERCUTANEOUS ELECTRICAL MUSCLE STIMULATION ATTENUATES POSTPRANDIAL HYPERGLYCEMIA IN OBESE MEN

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KYOTO UNIVERSITY

Introduction: The patients with type 2 diabetes are encouraged to exercise after a meal to attenuate postprandial hyperglycemia in order to reduce the risk of myocardial infraction. However, we know that there are diabetic patients who have a difficulty in performing physical exercise as a consequence of excessive obesity and/or orthopedic problems. Now, we tried to develop percutaneous electrical muscle stimulation (EMS), as an alternative to voluntary exercise, to treat postprandial hyperglycemia.

Methods: Eleven middle-aged obese men [age 43.7 (10.9) years, body mass 81.5 (9.2) kg, body mass index 27.4 (2.7) kg/m2, mean (SD)] served as subjects. Each subject participated in two experimental sessions, i.e., one was a 20-min EMS after a breakfast (EMS trial) and the other was a complete rest after a breakfast (Control trial). In EMS trial, quadriceps, biceps femoris, and gluteus maximus muscles were simultaneously stimulated at 4 Hz. In each experimental session, blood sample was taken before and 30, 60, 90, and 120 minute after the meal. Respiratory gas exchange and blood lactate concentration were measured during EMS and complete rest after a meal in EMS and Control trials, respectively.

Results: The elevation of blood glucose after the meal observed in Control trial was significantly attenuated in EMS trial ($P < 0.05$). In addition, the postprandial increase of blood insulin was significantly lowered in EMS trial ($P < 0.05$). It was also found that respiratory quotient and blood lactate concentration were significantly increased during EMS ($P < 0.05$).

Discussion: The novel finding of this study was that postprandial hyperglycemia was significantly attenuated by a 20-min EMS after a meal. In addition, the elevation of respiratory quotient and the increase in blood lactate concentration during EMS suggest that the attenuation of postprandial hyperglycemia was mainly attributed to the enhanced anaerobic glycolysis in contracting muscle and subsequent elevation of glucose uptake.

17:15 - 18:45

Invited symposia

IS-BM03 Adaptation in tendons and connective tissues in response to loading

REGULATORY FACTORS IN CONNECTIVE TISSUE ADAPTATION TO EXERCISE

HEINEMEIER, K.M.

BISPEBJERG HOSPITAL

Tendon tissue and the extracellular matrix of skeletal muscle are collagen rich tissues that are important for muscle function. Mechanical loading via exercise/training induces collagen synthesis in both tendon and muscle. This indicates an adaptive response in the connective tissue of the muscle-tendon unit. However, the precise mechanisms that lead from physical loading to changes in collagen production are yet unknown. Several in vitro studies on connective tissue cells indicate that stress-responsive growth factors, such as transforming growth factor-b-1 (TGF-b-1), insulin like growth factor-I (IGF-I) and connective tissue growth factor (CTGF) could be involved in this process. These growth factors are expressed in response to mechanical stimuli and at the same time they induce expression of collagen in connective tissue cells.

In support of this hypothesis, short-term strength training in rats leads to increased levels of TGF-b-1 and IGF-I expression in a pattern closely resembling the increase in collagen expression in both tendon and muscle tissue. CTGF on the other hand does not seem influenced by mechanical loading of tendon but does respond to loading of skeletal muscle.

Especially IGF-I may be an important player in connective tissue growth/maintenance. Recent findings show that increased systemic levels of growth hormone (GH) elevates IGF-I systemically (as expected), but also locally in tendon and muscle tissue. Simultaneously collagen mRNA expression and synthesis is increased in good correlation with local IGF-I expression. This suggests involvement of the GH-IGF-I axis in the regulation of collagen synthesis in connective tissue.

GENDER DIFFERENCES IN CONNECTIVE TISSUE RESPONSES TO EXERCISE – DO WOMEN ADAPT SLOWER THAN MEN?

HANSEN, M.

BISPEBJERG HOSPITAL

The incidence of several diseases linked to collagen-rich tissues seems to be biased by gender. Furthermore, women are at a greater risk than men of sustaining certain kinds of sports-injuries. Part of the gender difference may be caused by sex hormonal differences. Estrogen receptors have been localized in fibroblasts in ligaments, tendons and skeletal muscle. Animal studies have shown conflicting data concerning the effect of estrogen on tendon and ligament collagen protein turnover, and the knowledge is difficult to transfer to human caused by differences in the ovarian system. Human data in this field is very space, but this presentation will focus on recently results showing effects of gender, oral contraceptives and estrogen replacement therapy on tendon collagen protein synthesis, fibrillar structure and tendon biomechanical properties at rest and in response to exercise. Data suggests that tendon collagen synthesis is slower in women compared to men, and in oral contraceptive users compared to non-users both at rest and in response to exercise. Furthermore, estrogen replacement therapy seems to stimulate tendon collagen synthesis in postmenopausal women and thereby reduce the relative stiffness (young modulus) of the patellar tendon. In conclusion, the effect of female hormone estrogen seems to be dependent on the situation, age, and the direct and/or indirect effects of different types of estrogen. Taken together, these results may suggest a pivotal role for estradiol in maintaining homeostasis of female connective tissue.

References

M Hansen, M Kongsgaard, L Holm, D Skovgaard, SP Magnusson, K Qvortrup, JO Larsen, M Dahl, A Serup, J Frystyk, A Flyvbjerg, H Langberg, M Kjaer, "Effect of estrogen on tendon collagen synthesis, tendon structural characteristics, and biomechanical properties in postmenopausal women", J Appl Physiol. 2009 Apr;106(4):1385-93

M Hansen, BF Miller, L Holm, S Doessing, SG Petersen, D Skovgaard, J Frystyk, A Flyvbjerg, S Koskinen, J Pingel, M Kjaer, H Langberg, "Effect of administration of oral contraceptives in vivo on collagen synthesis in tendon and muscle connective tissue in young women", J Appl Physiol. 2009 Apr;106(4):1435-43.

M Hansen, S Koskinen, SG. Petersen, S Doessing, J Frystyk, A Flyvbjerg, E Westh, P Magnusson, M Kjaer and H Langberg ,"Ethinyl estradiol administration suppress synthesis of collagen in tendon in response to exercise in women",. J Physiol. 2008 Jun 15;586 (Pt 12):3005-16.

SP Magnusson, M Hansen, H Langberg, B Miller, B Haraldsson, EK Westh, S Koskinen, P Aagaard, M Kjaer, "The adaptability of tendon to loading differs in men and women", Int J Exp Pathol. 2007 Aug. 88(4):237-40

MORPHOLOGICAL AND BIOMECHANICAL ADAPTATIONS OF HUMAN CONNECTIVE TISSUE TO EXERCISE TRAINING - FROM HEALTHY TO OVERLOADED TENDONS

KONGSGAARD, M.

INSTITUTE OF SPORTS MEDICINE

Tendons play a key-role in human movement and proper tendon function is a requirement for optimal locomotion. Tendons have previously been regarded as somewhat inert structures unable to adapt structurally and functionally to changes in loading conditions. However, recent studies have clearly shown that tendons are quite capable of both structural and functional adaptations. Despite these adaptive capabilities, tendon overload injuries are highly frequent, disableing and resistant to treatment. To optimize functional performance, and to prevent and treat tendon overload injuries, it is necessary to understand the adaptations of healthy and injured tendons to mechanical loading. Subsequently, this presentation will focus on data concerning structural and functional adaptations, as well as clinical improvements, in response to various modes of loading in healthy and injured tendons.

An increasing number of recent studies have shown that tendons are capable of hypertrophy and increases in mechanical properties in response to loading. However, the magnitude of loading seems to be crucial, and therefore the role of high vs. low force loading with regards to specific functional and structural tendon adaptations will be discussed. Also, data suggest that regional variations in tendon structural and mechanical properties could be related to the development of tendon injuries. In this context, the possible tendon injury preventive effect of various loading regimes will be evaluated.

Loading based therapies, especially eccentric contractions, have been reported to be effective in the management of tendon overload injuries (tendinopathies). However, the clinical effectiveness of these therapies needs optimization, and the underlying mechanisms need to be established. This presentation will discuss recent data showing promising clinical effects of heavy slow resistance training in tendinopathy management. Additionally, data associating these promising clinical improvements with changes in fibril morphology, collagen crosslink properties and tendon mechanical properties will be presented. Last, a discussion on optimal load, volume and training frequency in loading based tendinopathy therapies will be put forward.

17:15 - 18:45

Oral presentations

OP-PI01 Philosophy and Ethics

MINDLESS COPING IN COMPETITIVE SPORT: SOME IMPLICATIONS AND CONSEQUENCES

ERIKSEN, J.

THE NORWEGIAN SCHOOL OF SPORT SCIENCES

Recent discussion in sport science has focused on to what extent one uses different kinds of cognitive capacities during skilled behavior and what role they play in the execution of skills in competitive sport. Do high-level athletes rely on mindful activity such as deliberate decision making, use of memory-based recognition and conscious controlled movements during skill execution or is it really the case that the action is done "without thinking" in an automatic or intuitive style? One of the more scientific approaches to this topic has been concerned with to what extent we make use of mental representations during experienced skill execution in sport. An obvious reason for this

discussion is the limited access we still have to observe, measure and to monitor the internal processes involved in our skilled behavior, and especially those processes that are inaccessible to our conscious mind.

The aim of this paper is to elaborate the phenomenological approach to skilful behavior proposed by Dreyfus and Dreyfus and to give an account of to what degree their approach may be considered a useful framework for a better understanding of how athletes use their cognitive capacities during skilful activity. According to Dreyfus and Dreyfus, it seems that beginners make judgments using strict rules and features, but that with talent and a great deal of involved experience the beginner develops into an expert who sees intuitively what to do without applying rules and making deliberate judgments at all. Their description of expertise is based on a non-representational view of the underlying cognitive structures for human behavior. The paper will subsequently examine if Dreyfus and Dreyfus' approach is capable of resisting the different attacks that have been made against their view, and in particular regarding the practical application of their approach to the skill domain of competitive sport. This paper also aims to explore the possible limitations of their description of highly skilled behavior leading to mastery.

OPERATIVE METHODOLOGY TO USE OF PHYSIOLOGIC FACTORS IN SPORT TRAINING: A PROPOSAL IN COMPLEXITY PARADIGM

ESTEVES, D., BRÁS, R., O'HARA, K., PINHEIRO, P.

UNIVERSIDADE DA BEIRA INTERIOR

Current research in coaching development infers that coaching is predominantly a decision-making process (Abraham et al., 2006). Nevertheless, there is a general perception that research in sports science does not meet the needs of coaches (Goldsmith, 2000; Williams & Kendall, 2007), since is not helping the coaching process, in order to make the best decisions. Consequently, there is a need for a model of coaching (Abraham et al., 2006). This model should consider the "real world" problems of the training process, taking in account the complexity of the sport performance phenomena, since in literature on coaching, several authors refer that exist a "gap" between sports science research and coaching practice (Spinks, 1997; Goldsmith, 2000; Williams & Kendall, 2007 and Midgley et al., 2007).

Under the scope of contributing to minimise that "gap" between research and coaching practice, specially referring to physiologic factors that impair sport performance, this work proposes an operative methodology that considers (1) the epistemological and methodological aspects of complexity; (2) the change in understanding the physiologic factors that influence sport performance, required by the complex approach and (3) a paradigm rupture in training methodology, that allow coaches to use physiologic factors in decision-making process of the sport training.

References:

ABRAHAM, A., Collins, D., Martindale, R. (2006). The coaching schematic: validation through expert coach consensus. J Sports Sci., 24(6), 549-64.

GOLDSMITH, W. (2000). Bridging the gap? Now there is a gap in the bridge! American Swimming Coaches Association (ASCA) Newsletter, 3, 2 – 4

MIDGLEY, A. W., McNaughton, L. R., Jones, A. M. (2007). Training to Enhance the Physiological Determinants of Long-Distance Running Performance: Can Valid Recommendations be Given to Runners and Coaches Based on Current Scientific Knowledge? Sports Med. 37(10), 857-880.

SPINKS, W. (1997). Sports research and the coach. Sports Coach, 19, 18 – 19.

WILLIAMS, S. J., Kendall, L. (2007). Perceptions of elite coaches and sports scientists of the research needs for elite coaching practice. J. Sports Sci., 25(14), 1577 – 1586.

SPORT MEDICINE AND THE ETHICS OF BOXING IN THE AREA OF GENOMICS –

MÜLLER, A.

MAASTRICHT UNIVERSITY

Among others the British Medical Association demands a ban on boxing for several years now (BMA, 1993, 2007). However, such a request on the basis of the potential health risk for boxers is falling short for ethical and societal reasons (Cowie et al., 2000; Leclerc & Herrera, 1999). It overlooks other forms of health risks in society in general (e.g. traffic, suicide) and health risk in other sport disciplines in particular, namely high risk sports such as mountain climbing (Müller, 2008). Furthermore the argument against boxing from a medical professional's perspective, such as the duty to heal can not 'automatically' override the respect for the athletes' autonomy which is used as an argument against the ban of boxing (Beauchamp & Childress, 2001). Thus a sound ethical approach needs to balance the stakeholder's views and (ethical) arguments. However, a general ban of boxing is no option for boxers, the reduction of risks is. E.g. the reduction of the number of rounds, usage of protective head gear, improvement of pre-participation examinations seems desirable form both sides, i.e. physicians and athletes (Loosemore et al., 2007; McCrory, 2007). But how far can/should preventive measures go? Should genetic testing (e.g. APOE e4) be part of those risks reduction strategies? (Jordan et al., 1997; Savulescu, 2005; Spriggs, 2004). If such a test is feasible should it be offered to athletes as a screening, i.e. to asymptomatic boxers or as a test, that means to athletes that already have a certain family history? What view do stakeholders (such as athletes, coaches, physicians, etc.) hold on this issue? In this paper I would like address these questions supported by qualitative empirical data (results of interviews and focus groups) of a two-years research project.

References

Beauchamp, T. L., & Childress, J. F. (2001). Principles of biomedical ethics.

British_Medical_Association. (1993). The Boxing Debate.

British_Medical_Association. (2007). Boxing. An update from the Board of Science

Cowie, C., Herrera, C. D., & Leclerc, S. (2000). The ethics of boxing. Br J Sports Med, 34(3), 230-.

Jordan, B. D., Relkin, N. R., Ravdin, L. D., Jacobs, A. R., Bennett, A., & Gandy, S. (1997). Apolipoprotein E epsilon4 associated with chronic traumatic brain injury in boxing. JAMA, 278(2), 136-140.

Leclerc, S., & Herrera, C. D. (1999). Sport medicine and the ethics of boxing. Br J Sports Med, 33(6), 426-429.

Loosemore, M., Knowles, C. H., & Whyte, G. P. (2007). Amateur boxing and risk of chronic traumatic brain injury. BMJ, 335(7624), 809.

McCrory, P. (2007). Boxing and the risk of chronic brain injury. BMJ, 335(7624), 781-782.

Müller, A. (2008). Risikosport : Suizid oder Lebenskunst? Hamburg.

Savulescu, J. (2005). Compulsory genetic testing for APOE Epsilon 4 and boxing. In C. Tamburrini (Ed.), The genetic technology and sport : ethical questions (136-146). London

Spriggs, M. (2004). Compulsory brain scans and genetic tests for boxers--or should boxing be banned? J Med Ethics, 30(5), 515-516.

SPORT AND ITS PHILOSOPHICAL SIGNIFICANCE

HOGENOVA, A.

CZECH OLYMPIC COMMITTEE

Sport and its philosophical significance

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Sport as a conflict phenomenon. Conflict is something fundamentally different to battle in the sense of war. Sporting conflict shows us something which is otherwise inaccessible both to the athletes themselves and the spectators watching them. Hence sport involves something other than triumph. Questioning is a commitment to thought, it is the utmost in man's spiritual life. Sport is hence a space for substantive questioning, which manifests itself right in the midst of competition. The spectator is drawn into the fundamental nature of questioning during the contest. The spectator experiences this questioning quite perceptibly. Sport is a place in which the truth can be unmistakably, indisputably and instantaneously experienced. The spectator and the athlete both know who will be first past the finish line. Such a testament of truth is not often experienced in everyday life; sport is an exception in this regard. The spectator experiences the uncovering of the essence of truth by watching the conflict unfold and is the so-called target witness of the truth of this conflict. This harbors within it the sense of ethics, pedagogy and humanities. Truth cannot be so easily confirmed during the course of everyday life. This can lead to turmoil and confusion which cannot often be completely explained even after thorough analysis. Sport is also a space for encountering genuine greatness. Sport as dialogue par excellence. Questioning, the path to truth and accomplishment – everything becomes feasible, comprehensible and unequivocal. The experience of encountering the truth occurs in the present, this is very important for the nature of man's thoughts even in other walks of life.

Sport is not only entertainment and a means to human health. It is something much more important than it seems at first glance. Hence, sporting events are important and the most important of all are the Olympic Games. The Olympic Games are not only entertainment, they are not only a space for the appreciation of advertising revenue, they are not only for the manifestation of peace on earth. The Olympic Games are a space in which athletes and spectators all over the world can experience truth as the foundation of being. It is also important to care for the philosophical sense of sport. This is often forgotten about!

Literature:

Heidegger, M., Hölderlins Hymne „Andenken." Frankfurt am Main: Vittorio Klostermann 1982.

MCNamee, M. J., Ethical Issues in Sport. Rotledge Chapman & Hall 2008.

THE FAIR PLAY PRINCIPLE AND OTHER VALUES IN SPORT

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In the text is assumed that man constitutes the highest value in sport and all other values are secondary in their relation to this principal value. They serve its strengthening. It refers, of course, to the principle of fair play and to all other moral values influencing behaviour and life of societies and persons connected with sport, since man – using Kant's terminology contained in "Groundwork of the Metaphysics of Morals" – is in sport a non-relative value. All others have a relative character.

The essence of sport, that is: the essence of a particular sport discipline, is constituted by its rules, regulations. They define its identity, character, qualities and principles of rivalry. They are its fullest and the most coherent definition. If they didn't exist, a given sport would cease to exist too. They constitute for it the second – next to man – value of a fundamental character and the principle of fair play can be applied only in its relation towards the rules regulating the course of sport rivalry.

However, in order to enable this rivalry to arise, it is necessary to meet, inter alia, one extremely important condition connected with proper training and preparing for competition. Only a suitable level of physical fitness and skills, a high degree of professional competence – not counting the whole sport infrastructure - enables sport rivalry to take place and makes it possible to achieve success as a social and individual value. Thus, fitness and skills of a luger, a bobsleigh rider or a tennis player are not enough to take part e.g. in ski jumping or car racing.

The preparations for competitions and the course of rivalry are highly positively influenced by the principles of fair play. They supplement the rules and humanise sport competitions saturating them with moral good.

Bibliography:

McIntosch P., Fair play: Ethics in Sport and Education, Londyn 1979.

Veblen T., The Theory of the Leisure Class, New York 1957.

Kosiewicz J., The Olympic Games from the Perspective of the Religious and Philosophical Conception of the Body, "Research Yearbook. Studies in the Theory of Physical Education and Sport" 2001-2002, vol. VIII.

Kosiewicz J., Olympic games as a reflection of needs, objectives and aliments of contemporary sport, "Acta Academiae Olympiquae Estoniae" 2001, vol. 9.

Loland S., Fair Play Historical Anachronism or Topical Ideal? In: McNamee M.J, Parry J.(eds.)., "Ethics and Sport", London 1998.

Loland S., Justice and Game Advantage in Sporting Games, "Ethical Theory and Moral Practice, 1999, vol.2.

McNamee M., Parry S.J., (edited) Ethics and Sport, London 2002.

Williams B., Ethics and the Limits of Philosophy, Cambridge 1985.

CAN PHYSICAL ACTIVITY INCREASE MENTAL HEALTH? NO WAY

BIRCH, J.

NORWEGIAN SCHOOL OF SPORT SCIENCES

Physical activity is apparently beneficial for almost everything these days. Even minds benefit from exercise we are told. At least, that is what is claimed in studies regarding physical activity to increase mental-, as well as physical health. From a philosophical perspective, how are we to interpret such claims? The suggestion in this talk is that we are confronting cases of mental causation. The two interesting ways such causation might happen is: 1) a mental state causes a physical state, and 2) a physical state causes a mental state. The first way might be psychosomatics, the latter is what I suppose is meant when claims about physical activity and mental health are made, so I will concentrate on this case, but the argument will also undermine the possibility of psychosomatics.

There are three standard ways to understand the relationship between mind and body in philosophy:

a) Substance dualism is the view that there are two substances in the world: the material body and the immaterial mind. These stand in a causal relation, but how the interaction works remains a mystery. Such a view of the world is not going to explain how physical activity makes a difference in the non-physical realm of the mind. It is a difficult scientific position to hold, since one of the most basic laws of physics is the closure principle.

b) Epiphenomenalism is the view that mind does not make a difference in the physical world, it is just an epiphenomenon. Since the view denies there is causation between the physical and the mental, it is certainly not the view you want to hold if you're claiming that physical activity benefits mental health.

c) So we are left with physicalism. Physicalism is the view that there is nothing but physical matter in the world. So what we call mental must be realized by, be identical with or supervene on the physical.

From a physicalist perspective, it is impossible to have mental or physical change without a physical cause. For physical activity to benefit mental health then, the activity must alter a physical state, say at the level of neurotransmitters, because if there isn't a change at the physical level, there isn't going to be any change at all: the mental is physical. If you claim there is a genuine mental change, you must defend the view called substance dualism. When it comes to mental causation, it's not a good option.

I believe these considerations are important because our concepts describe the goings on in the world. If what I have claimed above is justifiable, health workers should stop telling patients they are mentally ill (which some feel ashamed of, or believe is not really an illness at all), because they are physical ill. In the same way, physical activity cannot increase mental health, only physical health. But that is just as well.

The talk is based upon the work of Jaegwon Kim (2005).

References

Kim, J. Physicalism, or something near enough. Princeton, Princeton University Press, 2005

17:15 - 18:45

Oral presentations

OP-SO04 Sociology 4

TOWARDS AN INCLUSIVE INTEGRITY POLICY IN SPORT? A DECADE OF PREVENTION POLICY OF SEXUAL HARASSMENT IN SPORT IN THE NETHERLANDS

VERTOMMEN, T., MOGET, P., WEBER, M., VAN VELDHOVEN, N.

*NOC*NSF*

Integrity policies become more and more accepted in public governance, police and other social sectors. In sport however, there seems to be a lack of interest to install a set of protection measurements concerning integrity. We notice some examples of good practice in local and national sport federations or clubs. Unfortunately there are not enough coordinated, coherent and subsidized initiatives to install a toolbox of integrity instruments (Maesschalck & Vanden Auweele, 2008).

The prevention policy of the Dutch Olympic Committee against sexual abuse and harassment in sports has been crucial for the social safety for a decade now (Moget & Weber, 2008). Rules of conduct were formulated for coaches and other sport leaders and the NOC*NSF hotline was formed. Victims and perpetrators of sexual harassment but also other (indirect involved)athletes, parents, coaches, board members of clubs and federations can reach this emergency telephone 24/7 for questions, support, first relief and report on incidents. More support and advice, when necessary, is given by councilors and advisors.

Every year, several incidents (approximately 100 a year) are reported to NOC*NSF. Cases of sexual harassment and abuse, violence, unwanted intimacies, abuse of power, handled by the councilors and advisors of NOC*NSF produce crucial information on the nature and number of complaints concerning harassment and abuse in sport.

The registration forms of the councilors and advisors contain valuable information about the age, sex and position of victim and accused. Types of harassment, point in time and duration of the incident and sport discipline can also be found in these documents.

With this information we can check theories and models, f.e. the grooming process as described by Brackenridge (2001) and possible correlation between soft and serious types of harassment.

The research will also take a close look to the process of treating the complaints, so that this can be evaluated.

The ongoing research, of which the first results will be presented during the conference, is the first worldwide to evaluate a prevention policy in sport based on real incidents.

References

Brackenridge, C.H. (2001). Spoilsports. Understanding and preventing sexual exploitation in sport. London & New York: Routledge.

Maesschalck, J. & Vanden Auweele, Y. (2008). 'Integrity Management in Youth Sport: How to ensure that the Panathlon Declaration makes a real difference?', Ethics Management in Youth Sport, Implementation of the Panathlon Declaration, Strategies and Good Practices (CD-rom). Ghent: PVLO.

Moget, P & Weber, M. (2008). 'Vulnerabilities, pitfalls and chances in sports. A decade of social security policies in Dutch sports', Ethics Management in Youth Sport, Implementation of the Panathlon Declaration, Strategies and Good Practices (CD-rom). Ghent: PVLO.

SOCIAL INEQUALITIES AND OBESOGENIC ENVIRONMENT – WHAT ARE THE LINKS?

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Introduction: Overweight and obesity have become an epidemic problem in most countries of the western world (Brettschneider & Naul, 2007). Despite a lot of programs fighting the increasing number of overweight people the success of these programs, which are directed to the indiviual's behaviour, is rather limited. The own research has two main goals. On the one hand we look at the lifestyles of ten year old children from Cologne by examining their nutritional patterns, their media consumption as well as their level of physical activities in order to identify life-style patterns which might be strong predictors for the prevalence of overweight in children. On the other hand living conditions and social inequalities in an urban setting are analysed in order to identify the importance of these factors (Hoffmeyer-Zlotnik, 2005; Keller, 2007).

Methods: Nearly 1200 ten year old children from Cologne (Germany) have filled in a questionnaire in a classroom setting.Validated instruments to assess nutritonal patterns, media consumption and physical activity have been applied. In addition the fourth graders were measured and weight in order to assess the BMI for each kid.

Results: The analysis of the structural level reveals that their is a strong negative relationship between the housing conditions, the SES and the prevalence of overweight and obesity. Children growing up in suburbs are less active, watch more TV and show a higher BMI.

Discussion: These results show that children with low socio-economic background suffer from several negative impacts of an obesogenic environment (Richter et al., 2008; World Vision, 2007). These results have to be taken into consideration when new programs for the prevention of overweight and obesity are designed.

References

Brettschneider, W.-D. & Naul, R. (2007). Obesity in Europe. Frankfurt/Main: Peter Lang

Hoffmeyer-Zlotnik, J. H. P. (2005). Klassische Verfahren der innerstädtischen Typisierung. In Arbeitsgruppe-Regionale-Standards (Hrsg.), Regionale Standards: Ausgabe 2005. (S. 125-148) Mannheim: ZUMA.

Keller, C. (2007). Selektive Effekte des Wohnquartiers. Sozialisation in räumlicher Segregation. Zeitschrift für Soziologie der Erziehung und Sozialisation 27 (2), 181-196.

Richter, M.; Hurrelmann, K.; Klocke, A.; Melzer, W. & Ravens-Sieberer, U. (Eds.) (2008). Gesundheit, Ungleichheit und Jugendliche Lebenswelten. Ergebnisse der internationalen Vergleichsstudie im Auftrag der Weltgesundheitsorganisation WHO. Weinheim: Juventa.

World Vision (2007). Kinder in Deutschland 2007. Frankfurt/Main: Fischer.

'WE ONLY SMOKE WEED, DRINK BEER AND PLAY SPORT WHEN WE NEED TO': SPORT AND DRUG USE IN THE LEISURE LIVES OF YOUNG PEOPLE

SMITH, A.

UNIVERSITY OF CHESTER

Introduction: It is widely assumed that the promotion of young people's participation in sport and physical activity may be a particularly effective way of enhancing participants' health and preventing them from engaging in the use of legal and illegal drugs. However, such a view is premised on a one-sided and uncritically accepted perception of sport as an unambiguously wholesome and healthy activity in both a physical and a moral sense. Of course, such a perception is not wholly inaccurate, but it is one-sided and an appreciation of the other side of sporting culture might help us to develop a more realistic view of the likely effectiveness of those schemes in which sports of various kinds are used to promote health and social inclusion.

Methods: Set in this context, drawing upon questionnaire and interview data from a broader study that investigated the place of sport and physical activity in the lives of 1,010 15-16 year-olds attending schools in north-west England and north-east Wales, the central objective of this paper is to examine the independence between young people's participation in sport and their use of legal (e.g. alcohol and tobacco) and illegal drugs (e.g. marijuana) during their leisure time.

Results: The findings of the paper reveal that while participation in leisure-sport and physical activity was part of young people's quest for generating sociability and excitement in the company of friends and because it enabled them to do what they wanted, when they wanted and with whom they wanted, for many of them, and particularly the more frequent participants, playing sport and doing physical activity was just one component in their generally busy and wide-ranging leisure lives. It is also suggested that the consumption of drugs of various kinds did not prevent young people in the sample from engaging simultaneously in the consumption of legal and illegal drugs.

Discussion: In this regard, the paper argues that it is only possible to understand adequately where sport and physical activity fit into the multi-dimensional lives of 15-16 year-olds by examining those lives 'in the round', and by locating young people within the various networks of relationships to which they have belonged in the past, and which they continue to form in the present. The paper concludes by reflecting upon the relevance of the findings for understanding some of the policy issues surrounding the use of sporting schemes as vehicles of social policy in which the intention is to contribute to the promotion of health and social inclusion by reducing levels of legal and illegal drug use among young people.

THE ROLE OF PHYSICAL ACTIVITY AND SPORTS IN PREVENTIVE ACTIONS AGAINST DRUG ADDICTION IN RUSSIAN FEDERATION

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ST PETERSBURG RESEARCH INSTITUTE OF PHYSICAL CULTURE

Introduction. The drug addiction is considered today as a social pathology and one of global problems. A problem of additive behaviour represents the complex problem consists of some aspects: medical, psychological, social, etc. Proceeding growth of a drug addiction in Russia by the end of 2019 will lead to serious demographic 'failure' in several age categories of the Russian population that threatens preservation of the nation*.

Methods. As popular wisdom says, it is better to struggle for something good, than against something bad, so the question of preventive actions is put more widely, about integration of sports methods. This integration is carried out in several directions: [1]the sports world is

considered, how intuitively clear model for teenagers of a social reality with its situations of competitive struggle, victories and defeats; [2]physical activity and sports means find wide application in actions by means of carried out pedagogical and psychological support of socialization; [3]traditional methods of socialization adapt for interests and inquiries of the teenagers who are professionally going in for sports.

Results. During realisation of preventive actions programs, developed by employees of the St.-Petersburg research institute of physical culture, following results are reached: [1]we prepared methodical literature on use of means of physical activity and sports; [2]in system of teaching and educational process introduced the component directed on preventive actions against drug addiction; [3]there are constantly worked qualification improvement courses of sports-pedagogical employees at schools of Russia; [4]since 2005 we carried out annual all-Russian mass sports actions «against drugs». Constant regional sociological monitoring proves efficiency of the developed actions directed on preventive actions against drug addiction by means and methods of physical activity and sports. At all persons captured by preventive actions, in relation to psychoactive substances the quantity of children and the teenagers carried to group of risk has decreased for 20-25 % as compared took place prior to the beginning of the given actions.

Discussion. The physical activity and sports potential is very essential in researched problem. First, such employments are capable to satisfy the majority of those requirements that induce to try drugs. Also here both bright emotions, and intensive dialogue, and an eventful life, self-test and risk. Secondly, sports are the most powerful «social lift», allowing young men sharply to raise the status, on to leave qualitative other level of ability to live. Thirdly, it is activity which for the objective reason is not compatible to drugs and promotes the statement of healthy way of life.

References. *Boev B.V. Narcotism's fights in Russia:the analysis and the forecast of demographic consequences./methodological seminar FIAN, 2001, Moscow.

SPORT PRACTICE AND RESILIENCE: POWER TO OVERCOME.

SANCHES, S., RUBIO, K.

SAO PAULO UNIVERSITY

The educational sport psychology can be an important tool for the prevention and solution of a large number of social problems. One of the concepts related to it is the resilience, which is the capacity of some people that, even living in a hostile environment, can overcome the adversities and present adapted patterns of normality. People can be considered resilient when they present internal resources and abilities to avoid adversity determining negative directions for their lives. (Luthar, Cichetti and Becker, 2000). To investigate the resilience, we have to look at the risk factors, which can be defined as the negative events that can increase the probability of physical, social or emotional stress, and at the protective factors, that help dealing with these difficulties. The objective of the present study is to investigate how the sport practice can contribute to the development of the resilience, and what are the benefits from the acquisition of copings strategies to deal with stressful situations in different contexts of life. The method includes the investigation of the "life stories" (Rubio, 2006) of 10 elite athletes and the application of an adapted version of the "Five Fields Map" (Sanches, 2004). The results indicate many contributions of the sport practice: the sport as a profession that helps to overcome poverty; the opportunity to study with an athlete scholarship; the chance of not having to work at young age; the growth of their social and affective support net and the strengthening of significant bonds with good role models; the experience of positive emotions; increased health and body care, self-esteem, self-confidence and the development of future plans; the distance of drugs and criminality; the boost of social and group work abilities, autonomy and initiative to fight for wishes and dreams; better levels of self-control, empathy, and others. The conclusion of the study is that sport practice can decrease a large number of risk factors and increase other protective factors, contributing to the development of the resilience. This capacity of coping with adversities can help people that practice sports as a free time activity or with an educational or social finality, as well as the elite athletes that will cope better with the adversities (like losing or getting injured) and will have more chances to succeed in their sport career.

LUTHAR, S. S.; Cichetti, D. Becker, B. (2000) Research on Resilience: Response to Commentaries. Child Development, May / June. 71 (3), p. 573-575.

RUBIO, K. (2006) Brazilian Olimpic Medalists – memories, stories and the imaginary. São Paulo: Casa do Psicólogo.

SANCHES, S. M. (2004) Sport practice, social and affective development: social projects as a support net. Master´s Dissertation, Psychology Institute, Pontifical Catholic University of Campinas, Campinas – SP - Brazil.

NOT HEALTH PROMOTON BUT HEALTHY ACTIVITY

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HEDMARK UNIVERSITY COLLEGE

In order to bring the analysis of research into policy related to health and physical activity down to earth, this paper scrutinizes the views of the representatives of the implementers: the sport clubs. Based on document analysis and observation in board meetings, the role of sport clubs was identified to be, first, a facilitator for sport development which was associated with a competitive attitude, achievement orientation and development of athletes. However, during interviews, sport was, secondly, expressed to play a role in the development of social goods, such as upbringing and health. Regarding upbringing, one informant held: '[The sport club] shall be a place where children can get good values, attitudes, something more than just knowing the technical skills of football. We will take a societal responsibility. That is, we shall develop the human being, be in interaction with others and care for others. And not at least, we will give the children a positive experience for life'.

Paraphrasing Hillary Clinton, he noted that: 'it takes a whole village to raise a child'. There seemed to be competing ideals between the logic of sport as achievement oriented on the one hand, and sport as a social institution for well being and upbringing on the other. But for many sport club representatives, the provision of sport needs no further legislation; sport is good, period. The instrumental values of sport, as for example health, take a slightly different form in the discourse. Sport club representatives are not concerned with health in relation to somatic illness, but they believe in the value of sport because they see sport as a healthy way of spending leisure time, of growing up, and of personal and social development. With the application of neo institutionalism and the translation perspective, the perspective of the local organizations is underscored. In conclusion, it is suggested that sport policy is as much influenced by local sport policy, as vice versa. Aiming at identifying elements of government's sport policy in local and voluntary sport clubs, the analysis has to take the sport club representatives as the point of departure. The limited focus on health during the case studies of sport clubs may have several, but not necessarily mutual exclusive, reasons. First, it could be that health is simply not a focus for a sport club. Second, health is

implicit in the representatives' understanding of sport; it is so taken for granted that it is not considered to speak about. Third, and closest to reality for most informants, health is not mentioned explicitly because it is part of larger packages of societal goods.

17:15 - 18:45

Oral presentations

OP-RE04 Rehabilitation 4

RESISTANCE TRAINING IMPROVES MUSCLE STRENGTH AND FUNCTIONAL CAPACITY IN RELAPSING-REMITTING MULTIPLE SCLEROSIS - A RANDOMISED CONTROLLED TRIAL

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UNIVERSITY OF AARHUS; SOENDERBORG HOSPITAL; AARHUS UNIVERSITY HOSPITAL

Introduction: Patients suffering from multiple sclerosis (MS) are characterized by reduced muscle strength(1) and functional capacity(2). For MS patients, improvements in muscle strength and thereby functional capacity could make daily living easier and extend independent living. Progressive resistance training (PRT) has proven to be effective in increasing muscle strength and functional capacity during daily activities in healthy older people. However, the effects of PRT have only been sparsely investigated in randomised controlled trials in MS patients(3). We therefore tested the hypothesis that lower body progressive resistance training (PRT) can improve muscle strength and functional capacity in MS patients, and that possible improvements are maintained 12 weeks after the trial.

Methods:

The present study was a two-arm, 12 week randomised controlled trial (RCT) including a post study follow-up period of 12 weeks. 38 MS patients (EDSS;3-5.5) were randomised to a progressive resistance training group (Exercise, n = 19) or a control group (Control, n=19). The Exercise group completed a biweekly 12 week lower body PRT program and was afterwards encouraged to continue training, on their own. The Control group continued their usual daily activity level during the trial period. After the trial the Control group completed the PRT intervention. Both groups were tested before (Pre) and after 12 weeks of trial (Post) and at 24 weeks (Follow up) where isometric muscle strength of the knee extensors (KE MVC) and functional capacity (FS; score calculated from four functional tests) were evaluated.

Results: KE MVC and FS improved significantly after 12 weeks of resistance training in the Exercise group (KE:15.7±20.5%; FS:21.5±8.3%, $p<0.05$) and the improvements were significantly better than seen in the Control group ($p<0.05$). The improvements of KE and FS in the Exercise group persisted at Follow up after 24 weeks. The exercise effects were reproduced in the Control group during the 12 weeks PRT period after the trial.

Discussion: The present study gives support to use of resistance training in MS patients. Twelve weeks of intense PRT of the lower extremities leads to improvements of muscle strength and functional capacity in moderately impaired MS patients the effects persisting after 12 weeks of self guided physical activity.

References

(1) Armstrong LE, Winant DM, Swasey PR, Seidle ME, Carter AL, Gehlsen G. Using isokinetic dynamometry to test ambulatory patients with multiple sclerosis. Phys Ther 1983 Aug;63:1274-1279.

(2) Savci S, Inal-Inc, Arikan H, et al. Six-minute walk distance as a measure of functional exercise capacity in multiple sclerosis. Disabil Rehabil 2005 Nov 30;27:1365-1371.

(3) Dalgas U, Stenager E, Ingemann-Hansen T. Multiple sclerosis and physical exercise: recommendations for the application of resistance-, endurance- and combined training. Mult Scler 2008 Jan;14:35-53.

INFLUENCE OF THREE DIFFERENT BALANCE SHOES ON EMG-ACTIVITY DURING WALKING

TURBANSKI, S., LOHRER, H., NAUCK, T., FAULSTICH, M., SCHMIDTBLEICHER, D.

1. INSTITUTE OF SPORT SCIENCES, UNIVERSITY OF FRANKFURT/MAIN, GERMANY, 2. INSTITUTE OF SPORTS MEDICINE, FRANKFURT/MAIN, GERMANY

Introduction: In numerous studies it was shown that sensorimotor training on balance boards and on unstable surfaces leads to improved neuromuscular control. Injury prevention or rehabilitation is aimed by appropriate exercises. Recently, manufacturers advertise specific shoe and unstable sole constructions to induce neuromuscular training stimuli. Therefore, the purpose of this study was to compare muscle activity during walking using three different balance shoes.

Methods

Twelve healthy male subjects, all physical education students, participated in this study (age: 25.3+/-1.4 years; height: 180.9+/- 5.5cm; weight: 78.6 +/- 8.3kg). On two days subjects were adapted to the test shoes.

Muscle activity of the lower leg was analysed during treadmill walking using surface EMG. In every testing condition subjects walked four minutes at 4.5 km/h (1.25m/s) and the last 30 seconds of each trial were recorded. The treadmill was equipped with two force plates to detect ground reaction forces on both sides (left and right leg). First, each person performed an unshod trial (control condition). Then, MBT® shoe (MBT), Finnamic-Rollenschuh® (FIN), and Reflex Control® shoe (RC) were applied and tested in a randomized order. EMG-activity was recorded of the following muscles: m. tibialis anterior (TIB), m. gastrocnemius lateralis (GAS), and m. peroneus longus (PER). We calculated iEMG for each ground contact phase and the mean values of at least 20 steps were used for statistical analyses. The four testing conditions (barefoot and three therapy shoes) were compared by using ANOVA for repeated measures.

Results: In comparison to control condition (barefoot - BF) we found in all muscles a tendency to increased EMG-activity when subjects wore MBT and RC and decreased EMG-activity when subjects wore FIN. But the level of significance (p≤0.05) was not reached in muscles TIB and PER. In GAS and in summarized muscle activity we found significant differences between RC and the conditions FIN and

BF (p=0.000 – p=0.031). There were no significant differences between RC and MBT but a tendency to higher activity in RC in muscles GAS and PER.

Discussion: Our data indicate that the different therapy shoes show varying demands during walking on a treadmill. Similar effects were found in a study comparing these unstable shoes during postural control in one-leg stance (Lohrer et al. 2008).

In conclusion, we suggest that balance shoes with unstable sole constructions (e. g. MBT and RC) increase sensorimotor training stimuli during walking. One can speculate about positive influences on injury prevention and rehabilitation in athletes and in elderly people. The shoe FIN seems not to be adequate to achieve such effects.

References

Lohrer H, Turbanski S, Nauck T, Schmidtbleicher D (2008). Sportverletz Sportschaden, 22(4), 191-195.

CARDIOVASCULAR RESPONSES DURING INCREMENTAL ENDURANCE AND RESISTANCE EXERCISES IN SUBJECTS WITH AND WITHOUT CARDIOVASCULAR DISEASE

HAUTALA, A., KARJALAINEN, J., KIVINIEMI, A., MÄKIKALLIO, T., HUIKURI, H., TULPPO, M.

VERVE RESEARCH

Introduction: Both endurance (EE) and resistance (RE) exercises have been recommended to include in exercise training programs in subjects with and without cardiovascular disease (1). Blood pressure increases linearly during incremental EE, but blood pressure response during incremental RE is not well established. We compared cardiovascular responses during acute RE and EE. We hypothesized that RE results in higher blood pressure responses than EE at the same relative exercise intensities in subjects with and without coronary artery disease (CAD).

Methods

Ten healthy male subjects (age 46±5 yr, BMI 27±4 kg/m2, VO2peak 45±8 ml/kg/min, mean±SD) and ten male CAD patients (age 56±3 yr, BMI 26±2 kg/m2, VO2peak 29±5 ml/kg/min) performed a graded RE and EE protocols. RE was performed by knee extension device (HUR Oy, Kokkola, Finland) without Valsalva maneuver including sets of 15 double-knee extensions (45 s work, 75 s recovery) starting at 0 kg and followed by an increase of 4 kg every 2 minute until voluntary exhaustion. EE was performed by bicycle ergometer starting at 0 W and followed by an increase of 25 W every 2 minute until voluntary exhaustion. ECG, respiration and beat-to-beat blood pressure (Finapres, USA) were recorded during the protocols. Peak heart rate (HR) and peak systolic (SBP) and diastolic blood (DPB) pressures were analyzed from three successive beats at the end of the each work load. Rate pressure product (RPP), an index of myocardial work, was calculated as SBP multiplied by HR.

Results: HR was higher during EE compared to RE at the levels of 50 – 100% of peak exercise capacity (p=0.011 – 0.0001) in healthy subjects, as well as in CAD patients at the intensity level of 40 – 100% (p=0.044 – 0.0001). No significant differences were found in SBP or DBP between the exercises at the same relative work loads. However, in healthy subjects RPP was higher during EE than RE at the intensity levels of higher than 60 % of peak exercise capacity ($p<0.050$), and similarly in CAD patients at the intensity levels of higher than 70% of peak exercise capacity ($p<0.050$).

Discussion: Surprisingly, cardiovascular responses did not differ between EE and RE at low or moderate relative intensity levels of exercise. Peak cardiac work was even higher during EE compared to RE at the high intensity levels of exercise both in healthy subjects and in CAD patients. It appears that resistance training can be incorporated safely into rehabilitation programs for patients with cardiovascular disease.

References

1. Williams MA, Haskell WL, Ades PA, Amsterdam EA, Bittner V, Franklin BA, Gulanick M, Laing ST, and Stewart KJ. Resistance exercise in individuals with and without cardiovascular disease: 2007 update: a scientific statement from the American Heart Association Council on Clinical Cardiology and Council on Nutrition, Physical Activity, and Metabolism. Circulation 116: 572-584, 2007.

ADOLESCENT CONCERNS, PERSPECTIVES AND EXPERIENCES IN RETURNING TO SPORT FROM INJURY

PODLOG, L., SMITH, C.

TEXAS TECH UNIVERSITY

The purpose of this investigation was to examine injured adolescent athlete concerns, perceptions and experiences prior to a return to competition as well as during the initial come-back season. A total of 27 interviews with eleven Australian adolescents (aged 13-17) who had incurred a range of severe injuries (e.g., anterior cruciate ligament tears) were analyzed using Maykut and Morehouse's (1994) constant comparative method. Prior to their first competition, adolescents reported concerns about the potential effects of diminished fitness and skill levels, "falling behind" competitors, and anxiety over re-injury. At the same time, participants, particularly those with an extended competitive absence, commented that they "couldn't wait" to get back into competition, to achieve personal bests, and to compete alongside their teammates. For some (n=5), the eagerness to return to competition was tempered by the recognition of the need to take sufficient time in recovering to ensure optimal post-injury performances. Along these line, participants (n=4) indicated that coaches and parents reinforced the necessity of taking adequate time to recover and to avoid rushing a pre-mature return. These participants commented that it would likely take time to return to the same level of "sharpness", skill and fitness as before their injury. Following resumption of competitive play, adolescents articulated a range of positive and negative experiences. Adolescents (n=8) expressed feelings of satisfaction in making an expedient return to pre-injury levels and in receiving positive performance feedback from coaches and teammates. Others however (n=3), indicated that they put too much pressure on themselves to perform well in their first competition which in turn led to feelings of frustration and diminished confidence. In some cases, participants were extremely disheartened after experiencing re-injury or another traumatic injury shortly after their return to competition. In addition, frustrations over a lack of competitive fitness, and an inability to execute skills were persistent issues for some during the first several months of the come-back season. These challenges notwithstanding, adolescents typically indicated, that they "enjoyed being back on the team", they were "happy" to once again "do something that was fun", and to be part of the team. The results highlight the ways in which issues of competence (e.g., performance concerns), autonomy (e.g., self-induced pressures, an absence of coach/parental pressure), and relatedness (e.g., the importance of team affiliation) highlighted within self-determination theory may be relevant in examining the psychosocial processes associated with adolescent athletes' return to sport from injury. Further research utilizing an SDT conceptual framework is warranted.

References

Maykut, P., & Morehouse, R. (1994). Beginning Qualitative Research: A Philosophic and Practical Guide. London: The Falmer Press.

STANDARDIZED REHABILITATION PROGRAM MEETS PERSONAL STORIES OF MOVEMENT. A CHALLENGING DUET.

SCHRIVER, N., ENGELSRUD, G.

NORWEGIAN SCHOOL OF SPORT SCIENCE AND MOVEMENTUM APS

Introduction: Persons with an ACL ligament injury have different functional abilities following a rehabilitation program, even if the program is meant to be standardized in its activities. The reasons for this are discussed within medical research as being a problem with knee stabilization, differences in movement strategies or differences in muscular activity. The differences in functional outcome are, moreover, difficult to explain. Our perspective is that to be injured and to be in a rehabilitation process is a personal issue imbedded in an institutional context, and it might affect the patients' ability to move, after rehabilitation as well. Therefore the aim of this study was to investigate how the patients participate in the rehabilitation program and what their experience entail.

Method and material

The study consists of 46 interviews and observations with 28 patients with an ACL rupture. The interview was based on the understanding that the patients' language in the interviews contained both an institutional level and a personal level (Søndergård 2002).The interviews were tape-recorded and fully transcribed. The analyses are based on the informants' statements, and our observations, and reveal the different approaches the participants employ.

Results: Four themes were typical in the material: 1) "Exercise to just get it done"; 2) "Exercising what the body is familiar with"; 3) "Following the programme closely; 4) "Being indifferent to the program" The different approaches seem to be closely related to the patients´ prior experience with movement and their approaches towards the training.

Discussion: To talk about standardized training program holds a high value within research and so do demands for ensuring evidence and effect. Our results illustrate that it might be possible to talk about a standardized description of a program, but very difficult to ensure standardized performance. Herbert and Bø (2005) state that it is difficult to assess the quality of the intervention before it is known whether it is effective. Our results raise an important discussion and questions about how the patient's own understanding and interpretation plays a central part in the researcher's understanding of effect.

Participating in a rehabilitation program is realized in a multifaceted and complex way that is integrated into the lives and prior experience with movement of persons with an ACL injury.

References

Herbert, D. R. & Bø, K. 2005, Analysis of quality of interventions in systematic reviews, BMJ, vol. 331, pp. 507-509.

Svenaeus, F. 2003, Sjukdomens mening (The meaning of illness) Natur og Kultur.

Søndergård, D. 2002, Poststructuralist approaches to empirical analysis, Qualitative Studies in Education, vol. 15 no 2, p. 187-204

FUNCTIONAL LEVEL DURING SUB-ACUTE REHABILITATION AFTER TRAUMATIC BRAIN INJURY: COURSE AND PREDICTORS .

SANDHAUG, M., ANDELIC, N., VATNE, A., SEILER, S., MYGLAND, A.

AGDER UNIVERSITY

Objectives: To describe the functional level during sub-acute rehabilitation after severe and moderate traumatic brain injury (TBI), and to evaluate the impact of pre-injury and injury-related factors as predictors of early recovery.

Material and methods: A prospective study of 55 patients with moderate (n=21) and severe (n=34) TBI who received specialized, sub-acute inpatient rehabilitation. Functional level was assessed by the Functional Independence Measure (FIM). Possible predictors were analyzed in a regression model using FIM total score at discharge as outcome.

Results: At discharge from sub-acute rehabilitation, on average 53 days post-injury, 95% of patients with moderate TBI, and 62% with severe TBI had a good functional level with a FIM total score of 109-126. Among 34 patients with severe TBI 24% had a poorer functional level with a FIM total score <72 and 1 patient did not improve.

Predictors of functional level were FIM total score at rehabilitation admission (B= 0.452), Glasgow Coma Scale (GCS) score at rehabilitation admission (B= 6.022), length of post-traumatic amnesia (PTA) (B= - 0.088), length of stay (LOS) at acute hospitalization (B= -.165) and sub-acute length of stay (LOS) in the rehabilitation unit (B= 0.315). Conclusion: A high FIM score, high GCS score, short PTA period, short length of acute hospitalization and long stay are positive predictors of functional level at discharge from sub-acute rehabilitation hospital.

17:15 - 18:45

Invited symposia

IS-SS06 The ethics of enhancement in Sport and Exercise

TECHNOPHOBIA? RETHINKING FASTSKIN

MAGDALINSKI, T.

UNIVERSITY COLLEGE DUBLIN

In May 2009, FINA, the world governing authority for swimming, rejected just over 10 recently released elite racing costumes for not passing buoyancy and thickness tests and asked for modifications on a further 136 models. The decision is not without its consequences. World records established in now illegal suits will likely be returned to the previous holder, sponsorship arrangements may be hastily amended to ensure athletes have access to the best legal racing attire and manufacturers will race to meet FINA's thirty day deadline to resubmit their suits for approval.

The path of racing costumes over the past decade has not been easy. Heralded first as a timely and necessary innovation, the suits were almost immediately decried as unfair before being readily embraced in time for the Sydney 2000 Olympic Games. Although seemingly now a fixture in international swimming, there has, nevertheless, been an undercurrent of discontent bubbling under the surface, which erupted in 2008 with calls for the suits' review, if not immediate prohibition, following the release of Speedo's LZR and the bevy of broken records left in its wake.
In recent publications, I have argued that technologies applied to the body and those that enter the body – even where the physiological outcome is the same – are treated differently by a sportsworld willing to accept performance aids but not enhancement, however loosely it may be defined. Yet, the never-ending debate over the legitimacy of Fastskin suits presents a curious anomaly. External technologies, those that do not penetrate the skin, are typically more accepted than those that seek to alter the materiality of the body. Yet, the parameters established by FINA would seem to indicate a shift in how even external technologies are perceived and it would appear that a stricter conception of "performance enhancement" is being proffered, In this paper, I will review the debates that have surrounded Fastskin swimsuits over the past decade to determine whether, in the pursuit of the elusive "pure performance", recent conceptual shifts suggest the boundary between external and internal technologies are increasingly blurring.

ANTI-DOPING : TOWARDS UTOPIA OR DYSTOPIA ?

KAYSER, B.

UNIVERSITY OF GENEVA

In January 2009 new WADA anti-doping rules went into application, obliging elite athletes to be available for testing one hour each day of the year. Athletes must provide authorities in advance with 3-month daily programs and inform of changes. Three missed tests in 18 months are a doping offence. Even though the new regulation is somewhat easier for the athletes since only concerning a single hour a day, the wider application of the new rule is causing controversy and unrest. In Belgium a group of athletes has asked a court to probe the legality of the 365 day rule. FIFPro, a European soccer player union, is also questioning the legality of the rule. In the Netherlands an athlete union is considering launching a legal case and a national data protection institute is studying compliance of the rule and procedures with the law. Euro-parliamentarians are also studying the problem. Several athletes in tennis (Murray, Nadal, Serena) have voiced discontent in the media. It thus seems that both subjectively and legally limits to anti-doping regulation are potentially reached. Nevertheless, GPS-carrying by athletes to ease localization is proposed and actual experiments are underway with cyclists. Apart from urine, blood samples are taken, DNA profiling is used for forensic purposes and hair is discussed as another potential material. These developments revive the question on how far the quest for a drug-free sport should go and how far athlete surveillance can be pushed. Critical analysis must take into account several other problematic aspects of anti-doping: because of the limits of technology a negative test cannot exclude doping and winners can therefore never be declared clean with certainty. In fact, because of the limits to testing technology and procedures, the goal of anti-doping, the eradication of doping, is a utopian and impossible goal. These problems cannot be seen in a sports only framework since there is increased substance use for performance enhancement in society in general. The tendency of society is rather relaxed with regard to the use of performance enhancement outside sports, but there are signs of application of anti-doping principles in society at large. Anti-doping promises a utopian solution to a constructed problem, which should perhaps not be perceived as a problem in the first place, but delivers a rather dystopian outcome where a subset of civilians is treated in paternalistic fashion with increasingly repressive means in a climate of suspicion. The prospect of the application of the same principles elsewhere in society like in schools, universities, fitness clubs and in general, aimed at ridding humanity from all substance use for enhancement or pleasure is worrisome at the least.
Kayser B, Smith AC. Globalisation of anti-doping: the reverse side of the medal. BMJ. 2008 Jul 4;337:a584. doi: 10.1136/bmj.a584
Kayser B, Mauron A, Miah A. Current anti-doping policy: a critical appraisal. BMC Medical Ethics, 8 :2, 2007.

ETHICS AND PHYSICAL ENHANCEMENT: WHAT BASELINE, WHOSE JUDGEMENT?

HOLM, S., MCNAMEE, M.

CARDIFF UNIVERSITY AND SWANSEA UNIVERSITY

The aim of this presentation is to analyse the philosophical and ethical issues that arise in sports and health-related contexts regarding the use of biotechnological techniques that aim at enhancing one or more physical functions of human beings. New techniques have increased the scope and range of possible enhancement immensely. We first discuss the many different types of physical enhancement, noting that doping in sports is only a very minor part of the whole enhancement field. We then problematise the concept of enhancement and we show that deciding whether something should count as an enhancement is not a matter for pure personal decision. We then present the ethical arguments that have been put forward in the enhancement debate. We show that the validity of both the pro- and the anti-enhancement arguments is context-dependent and more specifically that some of the arguments against doping in sport are valid.

17:15 - 18:45

Oral presentations

OP-HF07 Health and Fitness 7

CHANGES IN PHYSICAL FITNESS BETWEEN THE YEARS OF 2003 AND 2008 IN YOUNG ADULT MEN

KYRÖLÄINEN, H., SANTTILA, M., VAARA, J., OHRANKÄMMEN, O., HÄKKINEN, K., FOGELHOLM, M.

UNIVERSITY OF JYVÄSKYLÄ, NATIONAL DEFENSE UNIVERSITY, TRAINING DIVISION OF DEFENSE COMMAND, ACADEMY OF FINLAND

Introduction: It has been shown that physical fitness has decreased between the years of 1979 and 2004 in Finnish young men (Santtila et al. 2006), and obesity has increased during the last ten years in the Western countries (Blair and Church, 2004). The purpose of the present study was to further examine changes in physical fitness and body characteristics between the years of 2003 and 2008 among young adult males.

Methods: The study design was a repeated cross-sectional, with independent samples in 2003 and 2008. A total of 849 (2003) and 783 (2008) men, who were invited to refresher training organized by the Finnish Defense Forces, volunteered for the present study. Because their mean age (29±4 vs. 24±3 yrs., p<0.001) differed significantly, all data have been adjusted for age. Height, body mass and waist circumference (WC) were recorded. Physical fitness tests consisted of grip strength, muscle endurance (recording the number of repetitions in one-minute push-up, sit-up and squat actions) and maximal oxygen uptake (VO2max). The initial work load in the bicycle ergometer test was 50 W increasing by 25 W every second minute until exhaustion (Fogelholm et al. 2006). Heart rate was recorded continuously by heart rate monitor (Polar Electro, Kempele, Finland). In addition, subjects fulfilled a questionnaire of physical activity and health.

Results: Mean (±SE) height of the subjects was 1.80±0.06 both in 2003 and 2008, body mass 78.5±1.1 vs. 80.5±0.5 kg (p=0.09), body mass index (BMI) 24.3±0.3 vs. 24.8±0.1 (p=0.11), and WC 0.88±0.09 vs. 0.86±0.04 m (p=0.02). Number of reps/min was 36±1 and 38±1 in sit-ups (p<0.01), 23±1 and 29±1 (p<0.001) in push-ups and 40±1 and 44±1 (p<0.001) in squats. Grip strength was 54.7±0.8 and 52.9±0.3 kg (p=0.05) and VO2max 43.7±0.7 and 41.5±0.3 ml/kg/min (p<0.01). In both years, WC (negative) and amount of physical activity (positive) were the main predictors of VO2max (together r2=0.49 and 0.46 in 2003 and 2008, respectively).

Conclusion: The present study demonstrated that in a large group of young adult men, aerobic fitness has decreased and muscle fitness increased during the last 5 years. At the same time, no changes (26-28% in both years) were observed in vigorous types of physical activity performed at least 3 times a week, body mass and BMI but, however, WC has decreased. These observed changes in physical fitness can partly be explained by changes (p<0.001) in their leisure-time physical activity. In 2003, 19.3 % reported to have performed endurance type physical activity, while its contribution was only 4.0 % in 2008. In conclusion, the changes in physical fitness are associated with the type and amount of physical activity, and WC is closely related to aerobic fitness.

References

Blair S.N. and Church T.S. (2004) JAMA 292:1232-1234.

Fogelholm M., Malmberg J., Suni J. et al. (2006) Int J Obes 30:962-969

Santtila M., Kyröläinen H., Vasankari T., et al. (2006). Med Sci Sport Exerc 38: 1990-1994.

THE EFFECT OF EXERCISE INTENSITY ON NEAT IN OVERWEIGHT/OBESE INDIVIDUALS

ALAHMADI, M.A., HILLS, A.P., KING, N.A., BYRNE, N.M.

THE QUEENSLAND UNIVERSITY OF TECHNOLOGY

Introduction: It has been often reported that the weight loss achieved through exercise interventions is less than expected. A possible reason is a compensatory decrease in non-exercise activity thermogenesis (NEAT) subsequent to the exercise bout. Research on obese boys has shown that NEAT increased with moderate-intensity exercise, but decreased after vigorous exercise (Kriemler et al., 1999). However, to our knowledge, a similar investigation in overweight/obese adults has not been published. The aim of this study, therefore, was to determine whether an acute bout of walking exercise impacts NEAT in overweight/obese adults, and most importantly to determine whether there is a difference between the impact of moderate- versus high-intensity walking exercise on NEAT.

Methods: 15 overweight/obese male adults with mean BMI of 30.4 ± 6.5 kg/m2 and mean age of 26.5 ± 3.0 years performed two single bouts of exercise at either moderate- or high-intensity walking exercise in two different occasions. The moderate-intensity exercise consisted of walking for 60 minutes on a motorized treadmill at 6 km/h. The high-intensity exercise consisted of walking at 6 km/h at 10% for five minutes followed by five minutes at 0% repeated for 60 minutes. NEAT was assessed by accelerometer on three days before, the day of, and three days following the exercise sessions.

Results: The average NEAT (counts/min) for moderate and high intensity protocols were: pre-exercise days (104.7 ± 25.7; 105.5 ± 25.9), exercise day (101.1 ± 42.9; 104.8 ± 43.1) and post-exercise days (113.7 ± 24.1; 113.2 ± 30.8). A two-way repeated measures analysis of variance (ANOVA) was conducted and showed that no significant changes in NEAT between moderate- and high-intensity (P = 0.74). ANOVA also revealed that no significant main effect for time (pre, the same day and post-exercise) was found (P = 0.26). The interaction effect between exercise intensity and days was also not statistically significant (P = 0.92).

Discussion: The primary finding from this study was that neither exercise intensity had a pronounced effect on NEAT on the day of exercise, nor on the 3 days subsequent to the exercise. Our results are contrary to those found by Kriemler et al., (1999) in obese boys, and by Goran and Poehlman (1992) in the elderly. Addition of 8 days exercise training has been reported to have no compensatory effect on NEAT in a lean, moderately active, group of men and women (McLaughlin et al., 2006). The current study reveals that the addition of a single bout of either low-moderate or more intense walking exercise does not adversely impact on NEAT in overweight and obese men. A longer term study in overweight and obese adults is needed to determine the effect on NEAT of accumulated exercise sessions in a week.

References

Goran, M. I. and Poehlman, E. T. (1992). Am J Physiol, 263, E950-957.

Kriemler, S., Hebestreit, H., Mikami, S., Bar-Or, T., Ayub, B. V. and Bar-Or, O. (1999). Pediatr Res, 46, 40-4.

McLaughlin, R., Malkova, D. and Nimmo, M. A. (2006). Eur J Clin Nutr, 60, 1055-61.

LONG WORKING HOURS INDUCE CHANGES IN HEALTH BEHAVIOR BUT NOT IN PHYSICAL FITNESS CHARACTERISTICS IN YOUNG MEN

VAARA, J., OHRANKÄMMEN, O., SANTTILA, M., HÄKKINEN, K., HÄKKINEN, A., KYRÖLÄINEN, H.

NATIONAL DEFENCE UNIVERSITY

Introduction: Among the working population, 11-26% work more than 50 hours per week (Caruso 2006, Kauppinen & Rantanen 2002). Some of the previous studies have demonstrated that prolonged working hours are associated with negative health behavior and health, decreased cognitive and psychological functions and increased general fatigue. However, there is not much information of physical characteristics of people with prolonged working hours (Caruso 2006). Therefore, the aim of the study was to investigate the effect of working hours on the health behavior and physical fitness characteristics in young men.

Methods

A total of 846 young Finnish men (24 ± 4 yrs.) volunteered to study. Volunteers were divided into the long (LW) and normal groups (NW) according to their working hours. LW consisted of persons with working hours of 51-60 per week (n=67) and NW persons with working hours of 31-40 per week (n=432). Health behavior was screened by a questionnaire of physical activity, smoking, alcohol consumption,

sleep duration and nutrition. Questions of stress perception, back pain and amount of sickness absence were also included. Body composition (height, weight, BMI, fat percent, waist circumference) and heart rate in rest were measured as well as aerobic capacity (VO2max) by bicycle ergometer test. Blood samples were taken to analyze serum concentrations of cortisol and testosterone concentrations.

Results: LW showed more negative health behavior such as more smoking ($p<0.05$) and lesser healthy nutrition ($p<0.05$) than NW. In addition, their self-reported sleep duration was shorter (7:00 vs. 7:25 h, $p<0.05$). They also suffered more from back pain ($p<0.05$) than NW. However, there were no differences between the groups in perception of stress, alcohol consumption or sickness absence. LW reported to be less physically active than NW ($p<0.05$), and had also higher resting heart rate (69 vs. 66 bpm, $p<0.05$). No significant differences between the groups were found in body composition, VO2max or serum hormones.

Conclusion

Prolonged working hours are negatively associated with health behavior, but not physical fitness characteristics or hormonal profile in young men. However, since many of the lifestyle-related diseases have a long latency period, more negative health behavior may cumulate further during the working career by leading to unfavorable changes also in physical fitness characteristics.

References

Caruso C.C. (2006) Possible broad impacts of long work hours. Ind. Health. 44(4): 531-536. Review.

Kauppinen T., Rantanen J. (2002) Work and health country profiles and national surveillance indicators in occupational health and safety. Appl. Occup. Environ. Hyg. 17(9): 603-605.

HEALTH RISK ANALYSIS FOR THE INDIVIDUALS PARTICIPATING IN SPORT

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Introduction: It is obvious that there is a positive relation between the health and starting sport in early ages. But nowadays, people have acquired different habits in advancing ages except for the sport habit they acquire in early ages. While they want to improve the life quality on the one hand, they can damage their body without being aware on the other hand. In this study, we wanted to examine the relation between the sport habits and the lifestyle-related habits. The purpose of this study was to evaluate the relation between the changeable and unchangeable risk factors of the individuals doing exercises.

Method

A cross sectional study was done on the individuals who have applied to a fitness club for a long time. 761 female and 911 male, total 1675 subjects (age= 32.77 ±10, 57) took part in this study. A detailed risk factors (tobacco and alcohol use, family history, injuries, metabolic and chronic diseases) analysis with Par Q test was applied to the participants before they start doing exercises by a doctor. The study lasted for a year. The data was collected in a fitness program and transferred to SPSS program. The relation between the risk factors were evaluated using correlation analyses ($p>0.05$).

Results: A significant correlation has been found between regular exercise and sex, tobacco and alcohol use. Also it has been found a positive relation between regular exercises and ankle injuries but a negative relation between regular exercises and waist and hip injuries. A negative correlation has been observed between the sport participants and Par Q test results. That is, the sport participants do not have any heart or respiratory complaints.

Discussion: It has been seen that the subjects who regularly participated in sport were mostly tobacco and alcohol users. It is also remarkable that some participants have problems in some joints. It has been observed that the most positive effect of exercise was that the cardio- vascular and cardio-pulmonary health of the participants was very good.

References

1.Vivian H.heyward. Advanced fitness assessment and exercise prescription. Human Kinetics.2006

Nieman C.David. Exercise testing and prescription.A health – related approach.McGraw-Hill Comp.2003

EFFECTS OF STRENGTH AND/OR ENDURANCE TRAINING AND NUTRITION ON SERUM HORMONES AND PHYSICAL FITNESS IN MIDDLE-AGED AND OLDER ADULTS

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Introduction: Strength training can minimize age-related loss of muscle strength and mass. Endurance training improves aerobic capacity and has a preventing role in several diseases. Physical adaptation during training is regulated through several mechanisms including hormonal and nutritional factors. The purpose of this study was to examine effects of 21 weeks of strength and/or endurance training and nutrition on serum basal hormone concentrations and physical fitness in 39-65 year old healthy adults.

Methods: Both women (W, n=81) and men (M, n=83) were randomized into strength training (S), endurance training (E), combined training (SE) or controls. S performed total body strength training and E performed bicycle training twice a week. SE did both strength and endurance training (2+2). All measurements were performed before and after the 21-week training period. Dietary intake was measured by 3+1 day dietary diaries. Muscle strength was measured by isometric knee extension and aerobic performance as maximal aerobic workload (pmax) during a gradual bicycle ergometer test. Serum basal concentrations of testosterone, cortisol and dehydroepiandrosteronesulfate were measured. Percent body fat (BF) and lean mass (LM) were estimated by dual X-ray absorptiometry.

Results: In a total group of W average dietary intake at week 0 were for energy (En) 7.4±1.4MJ, carbohydrates 47±6 En%, protein 19±3 En% and total fat 32±5 En% and in M 8.6±1.5MJ, 47±7 En%, 18±2 En% and 31±5 En%, respectively. Nutrition intake was similar in all four groups and did not change during the intervention in W (n=79) or in M (n=56). In both W and M, knee extension strength increased significantly in S (7±10% and 12±13%) and SE (11±10% and 10±10%), and in M also in E (5±10%), but not in the control groups. Pmax increased in all training groups ($p<0.001$), but not in the controls (between groups $p<0.001$). Average increases in Pmax were significantly higher in W and M in E (16±8% and 14±10%) and SE (17±9% and 14±7%) than in S (8±9% and 6±8%). Only minor changes occurred in serum hormones during training and there were no differences between groups. In W, the decrease in BF (by -1.0-2.0% units) was significant in all training groups and in M in E (by -2.1% units) and SE (by -1.9% units). In both genders SE increased total body LM significantly (2.2±2.6% and 2.1±2.4%) and the changes differed significantly between groups in W ($p=0.044$).

Discussion: As expected, strength and endurance training led to large training-specific improvements in muscle strength and aerobic performance. Combined strength and endurance training improved both neuromuscular and aerobic performance and also increased total body lean mass. Nutrition intake did not change during training. Typical Finnish diet was sufficient during high-intensity training which led to large improvements in physical fitness and to minor changes in serum basal hormones in middle-aged and older adults.

RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND HEALTH IN GERMAN ADOLESCENTS – FINDINGS FROM THE KIGGS- AND THE MOMO-STUDY

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Introduction: The German Health Interview and Examination Survey for Children and Adolescents (KiGGS) is a representative, nationwide cross-sectional study on the health status of children and adolescents from ages 0 – 17. It was conducted by the Robert-Koch Institute of Berlin (RKI). The KiGGS study was complemented by the Motoric-Module (MoMo) for the more differentiated recording of physical activity and physical fitness.

A broad conceptualization was used in KiGGS for the assessment of health. In this understanding health is subdivided in health resources (e.g. fitness, self-esteem), risk factors and complaints (e.g. BMI, emotional problems) and a subjective over-all health measure.

The analyses presented will focus on adolescents. We aim to answer the questions, (a) if there are any positive associations between physical activity and different health measures, and (b) if there are stronger associations between physical activity and health resources than between physical activity and risk factors.

Methods: The common sample of the KiGGS- and the MoMo-study consists of 4,529 children and adolescents from 4-17 years of age. Subjects were randomly selected from the KiGGS-study. Focusing on the links between adolescents' physical activity and health, a sub sample of N= 2,281 adolescents (M= 14.13, SD= 1.97; range 11-17 years of age; 50.5% boys) was used. The recording of physical activity, psychosocial health resources, physical and psychosocial complaints as well as over-all health measure was done by means of self assessment of the adolescents via questionnaire and that of the socio demographic characteristics by means of a questionnaire for parents. Physical risk factors were assessed by medical examination respectively lab findings and physical health resources by sport-motor tests. Hierarchical re-gression analyses were carried out for statistical evaluation.

Results: The data reveal that (highly) active adolescents have better results in most health parameters than somewhat or never physically active adolescents. Regression analyses reveal that physical activity explains up to 10% of variance in physical health resources (endurance, strength) and psychosocial health resources (self-perception of physical fitness), but is only slightly related to risk factors and complaints (e.g. BMI, cholesterol) and overall subjective health measures (e.g. wellbeing).

Discussion: The results correspond to international reports, which also found only weak links between physical activity and health parameters, especially risk factors (e.g. Biddle et al., 2004). Our findings show that the relationship between physical activity and health should be conceptu-alized not only under the perspective of reducing risk factors, but rather should focus on the enhancement of physical and psychosocial resources.

References

Biddle SJ, Gorely T, Stensel DJ (2004). J Sports Sci 22(8), 679–701.

17:15 - 18:45

Invited symposia

IS-BC03 The role of the inflammation process in exercised muscles

INFLAMMATORY REACTIONS IN MUSCLE AFTER EXERCISE: ARE HUMANS AND ANIMALS ALIKE?

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Researchers have investigated inflammatory reactions to exercise-induced muscle damage in both humans and animals, using a variety of methods to induce muscle damage and assess inflammation. In humans, muscle damage is induced using downhill running, box-stepping, drop-jumps and exercise on an isokinetic dynamometer. In rats, mice and rabbits, muscle damage is induced using downhill running, electrically-stimulated lengthening muscle contractions, and local injection of cardiotoxin or snake venom. In humans, researchers have investigated alterations in leukocyte infiltration in skeletal muscle after exercise from several different perspectives, including the effects of sex, age, repeated bouts of muscle damage, exercise intensity, antioxidant supplements, and drugs (e.g., calcium channel blockers, analgesics, non-steroidal anti-inflammatory drugs). Data from these studies indicate that sex, age and repeated bouts of muscle damage influence leukocyte infiltration. Research into the relationship between leukocyte infiltration, delayed onset muscle soreness (DOMS) and changes in muscular strength is inconsistent. The effects of multiple muscle biopsies on leukocyte infiltration following exercise-induced muscle damage are also questionable. In general, animal research has produced more consistent findings concerning the effects of sex, age, oestrogen, repeated bouts of muscle damage and non-steroidal anti-inflammatory drugs. Animal models of muscle damage and inflammation provide some advantages over research involving humans. In particular, animal models allow the removal of whole muscle, and more direct interventions to modulate leukocyte infiltration (e.g., gene knockout, antibodies against macrophages and neutrophils, clodronate). Comparisons between humans and animals are limited, however, for several reasons. First, fibre type distribution, oxygen delivery, oxidative potential and enzyme activity differ between human and animal muscle tissue (1). Second, the physical stress resulting from downhill running in humans likely differs from the physical stress that caged animals experience when running1. Last, electrically-stimulated contractions and injections of cardiotoxin or snake venom typically induce considerably greater muscle damage than voluntary exercise1. In summary, we can potentially learn more about muscle damage and inflammation from animal studies than we can from human studies, but caution is advised when translating animal physiology to human physiology.

1. C. Malm. (2001). Acta Physiol Scand. 3: 233239.

ANIMAL MODELS OF POST-EXERCISE LEUKOCYTE INFILTRATION: DETERMINING ROLE AND FUNCTION

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Animal models of post-exercise leukocyte infiltration: determining role and function

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A wide range of muscle damage scenarios have been used in animal studies of leukocyte infiltration. The most consistent support for a direct relationship between leukocyte infiltration, secondary muscle damage and subsequent repair comes from more extensive animal muscle damage models such as ischemia-reperfusion induced injury. Muscle contraction induced damage using running or electrically stimulated muscle eccentric loading in animals have occasionally produced controversial results. Although most exercise based animal studies also suggest that leukocytes are directly involved in accentuating secondary muscle injury as well as activating repair, some studies report muscle injury in the absence of leukocyte infiltration as well as leukocyte infiltration without evidence of muscle injury. Differences in experimental factors such as the type of exercise employed, the methods used for leukocyte detection, potential muscle fibre type differences as well as gender and hormonal related issues among others, may contribute to these occasionally divergent findings. In addition, the simple detection of leukocyte presence within muscle following exercise will not necessarily confirm that the leukocytes are actually active. The mechanisms by which neutrophils and macrophages can contribute to the necessary removal of post-damage muscle debris, their inadvertent contribution to secondary muscle damage and their critical role in initiating muscle repair mechanisms such as muscle satellite cell activation and proliferation have also been extensively documented using animal models. It is generally accepted that as well as actively participating in the removal of damaged tissue, neutrophils and more importantly, specific macrophage subspecies will directly contribute to the activation and proliferation of muscle satellite cells and the initiation of repair processes. Indeed, the inhibition of post-damage muscle leukocyte infiltration in animal models will completely prevent satellite cell activation and muscle repair. Oestrogen and gender can also play a role in post-exercise muscle inflammation and repair processes. Animal models have consistently demonstrated that oestrogen will attenuate post-exercise leukocyte infiltration and provided insight into the mechanisms associated with this effect. Despite this attenuation of leukocyte infiltration, recent studies have found that oestrogen will nevertheless also enhance post-damage muscle satellite cell activation and proliferation. The potential mechanisms for these effects of oestrogen highlight the complexity of mechanisms regulating post-exercise muscle damage, inflammation and repair. The role and advantages of using animal models in experimentally elucidating these mechanisms is also noted.

HUMAN MODELS OF POST-EXERCISE MUSCLE LEUKOCYTE INFILTRATION: STATUS, CHALLENGES AND LIMITATIONS

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During high-force exercise the force-generating capacity of muscle is gradually reduced, and in some cases the impaired muscle function persists for more than one week. Muscle damage may explain some of this weakness, and because tissue regeneration requires increased presence of inflammatory cells, the inflammatory reaction can be expected to develop after muscle-damaging exercise. However, in opposition to what is reported in experimental animals exposed to electrically evoked lengthening (eccentric) muscle actions, the prevalence of exercised-induced muscle damage in humans is under debate (1; 2; 4). On the basis of changes in muscle function, downhill running and conventional resistance exercise (weight lifting) seem to cause very modest amount of damage compared with single-joint maximal eccentric exercise. The discrepancy among studies investigating muscle damage and inflammation may consequently be explained by the degree of damage inflicted during exercise. Because several relevant human studies did not measure muscle function, the debate about muscle damage and inflammation lacks an important element. Recent results from our laboratory demonstrate that a significant accumulation of leukocytes occurs in "high-responder subjects", defined by large loss of force-generating capacity (>50%) and necrosis in the exercised muscle. Investigating leukocyte infiltration in human muscles after exercise is difficult because of the large individual response differences and methodological challenges with the biopsy procedure. For instance, repeated biopsies alone cause leukocytes accumulation, and obtaining biopsies from non-exercised muscles is required for appropriate experimental control (2). Non-invasive techniques, such as radionuclide imaging, can reveal accumulation of leukocytes in the exercised muscles, but leukocyte trans-migration through the vessel wall cannot be ascertained from these analyses. The presence of neutrophilic granulocytes in human exercised muscle is another unresolved issue (3). Some of the inconsistency between studies might be due to the use of non-specific antibodies for identification of neutrophils. In summary, leukocyte infiltration in human skeletal muscles after exercise seems to take place, but primarily when the degree of exercise-induced muscle damage is large. Tests of muscle function are imperative for assessing the degree of muscle damage. Additionally, obtaining and analysing biopsies involves certain methodological limitations, but it is the only way to directly verify leukocyte infiltration in the exercised muscles of humans.

1. Crameri et al. J Physiol 583: 365-380, 2007.

2. Malm et al. J Physiol 529 Pt 1: 243-262, 2000.

3. Schneider and Tiidus. Sports Med 37: 837-856, 2007.

4. Yu et al. Histochem Cell Biol 118: 29-34, 2002.

17:15 - 18:45

Oral presentations

OP-ST02 Sports 2

FACTORS INFLUENCING INDIVIDUAL TRAINING RESPONSE IN FOOTBALL PLAYERS

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SCHULTHESS KLINIK

INTRODUCTION. Several researchers have examined the effect of particular training interventions on various physical capacities in football players. However, the presence of confounding factors can influence the results of the training study, for example obscuring important differences during comparative studies. Confounding occurs when one or more separate factors (that are of no interest to the research) influence the outcome variable that the intervention is designed to moderate. However, if known, potentially confounding variables can be controlled using experimental or statistical techniques. The purpose of this study was to examine the factors influencing the individual training response in football players.

METHODS. 31 players [age 23(4)yrs, body mass 72(7)kg, height 178(5)cm] out of 46 assessed for eligibility completed the Yo Yo Intermittent Recovery (YYIRT) and a VO2max test at the end of the competitive season (end), at the beginning of the following season (pre), and after 7 weeks of training (post). During the training period heart rate and rating of perceived exertion (RPE) were measured. A hierarchical multiple regression model was applied with absolute pre-post change scores as dependent variable. All change scores entered in the models were corrected for the regression towards the mean (RTM) to control for statistical artifacts. The entering order was established based on collection feasibility of the variables: step 1) age; 2) pre-training values; 3) training load (TL) quantified with heart rate (TRIMP) or session-RPE relative to physical, technical training sessions and matches; step 4) changes in YYIRT or VO2max between the end of the previous competitive season and the start of the training.

RESULTS. Age explained 6% of variance in YYIRT changes (P=0.172). The absolute pre-training values explained only 2% (P=0.410) of variance (6% if RTM is not taken into account). TRIMPs explained an additional 22% (P=0.030) and end-pre change scores accounted for a further 14% (P=0.021). The total adjusted R2 of the full model was 0.33. When the session-RPE was entered instead of TRIMPs, the additional explained variance was 44% (P=0.001). The end-pre change scores explained a further 6% (P=0.078). The adjusted R2 of the full model was 0.48. Similar results were found for VO2max (data not presented).

DISCUSSION. The findings of this study indicate that TL accounted for a greater proportion of variance in pre-post changes of YYIRT and VO2max. The TL induced by technical-tactical sessions did not significantly influence the training outcomes (P>0.176). Furthermore, the additional proportion of variance explained by end-pre change scores suggests that the pre-experimental training level (and not the starting absolute value especially if corrected for the RTM) is a factor that may influence the individual training responses. These findings should be taken into consideration when designing and analyzing training studies for football players.

TRAINING LOAD, RECOVERY AND INTERVAL ENDURANCE CAPACITY IN ELITE FEMALE SOCCER PLAYERS

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Introduction: In 2007, Dutch female soccer players kicked-off for the first time in a new national premier league. Goal of this premier league was to stimulate female soccer in the Netherlands and qualify for international tournaments. Therefore, training load increased tremendously. However, little is know about the training-performance relation in elite female soccer. The purpose of this study was to monitor load and recovery in relation to interval endurance capacity.

Methods

At the start of the season in 2007, thirteen elite female soccer players (mean ± SD: age 22.8 ± 4.31 (range 17-30) years, body weight 64.4 ± 10.7 kg and body fat 25.1 ± 3.14 %) performed two Interval Shuttle Run Tests (ISRT) with eight weeks in between (Lemmink, et al. 2004).

During the ISRT, player alternately ran 30 seconds and walked 15 seconds, until exhaustion. The number of completed runs was registered as outcome of performance. Additional, heart rate was recorded at 5-s intervals (Polar, Kempele, Finland).

By means of training logs, training and match duration (minutes), session-RPE and Total Quality Recovery (TQR) scores were collected (Kenttä et al. 1998). Training load was calculated by multiplying training and match duration with session-RPE.

A paired samples t-test was used to test performance changes. Pearson's correlation coefficients were used to relate training load and recovery to performance.

Results: Average maximal heart rate was 193,6 ± 4,46 b•min-1 after the first and 191,9 ± 5,97 b•min-1 after the second ISRT. The female soccer players completed significantly more runs at the second ISRT (82.8 ± 10.8 runs) compared to the first (73.7 ± 8.1) (p<0.001). Average training and match duration was 349 ± 36 minutes per week. Average session-RPE and TQR scores were 13,3 ± 0,92 and 13.8 ± 1,2 respectively, indicating "somewhat hard" intensity and "reasonable to good" recovery. Improvement in endurance capacity was not significantly related to training load and recovery.

Discussion: It can be concluded that interval endurance capacity improved during the first eight weeks of the season, but was not related to training load and recovery. This might be due to a relative long period between both tests (Brink et al. 2009). Since the training response depends on individual characteristics, the heterogeneity (i.e. wide range in age) of the group might as well disturb this relation. Based on these results coaches should more frequently execute field tests and evaluate the individual training response.

References

Kenttä G, Hassmén P (1998). Overtraining and recovery. Sports Med, 26(1):1-16.

Lemmink KAPM, Visscher C, Lambert MI and Lamberts RP. (2004). J Strength Cond Res, 18(4), 821-827.

Brink M, Nederhof E, Schmikli S, Visscher C, Lemmink K. (2009). J Strength Cond Res, (accepted).

MHC COMPOSITION, SATELLITE CELLS AND SOCCER PERFORMANCE IN YOUNG PLAYERS AT DIFFERENT AGES

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Introduction: Various studies have evaluated the physical fitness of soccer players (Bangsbo 1994; Ekblom, 1986) and numerous performance testing have been suggested (Metaxas et al., 2004; Svensson and Drust, 2005). The purpose of this study was to examine the muscle fiber types and satellite cells in young soccer players at different ages and to compare with cardiorespiratory indices and isokinetic muscle strength.

Methods: The participants formed three groups: Group A, 15.2±0.6 yrs old (n=9), group B, 13.1±0.5 yrs old (n=10) and group C, 11.2±0.4 yrs old (n=13). Muscle biopsies were obtained from V.Lateralis and the analysis was performed by immunohistochemistry. Peak torque values was recorded of the quadriceps and hamstrings, at velocities of 60, 180, and 300°žsec-1. Maximal oxygen uptake (VO2max) was measured via a breath-by-breath analyzer system on treadmill.

Results: Group A had decreased type I percentage distribution compared to C by 21.3% (p<.01), while the type IIA relative percentage was higher by 18.4% and 18.1% compared to groups B and C (p<.05). Groups A and B had higher CSA values in all fiber types compared to C (.05<p<.001). Group A exhibited higher cross –sectional area (CSA) in type I fibers by 28.6% compared to B (p<.01). The number of muscle fibers and satellite cells as well as their ratio did not differ between the groups. Groups A and B had higher peak torques values at all velocities compared to C (.05<p<.001). VO2max in terms of mlּmin-1 was higher in groups A and B compared to C (p<.001). Correlation analyses showed a significant coefficient between CSA of type I and the maximal strength of quadriceps at 60ο in group A (r=.669, p=.049) while the percentage distribution of the type I fibers was correlated with the VO2max in group B (r=.661, p=.038). Significant coefficients were established in group C between the distribution of type I fibers and the maximal strength of quadriceps at 60ο (r=.845, p<.001) as well as the distribution of IIA fibers and the maximal strength of hamstrings at 300οžsec-1 (r=.611, p=.026).

Discussion: Τhe increased percentage of muscle fibers ΙΙΑ noticed in 15yrs old compared to the other groups should be mainly attributed to the different training program as well as to the age factor, since these fibers are strongly activated during exercise of increased workload. CSA, muscle strength and VO2max values seems to be expressed according to age. Nevertheless, the sampling and the heredity do play an important role in the formation of the results. It is suggested that the application of specific training in the developmental ages could lead to the differentiation of the muscular metabolic properties in a way that the muscular performance would be maximized.

References

Bangsbo J, (1994). Ho+Storm, Bagsvaed.

Ekblom B (1986). Sports Med, 3(1), 50-60.

Metaxas TI, Koutlianos NA, Kouidi EJ, Deligiannis AP (2004). J Strength Cond Res, 19(1), 79-84.

Svensson M, Drust B (2005). J Sports Sci, 23(6), 601-618.

SIMILAR EFFECTS OF HIGH-INTENSITY INTERVALS AND CONTINUOUS ENDURANCE RUNS DURING THE PREPARATION PERIOD IN HIGH LEVEL FOOTBALL

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Aerobic fitness in elite football players has received considerable scientific attention during the last decade. Mainly, two considerably different endurance training methods are used. These are, on the one hand, classical continuous endurance runs and, on the other hand, high-intensity intervals. Scientific data comparing these methods is lacking. The present study aimed at analysing performance effects of continuous endurance runs vs. high-intensity intervals during the preparation period in high level youth football teams.

5 youth teams from German professional clubs playing in the two highest divisions (2xU19, 1xU18, 2xU17; 16.5±1.1 yrs, 69.8±8.4 kg, 1.77±0.07 m) were randomly assigned to either a high-intensity (2 teams, N=22, HIT) or a continuous endurance training group (3 teams, N=40, CON). Endurance training was conducted on average two times a week over the 5-week preparation period. HIT consisted of 2x12-15 repetitions of 15-30 s high-intensity runs (125-140% of maximal lactate steady state velocity, MLSS, Stegmann et al. 1981, rest: 15-30 s), whereas CON included continuous endurance runs (80-95% MLSS for 30-60 min). Before and after the training period several performance tests were conducted: a multi-stage exercise test (GXT) to determine MLSS, a straight sprint test (5x30 m), an agility test (20 m course involving 6 turns) and vertical jump tests (drop jump, counter movement jump).

Both groups significantly improved MLSS (HIT: +0.7 km/h, effect size (ES)=0.96, CON: +0.6 km/h, ES=0.74, p<0.001 for pre-post intra-group comparisons) as well as maximal velocity during GXT (+0.3 km/h each, p=0.002) with no significant interactions between groups (p>0.26). Whereas straight sprint times did not change, agility was slightly improved (p=0.03, ES=0.26). Vertical jumping height was significantly decreased (p<0.001, ES=0.26 to 0.59) and drop jump contact time was slightly enhanced (p=0.06). No significant group interactions were observed (p>0.25).

The results of the present study suggest that continuous endurance runs and high intensity intervals induce similar improvements in endurance performance. In addition, both training programs have no different effects on speed and power abilities. The improvement in endurance capacity is within the range of values previously reported after a preparation period. As recently shown, high intensity intervals induce similar enzymatic and metabolic adaptations compared to continuous endurance exercise (Burgomaster et al. 2008) and, thus, the underlying changes in physiological processes may be similar for both training Methods: In conclusion, continuous endurance runs as well as high intensity intervals revealed similar effects in high level youth football players and, thus, may be used interchangeably in sports practice.

Burgomaster KA, Howarth KR, Phillips SM, Rakobowchuk M, MacDonald MJ, McGee SL, Gibala MJ. J Physiol 2008; 586.1: 151-160

Stegmann H, Kindermann W, Schnabel A. Int J Sports Med 1981; 2: 160-165

FASTER PLAYERS SLOWER TO RECOVER AFTER TRAINING AND COMPETITION, WITH POSSIBLE ADVERSE EFFECTS ON FOOTBALL PERFORMANCE

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Introduction: Speed and speed endurance are positively related to success in the football codes and are often included in talent identification and selection criteria of players (Reilly and Gilbourne 2003; Pyne, Gardner et al., 2005). These desirable characteristics, however, may predispose the player to greater post training and competition muscle damage (Paddon-Jones, Keech et al. 2005), potentially affecting the time course of recovery and performance in the next game. To explore this hypothesis, performance data routinely collected in a professional Australian Rules football club were analysed to assess the influence of selected player characteristics on recovery and playing performance.

Methods: Data were collected over a full competition season from a squad of 27 professional Australian Rules football players. Player characteristics assessed during the pre-season, including maximal speed over 40 m and time to complete six 40 m sprints (speed endurance), were used as moderating variables in hierarchical linear modelling of the data. The first analysis considered trends over the week in player self-ratings on six physical wellness items (general muscle, quadriceps and hamstring strain, fatigue, pain/stiffness, power). The second analysis explored the relationship between training load and weekly performance from playing statistics.

Results: A total of 2,583 self-rating questionnaires were analysed from completions on 183 days throughout the season. Ratings for all physical wellness items were worse in the days immediately post competition, improving steadily over the week to a game day low. Four of the six physical items (muscle, hamstring and quadriceps strain, power; $p<0.01$) were slower to recover for players with high maximal speed.

In the second analysis, player speed endurance was found to have a significant moderating effect ($p<0.05$) on the relationship between weekly training load and playing performance. Game performance in players who performed well on the six 40 m sprint test was adversely affected when training load increased above the mean.

Discussion: Analysis of self-ratings of wellness indicates that players with high maximal speed take longer to physically recover from weekly competition. Furthermore, players with good speed endurance find that their playing performance is adversely affected following a week when the main training session is heavier in load than usual. The practical implications of these finding are that players with high maximal speed need to be particularly diligent with recovery practices in the days following competition and heavy training sessions and may need to be protected from heavy intense training in the middle of the week.

References

Paddon-Jones, D., A. Keech, et al. (2005). Journal of Science and Medicine in Sport 8(3): 255-263.

Pyne, D. B., A. S. Gardner, et al. (2005). Journal of Science and Medicine in Sport 8(3): 321-332.

Reilly, T. and D. Gilbourne (2003). Journal of Sports Sciences 21(9): 693 - 705.

THE USE OF THE FUNCTIONAL HAMSTRINGS:QUADRICEPS RATIO (HECC:QCON) TO ASSESS FATIGUE AND INJURY RISK IN SOCCER

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Introduction: The high occurrence of hamstring strains in football has been associated with an imbalance in the strength of hamstrings and quadriceps muscles (Sangnier, 20073). This imbalance usually increases with fatigue and is classically assessed by the concentric hamstring:quadriceps ratio (Hcon:Qcon). However, the relevance of this ratio has been questioned, and it has been suggested to use the more functional eccentric hamstrings:concentric quadriceps ratio (Hecc:Qcon), (Hole et al., 20001). Only one study has investigated the effects of a soccer match on this ratio, showing a significant decrease in Hecc:Qcon at 120°.s-1 in the dominant leg only (Rahnama et al., 20032).Therefore the aim of the present study was to investigate the effects of fatigue induced by soccer on Hcon:Qcon and Hecc:Qcon in university-level soccer players.

Methods: 8 male soccer players (21.3±2.3 years; 178±8 cm; 78±8 kg) performed first a Yo-Yo intermittent recovery level 2 test to estimate their maximal aerobic capacity and a week later 3 tests within one session: a pre-test to assess the strength of their hamstrings and quadriceps on an isokinetic dynamometer (Cybex Norm, Phoenix Healthcare, Nottingham, UK) on both legs at 60°.s-1 and 180°.s1, followed by a simulated soccer test (Loughborouh Intermittent Soccer Test) and a post-test similar to the pre-test. During the LIST, HR was continuously measured (Polar S810, Kempele, Finland), and blood samples were taken every 15-min to analyse blood lactate concentration ([La-]b, Analox LM5, Analox Instruments Ltd., London, UK). Differences between pre- and post tests were analysed by a student T-test for paired samples. The relationship between the physiological parameters recorded in the LIST and the variation in H:Q ratios (ΔH:Q) between pre- and post-tests was assessed by a Pearson correlation. Statistical significance was set at $p<0.05$.

Results: All H:Q ratios were lower in the pre-test compared to the pre-test, however these differences were significant for Hcon:Qcon in the dominant leg at 180°.s-1only (0.76±0.09 vs.0.50±0.16, $p<0.05$), and for Hecc:Qcon ratios in the dominant leg at 60°.s-1 only (0.79±0.17 vs.0.65±0.08, $p<0.05$). Significant correlations were observed between HR and [La-]b and ΔHecc:Qcon ratios only.

Discussion-Conclusion

These results indicated that the functional ratio is a good way to assess fatigue and injury risk in football players and should be used instead of or in addition to the conventional ratio. Using an angular speed of 60°.s-1 provides better Results: References

1Hole, C.D., Smit, G.H., Hammond, J., Kuma,r A., Saxton, J., Cochrane, T. (2000). Ergonomics 43(10):1603-9.

2Rahnama, N., Reilly, T., Lees, A., Graham-Smith, P. (2003). Journal of Sports Sciences 21(11): 933-942.

3Sangnier, S., Tourny-Chollet, C. (2007). International Journal of Sports Medicine 28(11): 952-957.

17:15 - 18:45

Oral presentations

OP-TT01 Training & Testing 1

EFFECT OF HIGH-INTENSITY TRAINING IN HYPOXIA ON CYCLING PERFORMANCE AND LACTATE METABOLISM.

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UNIVERSITY OF LAUSANNE

Living and training at low altitude and adding some key training sessions in hypoxia (Live Low Train High (LLTH)) may be considered as an effective way of using altitude as a training stimulus for endurance athletes. It has also been shown to be effective in improving glucose tolerance in untrained individuals. However, its effects on performance are debated. Our hypothesis was that 4 weeks of LLTH would increase more endurance performance and lactate turnover rate of well trained cyclists than the same training regimen performed in normoxia. 14 cyclists participated to this study and replaced part of their weekly training schedule by 3 sessions performed in normobaric hypoxia (HYP) (~3000m) or normoxia (NOR) during 4 weeks. Before and after the training period, endurance performance was assessed during incremental tests performed in normoxia and hypoxia and a 40-km time-trial (TT) performed in normoxia. Lactate and glucose turnover rates were measured by means of stable isotope tracer infusion. After training TT performance was similarly and significantly improved in NOR and HYP. Maximal oxygen uptake was significantly ($p<0.05$) increased in NOR only. In hypoxia, a slight increase of maximal aerobic power and maximal ventilation ($p<0.05$) were measured in HYP. No effect of training was found on lactate turnover rates. In contrast, glucose metabolic clearance rate was decreased ($p<0.05$) and plasma concentration of insulin and glucose were increased after training in HYP ($p<0.05$). 3 athletes involved in HYP exhibited overtraining symptoms. Our results show no further effect of LLTH on sea-level endurance performance than does normoxic training and that LLTH may not improve performance at altitude. Thus questions are raised about the effectiveness of a LLTH protocol for performance enhancements and the athletes health with regard to the altered glucoregulation and overtraining.

EFFECTS OF BLOCK PERIODIZATION OF HIGH-INTENSITY INTERVAL TRAINING SESSIONS ON VO2MAX IN SUBELITE AND ELITE ATHLETES.

VOGT, M., BREIL, F., WEBER, S., WEISSKOPF, R., SCHLEGEL, CH., HOPPELER, H.

UNIVERSITY OF BERN

Introduction:

High-intensity aerobic interval training is very effective in improving VO2max in subjects of various fitness levels (2, 5). In highly-trained athletes, concurrent strength and endurance training programs may compromise the adaptive response to such high-intensity training sessions (1, 3). According to the alternative concept of block periodization (3, 4), we tested the effects of 7-14 days high-intensity interval training blocks in endurance trained subjects, elite cross country skiers, and junior and world class alpine skiers.

Methods & Results:

Study 1: 7 endurance-trained subjects (VO2max: 58.5 +/- 4.9ml/min/kg) performed 18 sessions of 4 x 4-min interval training on a cycle ergometer at 90-95% of HRmax in 14 days. Increase in VO2max (mean: +5.6 +/- 3.2%) was positively correlated to training intensity ($r = 0.81$, $p < 0.05$)

Study 2: During the summer preparation period, 9 elite cross country skiers (68.3 +/- 4.8ml/min/kg) performed three 5-day high-intensity interval training blocks separated by 4-week base training periods. Athletes were advised to execute all sessions at intensities above individual ventilatory threshold 2. VO2max increased by 6.4 +/- 4.2% ($p < 0.001$)

Study 3: 9 male (54.2 +/- 3.1ml/min/kg) and 4 female (50.4 +/- 6.6ml/min/kg) junior alpine skiers performed 12 cycle ergometer and 3 obstacle-run 4 x 4-min interval training sessions at 90-95% of HRmax in 11 days. VO2max and ski-specific field test scores increased in male skiers (+7.4 +/- 2.9%, $p < 0.001$; +8.8 +/- 3.9%, $p = 0.001$) but not in female skiers (+2.2 +/- 1.3%, $p = 0.35$; -7.6 +/- 3.1%, $p = 0.06$).

Study 4: Three world class alpine skiers performed 8 – 10 interval training sessions at 90-95% of HRmax in 14 days, followed by a 14-day low-intensity (<75% HRmax) high-volume (700 km) training period. All athletes improved VO2max (mean: +11.1%) and maximal power output (+7.3%).

Conclusion:

With a mean duration of only 13 days, high-intensity interval block training is very efficient in improving VO2max (on average by 6.5% or 0.5% per session) and performance. It should be considered that this adaptive response might be influenced by differences in training intensity (study 1) as well as gender (study 3). Persistent fatigue after the intensity block may be an issue.

References:

1. Coffey VG, Hawley JA. The molecular bases of training adaptation (2007). Sports Med. 37(9).
2. Helgerud J et al. Aerobic high-intensity intervals improve VO2max more than moderate training (2007). Med Sci Sports Exerc. 39(4).
3. Issurin V. Block periodization versus traditional training theory: a review (2008). J Sports Med Phys Fitness. 48(1).
4. Stølen T, Chamari K, Castagna C, Wisløff U. Physiology of soccer: an update (2005). Sports Med. 35(6).
5. Wisløff U et al. Superior cardiovascular effect of aerobic interval training versus moderate continuous training in heart failure patients: a randomized study (2007). Circulation 115(24).

EFFECTS OF GROUP EXERCISE VERSUS AEROBIC INTERVAL TRAINING UPON PEAK OXYGEN UPTAKE IN MYOCARDIAL INFARCTION PATIENTS

MOHOLDT, T., AAMOT, I.L., STØYLEN, A., STØLEN, T., GRANØIEN, I., MYKLEBUST, G., WALDERHAUG, L., GJERDE, L., HOLE, T., BRATTBAKK, L., GRAVEN, T., WISLØFF, U., SLØRDAHL, S.A.

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Introduction: Myocardial infarction (MI) patients from Norwegian hospitals are often offered to participate in group exercise training (GET). The effect of these rehabilitation programs is not well documented. We aimed to compare the traditional GET with treadmill interval training (INT) regarding peak oxygen uptake (VO2peak) in MI patients.

Methods: This study was based on data from three hospitals in Norway. Eighty-nine MI patients referred to hospital based rehabilitation were randomised to GET (n=59) or INT (n=30) in a 2:1 manner. Patients were recruited 2-12 weeks post MI. All patients were asked to meet for organised exercise training two times per week for 12 weeks and to exercise once weekly on their own. VO2peak was measured at baseline, at the end of the training period and again at a follow-up six months later. Patients randomised to GET participated in the usual exercise training program at the hospitals. The intensity of their exercise was supervised using heart rate monitors. In the INT group each training sessions consisted of four times four minutes intervals at 85-95% of HRpeak with lower intensity periods in between. All patients were encouraged to maintain exercise training until follow-up testing.

Results: VO2peak increased significantly more ($p = 0.006$) after INT than after GET (from 31.6 (SD 5.8) to 36.2 (SD 8.6) ml/min/kg (13.8%) in INT, and from 32.3 (SD 6.7) to 34.6 (SD 7.7) ml/min/kg (7.3%) in GET, both $p<0.0001$). Eighty-two patients came back for follow-up testing six months later. Compared to baseline, both groups had significantly higher VO2peak at follow-up, with an increase of 3.1 (SD 3.6) ml/min/kg in INT ($p <0.0001$) and 1.8 (SD 3.3) ml/min/kg in GET ($p = 0.0002$). The difference between the groups was not significant anymore after six month ($p = 0.12$)

Discussion: INT increased VO2peak more than GET during 12 weeks of exercise training in MI patients. Six months later there was no longer a significant difference between the increases in the two groups compared to baseline values. The results of this study may have implications for future organization of cardiac rehabilitation.

COMPARISON OF METABOLIC RESPONSES TO SELF-PACED, HIGH-INTENSITY INTERVALS IN TRAINED VERSUS WELL-TRAINED MALES

HETLELID, K., HEROLD, E., SEILER, S.

UNIVERSITY OF AGDER

Purpose

During steady state exercise, well-trained endurance (WT) athletes oxidize more fat at the same relative intensity compared to recreationally trained people (RT). However, less is known about substrate oxidation during high intensity intermittent exercise. We have compared total energy expenditure (TEE) and fat oxidation during a fixed duration, high-intensity, self-paced interval training prescription in WT and RT subjects.

Methods

Nine elite orienteers (WT, VO2max 71 ± 5 ml.min-1.kg-1) and 9 recreationally trained runners (RT, 55 ± 5 ml.min-1.kg-1) performed preliminary testing followed on a separate day by a 34 min interval-training session consisting of six, 4 min work bouts separated by 2 min recovery periods on a motorized treadmill with a constant 5 % incline. The session was prescribed as a high-intensity workout with the goal being to achieve the highest possible average running speed for the work bouts. Energy expenditure and fat oxidation were calculated from continuous measurements of VO2 consumption and CO2 production. Due to some net CO2 contribution from bicarbonate buffering during intermittent high intensity exercise, fat oxidation rates are presumably underestimated and should be considered minimum estimates.

Results: Blood lactate (6.2 ± 2.1 vs. 6.4 ± 2.5 mmol.L-1) and perceived exertion (RPE, 16.2 ± 1.4 vs. 16.2 ± 1.7) responses throughout the interval session were not different between WT and RT. However, VO2 during the last 3 minutes of each work bout was higher in WT (92 ± 1 vs. 87 ± 2 % VO2max, $p< 0.01$). TEE in the 34 min interval session was higher in WT (641 ± 46 Kcal vs. 552 ± 75 Kcal ($p = 0.009$). Fat oxidation during the interval session was 23.2 ± 4 g in WT vs. 9.4 ± 3 g in RT ($p < 0.001$). Estimated fat oxidation accounted for 35 ± 6 % of TEE in WT vs. 17 ± 7 % in RT. Despite the higher exercise intensity observed and equivalent RPE, Respiratory exchange ratio (RER) exceeded 1.0 only 2.7 ± 2 min of the 34 min session in WT vs. 10 ± 4 min in T ($p<0.001$).

Conclusions

When provided a verbal and written exercise description, WT and RT perform interval training at similar perceived intensity. However, WT oxidize more fat despite higher relative oxygen consumption rates. These results suggest that the superior fat oxidation of well trained athletes seen during low intensity continuous exercise extends to high intensity intermittent exercise, accepting the limitations associated with respiratory gas exchange measurements during intermittent exercise above the lactate threshold.

EARLIER TASK FAILURE FOLLOWING OVERTRAINING IS NOT ASSOCIATED WITH THE EARLIER ACCUMULATION OF MAXIMAL LEVELS OF BLOOD LACTATE

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UNIVERSITÀ DEGLI STUDI DI VERONA

Introduction: While high-intensity interval training (HIT) can improve performance (2), excessive HIT may result in the development of overtraining syndrome (OTS) (4). To date, most research has been directed towards determining indicators of OTS in an effort to predict and therefore prevent overtraining in athletes. However, less research has investigated why overtraining limits performance. Potential mechanisms include an increase in metabolic end products such as lactate (La), earlier attainment of VO2peak and an increased "sensation" of fatigue.

Methods: 18 males performed a graded exercise test to determine VO2peak and the lactate threshold (LT). Time-to-fatigue (TTF) at 20% of the difference between VO2peak and the LT was also assessed. Subjects were then matched and randomly assigned to either a control (CON) or training (TRAIN) group. Those assigned to TRAIN completed HIT 2/day, 7 days/wk for up to 3 wk. A TTF test replaced one of the training sessions every second day. Training continued until TTF decreased to 75% of the Day 1 time. VO2, [BLa] and RPE were determined at 75 & 100% of TTF on Day 1, and at 100% of TTF for all subsequent tests.

Results: TTF was not significantly different between TRAIN and CON at baseline (427 +/- 80 vs 449 +/- 101 s), but was significantly different at the final TTF test (375 +/- 71 vs 562 +/- 105 s; P< 0.05). For TRAIN, [BLa] measured at fatigue during the final TTF test (12.5 +/- 4.2 mmol/L) was not significantly different from the [BLa] measured at 75% of TTF on Day 1 (12.9 +/- 3.3 mmol/L), but was significantly less than the [BLa] measured at 100% of TTF on Day 1 (16.4 +/- 3.9 mmol/L). However, in TRAIN, both endVO2 and RPE during the final TTF test (54.9 +/- 6.9 mL/kg/min and 18 +/- 2 respectively) were significantly greater than the values recorded at 75% (49.8 +/- 4.2 mL/kg/min and 16 +/- 1), but not 100%, of TTF on Day 1 (53.7 +/- 5.8 mL/kg/min and 18 +/- 1).
Discussion: HIT resulted in significant performance decrements as assessed by the TTF test. These results are comparable to those of Fry et al. (3) who showed decreased TTF in 5 well-trained men after a period of intense training performed 2/day for ten days. The earlier task failure was not associated with the earlier accumulation of maximal levels of blood lactate. This is consistent with our previous results showing that fatigue is not related to muscle lactate levels (1). However, the earlier task failure was associated with the earlier attainment of VO2peak and the earlier sensation of fatigue. Future research should therefore examine additional mechanisms that may be associated with the earlier attainment of task failure following overtraining.
References
1. Edge, J., D. Bishop, & C. Goodman. J Appl Physiol. 101:918-925, 2006.
2. Edge, J., D. Bishop, C. Goodman. Med Sci Sports Exerc. 37:1975-1982, 2005.
3. Fry, R. W., et al. Br. J. Sports Med. 28:241-246, 1994.
4. Fry, R. W., A. R. Morton, & D. Keast. Sports Med. 12:32-65, 1991.

THE EFFECTS OF INTERVAL VS. HEAVY CONTINUOUS EXERCISE PROGRAMS ON OXYGEN CONSUMPTION, HEART RATE, AND LACTATE RESPONSES IN ADOLESCENTS

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ARISTOTLE UNIVERSITY OF THESSALONIKI AT SERRES

Short and long high-intensity intermittent exercise (SIE and LIE), as well as continuous exercise (CE) have been consistently used to improve aerobic performance. Studies in adults have reported that SIE elicits greater VO2 responses compared to moderate intensity (50-75% VO2max) CE. However, when CE is performed at heavy intensity (above lactate thresholds for ~25min) a slow component that is developed drives the metabolic rate closer to VO2max. No study has compared VO2 responses among SIE, LIE, and heavy CE. The study of VO2 response during different aerobic regimens is essential since it characterizes the exercise stimulus and thereby aerobic adaptations. The VO2 responses to exercise depend also on VO2 kinetics that is likely to be different during growth from those of adults. Thus, this study compared the physiological responses of SIE, LIE, and heavy CE, matched for exhaustion, in young adolescents. Nine teens (14 yrs.) performed a treadmill test to assess VO2max (55.5±4.6ml/kg/min), vVO2max (15±0.5km/h), and HRmax (200±4bpm). Then, they performed a SIE (30s at 110% vVO2max with 30s recovery at 50% vVO2max), a LIE (3min at 95% vVO2max with 3min recovery at 35% vVO2max) and a heavy CE (at 83% vVO2max). End-point for all protocols was a HR of 5bpm below HRmax. VO2 and HR were continuously measured and blood samples were obtained prior and after protocols to determine lactate (La-mmol/L). The results (mean ±SE) for LIE are presented including only exercise (LIE-EXE) for mean responses, and exercise and recovery times (LIE-PR) for times spent above 85%, 90%, and 95% VO2max. The time (min) of CE (22.4±1.9) and LIE-PR (28.3±2.8) were longer (p<.05) vs. LIE-EXE (15.7±1.4) and SIE (15.5±2.6), while the distance (m) covered in CE (4,586±384) and LIE-PR (4,836±462) was greater (p<.05) vs. LIE-EXE (3,726±338) and SIE (2,918±311). There were no differences among CE, LIE-EXE and SIE in mean VO2 (47.4±1.5, 44.8±1.2, 45.2±1.2), %VO2max (85.7±3.0, 81.3±3.3, 81.7±2.0), VE (92.5±4.0, 92.5±3.5, 92.7±3.3), RER (0.99±0.02, 0.96±0.1, 1.00±0.2) and HRmax (194±2, 195±2, 195±2). Mean HR was lower (in LIE-EXE vs. CE and SIE (179±2 vs. 183±2 and 185±2; p<.05), while La was higher in LIE vs. CE (8.9±1.1 vs. 6.8±1.1; p<.05) but not vs. SIE (7.6±1.1). All subjects reached 85% VO2max in LIE and SIE and 8 in CE; more subjects reached 95% and 100% VO2max in SIE vs. CE. However, the time (min) spent above 85% VO2max was higher (p<.05) in CE and LIE-PR vs. SIE (8.5±2.3, 9.4±1.3 vs. 4.6±1.2), and the time above 90% and 95% was higher (p<.05) only in LIE-PR vs. SIE (6.5±1.5 vs. 2.5±0.8 for 90%, and 3.7±1.3 vs. 0.9±0.4 for 95%) and not vs. CE (4.2±2.0 and 1.4±1.1). In conclusion, when matched for total work and exhaustion heavy CE (at 83% vVO2max) performed above the anaerobic threshold for ~25min elicits mean VO2, HR, lactate responses, and time spent above 90 and 95% VO2max similar to those in SIE, while LIE appears to generate a greater aerobic stimulus compared to SIE.

17:15 - 18:45

Oral presentations

OP-PH11 Physiology 11

MUSCULAR EXERCISE CAPACITY IN CHF PATIENTS AND ADAPTATIONS TO ONE-LEGGED KNEE EXTENSION ENDURANCE TRAINING

SLETTALØKKEN, G., REHN, T.A., MUNKVIK, M., RUD, B., NYMARK, B.S., SVARSTAD, S.O., SÖKJER-PETERSEN, M., LUNDE, P.K., SJAASTAD, I., SEJERSTED, O.M., HALLÉN, J.
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Congestive heart failure patients (CHF) are characterized by a low work capacity even during exercise with a small muscle mass (~2kg) when oxygen supply is not limited by cardiac output. We wanted to investigate whether CHF patients have a normal response to endurance training as compared to healthy subjects (HS). Work capacity as well as metabolic- and hemodynamic adoptions in the skeletal muscle was evaluated during fatiguing exercise.
Nine CHF patients and eleven HS performed six weeks of supervised one-legged knee extension (1-KE) endurance training (TL) four days a week, leaving the untrained leg as control (CL). After the training period, the subjects performed two-legged knee extension (2-KE) exercise on two submaximal intensities to test work economy, and a 1-KE time to exhaustion (TTE) endurance test (~14 min) with TL and CL

separately. Leg oxygen uptake (VO2) was measured invasively in both legs. Biopsies from vastus lateralis and CT scan of quadriceps femoris (QF) were obtained for both legs after the training period.

In the endurance tests the workload in CL was 23.1 (1.9) (mean ± SE) and 34.3 (1.8) W for CHF patients and HS respectively ($p<0.01$) while TTE was not different (11.5 (2.9) and 13.9 (3.3) min for HS and CHF, respectively). Hence work capacity was lower in CHF patients. To avoid TTE longer than 60 min in TL, workload was set based on pretests and was 7.6 (1.4)% and 16.4 (3.1)% higher in TL than in CL in HS and CHF patients respectively ($p<0.01$). Despite this, TTE was 0.8 (2.9) (ns) and 2.8 (1.0) ($p<0.05$) min longer in TL than CL for HS and CHF patients respectively. This demonstrates a training induced increase in work capacity that was higher in CHF patients than HS ($p<0.05$).

Evaluated from VO2 during 2-KE on submaximal intensities, the two groups showed same work economy which was unaltered by training. At exhaustion, leg blood flow and VO2 in CHF patients was 72 and 70% of that of HS respectively, and both variables were related to the mass of QF ($R=0.57$ and $R=0.77$ respectively; $p<0.01$). Hence leg perfusion and mass specific VO2 was not different between the groups. CHF patients had a higher oxygen extraction in TL compared to CL, but none of the groups showed any leg differences in blood flow or VO2. Number of capillaries around muscle fibers was lower for CHF patients than HS (86% of HS $p<0.05$) with no differences between legs. There was 65 (4)% and 58 (2)% muscle fiber type II in CHF patients and HS, respectively (ns) with no differences between legs. Fiber area and citrate synthase activity was the same between groups and legs.

In conclusion CHF patients have a lower work capacity during one legged exercise which was related to active muscle mass involved. In contrast to HS, CHF patients increased O2-extraction in trained leg, but no other changes in metabolic or hemodynamic variables were detected. However, CHF patients increased their work capacity even more than HS.

MAXIMUM STRENGTH IN CHRONIC CARDIOVASCULAR PATIENTS

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UNIVERSITY OF PADUA

Introduction: Patients suffering from heart disease display diminished exercise tolerance, which can be attributed not only to a reduction in aerobic capacity but probably also to a strength deficit. Cardiovascular rehabilitation is a well-established means of improving the functional capacity and resistance training is now recommended as a component of cardiac rehabilitation by the major guidelines. Aim of this study was to evaluate maximum dynamic strength of upper and lower limbs in patients affected by chronic cardiovascular disease.

Methods: The maximum strength of brachial biceps, brachial triceps, deltoids, femoral quadriceps and sural triceps was assessed in 20 healthy sedentary volunteers and 100 male patients with chronic cardiovascular disease: 26 patients who had undergone coronary angioplasty (PTCA), 46 patients suffering from chronic heart failure (CHF), 21 patients suffering from peripheral arterial disease of the legs and claudication (PAD), 7 patients who had undergone heart transplant (HT).

The maximum strength of each group of muscles was assessed by means of submaximal tests. The tests were deemed valid when, for a given load, the subject was able to carry out 10 or fewer repetitions of the movement before fatigue. Once the load and the number of repetitions valid for the test had been established, an indirect formula was used to calculate the value of 1 repetition maximum.

Results: Maximum strength of all the muscles tested was significantly ($p<.001$) lower in patients (mean and standard deviation of maximum strength expressed in kilograms: 149±55 of quadriceps, 130±45 of sural triceps, 6.58±2.1 of deltoids, 11.3±2.3 of brachial biceps, 8.35±1.9 of brachial triceps) compared to the control group (mean and standard deviation of maximum strength expressed in kilograms: 194±52 of quadriceps, 175±45 of sural triceps, 10.7±3 of deltoids, 15.3±2.4 of brachial biceps, 10.8±1.8 of brachial triceps). When patients were subdivided according to the type of disease, a clear trend among groups was displayed with maximum strength being higher in controls, followed by the PTCA group, then the CHF group, the PAD group and the HT.

Discussion: This study shows that chronic patients have a great strength impairment which parallels the history of disease. In our opinion this peripheral de-conditioning requires a different approach in the rehabilitation setting with lower loads for a more prolonged period of time. This lower intensity phase should yield a initial aerobic and strength reconditioning which is recommended before switching to higher intensity training. This information should be kept in mind when planning a rehabilitation program.

References

AACPR (2004). Guidelines for Cardiac Rehabilitation and Secondary Prevention Programs, Human Kinetics, Champaign.

Brzyski M. (1993). JOPERD, 64, 88-90.

Sarto P, Merlo L, Astolfo P, Sarto M, Bedin L, Noventa D. (2009). J Cardiovasc Med, 10, 27-33.

INCREASED ACCUMULATION OF INORGANIC PHOSPHATE IN PATIENTS WITH DIFFUSE ATHEROSCLEROSIS DURING INCREMENTAL CALF EXERCISE - A 31P MRS STUDY

SCHOCKE, M., ESTERHAMMER, R., OSTERMANN, S., PESTA, D., JASCHKE, W., FRAEDRICH, G., GREINER, A.

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PURPOSE: Patients with diffuse peripheral arterial disease (PAD) often suffer from atypical symptom including leg pain during exercise without any high-grade stenosis. The impact of PAD of muscle function is still unclear. The purpose of this study was to investigate the high-energy phosphate metabolism during submaximal incremental calf exercise in PAD patients without high-grade stenosis at the limb arteries.

METHOD AND MATERIALS: 35 patients with diffuse uni- or bilateral PAD and 24 normal controls were included into this study. For phosphorus 31 magnetic resonance spectrscopy (31P MRS), we used a FID sequence (TR=1000 ms; TE=0.13 ms; 10 averages) during exercise increments at 2, 3, 4 and 5 W. MR angiography was performed in the patients by using FLASH 3D sequences at three levels during a gadobenate bolus of 16 mL and moving bed technique. The muscle weight was determined in each patient and each volunteer with the help of T1-weighted, transversal slices. The time constants of phosphocreatine (PCr) were calculated for each increment as well as for recovery. The end-incremental PCr and inorganic phosphate (Pi) were correlated to the power output corrected for muscle size.

RESULTS: Patients with diffuse PAD showed significantly ($p<0.01$) increased PCr time constants during the incements at 4 and 5 W, but not at 2 and 3 W as well as during recovery. Both patients and volunteers showed a linear relationship between end-incremental PCr level and power output, whereby the slopes were significantly steeper in the patients (-6.28 vs. -4.97, $p<0.001$). The end-incremental Pi levels showed an exponential increase with workload in both groups. The patients showed a significantly higher exponent compared to the volunteers (0.2 vs. 0.15, $p<0.001$).

CONCLUSION: As indicated by the increased PCr time constants, muscle metabolism is impaired in patients with diffuse PAD at relatively high work intensities, whereby the normal PCr recovery time constants suggest a normal mitochondrial function. This finding might reflect remodelling processes within the calf muscle, which also corresponds to the patients' higher exponents in the observed exponential relationship between end-incremental Pi level and power output. Pi accumulation is supposed to play a key role in muscle fatique and limits muscle strength. This might explain the atypical symptoms in patients with diffuse atherosclerosis.

References:

1. Greiner et al., High-energy phosphate metabolism during incremental calf exercise in patients with unilaterally symptomatic peripheral arterial disease measured by phosphor 31 magnetic resonance spectroscopy. J Vasc Surg 2006;43(5):978-86.

2. Esterhammer et al., Phosphocreatine kinetics in the calf muscle of patients with bilateral symptomatic peripheral arterial disease during exhaustive incremental exercise. Mol Imaging Biol. 2008; 10(1):30-9.

3. Allen et al.; Skeletal muscle fatigue: cellular mechanisms. Physiol Rev. 2008; 88(1):287-332.

EFFECT OF OBESITY AND HEALTH-RELATED FITNESS MEASURES ON CIRCULATORY HEMODYNAMICS IN HEALTHY SEDENTARY COLLAGE STUDENTS

ALOMARI, M., KEEWAN, E., QHATAN, R., IBRAHEEM, R., ALAWNEH, K.

JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

INTRODUCTION: Vascular function (VF) and pulse pressure (PP) are clinically relevant as they are predictors for increased risk of cardiovascular diseases in young healthy individuals. However the relationships of obesity and health-related fitness measures with PP and VF are not clear. Therefore, this study examined the relationships of obesity and health-related fitness measures with circulatory hemodynamics in 19 apparently healthy sedentary collage students with age range 18-23 years.

METHODOLOGY: Obesity measures including body weight (BW), percent body fat (%BF), muscle mass (Mmass), waist/hip (W/H) ratio, and body mass index (BMI) were obtained. Additionally, health-related fitness including maximum walking distance achieved in 6 minutes (6MWD), maximum handgrip strength (MHG) and short-form international physical activity questionnaire (IPAQ) were assessed. For circulatory hemodynamics, strain-gauge plethysmography was used to measure blood flow at rest (RBF) and after 5-minute of occlusion (OcBf) while PP was calculated as systolic – diastolic blood pressure. Vascular resistance at rest (Rvr) and after occlusion (OcVr) were calculated with mean arterial blood pressure/blood flow whereas reactive hyperemia (RHBF) was calculated as OcBF-RBF. Subsequently, Person correlation was used to examine the relationships between obesity and health-related measures verses circulatory indices.

RESULTS: Measures of obesity including BW correlated with RHBF (r=0.4; p=0.05), OcVr (-r=0.4; p=0.07), and PP (r=0.7; p=0.002), while Mmass correlated with RHBF (r=0.4; p=0.04), OcVr (r=-0.5; p=0.03), and PP (r=0.6; p=0.01). Moreover, W/H ratio (r=0.5; p=0.05), and BMI (r=0.4; p=0.06) correlated with PP. As to health-related fitness, 6MWD correlated with RBF (r=0.5; p=0.03) and Rvr (r=-0.5; p=0.03) while MHG (r=0.7; p=0.002) and walking item of the IPAQ (r=0.6; p=0.01) correlated with PP. Interestingly, PP also correlated with OcBF (r=0.5; p=0.03), RHBF (r=0.5; p=0.04) and OcVr (r=-0.5; p=0.03).

CONCLUSION: The associations of obesity and health-related fitness measures with circulatory indices show that VF and PP are affected by BW, fat distribution, Mmass and level of fitness. These relationships are clinically significant as they pertain to circulatory hemodynamics.

MHC COMPOSITION OF SINGLE MUSCLE FIBRES, SATELLITE CELLS AND MYONUCLEI IN WRESTLERS

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ARISTOTLE UNIVERSITY OF THESSALONIKI

Introduction: Few studies have examined the effects of long-term wrestling training on muscle morphology and function (Adams et al., 1993; Tesch and Karlsson, 1985). All the above mentioned studies were conducted more than 20 years ago and they used mATPase staining methodology and not the modern sensitive immunohistochemical analytic method in order to study changes in the patterns of Myosin Heavy Chain (MHC) isoform expression. The aim of this study was to investigate the long-term effects of high intensity resistance wrestling training on MHC isoforms composition, on satellite cells and myonuclei behavior, on embryonic and neonatal MHCs and to compare with untrained subjects.

Methods

Nine Greco-Roman competitive wrestlers (mean age 20.1±2.7yrs, height 175.0±0.6cm, weight 83.2±12.5kg, yrs of training 7.6±2.7yrs) and six healthy physical education students (mean age 21.2±0.9yrs, height 180.0±0.3cm, weight 80.1±9.4kg) participated in this study. Muscle biopsies were obtained from deltoid muscle in order to investigate muscle fibre distribution, cross sectional area (CSA), single fibres, satellite cells and myonuclei by immunohistochemistry. MHC isoform composition of single fibres was determined with protein electrophoresis.

Results: Immunohistochemical analysis showed that muscle fibre distribution of the MHC I and IIA were significantly higher in wrestlers than in students ($p<.05$). The proportion of MHC IIX was higher by 7% in students compared to wrestlers. Electrophoretic analysis of single muscle fibres revealed a significantly higher proportion of fibres containing MHC I and hybrid fibres containing MHC IIC in wrestlers compared to students ($p<.05$). However, students displayed a significant higher proportion of MHC IIX compared to wrestlers ($p<.001$). The mean CSA of type IIA fibres and the number of myonuclei per type II fibres was significantly higher in wrestlers compared to students ($p<.05$). In wrestlers, myotubes were observed as well as internal nuclei, intermediate and small sized skeletal muscle fibres expressing embryonic and neonatal MHC and none in students.

Discussion: The present study revealed that the deltoid muscle of wrestlers contains a larger proportion of fibres with MHC I, IIA and single muscle fibres MHC I and IIC isoforms and very few fibres containing MHC IIX isoforms. Long-term wrestling training may cause hypertrophy especially in MHC IIA, and a transformation of MHC IIX into IIA and IIC of the deltoid muscle. The hypertrophy of MHC IIA seems to be associated with an increase in the number of the myonuclei attached to them and an increase in the number of satellite cells. It is suggested that the observed muscle fibre profile in the deltoid muscle of wrestlers may represent an adaptation based on the mechanical and biochemical demands of the long-term training.

References

Adams GR, Hather BM, Baldwin KM, Dudley GA (1993). J Appl Physiol, 74(2), 911-915.

Tesch P, Karlsson J (1985). J Appl Physiol, 59(6), 1716-1720.

EFFECTS OF ENDURANCE AND RESISTANCE TRAINING ON CALCITONIN GENE-RELATED PEPTIDE (CGRP) CONTENT IN SLOW AND FAST RAT'S MUSCLES

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UNIVERSITY

Calcitonin Gene-Related Peptide (CGRP), a 37-amino acid peptide generated by alternative processing of primary transcripts from calcitonin gene, is broadly distributed in the peripheral and central nervous systems of vertebrate and invertebrate species. CGRP plays a main role in Neuromuscular Junction (NMJ). This paper investigates the effects of Endurance and Resistance training on the content of CGRP in Slow and Fast Muscles. A number of twenty-two male Wistar rats (10 mo of age, 220± 20 gr, Iran Pasteur Institute) randomly were divided to three groups (Control (n=7), Endurance training (n=7), and Resistance training (n=8)) and followed 12 weeks training according protocols. Animals of the resistance training group were housed in metal cage with a wire-mesh tower; Endurance training (5 days a week, 60 min/day, 30 m/min speed) was performed by animals in endurance group. Forty-eight hours after last session of protocols, animals were anaesthetized with a mixture of KetamineTM and Xylazine. The right soleus (slow muscle) and anterior tibialis (fast muscle) were removed under sterile condition via an incision on dorsolatral aspect of the hindlimb. After removal, tissues were frizzed quickly in liquid nitrogen and kept at -70 ° C for later using. For CGRP assay, ELISA kit was used. For data analyses, One-way ANOVA was used. Data analysis showed that there was not a significant different between control and endurance training groups in slow and fast muscle's CGRP. But, the content of CGRP in both fast and slow muscles was significantly different in resistance training group compared with control group. It is expressed that training can be a main factor for CGRP releasing in muscles. In addition, the type and intensity of activity probably are contributed to CGRP content increase. Therefore, as recognized role of CGRP in NMJ and former researches reported that CGRP contant increse in motoneurons followed by exercise, the present research findings that has investeagated effect of different training on CGRP content in muscles is attractive.

Saturday, June 27th, 2009

08:30 - 10:00

Oral presentations

OP-ST06 Sports 6

THE EXTERNAL FORCES ACTING IN THE DIRECTION OF TRAVEL AND THEIR RELATION TO MECHANICAL ENERGY DISSIPATION IN SLALOM.

GILGIEN, M., REID, R., HAUGEN, P., SMITH, G.

NORWEGIAN SCHOOL FOR SPORT SCIENCES

Introduction:

The literature quantifying the external forces acting on an alpine skier is limited in general, but particularly in the slalom discipline. This study therefore describes the size and time course of the external forces acting on a skier parallel to the direction of travel based on the kinematics of a group of highly skilled slalom racers. Subsequently, the braking forces of ski-snow friction and wind drag are related to mechanical energy dissipation.

Method:

The derivation of the external forces was based on the kinematics of 6 members of the Norwegian Europa Cup team (aged 17-20). Skier kinematics were captured during 2 turns of a slalom race simulation by 4 panning and synchronized camcorders [1]. The centre of mass (COM) position calculation was based on the Zatsiorsky body segment parameter model and the de Leva adjustments. The component of gravity accelerating the skier downhill and the resultant force were both calculated from the COM position data. To calculate the air drag force, frontal area was estimated using a kinematics-based procedure, drag coefficients were adapted from a study of cross country skiers [2], and COM velocity was calculated using finite central differences. The remaining frictional force in the ski snow interaction was calculated as the difference between the resultant force, the air drag force and the component of gravity accelerating the skier downhill.

Skier mechanical energy dissipation, defined as the amount of total mechanical energy dissipated to the surroundings per meter altitude skied [3], was derived from the COM position data. The braking forces were then correlated to mechanical energy dissipation.

Results:

The air drag force acting in slalom is rather small and constant (25 - 50N), while the frictional force between ski and snow alters rapidly during a turn cycle with peak values as high as 500N occurring at about gate passage.

Energy dissipation showed a strong inverse statistical correlation with the frictional force in the ski-snow interaction ($R2 = -0.96$, $p < 0.001$), while the relation between energy dissipation and the air drag force was not significant.

[1] Nachbauer, W., et al. (1996). J Appl Biomechanics, 12, 104-115

[2] Spring, E., et al. (1988). Int. J. Sport Biomechanics, 4

[3] Supej, M. (2008). J. Appl Biomechanics, 24, 121–129

PHYSIOLOGICAL RESPONSE OF ELDERLY ALPINE SKIERS DEPENDS ON INDIVIDUAL MOVEMENT PATTERN.

SCHEIBER, P., SEIFERT, J., MÜLLER, E.

UNIVERSITY OF SALZBURG, DEPARTMENT OF SPORT SCIENCE & KINESIOLOGY

Introduction: It has been demonstrated that there are skiers who have a low physiological response when skiing, while other skiers have greater physiological responses at similar skiing velocities (Scheiber et al. 2009). Interestingly, the aerobic capacity of these skiers seemed to have little effect on the physiological responses of these technically homogenous skiers while skiing. It has also been reported that blood lactate is a valid predictor for cumulative physiological stress in alpine skiing (Seifert et al. 2008). It can be speculated that the inter-individual variation in kinematical variables of subjects skiing technique may also influence physiological response. Thus, the purpose of this study was to quantify the influence of kinematic variables on the physiological response in recreational alpine skiing.

Method: Nineteen older alpine skiers (61.1±5.7 years) performed two different ski-instructor paced (LP and HP) and one self paced (SP) skiing mode on a medium pitch, well prepared slope. Blood lactate (LA), HR, blood pressure (BP), and knee angle were determined. Mean knee angle (MKA), as well as the range of knee angle (RKA) of twenty double turns were calculated for each run. Pearson correlations were obtained between kinematical and physiological variables. Independent t-tests were performed to calculate mean group differences in kinematic and physiological variables of low (LO) vs. high lactate (HI) skiers.

Results: The most interesting physiological findings were found for LA. Mean LA of the whole group was 1.40±0.34 mmol.L-1 for LP runs, 1.94±0.59 mmol.L-1 for HP runs, and 2.34±0.87 mmol.L-1 for SP runs. MKA of LP runs was 123.8±6.1°, for HP runs 117.5±6.0° and for SP runs 117.1±6.0°. The RKA of LP runs was 19.0±3.9°, for HP runs 20.3±3.7° and for SP runs 17.7±3.6°. A significant correlation was found only for RKA and LA during SP runs, ($r^2=.465$; $p<.005$). Additionally, RKA of LO was significantly ($eta^2=.399$; $p<.012$) lower (15.3±2.5°) than those of HI skiers (19.8±3.3°). No correlations were found between physiological and kinematic variables for the ski-instructor paced skiing modes.

Discussion: These findings demonstrate that skiing with a lower vertical movement of the skiers' centre of gravity results in a lower lactate accumulation, than skiing with a greater movement. From a physiological standpoint, there might be an optimum of active bending/stretching in combination with the use of external forces, to minimize vasoconstriction of blood vessels as a result of static muscle work and to avoid unnecessary body movement.

References:

Scheiber P, Krautgasser S, Von Duvillard SP et al (2009) Physiological responses of older recreational alpine skiers to different skiing modes. Europ Journal of Applied Physiology, 105(4), 551 - 558.
Seifert J, Kroell J, Mueller E (2008) The Relationship of Heart Rate and Lactate to Cumulative Muscle Fatigue during Recreational Alpine Skiing. Journal of Strength & Conditioning Research. In Press.

THE RELATIONSHIP BETWEEN THE TIMING OF TAKE-OFF ACTION AND FLIGHT LENGTH BY USING TWO DIFFERENT TYPES OF JUMP-DOLLS

SASAKI, T., TSUNODA, K., HOSHINO, H., MIYAKE, S.
HOKUSEI GAKUEN UNIVERSITY

Introduction: The purpose of this study is to detect the optimal timing of jump action in ski jumping. Assuming a jumper could always produce same motions, the timing of jump action would be the most important variable for the flight distance. In this study, the jump of the two different jump-dolls were observed on the hill model (1/100). Dolls always produce same power during jump action. Thus, the flight distance solely depends on the timing of initiating the action. Therefore, it is possible to clarify the relationship between the timing and the flight distance.
Methodology: Two different types of jump-dolls were developed. First doll was used two springs for producing softer power. Four springs were set in respective joints (knees and hips) of the second types of the doll. The jump doll can reproduce the same hopping action on the take-off platform. The critical point (K) in the model of jumping hill is 160 cm. The dolls are able to jump on this model hill. The position of start on in-run is 150 cm away from the edge of platform. The peg, which releases the strength of the jump doll, was put on six places every 4 cm away from the edge of platform. Five times trials in two jump dolls were executed for every peg point. All the jump actions were recorded by the NAC video camera with 500 fps.
Results: The elapsed time for jump actions from squat position to full extension and speed of take-off were almost the same in both types. Using the same release point, the maximum flight distance was occurred in each doll. The release point is 4 cm before the edge of platform. The flight distance is 125 cm in type 1, and 166 cm in type 2. On the other hand, the minimum flight distance was observed in initiating jump action at the 12 cm before the edge. The flight distance is 88 cm in type 1, and 128 cm in type 2.
Discussion: Smooth action on each joint is achieved by a bearing devices, although the doll is made by wood, The doll-model produces the same strength at take-off actions, because, it is possible to take the same squat position anytime. Therefore, the jump -doll can be used in the experiment of ski-jump. In this study, the difference in the flight distance is only attributed by the difference of the timing of the jump action. As an evidence of the transition of the power, the oscillation of skis was exactly observed during the initial flight phase. This phenomenon already pointed out even in the human action (Sasaki et al., 2005). In the flight distance, the most effective timing for beginning the action is clarified in this experiment by the jump-doll.
Conclusion: Until the 4 cm from the edge of platform, the later the timing of beginning the action is, the larger the flight distance is. The jump-doll always transmits almost same power.

OPTIMIZATION OF AERODYNAMIC STABILITY IN SKI JUMPING: THE TUG-OF-WAR BETWEEN SAFETY AND PERFORMANCE

MARQUES-BRUNA, P., GRIMSHAW, P.
EDGE HILL UNIVERSITY

Introduction: Past research in ski jumping has aimed to increase jump length and modify ski length and hill design to make the sport safer (Schwameder, 2008). However, the assessment of aerodynamic stability (Anderson, 2007) for improved safety has received less attention (Seo et al., 2004). Thus, this study aimed to model aerodynamic efficiency and stability in pitch in ski jumping as a function of athlete's posture. The findings may be used to optimise flight posture and warrant safer training and competition.
Methods: Mathematical modelling was carried out using a hypothetical ski jumper with a typical mass of 70 kg, height of 1.76 m and ski length of 2.57 m (Seo et al., 2004). Lift (FL), drag (FD), lift/drag ratio (FL/FD), dPitching-moment/dAngle-of-attack slope (dM/dAA) at the trim AA and oscillatory frequency (FREQ) (Anderson, 2007) were calculated as a function of AA, ski opening angle (SOA; at 20°, 25° and 30°) and forward-leaning angle (FLA; at 0°, 10°, 20°, 30° and 40°) (Seo et al., 2004). Air density was set at 1.18 kg/m3, and air speed at 25 m/s to simulate competition at a large jumping hill (Schwameder, 2008).
Results: FL was largest with SOA = 30° & FLA = 0°-10°. FD increased monotonically from AA = 10°. FL/FD peaked at AA = 2°-12°, at which FL was rather low. dM/dAA became steeper with increased SOA and FLA, ranging from – 0.82 Nm/° for SOA = 20° & FLA = 0° to – 2.67 Nm/° for SOA = 30° & FLA = 40°. FREQ increased as a function of SOA and FLA, showing about half a cycle per second (0.51 Hz) for SOA = 30° & FLA = 10°.
Discussion/Conclusion
An optimised flight posture of SOA = 30° & FLA = 10° is suggested. This is a high-lift configuration that yields steep dM/dAA and high oscillatory frequency upon sudden deviations from trimmed flight. The high frequency may initiate transitory dynamic oscillations (Anderson, 2007). The findings add to the current priority to warrant safety in the sport (Schwameder, 2008).
References
Anderson, J.D. (2007). Fundamentals of aerodynamics. (4th ed.). McGraw-Hill. London.
Schwameder, H. (2008). Biomechanics research in ski jumping, 1991-2006. Sports Biomechanics. 7 (1): 114-136.
Seo, K., Watanabe, I. and Murakami, M. (2004). Aerodynamic force data for a V-style ski jumping flight. Sports Engineering. 7: 31-39.

PHYSIOLOGIC RESPONSES OF LOW AND HIGH STRESS RESPONDING RECREATIONAL ALPINE SKIERS TO DIFFERENT SKIING PACES

SEIFERT, J., SCHEIBER, P., MÜLLER, E.
MONTANA STATE UNIVERSITY, BOZEMAN, MONTANA; UNIVERSITY OF SALZBURG, SALZBURG, AUSTRIA

Introduction: Previous studies have demonstrated that there are skiers who demonstrate a low physiological response (LO; low lactate and HR), while others have a high physiological response (HI; high lactate and HR) when skiing at similar velocities. However, it is unknown how LO and HI respond to different skiing paces when compared to their individual self-paced skiing. It is important to understand

if, and how, the skiing intensity can be regulated, to minimize physiological stress. Thus, the purpose of this study was to quantify differences in physiologic variables of LO and HI responding skiers while skiing at three different paces.

Methods

Twenty, recreational alpine skiers (mean age: 61.1+5.6 y) performed two different paced and one self-paced (SP) skiing trials. Skiers were separated into LO and HI groups according to blood lactate (LA) at the end of their SP runs. The on snow tests contained five skiing segments per day. For each segment, subjects performed three different, randomized skiing trials; parallel ski steering turns (LP), long radii carving turns (HP), and SP. LP and HP runs were paced for time and intensity by a certified ski instructor. LA, HR, BP, and RPE (overall and legs) were collected at the end of each run. Physical fitness was assessed by a physical work capacity test. Testing took place on a groomed slope at Abtenau, Austria at an altitude between 746 and 1,138 m. An ANOVA with repeated measures and Bonferroni adjustment were used to analyze data. Significance was noted with $p<.05$.

Results: LA accumulation was significantly lower for LO than HI during LP (1.21+0.31 vs 1.70+0.55 mM/L), HP (1.35+0.33 vs 2.00+0.66 mM/L), and SP (1.43+0.26 vs 2.56+0.62 mM/L). LA levels did not differ between trials for the LO skiers, but were different for all skiing paces for HI. HR was lower for LO than HI during SP runs (113+11 bpm vs. 128+16 bpm; $p<0.03$), but no differences were observed during LP and HP runs. MAP, RPE legs, RPE overall, and fitness level did not differ between groups. The HI group responded with significantly lower stress, when skiing under paced conditions, compared to their SP run. This change was not observed in the LO skiers. No significant differences between LO and HI were observed for fitness level, run times, BP, MAP, RPE legs, or RPE overall.

Conclusions

HI skiers responded with a disproportionately greater level of stress than LO when changing trials during skiing. LA, for example, increased significantly by 17.6% when comparing LP to HP and 23.1% for HP and SP runs for the HI group. LA levels were not different between paces for LO. Paced skiing may aid in minimizing the changes in fatigue indices and potentially enhance the recovery in the HI skiers. Results demonstrate that RPE is not sensitive enough for inter-individual comparison. Interestingly, physical fitness seemed to have little to no effect on the physiological responses of this technically homogeneous group of recreational skiers.

ENERGETIC AND RESPECTIVE PART OF LACTIC AND AEROBIC SOURCES OVER A GIANT SLALOM IN YOUNG SKI RACERS.

HINTZY, F., GRENIER, J., COULMY, N.

1. LABORATOIRE DE PHYSIOLOGIE DE L'EXERCICE, 2. CELLULE DE RECHERCHE DE LA FÉDÉRATION FRANÇAISE DE SKI

The energy cost of a giant slalom event was previously measured by Saibene et al. (1985) and Veicteinas et al. (1985) during exercise and during recovery from a complete lap, tacking into account the blood lactate and the oxygen consumption. The actual main criticism is the disrespect of the real skiing conditions (Douglass bag method, VO2 not continuously measured, sport equipment..). The purpose of this study was then to quantify the total net energetic output and the part of both aerobic and lactic sources in alpine skiing over a giant slalom in young ski racers; then to estimate the influence of the biological maturation on these parameters. Seven minor ski racers aged in average (±SD) 14,0 ± 0,5 years were investigated and divided in two groups according to the gender or the biologic stages of maturation. They performed both a giant slalom in a field study and a incremental test (to determine the maximal aerobic capability). The oxygen consumption was measured breath to breath with an automatic gas analyzer system (Cosmed K4b², Rome, Italy) during the whole giant slalom and the blood lactate concentration was calculated before and 2 min after the slalom in order to respectively determine both aerobic and lactic energy sources. Average (±SD) V02, lactate and total net energetic output were respectively 44.8% VO2peak, 5.7 mmol.l-1 and 33,3 ± 6,6 kJ.min-1 with important inter-individual variations. The relative part of lactic and aerobic sources averaged 28.4% and 71.6%, respectively. The more advanced biologic maturation of some subjects tends to increase the participation of the lactic source. Present results showed low energy expenditure during a giant slalom in young racers, which increases with the subject's biologic maturation.

Saibene et al. (1985) Energy sources in alpine skiing (giant slalom). Eur J Appl Physiol 53: 312-6.

Veicsteinaset al. (1984). Energy cost of and energy sources for alpine skiing in top athletes. J Appl Physiol 56:1187-90.

08:30 - 10:00

Oral presentations

OP-MB01 Molecular Biology 1

THE ROLE OF GROWTH HORMONE IN MODULATING THE PATHWAY OF APOPTOSIS IN EXPERIMENTAL MODELS OF SKELETAL AND CARDIAC MUSCLE CELLS

DIMAURO, I., FANTINI, C., PITTALUGA, M., PARISI, P., CAPOROSSI, D.

UNIVERSITY OF ROME

Growth hormone (GH) is a peptide hormone capable to exert anabolic and lipolytic effects in muscle tissue (1-2). Moreover, recent studies report on beneficial effects of GH in protecting skeletal and cardiac tissues from damage caused by cell death (3). Based on these premises, we investigated whether supra-physiological concentration of exogenous rhGH could modulate cellular response to apoptosis-induced with free radicals (H2O2) on in vitro models of skeletal (C2C12, L6C5) and cardiac (HL-1) muscle cells.

To this aim we treated the cells, grown in presence or absence of GH (200ng/ml-1µg/ml), with H2O2 (100-500µM), thus analysing the features of cell death induced by ROS. We analysed cell growth and cell survival (MTS assay) and the morphological and molecular markers of cell death (nuclear fragmentation by Hoechst 33342 and TUNEL assays); chromatin fragmentation by DNA laddering; expression of the pro- and anti-apoptotic proteins (PARP, caspase-8, caspase-9, Bcl-xL and Bcl-2).

Through semi-quantitative RT-PCR, we verified that the GH receptor (GHR) is expressed in our cellular models, and that its mRNA level is strongly up-regulated by GH complementation. In skeletal myoblasts and cardiomyocites GH neither modulates cell growth nor cell survival under oxidative stress condition. After treatments with cytotoxic concentrations of H2O2 (100-500µM), the induction of apoptosis was clearly detectable in all cell lines, either as nuclear fragmentation and/or DNA laddering, but the frequencies of apoptotic nuclei or

the intensity of DNA fragmentation resulted not statistically different ($p > 0.05$) with respect GH complementation (C2C12: Ctrl 39% vs GH 51%; L6C5: Ctrl 49% vs GH 38%; HL-1: Ctrl 28.5% vs GH 20%). Indeed, the presence of GH in the culture medium did not affect the expression of the anti-apoptotic proteins Bcl-xL and Bcl-2, neither in basal conditions, nor after treatments with H2O2 radicals. As for the expression of the molecular markers of apoptosis, we found that oxidative stress determined in skeletal and cardiac muscle cells the activation of the intrinsic pathway of apoptosis, since the cleavage of the effector PARP protein was paralleled by the activation of pro-caspase 9, without involvement of caspase-8. Regarding the effect of Growth Hormone, the results from molecular analysis fully overlapped the morphological results, since the expression of caspase-8, caspase-9 and PARP resulted comparable between standard or GH-enriched conditions of culture.

In conclusion, our study indicated that, although sensible to the presence of GH in the culture medium, skeletal and cardiac muscle cell lines did not show modulation by growth hormone itself of the molecular pathways involved in the susceptibility to cell death induced by oxidative stress.

1. Fryburg DA. Am J Physiol. 1994 267:E331-6

2. Yuen and Dunger. Diabetes Obes Metab. 2007 9:11-22

3. Marzetti et al. Am J Physiol Regul Integr Comp Physiol. 2008 294: R558-67

METABOLIC AND PRO-APOPTOTIC FEATURES OF SKELETAL MUSCLE CELLS EXPOSED "IN VITRO" TO HIGH SALMETEROL CONCENTRATION

DURANTI, G., LA ROSA, P., DIMAURO, I., PARISI, P., SABATINI, S., CAPOROSSI, D.

UNIVERSITY OF ROME

Salmeterol is a long-acting β-2 adrenergic receptor agonist, producing smooth airway muscle relaxation and bronchodilation (1), prescribed for asthma treatment. β-2 agonists induce muscle hypertrophy, thus there is big concern about the possible abuse of the this drug by the athletes. Actually, WADA included Salmeterol in the proibited list, as anabolic substance, allowing its utilization only under specific medical exemption. Since the mechanism for the anabolic activity of Salmeterol is still unknown (2), and could underline some adverse effects reported recently, we investigated the link between the metabolic and citotoxic effects of Salmeterol on L6C5 and C2C12 muscle cells, identifying the genes possibly modulated by this drug. Proliferating and differentiated cells, exposed to different Salmeterol concentrations (0,1 -10μM) for 6 - 72 hours, were analysed for cell growth and survival (Mitotic Index, MI; MTS and Trypan blue exclusion essays), apoptosis pathway (nuclear fragmentation, TUNEL, PARP, Bcl-xL, caspases 8 and 9) and metabolic enzymatic activities [Glyceraldehydephosphate dehydrogenase (GAPDH), lactate dehydrogenase (LDH), citrate synthase (CS) and 3-OH acylCoA dehydrogenase (HAD)]. Through the MTS assay, we identified that Salmeterol induces anabolic effect in proliferating myoblasts ($p<0.01$), clearly already detectable after 6 hrs exposure to concentration of 2,5μM. This increase is paralleled by an inhibition of cell grow rate as evidenced by analysis of MI performed through Hoechst staining. The anabolic effect of Salmeterol was maintained constant up to 48hrs exposure, when a strong dose-dependent decrease in MTS absorbance determined by cell death (Trypan exclusion test) resulted apparent ($p<0.01$). The anabolic effect of Salmeterol was verified by glucose and fatty acid metabolism. Results indicate an increase of GAPDH, CS, HAD, and a decrease of LDH activities. Interestingly, differently from the physiological situation occurring during myoblasts differentiation, the double anabolic/cytostatic effect of Salmeterol was neither related to increase in cell resistance, since the expression of the anti-apoptotic Bcl-xL protein resulted unaffected, nor to differentiation, as demonstrated by lack of myogenin expression (western bloth analysis). Finally, the exposure of myoblasts to high concentration of Salmeterol (10μM) for 48 and 72hrs resulted toxic in both cell lines: the frequency of apoptotic nuclei (nuclear fragmentation and TUNEL), statistically higher with respect to control ($p< 0,01$) and the analysis of apoptotic markers (cleaved PARP and caspase 9 cleaved fragment) confirmed the putative Salmeterol activation of the intrinsic apoptotic pathway. In conclusion, in our cellular models for skeletal myoblasts, low Salmeterol exposure increases oxidative metabolic pathways and inhibits cell growth, while high Salmeterol exposure clearly exerts pro-apoptotic effects.

1. Timothy B Op't Holt EdD RRT AE-C FAARC..Respiratory Care 2007; 52:7

2. Diane M Spurlock, Tara G McDaneld, Lauren M McIntyre. BMC Genomics 2006; 7: 320

THE ROLE OF NRF-1 IN REGULATING GLUT4 EXPRESSION.

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UNIVERSITY OF CAPE TOWN

Introduction: Nuclear respiratory factor (NRF)-1 is a transcriptional factor that regulates mitochondrial biogenesis. Overexpression of NRF-1 in transgenic mice has been reported to have a dramatic increase in GLUT4 and myocyte enhancing factor (MEF)-2 (1). The increase in GLUT4 was surprising since NRF-1 has no binding sites in the Glut4 gene; hence the question is how does NRF-1 regulate GLUT4? The mechanism by which NRF-1 regulates Glut4 gene expression has not been studied. Because the Glut4 gene does not have the cis-element for NRF-1, it has been hypothesize that the increase in its expression when NRF-1 is over expressed (1), is a secondary to the effect of NRF-1 on the Mef2a gene, which has NRF-1 binding sites (2): NRF-1 induces increased MEF2A which, in turn, binds to its cis-element on the Glut4 gene to upregulate its expression. The aim of this study was investigate the molecular mechanism leading to GLUT4 upregulation.

Methodology: C2C12 cells were used to develop a tetracycline based gene expression system (Tet-On). The Tet-On system involves two plasmids, namely, the regulatory and response vectors and were transfected after G418 and hygromycin selection respectively to form a double stable cell line and the system activated by Doxycycline (1mg/ml). Small interference RNA for MEF2A was transfected to the double stable cell line at 6pmol. Western blotting was used to assess the level of expression. Binding was assessed by chromatin immuno precipitation (ChIP) assay.

Results: Results showed that NRF-1 overexpression showed a 4 fold increase in Mef2a binding, MEF2A to Glut4 binding increased 3.5 fold and NRF-1 to Alas gene binding increased 4.5 fold. Protein expressions for MEF2A and GLUT4 were increased 2.3 and 2.6 respectively.

Discussion: From these results we could conclude that NRF-1 overexpression increases GLUT4 via Mef2a binding resulting in increased MEF2A which in turn increases its binding to the Glut4 gene resulting in GLUT4 expression. Increases in mitochondrial and GLUT4 expression are essential in alleviating metabolic disease such as type II diabetes. Increase in mitochondrial content and oxidative capacity has been reported to reduce ceramide, diacylglycerol and long chain fatty acyl CoA which interferes with the insulin signalling pathway resulting in impaired insulin stimulated glucose transport and GLUT4 translocation (3). On the hand GLUT4 expression is necessary in glucose transport thereby maintaining euglycemia. NRF-1 can be an important target for drugs needed for the treatment and management of type II diabetes.

References
1. Baar et al., 2003. FASEB J. 17:1666-73.
2. Ramachandran et al., 2008. J. Biol. Chem. 283:11935-46.
3. Koves et al., 2008. Cell Metabolism. 7: 45-56.

INSULIN RESISTANCE IN OBESITY: A NEW CELLULAR MODEL

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Background: Obesity is associated with the development of insulin resistance and further leads to type 2 diabetes. In insulin resistance, glucose uptake is compromised, due to a decreased translocation of glucose transporter (GLUT4) on the plasma membrane. This defect is linked to a serine phosphorylation of the insulin receptor substrate (p-ser IRS-1), under the action of 2 kinases: IkappaB kinase-β (IKK-β) and c-Jun N-terminal kinase (JNK), rendering it a poor substrate for the activated insulin receptor. It has been observed that heat shock proteins (HSP) could modulate the activity of IKK-β and JNK and could then restore insulin sensitivity. Interestingly, it has recently been reported that monocytes from healthy subjects showed an insulin-stimulated increased expression of GLUT4. This could support the hypothesis that monocytes represent an innovative and powerful cellular model to investigate insulin-stimulated glucose uptake. The aim of this study was to investigate insulin signaling and the effect of HSP induction on insulin sensitivity in monocytes from obese people.

Method: 16 people (8men and 8 women, 44yr) were divided into 2 groups based on their BMI (control group or CG=21kg/m2, obese group or OG=31kg/m2). They performed an oral glucose tolerance test (OGTT) under fasting conditions. Blood samples were taken at rest and every 30min up to 2h post glucose ingestion. Area under the curve was calculated for glucose and insulin and index of insulin resistance (IR) and insulin sensitivity (%S) were measured using the HOMA2 model. GLUT4 was measured at every time points, while pJNK, pIKK-β, p-ser IRS-1, Hsp27 and Hsp72 were measured in fasting samples before and after a 2h incubation at 42C.

Results: Significantly higher BMI, IR and area under the curve for glucose and insulin during the OGTT were observed in OG compared to CG. Significantly lower %S and GLUT4 levels were observed at every time points in OG compared to CG. Negative correlations were observed between resting GLUT4 and BMI or %S (r<-0.6) and a positive one with IR (r>0.6). No significant difference was observed between the 2 groups for pJNK, pIKK-β, p-ser IRS-1, Hsp27 at rest whereas Hsp72 was significantly higher in CG. pJNK and pIKK were both positively correlated with p-ser IRS-1 (r>0.7). Heat shock significantly induced Hsp72 in both groups but induced Hsp27 only in CG. Hsp72 induction contributed to decrease pJNK in both groups but resulted in decreased p-ser IRS-1 only in CG.

Conclusion: Obesity is characterized by impaired insulin signaling and altered glucose transport capacity in monocytes. Although heat stress can modulate critical kinases activity, it does not restore insulin signaling in obese subjects and could then explain the impaired glucose transport in this population. Monocytes seem to provide a useful and powerful cellular model to investigate alterations in insulin signaling in metabolic disorders.

Т<–786>→С POLYMORPHISM OF ENDOTHELIAL NO-SYNTHASE <еNOS> IS A MARKER OF SPORTSMEN'S RESISTANCE TO EXERCISE-INDUCED HYPOXIA

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Introduction: Nitric oxide (NO), blood concentration of which is dependent from NO-synthase activity is known to be involved in various adaptation processes to hypoxia. These gene polymorphisms might affect the gene expression and hence individual possibilities of triggering hypoxia compensation mechanisms. The purpose of this study was to elucidate the frequency of polymorphisms in the eNOS gene in endurance athletes with adaptation to hypoxia.

Methods: During the course of the study a total of 42 highly qualified endurance athletes with adaptation to hypoxia (underwater swimming, rowing) and 35 athletes specialized in speed-power kinds of sports were enrolled.

A total of 84 subjects not involved in sport activities were recruited in the control arm. DNA was extracted from buccal epithelial cells.

The polymerase chain reaction (PCR) with following analysis of the length of restriction fragments was used to determine the Т(–786)→С polymorphism of the promoter and G(894)→T polymorphism of exon 7 of eNOS gene.

Results: Frequency analysis of Т(–786)→С polymorphism of the promoter demonstrated that the frequency of normal homozygous genotype T/T in endurance athletes with adaptation to hypoxia was 42,4% (Р=0,001) higher in comparison to those in the control population. In athletes specialized in speed-power kinds of sports the frequency of normal homozygous genotype T/T exceeded control only by 8,3% (Р=0,001). Genotype C/C was not found in the athletes group in our study. The еNOS activity accompanying the G/G variant of exon 7 polymorphism was 1.5 times higher in endurance athletes with adaptation to hypoxia than in those specialized in speed-power kinds of sports. Frequency of genotype G/T in both trained groups almost three times exceeded the control. Genotype T/T was not found in endurance athletes with adaptation to hypoxia, while it was two times higher in the control group in comparison to the group of subjects specialized in speed-power kinds of sports.

Discussion: Our data suggest possible influence of eNOS gene polymorphisms on the formation of the phenotype resistant to exercise-induced hypoxia. In endurance athletes with adaptation to hypoxia the frequency of C/C variant Т(–786)→С polymorphism of the promoter and T/T variant of exon 7 of eNOS gene was found to be lower than in those specialized in speed-power kinds of sports or not trained at all. That can be used for the selection process and have an importance in hypoxia resistance's assessment.

08:30 - 10:00

Oral presentations

OP-PH12 Physiology 12

EFFECT OF CAFFEINE INGESTION DURING PROLONGED EXHAUSTIVE EXERCISE ON SALIVARY IMMUNOGLOBULIN A, A-AMYLASE AND CORTISOL

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Exercise can have deleterious effects on the secretion of salivary immunoglobulin A (s-IgA), which appears to be related to perturbations in sympatheticoadrenal activation (Teeuw et al., 2004). Caffeine, commonly used for its ergogenic properties is associated with increased sympathetic nervous system activity, and it has been previously shown that caffeine ingestion before intensive cycling enhances s-IgA responses during exercise (Bishop et al., 2006). Therefore, the aim of the present study was to examine the effect of a performance cereal bar, containing caffeine, before and during prolonged exhaustive cycling on exercise performance and the salivary secretion of IgA, α-amylase activity and cortisol. Using a randomised cross-over design and following a 10 – 12 hour overnight fast, 12 trained cyclists, mean (SEM) age: 21(1) yr; height: 179(2) cm; body mass: 73.6(2.5) kg; maximal oxygen uptake, VO2max: 57.9(1.2) completed 2.5 h of cycling at 60%VO2max (with regular water ingestion) on a stationary ergometer, which was followed by a ride to exhaustion at 75% VO2max. Immediately before exercise, and after 55 min and 115 min of exercise participants ingested a 0.9 MJ cereal bar containing 45 g carbohydrate, 5 g protein, 3 g fat and 100 mg of caffeine (CAF) or an isocaloric noncaffeine bar (PLA). Unstimulated timed saliva samples were collected immediately before exercise, after 70 min and 130 min of exercise, and immediately after the exhaustive exercise bout. Saliva was analysed for s-IgA, α-amylase activity and cortisol concentration. Saliva flow rates were determined to calculate the s-IgA secretion rate. Data were analysed using a 2-way repeated measures ANOVA and post-hoc t-tests with Holm Bonferroni adjustments applied where appropriate. Time to exhaustion was 35% longer in CAF compared with PLA ((2177 (0.2) vs 1615 (0.16) s; $P < 0.05$)). Saliva flow rate did not change significantly during the exercise protocol. Exercise was associated with elevations in s-IgA concentration (9% increase), s-IgA secretion rate (24% increase) and α-amylase activity (224% increase) post-exhaustion ($P < 0.01$), but there was no effect of CAF on these responses. Salivary cortisol concentration increased by 64% post-exhaustion in the CAF trial only ($P < 0.05$), indicating an increase in adrenal activity following caffeine ingestion. Values were 35.7 (5.5) and 19.6 (3.4) nmol/L post-exhaustion for CAF and PLA, respectively. These findings show that ingestion of a caffeine containing cereal bar during prolonged exhaustive cycling enhances endurance performance, increases salivary cortisol secretion post-exhaustion, but does not affect the exercise-induced increases in s-IgA or α-amylase activity.

Bishop et al. (2006) Medicine and Science in Sports and Exercise, 38: 513-519

Teeuw et al. (2004) Biological Chemistry. 385:1137-1146

ESTIMATING THE TIME DEPENDENCY OF THE DEMAND IN RESPONSE TO AND RECOVERY FROM HEAVY EXERCISE

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UNIVERSIDAD POLITECNICA DE MADRID

Introduction: The problem of estimating the time dependency of the physiological demand in response to exercise is a fundamental problem in exercise physiology, where the lack of appropriate tools and techniques forces the assumption of a constant demand during heavy exercise. Models such as those developed by (Stirling et al, 2008a, 2008b, 2005) based on methods from nonlinear dynamical systems use such information when modeling the oxygen uptake and heart rate kinetics. The aim of this study is to apply the ALOPEX IV stochastic optimization method to estimate the heart rate demand in response to and in recovery from various heavy exercise intensities (Zakynthinaki and Stirling, 2008).

Methods: Beat to beat heart rate data were obtained from an athlete who performed a series of bouts of exercise at different constant intensities. The optimal fit of the heart rate model to the basic response pattern (Zakynthinaki et al, 2007) of the raw un averaged data for low exercise intensities was obtained used the stochastic optimization algorithm (Zakynthinaki and Stirling, 2007). The model was then fit to heavy exercise intensities by the use of an appropriate partition of the physiological time series and by means of stochastic optimization Zakynthinaki and Stirling (2008). This enabled us to estimate the time dependency of the heart rate demand for heavy intensity exercise and its subsequent recovery.

Results: For the first time the demand of the heart rate as a function of time was found for a heavy constant exercise intensity and the subsequent recovery. It was observed that time dependency of this demand was very different from the constant demand assumption.

Discussion: A method for estimating the demand in response to heavy constant intensity exercises was shown to provide new previously unobtainable information regarding the time dependent nature of the demand. This method was applied to the heart rate, however the method is equally as applicable to oxygen uptake kinetics and hence has many possible applications both in fundamental exercise physiology, medicine and sport.

References

Stirling JR and Zakynthinaki MS, (2008) J Nonlin Math Phys 15(sup3), 396-403..

Stirling JR, Zakynthinaki MS, Sampedro J and Refoyo I (2008a) J Nonlin Math Phys. 15(sup3), 426-436.

Stirling JR, Zakynthinaki MS and Billat VL, (2008b) Bul. Math. Biol, 70(5):1348-1370.

Stirling JR, Zakynthinaki MS, Saltin B, (2005) Bul. Math. Biol. 67(5), 989-1015.

Zakynthinaki MS, Stirling JR, (2008). Comp Phys Comm, 179(12), 888-894.

Zakynthinaki MS, Stirling JR, Sillero M, Sampedro J, Refoyo I, Materials Matematics, UAB (2007).

Zakynthinaki MS, Stirling JR, (2007) Comp. Phys. Commun. 176(2), 98-108.

WHAT IS THE BEST METHOD TO NORMALISE MEASUREMENTS OF ENDOTHELIAL FUNCTION FOR SHEAR STRESS?

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Introduction: Endothelial dysfunction is a key factor in the development of atherosclerosis. Pyke and Tschakovsky (2005) thought it critical to account for shear stress when examining group differences in flow-mediated dilatation (FMD), which is a surrogate marker of endothelial function in vivo. They introduced a method of normalisation by dividing FMD by the area under the curve of its eliciting shear rate (SR) stimulus (FMD/SR). Nevertheless, Harris and Padilla (2007) postulated that analysis of covariance (ANCOVA) is a more appropriate normalisation approach. Therefore, Tschakovsky et al. (2007) questioned whether different normalisation methods altered interpretations of group-differences in FMD. Our aims are to address this question and to explore the influence of different normalization methods on results from a repeated-measures experiment involving exercise.

Methods: In a cross-sectional study, forearm cuff inflation to supra-systolic pressure was undertaken for a period of 5 min in 16 children (9.90.3 yrs), 48 young-adults (25.34.2 yrs) and 15 older participants (57.54.3 yrs). Brachial artery FMD was calculated as change in artery diameter from the baseline preceding cuff inflation (%), whilst the area under the curve of SR was quantified from cuff deflation to the time of peak arterial diameter. In a further experiment, 10 males, aged 287 yrs, completed three 10-min bouts of cycling at 70%VO2max, interspaced with 10 min rest periods at 08:00 and 16:00 h. Brachial artery FMD was again measured 30 min before and after each bout of exercise. After exploring the relevant statistical assumptions, FMD/SR data were analysed using conventional ANOVA. Results were compared to those using the ANCOVA approach with SR as the covariate.

Results: In the cross-sectional study, the residuals from ANCOVA were normally distributed, which was not the case when FMD/SR data were analysed. The assumption of parallelism in ANCOVA was also upheld. Whilst ANCOVA revealed a significant age-related decline in FMD (9.9±1.0% to 5.7±0.9%; P=0.009), normalisation using FMD/SR resulted in no statistically significant differences being observed (P=0.101). Statistical power was 34% higher with ANCOVA than with FMD/SR. In the repeated measures experiment, FMD at rest was 3.7±1.6% lower at 08:00 h than at 16:00 h, but this diurnal variation was not evident post-exercise. The P-value for this interaction between time of day and exercise was 0.01 for ANCOVA but 0.06 for FMD/SR.

Conclusion: These data suggest that the ANCOVA approach to normalizing FMD for differences in SR holds more statistical power than the FMD/SR method. Statistical assumptions were also upheld with ANCOVA but not with FMD/SR. For these reasons, we support the use of ANCOVA to normalise measurements of FMD for differences in shear stimulus.

References

Harris and Padilla (2007). J Appl Physiol 103:1108
Pyke and Tschakovsky (2005). J Physiol 568: 357–369
Tschakovsky et al. (2007). J Appl Physiol 103:1109.

LEFT-VENTRICULAR HYPERTROPHY ASSOCIATES TO IMPAIRED MAXIMAL MYOCARDIAL PERFUSION IN ENDURANCE-TRAINED MEN

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Long-term endurance training induces morphological adaptations in heart, such as left-ventricular (LV) hypertrophy caused by wall thickening and cavity enlargement. Interestingly, these anatomical changes in the heart are strikingly similar to certain pathophysiological changes (Pellicia 2000). Previous studies have shown that the perfusion response in myocardium during dipyridamole- or adenosine infusion is decreased in several pathophysiological states with LV hypertrophy (e.g. Stolen et al. 2004). However, studies in endurance athletes with LV hypertrophy have shown contradictory results on myocardial perfusion response ranging from reduced to increased myocardial perfusion during dipyridamole- or adenosine-induced vasodilation compared to untrained men (Kjaer et al. 2005; Kalliokoski et al. 2002). The degree of hypertrophy could explain the discrepant findings in studies in athletes, but it has not been thoroughly investigated. Thus, we examined totally 31 endurance athletes (ET) and 25 untrained (UT) men in order to study the association between myocardial functional and anatomical parameters measured with echocardiography, and myocardial perfusion (at rest and during maximal vasodilation induced by iv adenosine) measured with Positron Emission Tomography. Both VO2max (60+-5 vs 42+-8 ml/kg/min, p<0.001) and LVmass index (169+-27 vs 102+-15 g/m2, p<0.001) were markedly higher in ET. Resting myocardial perfusion was similar between the groups (ET 0.7+-0.2 vs UT 0.8+-0.2 ml/g/min, p=0.22) whereas adenosine-stimulated perfusion was lower in ET (2.9+-1.0 vs 3.7+-1.0 ml/g/min, p<0.01). VO2max correlated inversely with adenosine-stimulated perfusion in ET (r=-0.39, p=0.03) and with resting perfusion in UT (-0.49, p=0.01). Forward LV work correlated linearly with resting perfusion in both groups (ET r=0.54, p<0.01; UT r=0.50, p=0.01). ET group was further divided into three subgroups according to LVmass index (ET1: LVmass index <150g/m2, n=9; ET2 LVmass index 150-180 g/m2, n=12; ET3 LVmass index >180 gm2, n=10). Adenosine-induced myocardial perfusion decreased gradually when LVmass increased (UT 3.7+-1.+0 vs ET1 3.3+-0.9 vs ET2 2.7+-1.4 vs ET3 2.6+-0.5 mL g-1 min-1, p=0.008). LVmass index was also inversely related to adenosine-induced perfusion in entire study population (r=-0.46, p<0.01). Therefore, these results suggest that endurance training-induced severe cardiac hypertrophy impairs myocardial perfusion capacity.

Kalliokoski K et al. (2002) Med Sci Sports Exerc 34:948-53
Kjaer A et al. (2005) Am J Cardiol 96:1692-98
Pellicia A (2000) Curr Cardiol Rep 2(2):166-71
Stolen KQ et al (2004) 10(2):132-40

METABOREFLEX SENSITIVITY IN INDIVIDUALS WITH MENTAL RETARDATION AND NON-DISABLED ADULT MALES

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Introduction: The exercise pressor reflex is a peripheral feedback neural system, composed of group III mechanically sensitive (mechanoreflex) and group IV metabolically sensitive (metaboreflex) afferent nerves. Stimulation of both of these reflexes results in increased sympathetic activity and elicits a blood pressure raising effect. Individuals with mental retardation (MR) have diminished work capacity, reduced peak oxygen consumption, and chronotropic incompetence compared to non-disabled (ND) individuals possibly due to auto-

nomic nervous system alterations. The aim of the study was to assess the contribution of the metaboreflex to the control of blood pressure and heart rate in individuals with MR and ND individuals.

Methods: Eleven healthy ND males (25.1±0.5 years) and ten healthy males with MR (26.4±5.5 years) volunteered for the study. The responses to isometric handgrip (HG) exercise and the persistence of active metaboreflex via local post exercise circulatory occlusion (PECO) were evaluated. The testing protocol involved a 3-min rest period, 3 min HG exercise at 30%MVC, followed by 3 min of post-exercise circulatory occlusion and 3 min of recovery (+PECO protocol). Following a 45-min rest, the same protocol was repeated without circulatory occlusion (-PECO protocol). Beat to beat blood pressure (Finometer) and heart rate were measured non-invasively throughout the protocol.

Results: Significant differences ($p<0.05$) in Mean Arterial Pressure (MAP) responses were observed between the two groups. In ND, during the +PECO protocol, MAP was similar in HG and post-exercise occlusion (delta change from rest 22.6±1.9 vs. 22.4±2.2mmHg, in HG and occlusion, respectively), while during the –PECO protocol, MAP was significantly higher in HG than in non-occlusion (delta change from rest 22.9±2.4 vs. 4.5±1.3mmHg, HG and non-occlusion, respectively; $p<0.05$). In MR, during the +PECO protocol, no differences were observed between HG and occlusion (delta change from rest 17.2±2.5 vs. 12.5±2.7mmHg, in HG and occlusion), while during the –PECO protocol, MAP was higher in HG than in non-occlusion (delta from rest 20.9±2.2 vs. 2.5±1.1mmHg, respectively). Comparisons between the groups revealed that during the post-exercise occlusion period MAP was significantly higher ($p<0.05$) in ND than MR (delta compared to baseline levels 22.4±2.2 vs. 12.5±2.7mmHg, ND and MR, respectively), indicating a lower metaboreflex activation in MR. Heart rate significantly decreased ($p<.05$) during the occlusion and non-occlusion periods in ND and MR; no differences in heart rate were detected during the occlusion between the two groups.

Conclusions: The significantly lower MAP response during the post exercise occlusion period in MR than ND, indicates a diminished metaboreflex sensitivity in individuals with mental retardation compared to non-disabled individuals.

THE STRUCTURAL ADAPTATION TO OVERLOAD IN SKELETAL MUSCLE IS INFLUENCED BY NITRIC OXIDE <NO> AND REACTIVE OXYGEN SPECIES <ROS>

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Introduction: We have recently shown that skeletal muscles of nitric oxide (NO)-producing neuronal NO synthase (nNOS)-knockout (KO) mice contain higher levels of reactive oxygen species (ROS). To determine whether this molecular adaptation has a functional impact, we have now characterized the influence of nNOS and reactive oxygen species (ROS) on the ultrastructure of skeletal muscle in response to overload.

Methods: Groups of wild type (WT)- and KO-mice (n= 8 animals each) were subjected to extirpation of the tibialis anterior muscle (TA). This established protocol leads to overload in its functional antagonist extensor digitorum muscle (EDL) within 14 days. Other groups of WT- and KO-mice (n= 8 animals each) were fed with a combination of ROS scavengers (vitamin C, N-acetyl-cysteine, coenzyme Q) for 14 days prior TA extirpation and during the 14 days of muscle stretch. Both the overloaded and the contralateral EDL were subjected to morphometric analysis at the light microscopy level.

Results and Discussion: Compared to the values in the contralateral EDL, muscle stretch raised significantly the capillary/fiber (C/F)-ratio and capillary density in the overloaded EDL of WT- and KO-mice but not of those animals that were treated with ROS scavengers. These results indicate that ROS rather than NO influence the growth of the capillary network in skeletal muscle. Interestingly, the basic values for C/F-ratio and the capillary density were significantly higher in mice of both strains fed with ROS scavengers than in those not treated with the scavengers suggesting that the reduction in ROS levels per se induced angiogenesis in skeletal muscle. The mean fiber area of skeletal muscle fibers was significantly lower in KO than in WT-mice but not changed by ROS scavenging pointing out that nNOS-derived NO but not ROS participates in hypertrophy of skeletal muscle fibers. In summary, overload-induced angiogenesis in skeletal muscle is controlled by ROS, while hypertrophy depends on NO only. These data might be of fundamental relevance to analyze and understand the functional impact of free radicals on skeletal muscle physiology.

Reference

Da Silva-Azevedo L, Jähne S, Hoffmann C, Stalder D, Heller M, Pries AR, Zakrzewicz A, Baum O. (2009). J Physiol, 587, 655-668.

08:30 - 10:00

Oral presentations

OP-HF05 Health and Fitness 5

ASSESSMENT OF SEDENTARY-TO-MODERATE INTENSITY PHYSICAL ACTIVITY BY A SHIRT POCKET-IN ACTIVITY MONITOR

OKURA, M., NISHIBAYASHI, K., OGATA, H., MIYASHITA, A., SHIOKAWA, T., KUMPEI, T., IKEDA, Y.

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BACKGROUND: There is considerable public health interest in the physical activity levels of adults, in part because an increased prevalence of obesity associated with lower levels of physical activity. However, there are currently few effective methods to objectively, noninvasively, and accurately evaluate the quantity of low-to-moderate intensity physical activities in free-living conditions. Triaxial accelerometers that are small in size and minimally intrusive to normal subject movement can be useful devices for predicting energy expenditure (EE) for various physical activities. Previous studies demonstrated higher correlation coefficients between acceleration counts obtained with waist-mounted triaxial accelerometer and the EE measured. However, some studies suggest that waist-mounted accelerometers tend to underestimate the EE for daily physical activity because they couldn't pick up signals during upper body movement, which mainly contributes to EE during sedentary-to-moderate physical activities. Thus, we hypothesized that methods for estimating EE would be improved by mounting the activity monitor in the upper body, for example, in a shirt-pocket. The purpose of this study was to develop a regression-based equation that estimates EE for sedentary-to-moderate intensity activities using total acceleration obtained by the shirt

pocket-in activity monitor. METHODS: Twenty Japanese adults equipped a shirt pocket-in activity monitor (AM-101, D30×W 80×H17, 19 grams; TANITA Co. Ltd) while in a whole body indirect calorimetry for 24 hours (6 PM to 6 PM the next day). The triaxial accelerometers measure acceleration in three dimentional directions. It samples acceleration at 16 Hz and assesses values from – 2 to 2 G (1 G is equal to the acceleration of free fall). The acceleration count was calculated as the average of the absolute values for acceleration for a given interval (1 minute). The protocol time was composed of sleep (8 hours) and various structured activity periods. Acceleration data from various activities and their relationship to energy expenditure obtained from the whole body indirect calorimetry allowed for the development of EE equations for daily physical activities. The developed EE equation was cross-validated on 9 Japanese adults. RESULTS: The acceleration data of various activities was strongly correlated with the actual EE measured by the whole body indirect calorimetry. The predicted physical activity EE (PAEE) was highly correlated with the actual PAEE measured by the indirect calorimetry, although the predicted PAEE was slightly higher than the measured PAEE. CONCLUSION: In conclusion, we found that the total acceleration obtained from the shirt pocket-in activity monitor was strongly and linearly correlated with the EE measured by the indirect calorimetery. The attachment of a triaxial accelerometer in a shirt-pocket is an ideal method to pick up the upper body movement in daily physical activity.

HEALTH-RELATED PHYSICAL FITNESS AMONG ADULTS AND ELDERLY POPULATION. PILOT DATA FROM THE KAN PROJECT PHASE II.

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Introduction: On instructions of the Public Health Department, the work with KAN (Kartlegging Aktivitet Norge) is part of the follow-up of the national plan "Working together for physical activity", and the goal is to make a system to monitor the level of physical activity (phase I) and health-related physical fitness (phase II) among the adults and the elderly population in Norway. The project is financed by the Norwegian Directorate of Health. The Norwegian School of Sport Sciences is in charge of the project in cooperation with 9 educational institutions at university and college level. Phase 2 will measure health-related physical fitness in an objective way. Therefore, the purpose of this pilot study was to accomplish a pilot study based on standardized test battery for registering health-related fitness in the age group 30-85 years.

Methods: A total of 31 men (n=16) and women (n=15), initially 56.3±14.2 years participated in the pilot study. The test battery is partly based on the ALPHA group recommendation by Suni et al. (2008), measuring muscle strength and motor fitness. Tests measuring flexibility were also chosen because of the connection between mobility and the ability to cope with activities of daily living according Rikli and Jones (1999).

Results: The participants (n=31) used 114.6 sec (SD 68.3) in the Static back extension test. In the Handgrip test (n=31) the score was 44.7 kg (SD 14.1). The results in the One leg standing test (n=31) was 33.0 sec (SD 20.6) and in the Modified push-up test the participants (n=24) accomplished 15.0 push-ups (SD 5.7) in 40 sec. Seven participants carried through the test on their knees and managed to do 9.6 push-ups (SD 3.8) in 40 sec. The results from the Chair Sit-and-Reach and Back Stretch tests 6.7 cm (n=30, SD 14.2), left arm over 0.6 cm (n=30, SD 13.3) and right arm over -4.1 (n=30, SD 10.4) respectively.

Discussion: Based on the high standard deviation shown on some of the tests and our subjective test experience, it is necessary to standardize all the tests in a way it makes it possible to implement the KAN test battery to all the 10 involved educational institutions.

References

Rikli R.E. and Jones C.J. (1999) Development and validation of a Functional Fitness Test for Community-residing older adults. Journal of Aging and Physical Activity. 7:129-161.

Suni J., Ruiz J.R., Castillo M.J., Husu P., Sjöström. (2008) Instruments for Assessing Levels of Physical Activity and Fitness (ALPHA project), Work package 6: Assessing Health-Related Fitness. Vrije University, Amsterdam 12. april.

CONCURRENT VALIDITY OF SIMPLE BODY FAT COMPOSITION ASSESSMENT METHODS IN RECREATIONAL ATHLETES

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INSTITUTE OF SPORTS SCIENCES

Introduction: A variety of methods can be used to determine percent body fat (% BF) as a cardiovascular risk factor and to classify recreational athletes of under-, normal- or overweight. However, various assessment methods may yield different results. Therefore the present study compared the most commonly used inexpensive, operationally simple, non-invasive techniques: bioelectrical impedance analysis (BIA), near infrared body composition analyzer (NIR) and hand-held caliper (Cal) measurements.

Methods: The sample of 120 young recreational athletes (80 male (M), 40 female (F), 23.9±2.8 yrs, 1.76±0.08 m, 73.63±10.16 kg and BMI 23.58±2.21 kg/m2) with a history of at least 3 years active participation in organized sport (>2 times activity/week) was measured by experienced examiners. For assessment, 3-point skinfold thickness (Lange skinfold caliper, Beta Technology, Santa Cruz, USA), near infrared body composition analyzer (Futrex, Futrex Software Services Europe, Bitburg, Germany) in a standardized sitting position and two different bioelectrical impedance analysis, standing (BIA-st) (Omron BF-500, Omron Healthcare, Mannheim, Germany) and prone lying (BIA-ly) (Nutriguard-S, Data-Input, Darmstadt, Germany) were performed in a randomized order. Percentage body fat calculations were used for device comparison and classification into the body fat categories (% BF) normal (10-19.9% (M), 20-29.9% (F)), underweight (<10% (M), <20% (F)), overweight (20-24.9% (M), 30-34.9% (F)) or obese (>25% (M), >35% (F)).

Results: The subjects show different percentage BF (mean±SD) in accordance to the four measurement methods used: BIA-ly 18.5±6.2%, BIA-st 20.3±7.0%, NIR 17.5±6.0% and Cal 12.0±6.6%. Due to BIA-ly/ BIA-st and NIR measurements the study population is classified into the categories underweight (7-15%), normal (71-77%), overweight (7-20%) and obese (0-7%). In contrast caliper measures lead to a somewhat different frequency distribution: underweight (70%), normal (27%), overweight (2%) and obese (1%).

Discussion: Many commonly used body fat assessment methods can be used at reasonable costs within minimal time (< 5 minutes) and require only limited investigator experience. However, the current results illustrate varying body composition classification according to the assessment method used in recreational athletes. The magnitude of difference seems to be linked to the underlying measuring mechanism. Whereas BIA and NIR measures revealed almost comparable results, great differences were observed in relation to the caliper method.

DUE TO THE RECENT FINDINGS NUTRITIONISTS AND CLIENTS ALIKE SHOULD BE CAREFUL COMPARING BODY FAT CALCULATIONS BETWEEN DIFFERENT ASSESSMENT METHODS: TOTAL AMOUNT AND INTENSITIES OF PHYSICAL ACTIVITY AS PREDICTORS OF LOW CARDIORESPIRATORY FITNESS

SILVA, G., AIRES, L., SILVA, P., MOTA, J., OLIVEIRA, J., RIBEIRO, J.C.

FACULTY OF SPORT - UNIVERSITY OF PORTO

Introduction: Cardiorespiratory fitness (CRF) is a powerful marker of health and is specially related to cardiovascular disease risk factors. The rationale behind CRF suggests that physical activity (PA) have some effect to change it. However, the discussion about whether PA amounts and intensities are related with CRF levels remains.

Purpose: To determine whether total amount and intensities of PA could define the risk of being in lower levels of CRF in young Portuguese students.

Methods: This is a cross-sectional study of 240 adolescents aged 12 – 18 y from Porto district in the North of Portugal. CRF was determined by the maximal number of laps attained in the 20m Shuttle Run Test. CRF levels (low fit or fit) were classified according to FITNESSGRAM reference standards. PA was measured by accelerometers during 7 consecutive days and classified in total PA (TPA), sedentary PA (SPA), light PA (LPA), moderate PA (MPA) and vigorous PA (VPA). Previous single logistic regressions were performed for each PA variable separately. Final logistic regression was used to determine the risk of being low fit for CRF from previous significant variables. Significance level was set at $p < 0.05$.

Results: Previous single logistic regression indicates that only gender, TPA, MPA and VPA were related with CRF. Final logistic regression model considering gender, TPA, MPA, and VPA pointed that VPA was the only significant indicator of the risk of being at low fit level of CRF. Odds ratio for being low fit was 0,844 (0,729 – 0,977) for VPA. In other words, as long as the levels of VPA are higher, lower is the change of being low fit.

Conclusion: The results indicate that VPA is the most important PA intensity to determine the risk of being at lower CRF levels. Thus, it would be reasonable to promote physical activity of vigorous intensities to improve CRF and by consequence to improve cardiovascular health in early ages.

This study was supported by FCT (Project: PTDC-DES-7242-2006; PhD grant: SFRH/BD/45090/2008)

EVALUATION OF A HEALTH PROMOTION PROGRAM FOR MUSIC STUDENTS

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UNIVERSITY OF VIENNA

Introduction: Confronted with an increasingly large number of students suffering from medical problems (Zander 2006), the need of a health prevention program became obvious at the University of Music and Performing Arts Vienna. Based on the concept of Physioprophylaxis the project 'music and muscles' was initiated and an interdisciplinary health program was established. Courses in a groupsetting are offered for students to strengthen their individual fitness (f.e. Body fit, Strength Training, Rhythm, Dispokinesis) as well as teamteaching courses with additional experts in Spiral Dynamics and Franklin–Method to show students and teachers healthier ways of playing music.

Methods: The aim of the study was to investigate the implementation process and the effectiveness of this health program for the prevention of playing-related health problems. It was hypothesized that the program would have positive effects on different aspects of health of the students and on their work as musicians in training. By now, 134 students participated in the evaluation studies with pre and post measurements (standardized questionnaires at the beginning and at the end of each course (Spahn 2006, Spahn et al. 2001, Spaulding 1995, Zander 2006), document analysis of the program, interviews with the project coordinator, teachers and trainers).

Results: Based on the pre-to-post measurements of the students, the overall distress has decreased as well as playing-related symptoms, general symptom frequency, and emotional disturbances and anxiety level. General coping with work as a musician and security in performance situations have improved and their behavior of practicing preventive exercises in their life and within daily routines of playing music have changed significantly.

Discussion: Although the project has initiated changes in individual (health) behavior of the students (daily training, body awareness and posture), more measures will be necessary to build up sustainable structures for health promotion. Especially the support of the teaching stuff of the university will be an important factor in catalyzing a broader acceptance for the prevention program in students and the distribution of healthier ways in learning procedures, ways of playing and performing music (Spaulding 2002).

References

Spahn C (2006). Gesundheit für Musiker. Projektverlag, Freiburg.

Spahn C, Hildebrandt H, Seidenglanz K (2001). Effectiveness of a prophylactic course to prevent playing-related health problems of music students. Medical Problems of Performing Artists, 16, 34-31.

Spaulding C (1995). Gesundheitsvorsorge im Ausbildungsprogramm von Berufsmusikern. In Wagner C (Hrsg.), Medizinische Probleme bei Instrumentalisten, 261-279. Laaber, Laqaber.

Spaulding C (2002). Interdisciplinary Collaboration in Music Institutions. Musikphysiologie und Musikermedizin, 9(4).

Steinmüller W (2007). Körperbewusstheit für Musiker. Projektverlag, Freiburg.

Zander MF (2006). Musiker zwischen Gesundheit und Krankheit. Projektverlag, Freiburg.

RELIABILITY OF PERCEPTIONS OF ENVIRONMENTAL VARIABLES CONNECTED TO PHYSICALLY ACTIVE COMMUTING ROUTES

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THE SWEDISH SCHOOL OF SPORT AND HEALTH SCIENCES

Purpose

The ecological approach on physical activity behaviours emphasizes the environment as an important factor influencing physical activity levels. Some instruments have been developed to assess the neighbourhood or the local environment (1, 2). Physically active commuting, however, make use of an extended environment as compared to the local ditto. Furthermore, there is a need for developing models for ratings of environmental variables connected to commuting route environments. The purpose of this study is therefore to report on a

questionnaire developed for assessment of the perception of various aspects of the commuting route environment believed to be associated to physically active commuting by bicycle.

Methods: A questionnaire was designed including 18 questions developed to assess the perception of the commuting route environment. The questions address variables in three environmental domains: physical, traffic, and social environment. Variables include areas such as greenness, aesthetics, exhaust fumes, noise, flow, velocities, congestion, and conflicts as well as overall perception of the commuting route environment. Fifteen-point response scales ranging from e.g. very low to very high were used.

The participants, physically active commuters, were recruited in mid November 2005, when they bicycled in the inner urban area of Stockholm, Sweden (n=53). The participants answered the questionnaires on two occasions, about two weeks apart, and their responses were used to assess the test-retest reliabilities. This study reports on 13 questions.

Three types of analysis were used: 1) order effects analyzed with Student's paired t-test, 2) the typical error, and 3) intraclass correlations coefficients based on a one-way model.

Results: No significant order effects were seen, except for in the variables called conflicts (8.7%, $p<0.05$), congestion of bicyclists (7.8%, $p<0.05$), and overall perception of the commuting route environment (7.5%, $p<0.05$). The typical errors ranged between 0.94-2.03. The variables called velocities of bicyclists (ICC=0.87), and congestion of bicyclists (0.83) produced the two highest ICCs and the variables noise (0.41), velocities of motorized vehicles (0.51), flow of motorized vehicles (0.57), and exhaust fumes (0.58) produced the four lowest ICCs.

Conclusion: The overall result indicates a generally reasonable to substantial test-retest reliability. These results support that the studied questions may be useful for the assessment of the commuting route environment believed to be associated to physically active commuting by bicycle. The questions can contribute to the growing knowledge regarding physically active commuting.

References

1. Pikora et al. Developing a Reliable Audit Instrument to Measure the Physical Environment for Physical Activity. Am J Prev Med. 2002;23(3):187-194.

2. Saelens et al. Neighborhood-Based Differences in Physical Activity: An Environment Scale Evaluation. Am J Public Health. 2003;93:1552-1558.

08:30 - 10:00

Oral presentations

OP-PP03 Physical Education and Pedagogics 3

PHYSICAL EDUCATION IN THE FOUNDATION PHASE (GRADES R-3): A SURVEY

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In an attempt to break the cycle aimed at maintaining social and ideological control, the new South African government has established a new legal and policy framework for education and training. The result was the National Curriculum Statement (NCS). As a reform the NCS promised to improve the quality of education for all in South Africa (SA). In this article, the emphasis is on Life Orientation (LO), a Learning Area of the NCS, in the Foundation Phase (PF) of the General Education and Training Band (GET). The main problem was to determine the perspectives of LO teachers regarding the implementation of LO and particularly the Learning Outcome, Physical Education (PE) in the FP in selected Western Cape high schools, a province in SA. Quantitative data captured by a questionnaire typifies the research design as a survey. In the survey primary schools (N=124) were randomly selected of which 50 FP teachers (N=50) returned questionnaires. Summary statistics using frequency tables and histograms were utilised. The data was analysed by Statistica 8.0 (2007). Every aspect as stipulated by the NCS seemed to be in place for the presentation of LO in the FP. However, the majority of teachers were not qualified to present PE which creates major problems in the sense that it nullified many of the other conclusions. Notwithstanding the status of LO, the situation holds specific implications for the growth and development of FP learners. It is recommended that the Department of Education (DoE) should take the initiative and lead in this regard to urgently provide specialist PE teachers for the FP. However, Higher Education Institutions (HEI's) should become more involved in training initiatives for prospective teachers in LO.

Key words: Outcomes-based Education; National Curriculum Statement; General Education and Training Band; Life Orientation; Physical Education; Teacher Training.

ASSESSMENT FOR LEARNING AND GENDER EQUITY IN PHYSICAL EDUCATION. A PROSPECT FROM NORWAY AFTER THE IMPLEMENTATION OF THE NEW NATIONAL CURRICULUM 2006

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STORD/HAUGESUND UNIVERSITY COLLEGE, BERGEN UNIVERSITY COLLEGE, SOGN OG FJORDANE UNIVERSITY COLLEGE

Introduction: Gender differences and stereotyping in Physical Education (PE) are well documented since the 70ties. Despite this, Davis(2003) highlights the fact that there are few recent research studies in which the authors have failed to show gender inequitable treatment. Klomsten(2006) concluded that a more conscious view of gender was required in Norway as well.

In Norway a new National Curriculum(Lk06) led to an increased focus on assessment and its role in education. All subject curriculums included competence aims, specifications of learning expected of pupils at various ages. These aims form the overall basis of assessment. Assessment for learning, focusing on goal guided feedback from the teacher as well as self assessment, is emphasized.

To what extent have the new assessment regulations led to changes in topics/contents and methods of teaching and assessment? How do they influence the issue of gender equity in PE? This presentation seeks to explore and discuss these questions.

Methods: Quantitative and qualitative analyses of data from three studies each being parts of a larger project which purpose is to investigate the complex relations between assessments and learning in PE: a survey of 89 PE-teachers from all over Norway; a study of expec-

tations, ambitions and activity preferences in PE of 140 pupils in upper secondary school. An interview based study of selected teachers and pupils.

Results: The study of pupils reveals significant gender differences on grade aspiration before the start of the semester. Girls and boys show significantly different preferences on football, athletics and dance. The survey of PE-teachers shows that 74 % spend less than 20 % of total teaching time on dance. 83 % spend 40-100% on sport. 0 % spend 40-100 % on dance. Nearly one half of the teachers report that they have changed their way of assessment since the introduction of Lk06.

Discussion: The data indicates that content and practice in PE is influenced by well-known gender stereotyping. Lk06 has not made a difference in respect of this. Activities that are stereotypically referred to as 'feminine appropriate', like dance, occupy very little of teaching time in PE. 'Stereotypical' is precise here, because football is the largest sport among girls in Norway. Why, then, is it not so popular in PE? A girl says that ballgames are fun when they practice skills and techniques. Not surprisingly it seems that how the activity is taught is more important than the activity itself. Assessment for learning presents itself as a way to tell the pupils how to understand and work with the competence aims.

References

Davis, K. L.(2003): Teaching for gender equity in physical education: a review of the literature, in Women in sport & Physical Activity Journal 12: 55-82

Klomsten, A. T.(2006): A study of multidimensional physical self-concept and values among adolescent boys and girls. Doctoral thesis. NTNU, Trondheim

ENVIRONMENTAL CORRELATES TO PHYSICAL ACTIVITY IN ADOLESCENTS: TRACKING ACTIVITY PATTERNS IN SCHOOLYARDS

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TELEMARK UNIVERSITY COLLEGE, NORWAY, UNIVERSITY OF LIFE SCIENCES, NORWAY

Physical activity is recognized to be an important factor preventing life-style risks at an early age and can be related to the quality of life and subjective experience in early ages. Environmental settings seem to influence the activity patterns of children in neighbourhoods and schoolyard, the latter being an important arena to promote PA in school children. However, physical activity seems to decrease, starting in early teenage years, somewhat more pronounced in girls than in boys and previous studies have described sedentary lifestyle characteristics among young people. This study focused on environmental facilitation of schoolyards and how environments promote physical activity in 9 graders in two different schoolyards. Methods: Schoolyards and facilities for PA were described and identified through ortophoto maps. The children's movement patterns and activity levels were measured during the main school break applying a GPS Garmin Forerunner 305 with combined heart rate monitoring. Data were then transferred to and structured in a Microsoft Access data base and further exported in dbf format to an attribute table in ArcInfo (ESRI). Spatial reference data were converted to a projected coordinate system and geocoded in ArcGIS using metric units. Variation of heart rate within schoolyard area were analysed in a 20 x 20 meter grid. For the grid analysis, the average heart rate of measured point recordings was used as a summary measure.

We also modelled a continuous area depicting the variation of average heart rate over the schoolyard, using ordinary kriging interpolation. The schoolyard surface was thus further smoothed and the resulting data projected as a 3-dimensional wire graph showing the variation of average heart rate over the school yard. Basic geostatics was calculated for sub-sets of data representing separate attributes like gender (Mean center, Standard distance deviation etc.). Ordinary statistics and graphs were calculated using SPSS, Axum and ArcGIS, including plug-in modules such as Hawth Tools, Spatial Analyst and Geostatistical Analyst. Results: Typical movement patterns such as walking around the school buildings were identified and a handball goal area was a typical determinant for PA in one school with monitored HR>160 bpm in girls. Generally, low activity levels (mean HR<120 bpm) were registered for both schools. In spite of available facilities for PA these were not extensively used during recess. Conclusion: GPS tracking and HR monitoring showed traditional movement patterns of low PA levels during recess at both schools and the students did not utilize available sport facilities. Activity did not meet recommended daily time and levels of PA in children and youth.

A SCHOOL-BASED PHYSICAL ACTIVITY PROGRAM INCREASES FITNESS AND DECREASES ADIPOSITY IN PRIMARY SCHOOL CHILDREN <KISS>: A CLUSTER-RANDOMIZED TRIAL

KRIEMLER, S.

INSTITUTE OF EXERCISE AND HEALTH SCIENCES

Background: Childhood obesity and physical inactivity are increasing dramatically worldwide with detrimental effects on fitness, cardiovascular health and quality of life. Schools provide an ideal setting for preventive interventions. We therefore conducted a randomised controlled trial to determine whether a school-based physical activity (PA) program during a full school-year improves body composition, fitness, cardiovascular health, PA and quality of life in primary school children.

Methods: Twenty-eight classes from two of 26 provinces in Switzerland were cluster randomized to the intervention (16 classes, n=297) and control (12 classes, n=205) groups. The intervention consisted of a multi-component PA intervention including daily physical education. Primary outcomes included body fat (skinfold thickness), aerobic fitness (shuttle run test), PA (accelerometry), and quality of life (questionnaires). Children and parents in the control group were not aware of the existence of an intervention group. Analyses were done according to intention to treat.

Results: 502/540 students consented to participate, 498 completed the pre- and postintervention assessment, mean age was 6.9 (SD 0.3) years for 1st grade and 11.1 (0.5) years for 5th grade. After adjustment for grade, gender and cluster, children in the intervention arm compared with controls showed statistically significant additional average changes in body mass index by -0.22 (95% CI -0.38 to -0.05, p=0.009), in sum of four skinfolds by -1.78mm (-3.38 to -0.19, p=0.02), in aerobic fitness z-scores by 0.22 (0.01 to 0.42, p=0.04), in moderate-vigorous physical activity in school by 14 min (5 to 23, p=0.008) and in the cardiovascular risk score by -0.18 (-0.30 to -0.05, p=0.005). Overall daily physical activity and quality of life did not change differently.

Conclusions A school-based multicomponent physical activity intervention including compulsory elements can improve physical fitness and reduce adiposity and a composite cardiovascular risk factor score in children. Implementation of such a program may help to improve health and fitness of our children, and also improve health later in life by reducing cardiovascular and other diseases.

Trial registration Current Controlled Trials [ISRCTN15360785].

This study was supported by the Swiss Federal Office of Sports and the Swiss National Foundation (PMPDB-114401)

EXPLORING THE INFLUENCE OF PHYSICAL EDUCATION PREDISPOSITIONS ON PHYSICAL EDUCATION OUTCOMES

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LIVERPOOL JOHN MOORES UNIVERSITY, UK

Introduction: The Youth Physical Activity Promotion Model (YPAPM; Welk, 1999) describes predisposing factors of attitude, enjoyment, perceived competence and self efficacy as key influences on young people's physical activity. These factors may be important within the school Physical Education (PE) setting which has been identified as an influential context for enhancing young people's physical activity. A key goal of PE is to develop physically educated and physically active youth (NASPE, 2004). The study purpose was to explore the influence of psychological predispositions in PE on theoretical outcomes of PE, including physical activity levels, knowledge and understanding of physical activity, and perceived links to opportunities available for out of school physical activity.

Methods: Two hundred and ninety-one Year 8 and 9 children (208 girls, 83 boys; aged 12-14 years) from three schools in the North West of England participated in this study. They completed a questionnaire pack which included the Physical Activity Questionnaire for Older Children (PAQ-C; Crocker et al., 1997), and items relating to knowledge and understanding of health-related exercise, perceived PE ability and worth, and how PE impacts upon physical activity participation outside of school. Sex-specific multiple regression analyses were used to explore the inter-relationships between variables.

Results: Perceived PE Worth and Ability accounted for similar amounts of variance in self-reported physical activity and knowledge of physical activity opportunities available outside of school, for boys (19.4-26.2%), and girls (14-16.3%). The significant predictor within each model differed between boys and girls; boys' Perceived PE Worth predicted physical activity levels ($p < 0.03$, B = 0.2, [S.E. = 0.09], β = .26), while for girls Perceived PE Ability was the most important variable ($p < 0.01$, B = 0.30, [S.E. = 0.07], β = .35). Types of physical activities participated in outside of school was impacted upon by Perceived PE Ability for boys ($p < 0.01$, B = 0.7, [S.E. = 0.16], β = .5), and by Perceived PE Worth for girls ($p < 0.01$, B = 0.35, [S.E. = 0.09], β = .33). Boys' Perceived PE Ability influenced their awareness of physical activity opportunities outside of school ($p = 0.008$, B = 0.47, [S.E. = 0.17], β = .33) but for girls Perceived PE Worth had greater effect ($p < 0.01$, B = 0.48, [S.E. = 0.1], β = .38).

Discussion: These results suggest that gender differences exist in how psychological predispositions in PE affect intended theoretical PE outcomes. Physical educators should be aware of these gender differences in order to develop targeted pedagogical strategies to enhance students' attainment of positive PE outcomes.

References

Crocker P R, Bailey D A, Faulkner R A, Kowalski K C, McGrath, R. (1997). Medicine & Science in Sports & Exercise, 29, 1344-1349.

NASPE. (2004). Moving into the future: National standards for Physical Education. Reston, Va: NASPE Publications.

Welk G. (1999). Quest, 51, 5-23.

THE WORLD GYMNAESTRADA - A MODERN FORM OF LING GYMNASTICS?

MECKBACH, J., LUNDQUIST WANNEBERG, P.

THE SWEDISH SCHOOL OF SPORT AND HEALTH SCIENCES

The World Gymnaestrada – A Modern Form of Ling Gymnastics?

Introduction: Different forms of kinetic culture were developed in Europe at the beginning of the 19th century. One of these was Ling gymnastics (Lundvall & Meckbach, 2003; Lundquist Wanneberg, 2004; Pfister, 2003). Ling gymnastics has been described as one of Sweden's biggest cultural export products and in 1939 an international gymnastic display, the Lingiad, was held in Stockholm. But Gymnastics festivals are not a select Swedish phenomenon (Pfister 2007). The first World Gymnaestrada (WG) was held in Rotterdam in 1953. The focus in this study is on the conceptual content of Ling gymnastics evident in the type of gymnastics performed, Gymnastics For All (GFA), at the WG.

Methods: Three concept pairs General-Elite, Collectivism-Individualism, and Modesty-Ambition have been used to both capture and analyse the elements of Ling gymnastics evident in the WG. The study is based on 20 group interviews (semi-structured) with a total of 53 gymnasts and 87 observations (semi-structures with an observational list) carried out during 2007 WG.

Results: The results show: i) one similarity between the two forms of gymnastics is amateurism: no one profited financially from their involvement, ii) another similarity is the view of collectivism and general: gymnastics should be done together and should be available for all, iii) the idea behind both gives everyone an opportunity to participate.

Discussion: The answer to the question whether the WG's concept of gymnastics, GFA, can be regarded as a modern form of Ling gymnastics is yes, with certain reservations. The study has shown that there also are differences in content; differences that to some extent can be explained by structural changes when it comes to the view of the individual versus the collective. But in terms of the approach to the type of display and an emphasis on diversity, the basic principles are the same. The final question is how a Swedish gymnastics form that is rooted in the early 19th century can live on in an international context today? As been pointed out by the Norwegian sociologist, Augestad (2001) and the German historian, Pfister (2003) the universality of the Ling gymnastics made it compatible with cultures other than Swedish. Obviously so even today – at least part of it.

References

Augestad,P. (2001). Sosiologisk tidskrift 9 (3), 233-253.

Kihlmark, O. (1988) Sv Idrottshistoriska föreningens årsskrift, 43-50.

Lundvall, S. & Meckbach, J. (2003). Ett ämne i rörelse. Diss. Stockholm.

Lundquist Wanneberg, P. (2004) Kroppens medborgarfostran. Diss. Stockholm.

Pfister, G. (2003). Sport in Society 6 (1), 61-91.

Pfister, G. (2007), Stadion 33 (1), 49-70.

08:30 - 10:00

Oral presentations

OP-SM02 Sports Medicine 2

IMPLICATION OF PPARS IN ANTI-ATHEROGENIC EFFECT OF SWIMMING EXERCISE IN APOLIPOPROTEIN E DEFICIENT MICE (APOE-/-).

SZOSTAK, J., MIGUET-ALFONSI, C., PELLEGRIN, M., BOUZOURENE, K., BERTHELOT, A., MAZZOLAI, L., LAURANT, P.
UFR MEDECINE PHARMACIE

Introduction: Atherosclerosis is a chronic inflammatory disease. Physical exercise significantly reduces atherosclerosis lesions. However, the precise mechanisms implicated are still unknown. Recent studies suggest that PPARs may have some anti-atherogenic effects. We assess the hypothesis that exercise training reduces atherosclerosis in ApoE-/- deficient mice by increasing PPARs expression.
Methods: Male ApoE-/- deficient mice and normal C57Bl/6J mice were used. ApoE-/- mice were fed with a high fat diet and randomized into tree groups: 1/ one exercise group underwent exercise training (60 min swimming, 5 times/week) for 13 weeks, 2/ one sedentary group, and 3/ one supplementary exercise group supplied with an antagonist of PPAR-g Bisphenol A-diglycide ether named BADGE. C57BL/6J mice were used as control and divided into two groups: control exercise and control sedentary. Implications of PPARs in anti-atherogenic effects induced by exercise training are measured by quantification of PPAR mRNA by PCR quantitative in aorta and muscle solaris.
Results: Atherosclerotic lesions in ApoE-/- deficient mice were significant decreased in ApoE-/- mice underwent protocol swimming for 13 weeks in comparison to the ApoE-/- sedentary group. In contrast, exercise in mice supplied with BADGE did not suppress the atherosclerotic lesions. Exercise significantly increased expression of PPAR-g in aorta of ApoE-/- mice. Interestingly, the increased expression of PPAR-g in vascular wall was inversely correlated with the atherosclerotic plaque area. PPAR-b and a were not modulated in response to exercise training in aorta.
In soleus muscle, expression of PPAR-b was modulated by exercise training. Expression of PPAR-b in ApoE-/- mice was significantly increased in response to exercise training. Moreover, expression of PPAR-b was significantly decreased in ApoE-/- mice in relation to control mice. Interestingly, exercise in ApoE-/-mice supplied with BADGE, generated a significant decrease of PPAR-g and PPAR-b expression in comparison to ApoE-/- mice underwent exercise.
Conclusion: exercise prevents the development of atherosclerotic lesions in aorta. Our findings indicate that PPAR-g are implicated in the anti-atherogenic effects induced by physical exercise. In soleus, exercise training was associated with increased PPAR-b expression. This may be due to an increase of the muscle oxidative capacity in response to exercise training.

EMG ACTIVITY OF ECCENTRIC QUADRICEPS MUSCLE ACTIONS IS GREATER DURING FLYWHEEL THAN WEIGHT STACK TRAINING

NORRBRAND, L., POZZO, M., TESCH, P.A.
MID SWEDEN UNIVERSITY

Potential neural training adaptations in response to identical resistance exercise programs, using either an isoinertial flywheel device or a traditional knee extension weight stack machine, were studied by measuring electromyographic (EMG) activity of superficial vastii muscles pre and post 5 wk training.
Methods: Seventeen healthy, untrained men were assigned to 5 wks unilateral knee extension training (2-3 sessions/wk, 4 sets of 7 repetitions) using either a weight stack machine (WS; n=8) or a flywheel device (FW; n=9). Training specific mean and angle specific (90, 120 and 150° knee angle) EMG root mean square of mm. vastus lateralis (VL) and vastus medialis (VM) of concentric (CON) and eccentric (ECC) actions were measured. EMG was normalized using EMG measured during a maximal isometric action as a reference.
Results: Pre training, grp FW showed greater overall angle specific normalized EMG of VL and VM ($p<0.05$), greater mean normalized EMG within the ECC action (FW VL; 0.71±0.26, FW VM; 0.67±0.22, WS VL; 0.37±0.10, WS VM; 0.41±0.13, $p<0.05$), and greater overall ECC-CON EMG ratio (FW VL; 0.72±0.10, FW VM; 0.71±0.10, WS VL; 0.49±0.05, WS VM; 0.47±0.07, $p<0.05$) compared with grp WS. There were no group differences for the CON action (FW VL; 1.04±0.58, FW VM; 1.00±0.43, WS VL; 0.75±0.19, WS VM; 0.87±0.25, $p>0.05$). Following training, both groups showed increased isometric and training specific strength of the trained limb ($p<0.05$). Neither group showed altered ($p>0.05$) CON or ECC mean normalized EMG with training. However, groups showed different training responses for CON angle specific normalized EMG ($p<0.05$). Grp WS showed trends to increased normalized EMG at 90° (VL: p=0.019, VM: p=0.036) and 120° (VL: p=0.016, VM: p=0.085) knee angle. The CON angle specific normalized EMG of grp FW was near maximal both pre and post training, and hence unchanged over time ($p>0.05$).
Conclusion: The current results suggest that, muscle activation (i.e., EMG amplitude), during FW resistance exercise is near maximal from onset of the training period. Hence, greater normalized ECC EMG and ECC-CON EMG ratios may explain the more robust hypertrophy reported earlier following FW compared with WS training (1, 2). Training using WS evoked markedly less EMG activity in a large part of the range of motion. Thus, the low normalized ECC EMG and ECC-CON ratio are commensurate with the observations that neural adaptations typically are very prominent during the first weeks of traditional weight training.
1. Norrbrand L, Fluckey JD, Pozzo M, and Tesch PA. Resistance training using eccentric overload induces early adaptations in skeletal muscle size. Eur J Appl Physiol 102: 271-281, 2008.
2. Tesch PA, Ekberg A, Lindquist DM, and Trieschmann JT. Muscle hypertrophy following 5-week resistance training using a non-gravity-dependent exercise system. Acta Physiol Scand 180: 89-98, 2004.

ASSOCIATION BETWEEN PHYSICAL FITNESS AND RISK OF INJURIES DURING 18 WEEKS IN THE SWISS ARMY RESCUE TECHNICIAN SCHOOL

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SWISS FEDERAL OFFICE OF SPORTS

A mismatch between individual physical capability and job requirement can increase the risk for injury. Therefore, military organisations test the physical fitness of their conscripts to assign them to an adequate job. At the Swiss Army recruitment a new physical fitness test battery (1) was implemented. However, no objective fitness test related profiles of job requirements are available so far. The association of injuries incidence with initial physical fitness may provide information on the minimal physical demand of jobs.

In this study all participants were recruits of the Swiss Army rescue technician's school. Their physical fitness was assessed at the army recruitment with the test battery described elswhere (1). Overuse injuries were assessed continuously during the 18 weeks of military service by the local military medicine centre. The discriminative power of physical fitness tests for predicting the risk of overuse injuries was tested with receiver operating characteristic (ROC) analysis. ROC curves were plotted to identify the optimal cut-off values.

Data of 149 rescue technician's are used in these analyses. Overuse injuries forced 22.3% of recruits to receive medical treatments during 18 weeks of service. ROC curve analysis showed a significant ($p < 0.05$) area under the curve for standing long jump, trunk muscle strength test, progressive endurance run and fitness total score (0.640, 0.627, 0.621 and 0.646, respectively). The overuse injury rate among conscripts who exceeded the cut off distance of 2.2m in standing long jump (n = 100) was 17.3%, for those with lower jump distances 37.1%. The overuse injury rate among conscripts who exceeded the cut-off value of 130s in the trunk muscle strength test (n = 50) was 10.0%, for the others 31.3%. The overuse injury rate among conscripts who exceeded the cut-off score of 10.5 points in the progressive endurance run (n = 114) was 17.4%, for the others 38.9%. The overuse injury rate among conscripts who exceeded the cut-off score of 64 points in total fitness test (n = 119) was 17.6%, for the others 45.1%.

Muscle fitness of lower extremities and trunk as well as aerobic endurance do have a negative relation to risk of injury during military service of rescue technician. Discriminative power for predicting risk of overuse injuries of the three discussed fitness tests is comparable. To reduce overuse injuries in military service we suggest that physical fitness of some recruits shall be enhanced by systematic training or conscripts with fitness below the cut off values should be assigned to physically less demanding jobs. We finally conclude that ROC curves are a helpful statistical method in the process of determine job requirements in military organisations.

1 Wyss T. et al. (2007): Assembling and Verification of a Fitness Test Battery for the Recruitment of the Swiss Army and Nation-wide Use. Schweiz. Zeitschr. Sportmed. und Sporttraumat. 55: 126-131.

EFFECT OF DIFFERENT RHEPO DOSAGES ON CYCLING PERFORMANCE

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HUMAN MOVEMENT SCIENCES

Introduction: The administration of recombinant human erythropoietin (rhEPO) increases maximal as well as submaximal cycling performance (Birkeland et al., 2000; Russell et al., 2002; Thomsen et al., 2007). Less is known about the dose dependency of rhEPO administration on cycling performance and the time course of performance enhancement. Therefore, the aim of the study was to investigate increments in maximal and submaximal cycling performance at different time points and dosages.

Methods: In a double blind, placebo-controlled study design 40 subjects were assigned to 4 groups differing in dosage of rhEPO administered 3 times a week over a 4 weeks period (control [C]: saline injection, low concentration [L]: 20IU rhEPO/kg body mass, medium concentration [M]: 85IU rhEPO/kg body mass, high concentration [H]: 150IU rhEPO/kg body mass). Maximal and submaximal cycling performances were assessed by an incremental test (maximal power output [Pmax] and maximal oxygen consumption [VO2max]) and a constant-load test (time to exhaustion [tlim]) at 85% Pmax of incremental test performed before rhEPO treatment. Data is presented as mean [standard deviation].

Results: After 2 weeks of rhEPO administration, no significant changes in VO2max occurred while VO2max was increased after 4 weeks in H (+5.6 [4.3]%, $p<0.01$) and M (+5.7 [5.1]%, $p<0.01$). This improvement was accompanied by an increase in Pmax for H (+5.8 [4.1]%, $p<0.01$) and M (+2.5 [3.1]%, $p<0.05$) after 4 weeks of rhEPO administration. H and M improved tlim by 69.7 [73.4]% ($p<0.01$) and 44.8 [62.7]% ($p<0.05$), respectively. In contrast to VO2max and Pmax, tlim was already increased after 2 weeks of rhEPO administration for H (+32.1 [28.0]%, $p<0.001$) and M (+22.5 [31.5]%, $p<0.05$). Additionally, C improved tlim by 21.4 [23.8]% ($p<0.05$) after 4 weeks. Changes in Pmax and concomitant alterations in tlim were fitted best by an exponential curve equation ($y=0.033 \cdot \exp [3.577 \cdot x]$, $R2=0.26$, $p<0.001$).

Discussion: Improvements in submaximal cycling performance (tlim) occured after 2 weeks of rhEPO administration already, mainly for high and medium rhEPO dosage. The submaximal performance is enhanced further after 4 weeks of rhEPO treatment where significant improvements in maximal cycling performance (VO2max, Pmax) became apparent as well. This indicates that improvements in submaximal cycling performance are not only due to increased maximal cycling performance (explaining 26% of the variance of increased submaximal cycling performance). Probably other mechanisms, as increased oxygen availability in working muscles and concomitant metabolic changes or direct effects of rhEPO on skeletal muscles, are leading to more pronounced improvements in submaximal compared to maximal performance.

References

Birkeland et al., Med Sci Sports Exerc 32: 1238-43, 2000.

Russel et al., Eur J Appl Physiol 86: 442-9, 2002.

Thomsen et al., Eur J Appl Physiol 101: 481-6, 2007.

COMPLIANCE WITH THE ACTIVITY GUIDELINES FOR CHILDREN AND ADOLESCENTS IN GERMANY

JEKAUC, D., WOLL, A., WAGNER, M., BÖS, K.

UNIVERSITY OF KONSTANZ

Introduction: Being physically active is an important condition for a healthy development of children and adolescents. Compared to those who are inactive, physically active young people have higher levels of cardiorespiratory fitness, lower levels of body fat, stronger bones and mus-cles, as well as lower anxiety and depression rates (Strong et al., 2005). For this reason, some national governments published specific activity guidelines for children and adoles-cents. In the most recent activity guidelines from the Sport Unit of the European Commis-sion (2008), it is recommended that children and adolescents should have 60 minutes or more of moderate to vigorous physical

activity daily. This study represents a first survey which provides nation-wide representative data for physical activity and sports in Germany.

Methods: The target population of the study are all children and adolescents living and registered in the Federal Republic Germany aged between 4 and 17 years. The participants of the study were recruited in 167 sample points across Germany. The sample consists of 4529 children and adolescents who were tested in regard to physical activity, motor fitness, and health status. The measurement of the compliance with the activity guidelines was con-ducted on the basis of the screening questionnaire by Prochaska, Sallis and Long (2001).

Results and Discussion: Looking at the whole sample, only 15.3% of children and adolescents aged between 4 and 17 years meet the 60-min guideline. The proportion of girls (13.1%) meeting this guideline is significantly (chi2 = 14.0; df = 1; $p < .001$) lower than the proportion of boys (17.4%). Fur-thermore, the results of this study lead to the conclusion that the proportion of children and adolescents who meet the physical activity guidelines decreases with increasing age. Every third child of kindergarten age can achieve this activity guideline, however in primary school the compliance with the activity guidelines is reduced to only every fifth child. With the transition to the secondary school, there are less than 10% of adolescents meeting the 60-min guideline. Finally, in the age group between 14 and 17 years every 20th girl and every 12th boy comply with the activity guideline. These results suggest that only a small percentage of German children and adolescents are sufficiently physically active und em-phasise the importance of endeavours to promote physical activity and sports among chil-dren and adolescents.

Reference

Strong, W.B., Malina, R.M., Blimkie, C.J., Daniels, S.R., Dishman, R.K., Gutin, B. et al. (2005). Evidence based physical activity for school-age youth. Journal of pediatrics, 146, 732–737.

European Commission (2008). EU Physical Activity Guidelines. Recommended Policy Actions in Support of Health-Enhancing Physical Activity. Brussels: European Commission.

MUSCULAR STRAIN RISK FACTORS IN YOUNG SOCCER PLAYERS

VENTURELLI, M., SCHENA, F., BISHOP, D.

UNIVERSITY OF VERONA

Introduction: Soccer is a popular game practiced all around the world by teenagers. However, despite being a relatively safe sport, muscle strain injuries during competitive matches are very common compared to other team-sports. Several studies have previously reported potential intrinsic and extrinsic risk factors for soccer players. These include exposure time to training and matches, increased age, previous injury, joint laxity, lack of training, and low endurance (Arnason 2004). While this information is valuable, few studies, to date, have investigated risk factors for soccer injuries using Cox regression, as recommended by UEFA (Hagglund 2005). The specific advantage of this advanced statistical is that it can be adjusted for actual playing time, which can vary greatly between players in the same team. The aim of this study was to investigate the survivor covariates probability to muscle strains, in young soccer players.

Methods: 75 young soccer players (16.4±1.6 y) were followed for a season (10 months). At baseline, all players were tested for body size e composition; yo-yo endurance test, flexibility, and jump performance (SJ, CMJ and DiHJ=CMJ-SJ). Team coaches and physicians recorded players' exposure (training and matches) and muscle thigh injuries (grade II lesions confirmed by echographic exam). A multivariate stepwise forward Cox proportional hazards model was used to evaluate survival probability predictors, for thigh muscle strains.

Results: Significant correlations were recorded between thigh strain survival probability and: previous injury, field positions (defenders as midfields), height, body mass, BMI, percent body fat, yo-yo step result, SJ and DiHJ. However, the multivariate Cox regression result (Haz. Ratio; C.I. 95%) showed that, only previous injuries 2.74 (1.17-6.40), DiHJ 0.79 (0.72-0.88), and height 1.15 (1.05-1.25) were significantly correlated to thigh strain survival probability.

Conclusion: This study confirms that previous injuries are an important risk factor, as reported by other investigations (Arnason 2004). However, we also found that low jump ability and an elevated players stature increased the probability of a grade II thigh strain. This could be explained by poor player coordination, influencing jumping ability (Bobbert 2001), which may be even more evident in tall young players. An early evaluation, and regular monitoring, of these parameters could assist teams to identify players at high risk who needs to be placed in preventative training programs.

References

Arnason A, et al. Risk factors for injuries in football. Am J Sports Med. 2004.

Hagglund, M. et al. Methods for epidemiological study of injuries to professional football players: developing the UEFA model. Br J Sport Med. 2005.

Bobbert, M. Dependence of human squat jump performance on the series elastic compliance of the triceps surae: a simulation study. J Exp Biol. 2001.

08:30 - 10:00

Oral presentations

OP-PH06 Physiology 6

PROTECTIVE EFFECTS CONFERRED BY FOUR BOUTS OF SUBMAXIMAL ECCENTRIC EXERCISE IN COMPARISON TO ONE BOUT OF MAXIMAL ECCENTRIC EXERCISE

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NATIONAL CHIAYI UNIVERSITY

Introduction: A bout of eccentric exercise (ECC) confers protective effects against subsequent bout of more demanding ECC. Our recent study (1) showed that a submaximal ECC bout, in which 30 lengthening contractions with a load of 40% maximal isometric strength (MVC) were performed (40% ECC), conferred 20-60% protection against a subsequent bout of maximal ECC performed 2 weeks later. However, its magnitude of the protective effect was significantly less than that (65-100%) conferred by the maximal ECC. It is possible that repeating

the 40% ECC bouts several times increases the protective effect. This study tested the hypothesis that 4 bouts of 40% ECC performed every 2 weeks would confer similar protective effect to one bout of maximal ECC against subsequent bout of maximal ECC.

Methods: Thirty untrained men (22.2 ± 2.0 y) were placed into two groups (n=15 per group); 4 x 40% (40%) and control (CON) groups by matching the pre-exercise MVC. The 40% group performed 4 bouts of 40% ECC consisting of 30 lengthening contractions of the non-dominant elbow flexors every 2 weeks and 30 maximal lengthening contractions of the same muscle (100% ECC) 2 weeks after the last 40% ECC. The CON group performed two bouts of 100% ECC with the non-dominant arm separated by two weeks. MVC at 6 angles, optimum angle (OA), concentric isokinetic strength (30 and 300°/s), range of motion (ROM), upper arm circumference (CIR), plasma creatine kinase activity (CK) and myoglobin concentration (Mb), muscle soreness (SOR), and echo-intensity (EI) of B-mode ultrasound images were taken before, immediately after, and for 5 days following each ECC. Changes in the measures after 100% ECC were compared between the groups by a two-way repeated measures ANOVA. Changes in the measures after 40% ECC were also compared amongst 4 bouts.

Results: No significant differences in the changes in any measures were evident between the 100% bout of the 40% group and the second 100% bout of the CON group. For the 40% group, changes in all measures except for OA and CIR following the second to fourth bouts were significantly ($P<0.05$) smaller than those after the first bout, but the changes in all measures except for SOR were not significantly different amongst the second, third and fourth bouts. Moreover, compared with the changes after the first 40% ECC, the changes after the 100% ECC were similar for OA, MVC, ROM, CIR, and SOR, but were significantly ($P<0.05$) smaller for CK, Mb and EI.

Discussion: These results showed that the 4 x 40% ECC produced similar protective effect to that conferred by a bout of 100% ECC against 100% ECC. It should be noted that changes in the measures after 40% ECC were always smaller than those after 100% ECC. These results suggest that performing less damaging ECC repeatedly attenuates muscle damage in a similar magnitude to maximal ECC, and this can be used as a strategy to minimise muscle damage.

References

1) Chen TC, Nosaka K, Sacco P (2007) J Appl Physiol, 102, 992-999.

COMPARISON IN MUSCLE DAMAGE BETWEEN FIRST AND SECOND ELECTRICAL MUSCLE STIMULATION BOUTS OF THE KNEE EXTENSORS

ALDAYEL, A., MCGUIGAN, M., JUBEAU, M., NOSAKA, K.

EDITH COWAN UNIVERSITY

INTRODUCTION: Isometric contractions of the quadriceps femoris evoked by electromyostimulation (EMS) induce muscle damage indicated by decreases in maximal voluntary contraction strength (MVC), delayed onset muscle soreness, and increases in creatine kinase (CK) activity in the blood (1). It is known that muscle damage is attenuated in a subsequent bout eccentric exercise (2). A recent study (3) reported that such adaptation effect was induced in eclectically stimulated eccentric exercise. However, no previous study has examined if this is also the case for muscle damage induced by EMS isometric contractions. Therefore, this study compared between first and second bouts of EMS isometric exercise of the knee extensors for changes in MVC, muscle soreness and tenderness, and plasma CK activity.

METHODS: Nine healthy men (31 ± 4 yrs) with no resistance training experience for the last six months had two EMS bouts separated by 2-3 weeks. One of the knee extensors (randomly chosen) was stimulated by an Intelect Stim (Chattanooga, USA) while seating on a Biodex isokinetic dynamometer with the knee joint angle of 100° (0°: full extension). Four self-adhesive electrodes were placed on the anterior surface as follows: 2 positive electrodes over the motor point of the vastus lateralis and vastus medialis, and 2 negative electrodes on the proximal portion of the quadriceps femoris. Forty isometric contractions were induced by EMS with biphasic rectangular pulses (75 Hz, 400 μs, on-off ratio 5-15 s), while the current amplitude was consistently increased throughout contractions until maximal tolerable level. Criterion measures consisted of maximal isometric strength at 100°, muscle soreness (a 100-mm visual analogue scale), pressure pain threshold of the muscles, and plasma CK activity. These measures were taken before and 1, 24, 48, 72 and 96 h after EMS bout. Changes in the measures over time were compared between bouts by a two-way repeated measures ANOVA with a Tukey's post-hoc test.

RESULTS: The evoked torque produced during both bouts was approximately 30% of MVC, and no significant difference between bouts was evident for the changes in torque over 40 contractions. MVC decreased significantly ($P<0.05$) by 26% at 1 h after both bouts, but the recovery was significantly ($P<0.05$) faster after the second bout (100% at 96h) than the first bout (81% at 96h). Development of muscle soreness and increases in CK were significantly ($P<0.05$) smaller after the second bout than the first bout.

DISCUSSION: These results showed that the second bout resulted in less muscle damage than the first bout. This adaptation is similar to that shown in eccentric exercise-induced muscle damage (2,3). It appears that the protective adaptation is induced locally rather than centrally.

REFERENCES

1) Jubeau M et al. (2008) Appl Physiol, 104:75-81

2) Clarkson P et al. (1992) Med. Sci Sports Exerc, 24:512–520

3) Black C & McCully K (2008) Med Sci Sports Exerc, 40:1605-15

DELAYED ONSET MUSCLE SORENESS AFTER LOW-INTENSITY RESISTANCE EXERCISE WITH AND WITHOUT VASCULAR OCCLUSION

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Introduction: Strength training with low loads in combination with vascular occlusion may induce moderate to severe delayed onset muscle soreness (DOMS) (Wernbom et al, 2006). Because DOMS after occlusion training has been largely unreported in the literature, we decided to review DOMS data collected from two recent experiments conducted in our laboratories.

Methods: In Experiment 1, ten subjects performed three sets of dynamic unilateral knee extensions with (randomized limb) and without (contralateral limb) cuff occlusion, at a load of ~30% of 1RM. For each limb, all sets were performed to concentric torque failure.

In Experiment 2, seven subjects performed five sets of dynamic unilateral knee extensions with and without cuff occlusion, at a load of ~30% of 1RM. The occluded limb performed all sets to failure, while the non-occluded contralateral limb was matched to perform exactly the same number of repetitions in each set as the occluded limb.

In both trials, a wide cuff was used, the occlusion pressure was 90-100 mm Hg (~50-60% reduction of femoral blood flow at rest) and the pressure was maintained between sets. The inter-set rest period was 45 seconds in both trials. The number of repetitions performed per set and in total were counted as a measure of the volume of work. DOMS was rated with a 0-10 visual-analog-scale (VAS) pre and post-exercise (at 0, 24, 48, 72, 96 and 120 hours).

Results: In Experiment 1, the total number of repetitions was 76 for the non-occluded limb and 53 for the occluded limb ($p<0.05$ for the difference in volume). The VAS-ratings peaked at 48h and reached a higher value for the non-occluded limb (5.0) than the occluded limb (3.3) ($p<0.05$).

In Experiment 2, the total number of repetitions was 57 for the occluded limb (and thus also for the non-occluded limb). The VAS-ratings peaked at 48h and reached a higher value for the occluded limb (6.2) than the non-occluded limb (5.3) ($p<0.05$).

Discussion: Both training with and without cuff occlusion resulted in DOMS and one likely explanation is that relative ischemia occurred even in the non-occluded condition (Wernbom et al, 2008). Collectively, the results indicate that both volume and the level of effort are important factors for muscle soreness induced by low-intensity ischemic strength training. Interestingly, new data suggests that the muscle activity increases not only during the concentric phase, but also during the eccentric phase as the point of torque failure draws closer, which may contribute to the DOMS (Wernbom et al, 2009). We are currently investigating muscle damage and recovery from an acute bout of occlusion training at the cellular level.

References

Wernbom M, Augustsson J, Thomee R. (2006). J Strength Cond Res, 20, 372-77.

Wernbom M, Raastad T, Augustsson J. (2008). Scand J Med Sci Sports, 18, 401-16.

Wernbom M, Augustsson J, Järrebring R, Andreasson M. (2009). J Strength Cond Res, (In press).

INFLUENCE OF COMPETITIVE LIFTING TASKS ON PLASMA CONCENTRATION OF BIOCHEMICAL CARDIAC MARKERS

TSCHAN, H.

INSTITUTE OF SPORTS SCIENCES

Introduction: The fear of damage to the cardiovascular system has led most exercise specialists to urge against any breath holding during resisted exercise. Possible detrimental effects include an increase in ventricular diastolic pressure and wall stress, possibly leading to unfavourable remodelling, myocardial ischemia and malignant arrhythmia. Circulating levels of the specific cardiac marker NT-proBNP reflect ventricular diastolic wall stress and are strongly related to mortality. The purpose of this study was to evaluate the effects of static and heavy lifting tasks (weightlifting and power-lifting exercises) on the plasma concentration of NT-proBNP a levels and on other bio-chemical cardiac markers in trained weightlifters.

Methods: 12 healthy well trained weightlifters (national class) performed 6 sets of 6 lifting exercises (snatch, clean, jerk, squat, deadlift, bench-press) with the goal to lift as much weight as possible. Blood samples were drawn from each subject 1 hour before the exercise training as well as immediately after finishing the exercise test and 2 hrs post-exercise. For detection of myocardial and skeletal muscle damage cardiac Troponin I (cTnI), total creatine kinase activity (CK) and myoglobin (Myo) were measured. Serum concentrations of cTnI and myoglobin were measured by immunassays total CK activity by routine photometric assay. For detection of myocardial overload NT-proBNP was analyzed within 24 hours using an electrochemiluminescence immunoassay. A one-way ANOVA with repeated measures was used to detect changes over time. The Tukey Honestly Significant Differences (HSD) post-hoc test was used to determine the location of differences when significant main effects were detected.

Results: Beside cTnI all markers showed significant elevations ($p < 0.05$-$p<0.001$) over the time course of the 3 blood draws. A significant percentage of laboratory parameters analyzed in this study (CK and Myo) were outside the reference ranges. However, the sensitive and specific biochemical markers for detecting myocardial damage (cTnI and NT-proBNP) stayed within the reference ranges and tended to decrease toward baseline levels already 2 hrs after exercise training.

Conclusion: From the present study it would appear that heavy resistance exercise is well tolerated by experienced weightlifters without showing any evidence that lifting tasks damages the myocardium. The elevation of the non-specific markers (CK and Myo) may reflect a transient inflammation-like response (mild tissue trauma of the skeletal muscles) following the very intense acute exercise.

TRAINING SPECIFIC ADAPTATIONS OF CONSTITUTIVE AND STRESS-INDUCIBLE HEAT SHOCK PROTEIN GENES IN TRAPEZIUS MUSCLE OF FEMALES WITH CHRONIC NECK MUSCLE PAIN

SJØGAARD, G., ZEBIS, M.K., KIILERICH, K., PILEGAARD, H., SALTIN, B.

UNIVERSITY OF SOUTHERN DENMARK

The prevalence of work-related chronic neck muscle pain has been steadily increasing through the past two decades and is particular frequent in the trapezius muscle, TM, among females with repetitive tasks. Physical exercise has been recommended as treatment to relieve neck muscle pain. However, the actual effect of various physical exercises on stress related gene profile of the painful TM is unclear. The potential role of heat shock proteins, HSPs, in preserving cells from stress and preparing them to survive various types of environmental challenges suggests that these proteins could also play a relevant role in mediating suitable adaptive response of skeletal muscle to physical exercise.

In a randomized controlled study, 25 female office workers with a clinical diagnosis of TM myalgia were assigned to either 10 wks of specific strength training of the TM, SST, general fitness training in terms of leg cycling only, GFT, or a reference intervention without physical activity, REF. Muscles biopsies were taken from the TM before and after 10 wks intervention and mRNA levels for the stress-related proteins HSP70 and HSP72 were measured.

At baseline the median values (5th - 95th percentile) mRNA content for HSP70 was 0.25 (0.09 – 0.59) and for HSP72 0.25 (0.08 – 0.49) expressed relative to single-stranded DNA content. After 10 wks intervention mRNA content for HSP70 decreased (~30%) in the SST group only ($P=0.066$), while HSP72 decreased (~40%) in SST ($n = 9$, $P= 0.041$) as well as GFT ($n= 10$, $P = 0.80$), while no changes occurred in the REF.

A novel finding of the present study is that 10 wks of SST lowered mRNA concentration of the stress-inducible HSP72 as well as the constitutive HSP70 in females with work-related TM myalgia. Strength training is associated with changes in protein synthesis and degradation, and since HSPs assist in these processes, the expression of HSP could increase initially but decline in the later phase of the training period. Mechanisms exist, which are able to attenuate the HSP response and the observed down-regulation of HSP mRNA content in the present study may reflect an improved cellular homeostasis of TM fibers. The GFT intervention also lowered the HSP72 mRNA content. Induction of stress protein synthesis after moderate-intensity exercise may occur in both active muscle and in less active muscle, indicating that the signal which initiates the stress response is produced by and affects the whole body. The existence of a generalized response of skeletal muscle to physical stress could explain the present finding in GFT, which did not involve exercise of TM, that HSP72 mRNA content in TM was lowered after a prolonged training period. In conclusion: The decrease in stress-inducible HSP72 mRNA content after 10 wks SST and GFT supports the notion of systemic signaling. However, only SST decreased the constitutive HSc70 underlining the significance of involving the painful muscle in training for improved cellular homeostasis.

08:30 - 10:00

Invited symposia

IS-BM09 Bone and exercise

MUSCLE FORCE AND STIFFNESS AND THEIR IMPACT ON BONES

HANS SCHIESSL, PFORZHEIM
GERMANY

Without abstract submission

MUSCLE EXERCISE: HIGH SOPHISTICATED TECHNIQUE WITH VIBRATION EXERCISE

MARTIN RUNGE, RAINER RAWER, ESSLINGEN
GERMANY

Without abstract submission

MUSCLE & BONES IN MASTER ATHLETES AND IN SPACE.

DIETER FELSENBERG, BERLIN
GERMANY

Without abstract submission

08:30 - 10:00

Invited symposia

IS-BM02 Strength training B: Neuromuscular mechanisms

TRAINING EFFECTS ON THE CHARACTERISTICS AND BEHAVIOUR OF HUMAN MOTOR UNITS

DUCHATEAU, J.
UNIVERSITE LIBRE DE BRUXELLES

The force generating capacity of an isolated muscle is strongly associated with its cross-sectional area. However, the strength produced during natural movements depends on the extent to which a muscle and its synergist and antagonist are activated by the nervous system (2). Although strength training is known to induce hypertrophy of the muscle fibres, some studies have suggested that increase in voluntary activation can also contribute to the improvement in performance. A greater activation can be the result of a more complete recruitment of motor units (ensemble comprising a motor neurone, its axon and the muscle fibres innervated by this axon) and/or an increase in discharge rate. In addition to the increase of the force produced by each motor unit after training (3), recent evidences indicate that the maximal discharge rate attained by motor unit is enhanced without any change in synchronization (4). This neural adaptation occurs mainly at the beginning of a training programme.

In many sports and activities of daily life, the ability to rapidly develop force is equally important, or even more important, than the maximal force itself. Movements that are performed with maximal velocity are usually defined as ballistic actions (1). The maximal rate of force development during a ballistic contraction is not only limited by muscle speed-related characteristics, but also by neural factors. Among them, the capacity of the nervous system to recruit a great percentage of the motor unit pool at the onset of muscle activation and to drive these units at a high discharge rate is an important aspect. In that context, it has been demonstrated that dynamic training consisting in rapid contractions against a small load (30-40% of maximum) augments both the rate of force development and the instantaneous discharge rate of motor units (5). In addition to the latter adaptation, the incidence of doublet discharges with an interval of less than 5 ms is increased. These neural changes, that contribute to enhance the maximal rate of force development, appear to adapt specifically to the training conditions. Together, these findings show that, in addition to intrinsic adaptations of the muscular system, the rate of force development during a ballistic contraction is modulated by chronic changes in motor units discharge pattern.

The presentation will synthesize current understanding on motor unit characteristics and behaviour during voluntary contraction and then evaluates the adaptations to strength and power training. The specificity of training adaptations will be highlighted.

References.
(1) Desmedt JE & Godaux E. J Physiol 264: 673-694,1977
(2) Duchateau J, Semmler JG & Enoka RM. J Appl Physiol 101: 1766-1775, 2006
(3) Kamen G & Knight CA. J Gerontol A Biol Sci Med Sci 59: 1334-1338, 2004
(4) Kidgell DJ, Sale MV & Semmler JG. Exp Brain Res 175:745-753, 2006
(5) Van Cutsem M, Duchateau J & Hainaut K. J Physiol 513: 295-305, 1998

TIME COURSE OF NEUROMUSCULAR ADAPTATIONS TO STRENGTH TRAINING

NARICI, M.V., SEYNNES, O.R.
MANCHESTER METROPOLITAN UNIVERSITY

The initial strength gain in resistive training (RT) is generally considered to be due to the intervention of neural factors while the contribution of hypertrophic factors occurs several weeks later (7). Indeed, a rapid increase in EMG activity occurs within few weeks of RT (3,6) whereas muscle hypertrophy seems to appear only after 8 to 12 weeks (4,6). However, considering that the molecular and cellular responses occur within hours or even minutes of a single bout of RT (1, 9) and that fibre hypertrophy is detectable within 4 weeks of training (10), the alleged delay in the onset of muscle hypertrophy seems mostly due to the sensitivity of the muscle size assessment method. Proliferation of muscle satellite cells has been found within 4 days of a single RT bout, sustained by an increase in myofibrillar protein synthesis within few hours of exercise (5). Hence these two fundamental adaptations necessary for muscle hypertrophy start in the very initial phases of RT, pointing to a progressive rather than to a 'sudden' increase in muscle. This scenario is consistent with the results of a recent 5-week, high-intensity, concentric/eccentric RT study in young males (8). In addition to the well expected increase in muscle strength and neural drive (EMG), changes in muscle architecture (assessed by ultrasound), indicating a rapid addition of sarcomere in series and in parallel, were found within 15 days of RT and gross muscle hypertrophy (assessed by MRI) was detectable after just 20 days of RT. This rapid skeletal muscle remodeling is probably modulated by changes in mechanosensitive proteins such as focal adhesion kinase whose content and activity increase within few days of overloading (2). These recent findings show that RT induces an immediate myogenic response leading to early structural alterations and suggest that the development of muscle hypertrophy is a progressive, rather than a delayed, process.

References
1. Bickel CS, Slade J, Mahoney E, Haddad F, Dudley GA, and Adams GR. 2005. J Appl Physiol 98.
2. Flück M, Carson JA, Gordon SE, Ziemiecki A, Booth FW.1999. Am J Physiol. 277
3. Hakkinen, K., Alen, M. &. Komi, P.V. 1985. Acta Physiol. Scand. 125.
4. Jones, D.A. & Rutherford, O.M. 1987. J. Physiol. 391.
5. Moore DR, Phillips SM, Babraj JA, Smith K, and Rennie MJ. 2005. Am J Physiol Endocrinol Metab 288.
6. Narici, M.V., Roi, G.S., Landoni, L., Minetti, A.E. & Cerretelli, P. 1989. Eur. J. Appl. Physiol. 59.
7. Sale DG. 1988. Med Sci Sports Exerc 20.
8. Seynnes OR, de Boer M & Narici MV. (2007). J Appl Physiol 102.
9. Staron RS, Karapondo DL, Kraemer WJ, Fry AC, Gordon SE, Falkel JE, Hagerman FC, and Hikida RS. 1994. J Appl Physiol 76.
10. Woolstenhulme MT, Conlee RK, Drummond MJ, Stites AW, and Parcell AC. 2006. J Appl Physiol 100.

INHIBITORY AND FACILITATORY MECHANISMS WITH RESPECT TO STRENGTH AND POWER TRAINING

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UNIVERSITY OF FREIBURG

Apart from muscle morphology, architecture and fiber type, the magnitude of efferent as well as afferent neural drive influences the capacity to produce maximal force (7). Increases in strength therefore depend on the facilitation of the efferent drive and/or the improved utilization of afferent excitation. To start with the second point, it is unlikely that strength training modulates the sensory information per se. Training may rather improve the integration of afferent excitation into the voluntary drive. Previous studies using electrical nerve stimulation support this assumption by showing enhanced spinal reflex excitability after strength training. This adaptation seems to be irrespective of the exact kind of strength training; i.e. increased H-reflexes were observed after ballistic (9), maximal isometric (6) and dynamic strength training (1). The most likely mechanism to explain this improved utilization of afferent Ia excitation is a reduction in presynaptic inhibition.

Adaptations on the efferent side are less well understood. Based on V-wave measurements, Aagaard et al. (1) assumed increased supraspinal drive after strength training. Although this seems plausible, it still has to be shown which part of the brain contributes to an enhanced drive. Strength training studies using transcranial magnetic stimulation (TMS) showed either i) reduced (5), ii) increased (3), iii) unchanged (2) or iv) task specific (8) modulation of corticospinal excitability. The differential outcomes were speculated to depend on the experimental condition, the tested muscle(s) and/or the training regime and were often taken as evidence for minor contribution of the motor cortex (M1) in adapting MVC after strength training. However, in a recently conducted study, the output of M1 was lowered during the performance of strength exercises by means of repetitive TMS (4). The authors speculated that if M1 was responsible for strength adaptations, inhibition of M1 would reduce strength gains. As this was actually the case it seems that increases in MVC after strength training rely on sufficient efferent drive of M1 during training. So far, little is known about neuroplasticity in other supraspinal structures.

In summary, strength training probably induces disinhibition at the spinal level leading to facilitation of spinal reflexes. On the other hand, motor cortical activity seems to be important during strength training but it is not clear whether increased MVC is dependent on facilitation of the corticospinal drive.

1. Aagaard P et al.. J Appl Physiol 92: 2309-2318, 2002
2. Carroll TJ, et al.. J Physiol 544: 641-652, 2002
3. Griffin L and Cafarelli E. J Electromyogr Kinesiol 17: 446-452, 2007
4. Hortobagyi T, et al. J Appl Physiol 106: 403-411, 2009
5. Jensen JL, et al. J Appl Physiol 99: 1558-1568, 2005

6. Lagerquist O, et al.. J Appl Physiol 100: 83-90, 2006
7. Macefield VG, et al.. J Physiol 471: 429-443, 1993
8. Schubert M, et al. Eur J Neurosci 27: 2007-2018, 2008
9. Taube W, et al. Int J Sports Med 28: 999-1005, 2007

08:30 - 10:00

Invited symposia

IS-BM07 Cycling

THE BIOENERGETICAL AND BIOMECHANICAL HISTORY OF CYCLING

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UNIVERSITY OF MILAN

Similarly to the evolutionary struggle towards global mobility observed in animal species on a much wider time scale, human ingenuity has worked to circumvent the inherent limitation of a given musculo-skeletal system to enhance mobility and speed. In about a century (1817-1890 CE) the very first individual means of transport moved just by human power, the bicycle and its precursors, has been invented and rapidly developed up to a standard design that was only refined successively. From the 'Hobby Horse' to modern bikes, a short time scale evolution in manufacturing technology has solved a progression of physiological and biomechanical problems related to how to make the best use of the same muscles in spite of an increasing progression speed. By arranging a set of experiment where the same group of subjects rode replicas of the most significant bicycle models appeared as breakthrough in the 19th century, it was possible to dissect the relevant components of the mechanical work as determinants of the metabolic energy required to travel at the same speeds. This resulted in a study (Minetti et al 2001) about the evolutionary improvement in bicycling economy and its biomechanical explanation. The total mechanical work has been calculated as the sum of the 'external' component, due to the need to overcome rolling resistance and air drag, and the 'internal work', related to the movement of the lower limbs with respect to the body centre of mass (BCOM) during pedalling. The general conclusion from that study was that each newly invented bicycle model, while changing the partitioning of the three work components associated to a higher travelling speed, allowed muscles to operate at the same, maximal contraction efficiency.
A later investigation (Minetti 2001) on the metabolic equivalent of the internal work in cycling seemed to confirm the validity of the model equation designed for the historical study. A more accurate biomechanical analysis suggested that, despite the minimal change in BCOM due to pedalling, most of the internal work is devoted to maintain constant the angular speed of the chain wheel. Another important and often neglected component of the internal work, namely the joint/tissue friction, could contribute to better explain the overall economy of cycling.
REFERENCES
Minetti A. E., J. Pinkerton and P. Zamparo. From bipedalism to bicyclism: evolution in bioenergetics and biomechanics of historic bicycles. Proc. R. Soc. B 268: 1351-1360, 2001.
Minetti A. E.. The metabolic equivalent of internal work in cycling. 4th World Congress of Biomechanics, Calgary, 2002.

FACTORS AFFECTING CYCLING CADENCE CHOICE AND CADENCE INFLUENCE ON PERFORMANCE

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NORWEGIAN SCHOOL OF SPORT SCIENCES

A considerable interest among researchers, coaches, and cyclists for cadence choice during submaximal cycling dates nearly 100 years back (Benedict & Cathcart, 1913). The current knowledge of factors affecting the freely chosen cadence and of the influence of cadence choice on performance has been summarized recently (Hansen & Smith, 2009). In particular, within the past 10 years, a number of papers brought novel insight into the topic. For example, under the influence of central pattern generators, which are constituted of neural networks in the spinal cord, a robust innate voluntary motor rhythm has been suggested as the primary basis for rhythmic movements (Zehr, 2005) including freely chosen cadence (Hansen & Ohnstad, 2008). This might clarify the cadence paradox, which has been described as the freely chosen cadence during low to moderate submaximal cycling being considerably higher and thereby less economical than the energetically optimal cadence (Kohler & Boutellier, 2005). Despite that central pattern generators apparently are important for the robust and highly individual base of the freely chosen cadence during submaximal cycling, the possible influence of factors internal and external to the cyclist on the choice of cadence under certain circumstances should be acknowledged. Thus, a number of factors including for example age (Balmer et al., 2008), power output (Hansen et al., 2002), and road gradient (Lucia et al., 2001), have been reported to affect the choice of cadence to some extent. But, it is likely that, during unrestricted pedalling, sensory feedback of changes to external conditions as well as internal conditions merely fine-tunes the innate motor rhythm. Finally, as to cadence influence on performance; during high intensity cycling, close to the maximal aerobic power output, cyclists choose an energetically economical cadence (Brisswalter et al., 2000) that is also favourable for performance (Nesi et al., 2004). However, the choice of a relatively high cadence during cycling at low to moderate intensity is energetically uneconomical and could compromise performance during prolonged cycling (Hansen et al., 2006).
References
Balmer J et al. (2008) J Sports Sci 26: 57-62
Benedict FG & Cathcart EP (1913) Carnegie Institution of Washington, Washington, D. C.
Brisswalter J et al. (2000) Int J Sports Med 21: 60-64
Hansen EA et al. (2002) Acta Physiol Scand 176: 185-194
Hansen EA et al. (2006) Eur J Appl Physiol 98: 227-233
Hansen EA & Ohnstad AE (2008) Exp Brain Res 186: 365-373
Hansen EA & Smith G (2009) Int J Sports Physiol Perform 4: 3-17

Kohler G & Boutellier U (2005) Eur J Appl Physiol 94: 188-195
Lucia A et al. (2001) Med Sci Sports Exerc 33: 1361-1366
Nesi X et al. (2004) Can J Appl Physiol 29: 146-156
Zehr EP (2005) Exerc Sport Sci Rev 33: 54-60

THE PULL UP ACTION IN CYCLING: IMPLICATIONS FOR PERFORMANCE AND TRAINABILITY

MORNIEUX, G.
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Introduction: The pull up action in cycling refers to the ability to apply an effective pedal force (i.e. tangential to the crank displacement and in the same direction than its rotation) during the upstroke phase. However, it is questionable to which extent this action would be beneficial for the performance. Takaishi et al. (1998) have reported lower oxygen uptake for elite than for recreational riders. They argued that lower oxygen uptake was associated with a greater pull up action. Hence, training this pull up action might be relevant. It has been showed that a feedback training (instantaneous representation of the pedal forces profiles while riding) would allow modifying the pedalling pattern (Sanderson and Cavanagh, 1990). Therefore the aim of this study was to determine i) to which extent the pull up action might be beneficial for performance in cycling and ii) how it could be trained.

Methods: Elite and recreational cyclists were measured on a SRM ergometer, instrumented with 2D pedal forces transducers (Powertec). Oxygen uptake and electromyography for different relevant muscles were recorded. Subjects rode either with single pedal, clipless, or clipless and the pedal force feedback. This feedback allowed subjects controlling their pull up action. Finally subjects participated to a training study with this feedback (2x a week/6 weeks).

Results: Results have showed no significant difference for all aforementioned parameters for both cyclist groups when cycling with clipless vs. without. However, using feedback enhanced significantly the effective pedal force during the upstroke while increasing also the oxygen uptake. With feedback, tibialis anterior, rectus femoris and biceps femoris activity increased significantly. Furthermore, timing parameters (on/off) for these muscles changed. After 6 weeks feedback training, subjects altered significantly their pedalling pattern. Indeed, pedal forces were higher during the upstroke and therefore lower during downstroke, whatever the power output tested (i.e. 100, 200 and 300Watts). The control group, which trained without feedback, did not show such changes.

Discussion: Clipless did not allow any pull up action during sub-maximal cycling. However, pedalling with feedback helped to achieve this pull up action and changed therefore the pedalling pattern. Unfortunately, this increase in pedalling effectiveness also impaired oxygen uptake, as reported by Korff et al. (2007). As a consequence, even if the pull up action seems to have benefits for pedalling mechanics, performance might rather be impaired, at least as long as subjects are not used to this action.

After a pull up action training, subjects had learned how to pull up on the pedal. Therefore it is possible to change the pedalling pattern and to enhance the pull up action.

References

Korff T et al. (2007). Med Sci Sports Exerc, 39, 991-5
Sanderson DJ, Cavanagh PR (1990). Can J Spt Sci, 15, 38-42
Takaishi T et al. (1998). Med Sci Sports Exerc, 30, 442-9

10:15 - 11:45

Invited symposia

IS-BM06 Biomechanics in Alpine Skiing

MEASURING TECHNOLOGY AND PHYSICS IN ALPINE SKI RACING

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Evaluating performance in top level ski racing is crucial for improvement of the athletes. This is the area, which is normally covered by physics and/or technology. To use physics and technology to the highest extend, it is important to understand the scheme of approaching the problem. If one scale of the world is investigated, then one scale bellow should be understood. For example, when we would like to evaluate skier's velocity (kinematics), we should understand the acting forces (dynamics), which are the reason for the movement. This is "one scale bellow". To continue, the skier is affected by gravity, ground reaction force including the friction, air drag etc. To understand whether these are strong or weak, another "scale bellow" should be investigated, e.g. for air drag the fluid dynamics, for friction the turn and gliding principles, material and snow properties. The further we investigate, closer to the atomic or subatomic scale we come.

As an example of this approach in physics and technology, the consequence of carving entering WC races will be discussed. The changes occurred in the turning principles, i.e. carving instead of skidding, therefore basic physical parameter values several "scales bellow" were altered. Therefore, it was inevitable that the whole structure up to the racing technique was needed to be adopted. Basics steps of the mechanical modelling of the "new" single motion technique (Supej et al., 2002), its evaluation by computer simulation, forces measurements and performance measurements comparing to the "old" double motion technique will be presented.

The details in performance are important, even when the racing technique is known. There physical principles of mechanical energy can be used, more specifically: diff(e-mech) (Supej, 2008), which represents "one scale bellow" the velocity and time that are normally used to classify the racers. The latest technology, i.e. high end GNSS RTK system, can be used to measure and calculate diff(e-mech). But GNSS devices survey only the antenna position and not the skier's CG. The CG can be approximated by improved methodology of measurement and mechanical modelling (Supej et al., 2008).

There are also many other examples in alpine skiing, where physics and technology are working hand in hand. Beside that, most of the sensors work on physical principles. To conclude, physics and technology are deeply related.

Supej M, Kugovnik O, Nemec B (2002). New advances in racing slalom technique. Kinesiol. slov., 8(1), 25-29.
Supej M (2008). Differential specific mechanical energy as a quality parameter in racing alpine skiing. J. appl. biomech., 24(2), 121-129.
Supej M, Kugovnik O, Nemec B (2008). DGPS measurement system in alpine skiing track and center of mass estimation. V: Jiang Y et al. (eds). Proceedings of First Joint International Pre-Olympic Conference of Sports Sciences and Sports Engineering: Ninjing, China, Vol. 1. Liverpol: World Academic Union, 120-125.

MECHANICAL ENERGY DISSIPATION, MOVEMENT, AND PERFORMANCE CHARACTERISTICS IN COMPETITIVE ALPINE SKIING

REID, R., GILGIEN, M., KIPP, R., HAUGEN, P., SMITH, G.
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INTRODUCTION: In 2005, Supej et al. [1] introduced a method of computing the mechanical energy losses of a skier to his surroundings as a measure of turn quality. Characterizing how elements of technique influence energy loss may help our understanding of how technique and performance relate. The purpose of this study was to describe the time-course of ski and center of mass (COM) motion characteristics and their relationships to both mechanical energy dissipation (EDISS) and performance in slalom.
METHODS: Six members of the Norwegian men's national team were analyzed through 2 turns during race simulations on 2 courses set with 10 and 13 m distances between gates. 3-D positions were captured from 4 cameras and control points distributed near the course [2]. Skier mechanical energy was determined knowing COM velocity and altitude. EDISS was calculated by differentiating mechanical energy with respect to altitude [1]. Pearson product moment correlation coefficients (r) were calculated to assess the relationship of instantaneous measures of COM fore/aft position and outside ski attack angle (γSKI) with EDISS. Average fore/aft position, fore/aft range of motion, amplitude of COM vertical motion and average initiation phase γSKI were compared to performance time using Spearman rank correlation coefficients (ρ).
RESULTS: Skier fore/aft position correlated strongly with both performance (ρ=1.0) and EDISS (r=.73, p<.001) on the 10 m course but less strongly on the 13 m course (ρ=.72, p=.10 & r =.54, p<.001, respectively). Significant correlations were observed between the amplitude of COM vertical motion and performance on both the 10 (ρ=.83, p=.04) and 13 m (ρ=.79, p=.06) courses, with the faster skiers having smaller amplitudes. Initiation phase γSKI was not significantly correlated to performance on either course (ρ=.26 and .34 for the 10 and 13 m courses, respectively). Correlations between instantaneous γSKI and EDISS were r=.29 and .01 for the 10 and 13 m courses, respectively.
DISCUSSION: While the time correspondence of skier fore/aft position and EDISS was high on the 10 m course, the relationship was less clear for the 13 m course. This may be related to the larger γSKI observed on the 10 m course. The strong correlations on both courses between vertical displacement and time suggest that vertical motion plays an important role in performance. Since it is the ground reaction force that turns the skier, excessive unloading from the snow surface due to increased vertical motion is likely to delay turning and thus be detrimental to performance during rapid turn transitions. The low correlations between γSKI and EDISS are surprising, and suggest that though skidding may influence EDISS, other factors may play a greater role.
REFERENCES:
[1] Supej, M. et al. (2005). In Müller, E. et al. (Eds), Science and Skiing III. Meyer & Meyer Sport, 172-185.
[2] Nachbauer, W. et al. (1996). J Appl Biomech, 12, 104-115.

TASK VARIATION AS A CRUCIAL POINT IN TECHNIQUE TRAINING OF ALPINE SKI RACERS

KRÖLL, J., BIRKLBAUER, J., MÜLLER, E.
UNIVERSITY OF SALZBURG

Variability, which traditionally (and from traditional motor learning perspectives) has been considered to be noise and detrimental to normal function, has more recently been considered to be an essential element to offer flexibility in adapting to perturbations (Hamill et al 1999). Therefore a crucial point of modern methods in motor learning is a high degree of task variations.
According to Bernstein (1967) our central nervous system has a compensation function between necessary movement forces and reactive phenomena (gravitation, inertia, forces stored in muscle-tendon-unit). Altering these reactive phenomena requires different neuromuscular patterns for an appropriate movement outcome. In Alpine ski racing we have movements which have constantly cyclic components (turn by turn), but, compared to other cyclic movements (e.g. running), external circumstances which alter reactive phenomena in a distinct amount (e.g. snow conditions).
With regard to technical training of elite alpine skiers our aim is to find task variations which additionally alter those reactive phenomena, but not exceed the solution space for ski racing. Therefore the interpolation ability to adequately adapt to new situations should be improved. To fulfill these requirements, two specific training devices were developed and evaluated by comparing some task variations to normal ski racing.
The first device is a ´see-saw´ based plate between the binding and the ski (Sensowip, Kröll et al 2006). The plate can be cushioned by springs or fixed with an inclination in sagittal plane. The second device is a system based on elastic cords fastened between joints acting as constraints to increase the degree of freedom and consequently the alteration of reactive phenomena (Tendybelt). This device is not exclusively designed for alpine skiing as studies on running and volleyball were performed recently with similar theoretical background (e.g. Haudum et al 2008).
In the current presentation, kinetic variations of several settings (3 SensoWip tasks; 3 Tendybelt tasks) compared to the normal situation (case studies) and the influence on runtimes during a training session (n=7) will be presented. Strong effects in all six tasks were found for the force distribution in sagittal plane (up to 25%, eta2=.74), while the overall force distribution between inside and outside was only marginally influenced (up to 3%, eta2=.09). The influence on runtimes was in 4 tasks significant but in all cases lower than 6%.
It can be concluded that the use of the two devices alters substantially the reactive phenomena, while the solution space for ski racing technique is not exceeded. Hence, the devices generate movement variations similar to that recommended for modern technical training.
Bernstein NA (1967). The coordination and regulation of movement
Hamill J et al (1999), Clin. Biomechanics, 14, 297-308.
Haudum A et al. (2008), Book of Abstract 13th ECSS Congress, 125.
Kröll et al (2006), XXIV ISBS Symposium, 559-563.

10:15 - 11:45

Oral presentations

OP-MB02 Molecular Biology 2

ALTERATION OF MUSCLE FIBRE COMPOSITION IN MALE JUNIOR ELITE ROAD CYCLISTS OVER THE COMPETITION PERIOD

FRESE, S., LOOSER, P., GEHLERT, S., BOELCK, B., BLOCH, W.

GERMAN SPORT UNIVERSITY COLOGNE

The cellular specialization of skeletal muscle fibres enables remodeling of the muscle's structural makeup according to alterations in functional demand. The capability to load-dependent muscle fiber type specific adaptations demonstrates the enormous plasticity of human skeletal muscle and the specificity of the adaptive response.

Close to the annual road cycling exercise planning we focused on the competition period to investigate the chronic skeletal muscle response to endurance exercise after the repeated impact of stimuli that occurs with competition and training performance.

The aim of this study was to investigate the activity-dependent muscle plasticity allowing for phenotypic stimuli and consequent muscular modifications.

Ten male elite cyclists (18.1±0.57yr) participated in this study. They had a history of >5yr of race experience and were part of competitive cycling teams at national level. In february (Pre) before beginning of the competition period and at the end in october (Post) the subject's performances have been tested by an incremental cycling step test to exhaustion. There was a spirometry and lactate survey. After the following two days each with a moderate cycling endurance exercise (~60-65% of subject's V˙o2peak;~90-120min) standardized muscle biopsies were taken of vastus lateralis muscle by needle biopsy the third day. The analysis of fibre composition was effected by histochemical ATPase-staining.

The muscular monitoring over the competition period illustrates no difference in mean value of the absolute ratio of fast twitch (Pre:36.29±2.56%;Post:41.14±9.99%) and slow twitch fibres (Pre:63.71±2.56%;Post:58.86±9.99%). But remarkable is the individual big range of relative remodelling of fibre types IIA and IIX within the fast twitch fibre spectrum.

Estimable is the fibre pattern of two subjects with a reduction of fatigue-resistance phenotype decreased by 31% and an accession of fibre type II increased by 59% compared with Pre ($p<0.05$).

However the analysis of fibre composition shows muscular modifications of the fast twitch fibre distribution-the rate of slow twitch fibres remains nearly constant.

In conclusion, the profile of muscle perturbation exerts essential control over the muscle phenotype. After execution of the extensive endurance winter training the subjects have a divergent fibre spectrum from the competition period. The chronic response to high intensity sessions over the competition period shows the cellular specialization that allows the recruited muscle fibres to adjust its metabolic and contractile makeup in response to alterations in functional demands. Thus we have to think about the extensive winter exercise regime and an improvement of exercise regulation that pass into the competition period.

THE REGENERATIVE CAPACITY OF SKELETAL MUSCLE IN EXPERIENCED ENDURANCE RUNNERS

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Purpose: The muscle of distance runners has presumably sustained numerous cycles of exercise-associated damage and regeneration or remodelling. Whether this interferes with the finite regenerative capacity of the skeletal muscle in asymptomatic runners is not known. To assess the chronic effects of a large exposure to running on muscle, this study compared markers of remaining regenerative capacity in the muscle of experienced endurance runners to that of sedentary controls.

Methods: Biopsies of the vastus lateralis muscle from 19 experienced endurance runners (ATH) (mean age: 43±7 years) were compared to those of 19 sedentary individuals (SED) (mean age: 39±10 years). The runners had covered approximately 50 000 km in training and racing over 15 years. Laboratory analysis determined the proportion of satellite cells present, terminal restriction fragment (TRF) lengths and morphology of the muscle samples.

Results: The proportion of satellite cells (number of satellite cells per number of myonuclei) present in the muscle of the runners was similar to that of the controls (ATH 3.8 ± 1.5 % vs CON 3.0 ± 0.7 %, $p=0.377$). There were also no differences in the minimum TRF lengths (ATH 6.9 ± 0.9 kbp vs CON 7.0 ± 0.8 kpb, $p=0.805$), in the muscle of both groups. The minimum TRF length of the runners was, however, inversely related to their years in distance running ($r= -0.63$, $p=0.007$) and hours spent training ($r=-0.51$, $p=0.034$).

Conclusion: The remaining regenerative capacity of the muscle of experienced runners was no more compromised than that of sedentary individuals despite the increased demand for skeletal muscle repair, regeneration and adaptation. Skeletal muscle appears to be a robust organ with sufficient capacity to tolerate large exposures to endurance running.

ULTRA-ENDURANCE EXERCISE AND DNA STABILITY: ROLE OF INFLAMMATORY AND ANTIOXIDANT RESPONSES

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Introduction: Exhaustive endurance exercise has been shown to induce both a systemic inflammatory response as well as DNA damage. Hypothetically, exercise-induced DNA damage might either be a consequence of inflammatory processes or causally involved in inflammation and immunological alterations after strenuous prolonged exercise. Nevertheless, experimental data regarding a direct relation-

ship are lacking (3). One primary aim of the present study was to test this hypothesis and whether there is a further interaction of oxidative stress (OS) and antioxidant (AO) responses following an Ironman (IM) triathlon.

Methods: Blood samples were taken from 42 male triathletes (mean±SD: age: 35.3±7.0 yr, cycling VO2 peak: 56.6±6.2 ml kg-1 min-1) 2 days (d) before an IM, then immediately, 1, 5, and 19 d post-race. Blood was analysed for inflammatory, immune-endocrine responses, muscle damage, OS markers, endogenous and exogenous AOs and plasma AO capacity (1, 2). 20 and 28 subjects were randomly selected for the assessment of DNA and chromosomal stability in lymphocytes measured via the cytokinesis block micronucleus cytome (CBMN Cyt) (4) and the single cell gel electrophoresis (SCGE) assays (including lesion specific enzymes), respectively. Correlation, one-factorial ANOVA and post hoc analyses were applied to assess potential associations.

Results: The IM induced a pronounced initial systemic inflammatory response (2). Concomitantly with a transient increase in most OS markers there were strong AO responses (1). Increased DNA instability was detected by the SCGE technique, but these changes were temporarily. Endpoints within the CBMN Cyt assay actually decreased post-race (4). No associations were found between endpoints of DNA stability and inflammation or muscle damage (3). Endonuclease III-sensitive sites correlated negatively with the oxygen radical absorbance capacity immediately ($r = -0.54$; $P<0.01$) and 1 d post-race ($r = -0.65$; $P<0.05$).

Discussion: The current results indicate that DNA effects in lymphocytes are not responsible for exercise-induced inflammation and, that inflammatory processes do not directly promote DNA damage. However, our data suggest that training- and/or exercise-induced responses in the AO defences might have prevented DNA damage through reactive oxygen species derived from inflammatory cells.

References

1. Neubauer O, König D, Kern N, Nics L, and Wagner KH (2008). No Indications of Persistent Oxidative Stress in Response to an Ironman Triathlon. Med Sci Sports Exerc 40: 2119-2128.

2. Neubauer O, König D, and Wagner KH (2008). Recovery after an Ironman triathlon: sustained inflammatory and muscular stress. Eur J Appl Physiol 104: 417-426.

3. Neubauer O, Reichhold S, Nersesyan A, König D, and Wagner KH (2008). Exercise-induced DNA damage: Is there a relationship with inflammatory responses. Exerc Immunol Rev 14: 51-72.

4. Reichhold S, Neubauer O, Ehrlich V, Knasmüller S, and Wagner K-H (2008). No acute and persistent DNA damage after an Ironman triathlon. Cancer Epidemiol Biomarkers Prev 17: 1913-1919.

SEX DIFFERENCES IN MUSCLE PROTEIN SIGNALLING

HAWKE, E., EDGE, J., DENT, J., MUNDEL, T., SHORT, M.J., MCMAHON, C., COFFEY, V.

UNIVERSITY OF VERONA

The number of women participating in team-based sports is rapidly increasing and therefore, identifying sex differences in training adaptations warrants investigation. Repeated-sprint (RS) ability has been shown to be an essential fitness component in many team based sports, therefore training methods include RS training aimed at optimising the athletes ability to perform RS efforts. While the adaptive effects of endurance and resistance training have been well researched, the effects of RS training on muscle protein synthesis are not well known. Few studies to date have investigated these effects in females, despite clear gender differences in adult human muscle mass and possible substrate utilisation differences during exercise between males and females. The purpose of this study was to determine the effects of a RS bout on muscle signalling and blood measures in well-trained male and female footballers.

Eight female and seven male senior football players (Mean ± SD, age, 19±1 y, VO2peak 53.0±5.1 ml•kg-1min-1) and seven male senior football players (Mean ± SD, age, 19±3 y, VO2peak 59.0±6.6 ml•kg-1min-1) performed four bouts of 6 x 30m maximal sprints spread equally over a 40 minute period. Sprint time was measured at 30m for each sprint. Muscle biopsies (vastus lateralis) and venous blood samples were taken at rest, 15 min following exercise and 2 h into recovery. Venous blood samples were taken at the same time points as the biopsies.

There were no differences ($P > 0.05$) between the female and male athletes in blood lactate response to RS or HR attained at the end of each bout of RS or during recovery between sprints. No changes ($P > 0.05$) were recorded in blood insulin or total or phosphorylated Akt at any time point or between genders. While there were no sex differences in total 4E-BP1, the phosphor of 4E-BP1 was significantly higher at rest in males compared to females ($P < 0.05$). Following exercise, there was a significant reduction in phosphorylation of 4E-BP1 in the males but not the females. By 2 h post-exercise phosphorylation of 4E-BP1 had returned to resting levels for both males and females.

While there were no differences in the resting or post-exercise muscle Akt or other physiological measures such as HR, blood lactate or blood insulin, the females had a reduced phosphorylation of 4E-BP1 at rest compared to the males. Additionally there was no significant change in phosphorylation of 4E-BP1 in the females following exercise. However, similar to studies using males and performing resistance exercise, the males in the present study had a reduction in phosphorylation of 4E-BP1 post exercise, which returned to basal levels by 2 h. These results indicate there may be small sex differences in the translational machinery regulating muscle mass. The lack of change in phosphorylation of 4E-BP1 following exercise in females may be due to sex differences in activation of AMPKinase, previously reported following intense exercise.

THE AKT-DEPENDENT ENDOTHELIAL NITRIC OXIDE SYNTHASE (ENOS) PHOSPHORYLATION IS NOT THE PRIMARY MOLECULAR MECHANISM UNDERLYING THE BENEFICIAL EFFECT OF LONG-TERM EXERCISE ON ATHEROSCLEROSIS

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SERVICE OF VASCULAR MEDICINE AND EXERCISE PREVENTION INNOVATION AND TECHNICO-SPORTING WATCHING DEPARTMENT

Introduction: Exercise reduces atherosclerosis extension in humans and animal models (Niebauer et al., 1997; Pellegrin et al., 2007). However, the precise anti-atherosclerotic molecular mechanisms of exercise are still unclear. Exercise-induced increase of vascular eNOS phosphorylation through the protein kinase Akt has been regarded as a vasculoprotective mechanism in patients with coronary artery disease (Hambrecht et al., 2003). Therefore, the aim of this study was to assess whether this regulatory pathway underlie the beneficial effect of exercise in experimental atherosclerosis using Apolipoprotein E-deficient mice (ApoE-/-) mice.

Methods: Hypercholesterolemic ApoE-/- mice were subjected to 24-week swimming exercise (50 min/day; 5 days/week). A group of sedentary animals were used as controls. Morphometry and characteristics of plaque stability were assessed in plaques from aortic sinus by immunohistochemistry. Expression of eNOS, eNOS phosphorylation at Ser1177, Akt, and Akt phosphorylation at Ser473 were measured in aortas by western blot.

Results: Morphometric analysis revealed that swimming significantly reduced by 30% the surface of atherosclerotic lesions. Moreover, plaques from exercised mice showed a more stable phenotype than that of sedentary ones: decreased layering, macrophage content ($p<0.05$), increased fibrous cap thickness and smooth muscle cells ($p<0.05$). Levels of eNOS, eNOS phosphorylation at Ser1177, Akt, and Akt phosphorylation at Ser473 did not differ significantly between exercised and sedentary ApoE-/- mice.

Discussion: Long-term exercise prevents atherosclerosis extension and promotes plaque stability in ApoE-/- mice. This anti-atherosclerotic effect is independent of changes in Akt/eNOS phosphorylation pathway. Exercise represents an essential non-pharmacological tool for the prevention of atherosclerosis-mediated cardiovascular events.

References

Niebauer J, Hambrecht R, Velich T, Hauer K, Marburger C, Kalberer B, Weiss C, von HE,Schlierf G, Schuler G, Zimmermann R, Kubler W. (1997). Circulation,96:2534-41.

Pellegrin M, Berthelot A, Houdayer C, Gaume V, Deckert V and Laurant P. (2007). Atherosclerosis,190,35-42.

Hambrecht R, Adams V, Erbs S, Linke A, Krankel N, Shu Y, Baither Y, Gielen S, Thiele H, Gummert JF, Mohr FW and Schuler G. (2003). Circulation,107,3152-3158.

COOPERATION OF NKT CELLS AND TREG CELLS IN REGULATORY EFFECT ON TH1/TH2 IMBALANCE AFTER OVERTRAINING IN RATS

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Purpose: At present, the exercise immunology field is becoming increasingly interested in the relationship between T helper (Th) lymphocyte subsets and immunosuppression during overtraining, excessive exercise, or fatigue[1]. We have recently found that defective NKT cell function is related to the emergence of exercise-related immunosuppression [2,3]. The unique features of NKT cells are reminiscent of another T regulatory (Treg) cell population: CD4+CD25+ Treg cells. CD1d-restricted NKT cells and CD4+CD25+ regulatory T (Treg) cells are thymus-derived subsets of regulatory T cells that have an important role in the maintenance of Th1/Th2 lymphocyte balance. Whether NKT cells and Treg cells cooperate functionally in the regulation of exercise-related immune imbalance is not known. We have explored this possibility in overtrained Sprague-Dawley rats. Methods: Eight-week-old female Sprague-Dawley rats were trained with a progressively increasing load for 9 weeks. At 36 h and at 7 d after training, groups of rats were euthanized. The whole blood was used to detect hemoglobin(Hb) , plasma was analyzed for hormones testosterone(T) and corticosterone(C), and spleen was harvested for detecting NKT cells, CD4+CD25+ cells and IFN-γ and IL-4 producing cells. We have demonstrated whether activation of NKT cells by a synthetic glycolipid activator of NKT cells, α-galactosylceramide (α-GalCer), inhibits the development of exercise-related immune imbalance. Results: The results indicated, at 36h after training, that the decrease in Hb, T and C concentration reflected overtraining or excessive exercise. At 7 d after training, NKT cell populations and CD4+CD25+ cells populations decreased, and a Th1/Th2 lymphocyte imbalance occurred. α-GalCer was found to enhance NKT cell numbers by 69% and CD4+CD25+ cells numbers by 1.2 time. In addition, α-GalCer shifted the Th1/Th2 lymphocyte imbalance by increasing the frequency IFN-γ secreting cells, while concomitantly decreasing IL-4 secretors. Conclusion: α-GalCer-activated NKT cells can induce expansion of CD4+CD25+ Treg cells, which in turn mediate the therapeutic effects of exercise-related immune imbalance. Induced cooperation of NKT cells and Treg cells may serve as a superior strategy to treat overtraining-induced immune imbalance.

Reference:

1. Smith LL. Overtraining, excessive exercise, and altered immunity: is this a T helper-1 versus T helper-2 lymphocyte response? [J]. Sports Med 2003; 33 (5): 347-64.

2. Wang Tian , Chen Peijie, Gao Binghong. Effects of Simulated Hypoxic Training on Such Indexes as Lymphocyte Subsets of Female Rowers. Sports Sci 2006; 26(6): 59-61

3. Zhu Zheng, Chen Peijie. Characteristics of Runners'Immune Cell Changes with Acupuncture Interference after 4 Hours'Half-Marathon Race. J Shanghai Uni Sport. 2007; 31(2):64-73.

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Oral presentations

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EFFECTS OF INTERMITTENT HYPOBARIC HYPOXIC EXERCISE ON CARDIOVASCULAR RESPONSES DURING MODERATE EXERCISE IN POST MENOPAUSAL WOMEN

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Introduction: Cardiovascular diseases remain the major cause of mortality in postmenopausal women. Although hormone replacement therapy improves some of these risk factors, no overall cardiovascular benefit has been noted with it. Recently, we have reported that aerobic exercise under a hypobaric hypoxic condition could reduce more effectively total peripheral resistance (TPR) and blood pressure inducing the increase in vasodilaive capacity of adult men (Ogita 2008). Therefore, the present study aimed to examine whether intermittent hypobaric hypoxic exercise bring also comparable cardiovascular adaptations in postmenopausal women.

Methods: The subjects were 16 postmenopausal women (56±3 yrs). They were matched for physical fitness level into two groups and then randomized to normobaric normoxic exercise group (N, n=8) and hypobaric hypoxic exercise group (H, n=8). The aquatic exercise training was done in swimming pool located in a chamber where atmospheric pressure could be regulated. The exercise was performed at the intensity of 50%VO2max level for 30 minutes/training session, 4 days/week, for 8 weeks. H had the exercise in the hypobaric condition corresponded to 2000m above sea level, and was exposed to the condition for 2 hours/session. Before and after the training period, VO2max and cardiovascular responses such as heart rate (HR), stroke volume (SV), cardiac output (CO), and systolic (SBP),

diastolic (DBP) and mean blood pressure (MBP) during cycling exercise at the intensity of 50%VO2max, which was determined before the training, were measured. In addition, the diameter of the popliteal artery was measured at rest and during reactive hyperemia after release of 5-minute arterial occlusion.

Results: After the 4 weeks of training, VO2max did not change significantly in both groups. In cardiovascular responses during the moderate exercise, no significant changes were observed in N. On the other hand, SV and CO in H significantly increased, furthermore, SBP (pre: 174±22, post: 155±15 mmHg), MBP (pre: 114.0±14.9, post: 103.3±11.2 mmHg), and the calculated TPR (MBP/CO) significantly decreased ($P<0.05$). The diameter of popliteal artery at rest did not change significantly in both groups, however, peak diameter during reactive hyperemia significantly increased only in H (pre: 5.4±0.5, post: 6.0±0.7 mm) ($P<0.05$).

Discussion/Conclusion

These findings suggest that exercise in hypobaric hypoxic condition could induce more effectively beneficial cardiovascular adaptations, such as a reduction of TPR and BP with an increase in vasodilative capacity, for postmenopausal women as well as adult men when compared to the exercise under normal condition.

Reference

Ogita,F. et al. (2008) Effects of exercise training at different hypobaric hypoxic conditions on cardiovascular adaptations. Book of Abstracts, 12th Annual Congress of ECSS: 394-395.

THE EFFECTS OF 70 DAYS OF SKIING ACROSS GREENLAND ON BODY COMPOSITION, COLD- AND ALTITUDE TOLERANCE AND WORK PERFORMANCE IN TWO ELDERLY MEN

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Introduction: The physiological effects of a 70-day ski expedition across the Greenland ice-cap on two men, 59 and 60 years old, were studied. They started in May 2008 and covered 1550 km, from Thule to Cape Morris Jessup, on skis pulling sledges of 170 kg. Mean altitude was 2000 m. Work typically consisted of 8 bouts per day of 50 min low to medium intensity work with 10 min pauses and a longer lunch break. The diet was fat enriched but with a negative energy balance for most of the duration.

Methods

The men were tested on two consecutive days for body composition, cold and altitude adaptation, upper and lower body work performance and hematologic status. The tests were executed 10 days before and 5 days after the expedition, using both standardized and specially designed tests as specified below. No statistical analysis was done but a response identified substantial changes with the same trend in both men. Individual data are presented.

Results: Measurements with an iDXA body scanner revealed that the men had lost body weight (8.3 and 4.3 kg), entirely due to a loss of body fat (14.7 and 7.2 kg), while lean body mass increased (6.5 and 2.9 kg). Cold-induced vasodilation (CIVD, laser Doppler) and manual dexterity during cold exposure (pegboard and finger tapping test) were unchanged after the expedition, but a subjective rating of cold discomfort indicated improved tolerance. Spleen contraction was seen (ultrasonic imaging) after 20 min simulated 3000 m altitude exposure (15% and 37%), and this response was attenuated after the expedition (12% and 28%). Baseline SaO2 and apneic ability after 20 min altitude exposure was unchanged. Reticulocyte count had increased by 80% and 84% but Hb was unchanged. Aerobic capacity increased in both arms and legs (A: 16 and 14%, L: 6 and 2%), while anaerobic capacity had decreased. Blood cholesterol (LDL and HDL) increased, but the LDL/HDL ratio was lowered (by 21% and 11%) after the expedition.

Discussion: In response to the long-lasting, low-intensity work with a negative energy balance, fat mass decreased in accordance with previous studies on younger subjects (e.g. Helge et al 2003), but an increase in lean body mass has not previously been reported for such long term exposure. Hand cold-acclimation may have been prevented by gloves, but subjective rating suggested some habituation. Decrease in spleen contraction at altitude exposure may suggest adaptation to altitude (Richardson and Schagatay 2007), which accords with the increased reticulocyte count. Training prior to the expedition mainly involved the legs, explaining why the arms' aerobic capacity increased more. The decrease in anaerobic capacity was probably related to the low intensity of the work. The fat enriched food may explain the increased LDL and HDL while the decreased LDL/HDL ratio may reflect the low intensity work. We conclude that men in their 6th decade adapt to long term endurance work and environmental stress in a similar way as the younger men previously studied, except for the increased muscle mass.

SPLEEN CONTRACTION AND ERYTHROCYTE RELEASE IN ELITE APNEA DIVERS DURING SUBMAXIMAL AND MAXIMAL EFFORT APNEAS

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Introduction: Spleen contraction has been observed in humans during e.g. apnea (Schagatay et al 2001) and simulated altitude exposure (Richardson et al 2008). The resulting autotransfusion of erythrocytes enhances gas storage capacity (Schagatay et al 2001). It was observed in non-divers that serial apneas evoke a more powerful spleen contraction than a single apnea, with a plateau after 3 apneas. Our aim was to reveal if time-limited, medium effort serial apneas in elite divers induce a maximal response, or if the response is further enhanced by a maximal effort apnea.

Methods: Eight female and 14 male elite apnea divers of mean(SD) age 29(7) years volunteered during two different international apnea competitions. After 20 min of prone rest and a 2 min countdown, the subject inspired deeply and held the breath for 2 min. After the first apnea (A1) the subjects breathed spontaneously for 2 min until the next apneic episode. Three apneas of 2 min duration were performed in this manner, each terminated by a 10 s countdown. The fourth apnea (Amax) was a relaxed maximal effort apnea performed after an additional 2 min rest, without prior hyperventilation. Arterial oxygen saturation (SaO2) was recorded continuously (Nonin pulse oximeter) while venous blood samples were drawn before and after the four apneas for hemoglobin (Hb) values (Hemocue). Spleen diameters were measured in 3 axes on ultrasonic Doppler images, for volume calculations. A pilot study revealed that maximum spleen contraction occurred at apnea termination both at 2 min and maximal apneas, and we therefore focused on measuring spleen volume at this point for the apnea response.

Results: An increase in Hb with concomitant spleen contraction occurred after A1, and the responses increased further after A2, while no further increases occurred with A3. There was, however, a further increase in both Hb and spleen contraction ($p<0.05$) after the maximal apnea, which had a mean (SD) duration of 4 (1)min. Mean spleen volume decreased from 311 to 247 mL across A1-3, and then to 223 mL

after A4. Mean Hb increased from 135 to 140 g/L across A1-3 and then to 142 g/L after A4. Both parameters had returned to baseline after 10 min. Nadir SaO2 after apnea was 94% for A1-3 and 81% for Amax.

Conclusions: We conclude that elite divers, with an extended apneic ability compared to non-divers, achieve further spleen contraction and red cell release during maximal effort apneas compared to medium effort apneas. This appears related to the lower SaO2. This information may be important when comparing responses between groups with different apneic ability, and for elite apneists when planning their warm-up.

References

Richardson M., Lodin A., Reimers J., Schagatay E. (2008). Short-term effects of normobaric hypoxia on the human spleen. Eur J Appl Physiol 104, 395-399.

Schagatay E., Andersson J.P.A., Hallén M., and Pålsson B. (2001). Selected contribution; Role of spleen emptying in prolonging apneas in humans. J Appl Physiol, 90, 1623-1629.

CHANGES IN PACING STRATEGY IN RESPONSE TO AN ACUTE SHIFT TO AND FROM HYPOXIA

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Introduction: It is well known that hypoxia decreases exercise capacity but less is known about how acute changes in ambient oxygen concentration (FIO2) affect pacing profiles. The pacing profile during a time trial usually includes an initial surge, a middle plateau and an end-spurt (Amann et al. 2006; Noakes et al., 2008; Billat et al., 2006). The purpose of this study was to describe changes in pacing profile and physiology in response to a mid-exercise change in FIO2.

Methods: Eight male cyclists completed two 20 km time trials in random order. In one trial, the 1st 10 km was normoxic (FIO2=21%) and the 2nd 10 km was hypoxic (FIO2=15% ~2700 m). The order was reversed in trial two. Subjects were blinded to the conditions. The trials were done inside a chamber set at normobaric pressure. Subjects acclimatised to the initial FIO2 for 10 min before each trial. Expired gases (4, 14 km), cardiac output (Q) (continuous), and blood gases (0, 4, 9, 14, 19 km) were measured. Subjects used their own bicycles on an electrically braked cycle trainer. PO was averaged over 2 km. Analysis was by a Students' t-test and repeated-measures ANOVA with Bonferroni post-hoc.

Results: Power output (PO) was lower in hypoxia at every interval except 12 and 14 km ($p<0.01$). PO for the final 2 km was 116% of the mean PO for the 2nd 10 km in normoxia, but only 102% in hypoxia ($p<0.01$). VE during hypoxia was higher at 14 km ($p<0.05$) and pO2 during hypoxia was lower at every interval ($p<0.001$). Q for the final 2 km was lower in hypoxia ($p<0.001$).

Discussion: PO changed less than 210 sec after switching FIO2. Descriptively, pacing during the 1st 10 km was similar in both conditions, but absolute PO was lower in hypoxia. The attenuated hypoxic end-spurt was consistent with Amann et al. (2006). Q during the end-spurt was lower during hypoxia and thus was not limiting. Instead, the end-spurt seemed to be related to the altered VE and pO2. However, altered PO during the first 500 m (~60 sec) and a quick PO response after changing FIO2 (cf., Joseph et al., 2008) suggests that pacing changes are not merely a result of peripheral fatigue. Indeed, the initial PO was likely determined during the 10 min pre-trial equilibration period and/or from sensations in the first minute of exercise. Changes in PO with altered FIO2 may have involved a rapid oxygen sensing response. The data support the notion of an initial anticipatory component to pacing based on sensation.

References

Amann M, Eldridge MW, Lovering AT, Stickland MK, Pegelow DF, Dempsey JA (2006). J Physiol, 575(3), 937-952.

Noakes TD, Lambert M, Human R (2008). Brit J Sport Med, 2008.046763v1

Billat VL, Wesfreid E, Kapfer C, Koralsztein JP, Meyer Y (2006). J Physiol Sci, 56(1), 103-111.

Joseph T, Johnson B, Battista RA, Wright G, Dodge C, Porcari JP, De Koning JJ, Foster C (2008). Med Sci Sport Exerc, 40(2), 381-386.

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VIGOROUS LATE-NIGHT EXERCISE AFFECTS CARDIAC AUTONOMIC CONTROL DURING SLEEP BUT NOT OBJECTIVE OR SUBJECTIVE SLEEP QUALITY IN PHYSICALLY FIT YOUNG ADULTS

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BACKGROUND: Late-night exercising has generally been viewed as a typical symptom of a 24-hour society. This study was performed to solve whether a late-night exercise disturbs sleep – the most important time period for recovery.

METHODS: The sleeps of eleven physically fit young adults (7 males, 4 females, aged 26±3 yrs, VO2max 54±8 ml/kg/min) were monitored in a sleep laboratory in a counterbalanced order 1) after a day including vigorous late-night exercise and 2) after a control day without exercise. The exercise was an incremental cycle ergometer exercise until voluntary exhaustion. The exercise started at 21:00±0:28 hh:min and lasted for 28±3 min. The bed time was 2:13±0:19 h:min after finishing the exercise. ECG RR-intervals (Alive Heart Monitor) and polysomnography (BrainVision Recorder) were recorded during sleep. Cardiac autonomic control was analyzed with First-beat HEALTH Software (Jyväskylä, Finland), and assessed by HR and HRV as well as variables based on both HR and HRV (physiological stress-% and relaxation-%). Objective sleep quality was analyzed from sleep stages determined using a standardized scoring protocol. Subjective sleep quality was assessed by a question "how tired do you feel yourself physically right now?" asked in the evening and morning. The scale for the question was 1-10 (1 = not tired at all, 10 = very tired). Statistical differences were examined using Wilcoxon test and paired samples t-test.

RESULTS: During the whole sleep, the subjects' HR was significantly higher (54±7 vs. 51±7, $p<0.01$), stress-% higher (18±14 vs. 5±13 %, $p<0.01$), and relaxation-% lower (71±18 vs. 85±14 %, $p<0.01$) after exercise compared to control day. HR was higher during the first four hours of sleep after exercise compared to control day ($p<0.01$-0.05), while HRV tended to be lower during the first hour of sleep. However, the subjects tended to sleep more slow wave sleep (SWS), which is physiologically the most restorative sleep stage, after exercise than control day ($p=0.08$). Moreover, the subjects slept more non-REM-sleep after exercise than control day ($p<0.001$). Only two subjects spent more time awake while in bed after exercise compared to control day. After exercise day, the subjects seemed to be more tired in the evening than in the morning (5.7±2.0 vs. 3.7±2.1, $p=0.07$). However, after control day no such decrease in tiredness occurred from the evening to the morning (4.9±1.9 vs. 4.5±1.9).

DISCUSSION: The results of this study showed that vigorous but relatively short late-night exercise performed 2-2.5 hours before bed time affects cardiac autonomic control especially during the first hours of sleep. However, objective and subjective sleep quality may be even enhanced after exercise compared to control condition. We conclude that this kind of exercise procedure has minor effects on the essential recovery process during sleep.

ROLE OF STRENGTH TRAINING IN ENDURANCE RUNNERS DURING PREPARATORY, MAXIMAL VERSUS EXPLOSIVE, AND REDUCED STRENGTH TRAINING PERIODS.

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Strength (STR) and endurance (END) training produce divergent adaptations and are often performed concurrently. An interference effect (1) between STR and END training is often related to high intensity/volume and long duration of training, but it is possible for concurrent training to lead to increased STR and END performances even in endurance athletes (2). A reduction in training stimulus leads to a reversal in adaptations as demonstrated by decreased activation and STR of detrained muscles (3).

Twenty-eight male recreational END runners (mean±SD, age 35.4±6.8yrs, height 180±5.3cm, body mass 79.3±7.5kg) were divided into three STR training groups: maximal (M=11), explosive (E=10) and circuit training (C=7). Within these groups, subjects completed 6 weeks of common preparatory STR training (PRE) and then a specific 8-week STR training intervention (STI) followed by 14 weeks of intentionally reduced strength training and increased endurance training (RST). STR training (including at least two exercises for leg extensors) occurred on average 1.3±.02, 1.5±.03 and 0.5±.03 times per week in each training period, respectively, while END training volume (running km) increased progressively throughout the study. Concentric leg press strength (1RM), jumping power (CMJ), muscle activation (EMG of VL + VM) and END performance (vVO2, VO2MAX, running economy (RE)) were measured prior to PRE (-6), at 0, 4 and 8 weeks of STI and after RST (+14).

During PRE and STI, 1RM improved significantly in all groups peaking at 4 (7.7, 3.2 and 6.4% in M, E and C from -6, respectively), while significant gains in CMJ peaked at 8. Gains in 1RM were accompanied by increased EMG of VL+VM in M and E (p=0.027 and 0.002) but not in C. VO2max increased only in M from -6 to 8 (4.3%), vVO2 improved significantly in all groups from -6 to 8 and RE in E improved significantly by 2.4%. Following RST, progressive decreases were observed in 1RM, CMJ and EMG which were significant in 1RM and EMG of M (p=0.002 and 0.038). However, significant increases in vVO2 of M and E (4.7 and 2.4%), RE of M (7.7%) as well as some gains (n.s.) in VO2max continued in M and E.

Both M and E STR training performed concurrently with high volume END training led to increases in 1RM, CMJ and EMG but strength development plateaued indicating some interference over a prolonged period. Nevertheless, these neuromuscular improvements were accompanied by progressive gains in VO2max, vVO2 and RE. RST resulted in decreases in 1RM, CMJ and EMG; however, vVO2 and RE continued to improve in M and E. Adaptations to ST were maintained to some extent, since 1RM, CMJ and EMG did not fall below starting values. Thus, improved neuromuscular performance and increased preparedness for an increase in running volume due to STR enabled subjects to improve END performance.

1. Hickson RC Eur J Appl Physiol. 45: 255-263, 1980.

2. Mikkola J et al. J Strength Cond Res. 21:613-620, 2007.

3. Häkkinen K Crit Rev Phys Rehab Med. 6:161-198, 1994.

10:15 - 11:45

Oral presentations

OP-SM03 Sports Medicine 3

EFFECT OF NSAID ON HUMAN SKELETAL MUSCLE SATELLITE CELLS FOLLOWING ECCENTRIC EXERCISE

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Introduction: Satellite cells – the stem cells of skeletal muscle – are essential for skeletal muscle adaptation to exercise and for muscle regeneration. They contribute to hypertrophy by providing new myonuclei and assist in repair of damaged muscle fibre segments. Non-steroidal anti-inflammatory drugs (NSAIDs) are widely consumed by athletes when faced with injuries and by rheumatic patients, but the influence of these drugs on muscle satellite cells and adaptation is not fully understood. Following a 36 km run the observed increase in satellite cell number (27%) was blunted by ingestion of NSAIDs (Mackey et al., 2007) pointing towards a negative influence of NSAIDs on satellite cell proliferation in vivo in humans. The aim of the present study was to investigate the effect of local NSAID infusion on satellite cells in vivo in human muscle.

Materials/Methods: Eight healthy male subjects (unaccustomed to leg resistance exercise) performed 200 maximal eccentric contractions with each leg. NSAID (Indomethacin) was infused via a microdialysis catheter into one leg (NSAID leg) before, during and for 5 hrs after exercise, the other leg being working control (unblocked leg). Biopsies were sampled from m.vastus lateralis before and 8 days post exercise. Satellite cells were analyzed by immunohistochemistry using antibodies against the transcription factor Pax7, and neural cell adhesion molecule (NCAM). Cell proliferation was analyzed using an antibody against the cell cycle marker Ki67.

Results: The number of Pax7+ cells per myofibre was increased by 75 % on day 8 post exercise in the unblocked leg (mean 0.13, SE 0.03) compared with pre exercise (mean 0.08, SE 0.02, P=0.03), while levels were unchanged in the NSAID leg (mean 0.06, SE 0.01, P=1.0). On day 8 post exercise the number of Pax7+ cells (per myofibre) tended to be lower (P=0.06) in the NSAID leg compared to the unblocked leg.

Very few proliferating (Ki67+) cells were found with no effect of NSAID, on average only one Ki67+ cell was found per 100 myofibres on day 8 post exercise.

Conclusion: The results indicate that NSAIDs may negatively affect satellite cells and muscle adaptation following eccentric exercise. This is clinically relevant given the widespread consumption of NSAIDs among athletes and rheumatic patients.

References
Mackey AL, Kjaer M, Dandanell S, Mikkelsen KH, Holm L, Døssing S, Kadi F, Koskinen SO, Jensen CH, Schrøder HD, Langberg H. (2007). J Appl Physiol, 103(2), 425-31.

ISOKINETIC QUADRICEPS AND HAMSTRINGS MUSCLE STRENGTH AND THE ACL INJURY IN FEMALE HANDBALL PLAYERS

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A disproportionate rate of ACL injuries between sexes is frequently reported in high-risk sports involving plant-and-cut movements. The ratio of female risk to male risk is generally between 2 and 3, depending on sport specificity and level of practice. The seriousness of the ACL injury stresses the need to improve the management of its risks and causes. As the knee flexor musculature is important on active knee stabilization, it's normalized value (hamstrings/quadriceps peak torque ratio - H:Q) has been suggested as an ACL injury risk indicator.

Purposes: to characterize the muscular force adaptations over the players' handball career; and to investigate a possible epidemiological correlation between lower limb isokinetic strength and previous or subsequent ACL injuries.

Sample: 100 elite Portuguese female handball players, 19±4 years old, practicing handball for 7±4 years. The players were evaluated about 3 months after the beginning of the sport season and any sequent knee injury was registered. They were further subdivided into 3 groups: those with no previous history of ACL injuries (91 players), those with previous or chronic ACL injury (9 players) and those that in the following season suffered an ACL injury (4 players). The isokinetic torque-angle curves were obtained with a Biodex 2 dynamometer at 90º/s (concentric). A clinic evaluation was performed to identify any previous knee injuries and a screening questionnaire was used to assess some vital and sports related information.

Results: in players with healthy knees the measured H:Q ratio (45%±7%) is lower than several publish desirable values.

In injured players, the knee where reconstructive surgery was performed showed, about 4 years later, approximately 10% reduction of the extension peak torque and no significant reduction on the extension work capability, an indicator of a change in the shape of the torque-angle curve.

A small linear neural network (one layer, two node) was trained with half the available isokinetic data. With an optimized turnover point (A=0.981), the model was applied to the full size sample, miss-predicting only 4 cases (4 false-positive ACL ruptures). It even predicted all 4 cases of ACL ruptures that occurred about 1 year after the isokinetic evaluation. A total squared correlation of 62.6% was obtained, with the hamstrings peak torque (36%) as the most powerful single factor.

An odds ratio analysis on the logistic regression showed that an improvement of a single N.m on the peak knee flexor torque improves the chance of not having an ACL injury by a factor of 1.27 on average, although the 95% confidence interval contains unity.

Conclusions: we could not substantiate the importance of the H:Q isokinetic peak torque ratio as a risk indicator but a more complex model like this may be of some real value. It will improve with all additional evaluations but it already suggests the importance of the knee flexor musculature in the ACL rupture prevention.

COMPARISON BETWEEN RESISTANCE TRAINING PROTOCOLS ON MARKERS OF GLYCEMIC CONTROL IN TYPE 2 DIABETES MELLITUS

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Introduction: Despite the fact that exercise training has been shown to be very effective in type 2 diabetes mellitus (T2DM), it still remains elusive, which protocol of resistance exercise training is most effective in improving glycemic control.

PURPOSE: It was the purpose of this study to compare two different protocols of resistance training, i.e. hypertrophy versus endurance strength training, on various metabolic markers in T2DM.

Methods: Thirtytwo patients with T2DM (mean age 64,8 +/- 9,0 years, 13 men and 19 women) were randomized between hypertrophy strength training (HST: n=16; 2 sets of 10-12 repetitions at 70% of the one-repetition maximum (1RM)) or endurance strength training (EST: 2 sets of 20-25 repetitions at 40% of 1RM) twice a week for eight weeks on a multi gym weight-lifting machine (Nautilus® nx200). In addition submaximal ergometer based aerobic training (Daum®Ergometer Fitness3; 60-70% of heart rate reserve) was performed by all patients.

Results: Systolic blood pressure at rest (HST: 131.3 +/- 17.2 to 125.3 +/- 17.6 mmhg, p=0,001; EST: 135.3 +/- 16.4 to 128.4 +/- 14.3 mmhg, p=0,008); aerobic exercise capacity (HST: 121.0 +/- 26.8 to 142.4 +/- 29.9 W, p=0,001; EST: 127.6 +/- 22.5 to 140.1 +/- 23.3W, p=0,008); muscle mass of both arms (HST: from 4825 +/- 1233 to 5077 +/- 1333g, p=0,003; EST: from 5231 +/- 1284 to 5475 +/- 1461g, p=0,01); upperarm strength assessed during chest-press (HST: p<0.001; EST: p<0,001); and back-pull (HST: p<0.001; EST: p<0,001) all improved significantly in both groups. Furthermore hemoglobin A1c improved significantly in EST (from 7.5 +/- 1.2 to 7.2 +/- 1.0%, p=0,04) but not in HST (from 6.9 +/- 1.2 to 6.8 +/- 0.8%, p=0,2). Intraabdominal fat remained unchanged in both groups (HST: p=0,1; EST: p=0,5). HDL (from 53.6 +/- 16 to 58.6 +/- 13,4mg/dl, p=0,02), fastening insulin, and urea acid significantly improved in EST only.

Discussion: Both hypertrophy and endurance strength exercise training performed on top of an ergometer-based aerobic exercise program led to a similar increase in muscle strength. In addition, endurance strength training led to superior reduction in important glycemic parameters like hemoglobin A1c (p=0,04), fructosamin (p=0,002), LDL (p=0,02), urea acid (p=0,04) and fastening insulin (p=0,001). Thus, we conclude strength training in general is a beneficial addition to aerobic exercise training. However, endurance strength training appears superior to hypertrophy strength training, since it not only improves strength, but also exerts beneficial effects on patients' cardiovasular risk profile.

EXERCISE IMPROVES THE MITOCHONDRIAL ANTIOXIDATIVE DEFENSE CAPACITY IN ADIPOSE NON-DIABETIC AND DIABETIC MEN

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GERMAN SPORT UNIVERSITY COLOGNE

Diabetes has been shown to be accompanied by an increased generation of reactive oxygen species and a depression of the antioxidant defense capacity. The present study investigated whether a three months exercise intervention is able to improve the oxidative stress situation in non-insulin dependent adipose male diabetics (age: 40-60 yrs, n=13). Half of the patients were taking place in an endurance and the other half in a strength endurance training. Non-diabetic adipose men, who participated in a 3 mo strength training, were investigated for comparison (age 40-60 yrs, n=7). Before and after the 3 mo-exercise, biopsies were taken from the M. vastus lateralis. Immunohistochemical stainings were performed for gluthathion peroxidase 1 (GPX1) and superoxide disutase 2 (SOD2), two mitochondrial antioxidative enzymes, as well as for HSP70, an oxidative stress/hypoxia signalling molecule.

Under basal situations (i.e.before the training), GPX1 was slightly decreased in the M. lateralis of diabetic compared to the non-diabetic men (7.01.8 arbitrary Units (ArU) vs. 9.33.9 ArU, p=0.096). The regular participation in exercise resulted in a significant increase in the GPX1 protein expression in the diabetic men (+16%). GPX1 protein content was not changed by exercise in the non-diabetic group. SOD2 and HSP70 were similar in the non-diabetic and diabetic group before the exercise program. Exercise significantly increased SOD2 in both non-diabetic and diabetic participants (+18%). The exercise-induced HSP70 protein content was only significantly increased in the diabetic persons (+16%).

Conclusions: Diabetes depresses the mitochondrial antioxidative defense regulation/signaling of H2O2 at very early stages of the disease. This situation can be improved by regular physical activity. The regulation of the protein expression of the SOD2 seems to be differentialy regulated from that of GPX1 under both physiological (exercise) and pathophysiological (diabetes) situations.

CASE REPORT: SEVERE IRON DEFICIENCY ANAEMIA AND REDUCTION OF VO2MAX IN AN ELITE ROWER

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Introduction: An elite rower experienced a dramatic decrease of physiological performance in an incremental rowing exercise test and VO2max was decreased. Subsequently, iron deficiency anaemia was detected. As the rower was regularly evaluated physiologically, time course of iron status, erythropoesis and physical performance can be reported.

Material and Methods: Measurements included 4 pre-anaemia values that were averaged (PRE). 2nd measurement was 6 months later during peak of anaemia (ANM). 3rd measurement (POST) took place 10 months later, 8 months after normalization of [Hb]. Blood Volume (BV), Red Cell Volume (RCV), total Haemoglobin mass (tHb) were determined using the optimised CO-rebreathing method, VO2max was measured breath-by-breath. Ferritin and soluble transferrin receptor (sTr) were measured in serum.

Results: The anaemia caused a dramatic decrease of tHb from 1267 g (PRE) to 917 g (ANM) (-27.6 %), RCV (-20.9 %), [Hb] (-30.8%). VO2max decreased from 5.8 to 4,8 l/min (-17.5 %). This was accompanied by an increase of PV from 4359 ml (PRE) to 5254 ml (20.5 %) resulting in a normovolemic BV-situation. At POST, haematological values increased compared to PRE: tHb 1377 g (8 %), BV (6.2 %), EV (2 %) and PV 4820 ml (9.6%). VO2max was 6.0 l/min. Ferritin values were (PRE – ANM - POST): 38 - 24 - 41 mg/l. sTr were 1.7 - 3.5 - 1.6 µg/l.

Discussion: The diagnosis revealed a hp-negative gastritis, possibly induced by intake of non-steroidal antiphlogistics due to back pain. Subsequently, gastritis was treated with a protone pump inhibitor and iron was substituted intravenously after ANM. The PRE values showed a critical iron status. When gastritis induced

blood loss and iron resorption disturbance occurred, erythropoiesis failed. Despite the decrease in VO2max and performance, ferritin levels barely decreased below clinical relevant values. Only sTR and direct tHb-measurement definitely indicated iron deficiency anaemia. The increase of PV at ANM did not compensate the loss of oxygen transport capacity. After successful treatment, tHb and BV were 8%, and VO2max was 3 % higher compared to PRE. The VO2max-levels at PRE and POST support the finding, that a change of 1g tHb in healthy conditions is associated with a change in VO2max of 4.4 ml. The borderline sTr in POST may indicate again increased iron demand.

Conclusion: Ferritin-levels are of limited value for diagnosing iron deficiency in highly trained athletes, since ferritin behaves also as an acute phase protein and may be elevated by training related acute phase reactions. [Hb] may be falsely negative influenced by hemoconcentration. The anaemia was definitely detected by sTr level and tHb-measurements. After successful treatment of anaemia, tHb increased to the highest level observed in this athlete.

RELATION OF PHYSICAL ACTIVITY INTENSITY AND ENERGY CONSUMPTION – PRELIMINARY RESULTS

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To counteract the decrease of physical activity in most western civilizations, common recommendations intend to increase daily life activities of the subjects in order to enhance energy expenditure. Mostly, cycling, varying walking speed and stair climbing are addressed (e. g. Crouter et al. 2003; Harrell et al. 2005). The amount of physical activity and energy expenditure is measured by pedometers, accelerometers or oxygen consumption analyzer (Crouter et al. 2003; Fudge et al. 2007), but little is known about the relation of energy expenditure and the intensities of the activities. Therefore, the aim of the present study is the computation of equations to convert steps into energy consumption taking age, sex and frequency of steps into account.

Thus, 300 subjects divided into six age groups (children to seniors) are to be measured. A local ethics committee approved of the study.

This abstract includes preliminary data for the age groups >60 (53.0 ± 5.9 years, 167.3 ± 5.3 cm, 66.7 ± 9.0 kg) and 40-60 years (66.4 ± 4.1 years, 170.2 ± 8.2 cm, 66.8 ± 11.2 kg). All subjects were healthy and gave written informed consent. Equipped with a step-activity-monitor at the right ankle, storing gait cycles in 1-min intervals [cycles/min], and a mobile oxygen consumption analyzer calculating energy consumption [MET] breath-by-breath, the subjects completed a parcour consisting of resting and walking at varying speed. Mean values of the last three or one and a half minute of each activity were computed, whereas resting oxygen consumption was subtracted from the activity values.

No significant differences were found between age groups. Thus, square regression analysis revealed Y=-0.662x2+9.359x+34.767, R2=.54 ($p<0.01$) for the necessary step frequency to meet given MET values for all subjects.

The results show that the increase of energy expenditure is non-linear to an increase of walking intensity. If physical activity is measured with devices allowing for a calculation of walking intensity, a more solid estimation of energy expenditure is possible. Furthermore, recommendations regarding an increase of physical activity can be rephrased taking walking intensity into account.

Further investigations will show if the equation has to be altered for different sex and age groups.

References

Crouter, S. E., Schneider, P. L., Karabulut, M., & Bassett, D. R. (2003). Validity of 10 electronic pedometers for measuring steps, distance, and energy cost. Medicine & Science in Sports & Exercise , 35 (8), S. 1455-60.

Fudge, B. W., Wilson, J., Easton, C., Irwin, L., Clark, J., Haddow, O., et al. (2007). Estimation of oxygen uptake during fast running using accelerometry and heart rate. Medicine & Science in Sports & Exercise , 39 (1), S. 192-98.

Harrell, J. S., McMurray, R. G., Baggett, C. D., Pennell, M. L., Pearce, P. F., & Bangdiwala, S. I. (2005). Energy cost of physical activities in children and adolescents. Medicine & Science in Sport & Exercise , 37 (2), S. 329-36.

10:15 - 11:45

Oral presentations

OP-PP04 Physical Education and Pedagogics 4

PE AND HEALTH - THE FRAME FACTOR THEORY FOR ANALYSING EDUCATIONAL SETTINGS

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On a normative level as a subject Physical Education and Health (PEH) seems to adjust rapidly to changes in society, whereas on the practical level it seems receptive to limiting factors like time, facilities and dominating inherited practices. What choices and determinants of options do teachers have and use, and how are students involved in the framing of PEH?

The purpose of the study has been to investigate the process between the transmission of curriculum and the realisation of content as viewed by teachers and students of PEH in secondary schools in Sweden. Bernstein's concepts of classification and frames together with Linde's work defining the arenas of formulation, transformation and realisation. are used as analytical tools. The empirical material consists of quantitative data from questionnaires administered to teachers (n=61) and students (n=380, aged 15–16 years) within a national multi-disciplinary project entitled School-Sport-Health (SIH).

Results From the formulation arena of a broad given content the content given seems to become narrowed in the process of transformation, transmitting and realisation of content. Limiting factors as time and facilities are not strongly influencing the content provided. Lack of perceived subject matter knowledge is not mentioned at all as limiting the teaching objectives. When organising and conducting lessons, teachers mostly address the entire group of students and seldom give instruction in smaller groups. Just over half the students responding to the questionnaire expressed doubt about whether the teacher was aware of their previous experiences/knowledge.

Discussion: By using Bernstein's principles of classification and framing for understanding the results of the study, PEH in secondary schools in Sweden emerges as a weak subject, where the framing of subject is not strongly bound to limiting factors as time and facilities. It seems to be more influenced by the boundaries set by other agencies and the process of transforming and transmitting of legitimate knowledge by teachers. In some respects students active in organised sport seem to act as a steering group in terms of how PEH teaching is addressed.

ReferencesBernstein, B. 2003. Class, Codes and Control. Vol. 4. The structuring of pedagogic discourses. London: Routledge,

Lundvall, S. & Meckbach, J. 2008. "Mind the Gap – Physical Education and Health and the Frame Factor Theory as a Tool for Analysing Educational Settings", Physical Education and Sport Pedagogy, 2008:4, pp. 345-364.

COMPARATIVE INVESTIGATION IN CREMONA AND PROVINCE AMONG DIFFERENT SPORT DISCIPLINES AT 12 YEARS

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INTRODUCTION: In these last years the sporting practice to juvenile level, represents a social phenomenon of great interest and constitutes a privileged context, inside which young people enhance an harmonic, motor, technical and psychological development. This research wants to verify how important is the education and the development of the motor abilities, before improving the executive techniques of the sport.

MATERIALS AND METHODS: The research, made in 2008, has been directed into 6 different sport disciplines and it has interested motor test and one questionnaire. The tests have been administered to 150 athletes of 12 years old, practising 3 individual sport and 3 team sport and 100 students (control group) attending the middle school. The practising young males trained 3 times per week and at school they attend to 2 h of Physical Education per week; the control group attends to 2 h of Physical Education at school per week and during the leisure time did not practice any motor activity.

RESULTS: The trends are the following: 60 m fast run, basketball, track and field, basket obtained best data results compared to control group and the other sport disciplines. In the 1200 m run test, the control group and the karate athletes obtained worse results compared to the athletes of other disciplines. In the stick test, the athletes of volleyball and basketball obtained worse results compared to athletes of others discipline; in the sit & reach, the athletes of soccer obtained worse results compared to the athletes of others discipline. In the forward throw of medical ball test, the athletes of basketball, swimming obtained better results compared to the control group and to athletes of others discipline. In the long standing jump, the athletes of basketball, volleyball and track and field obtained better results compared to athletes of other sport discipline; relativity to feet rapidity the data of basketball, volleyball and karate are superior to the other sport. The analysis of the questionnaire outlined that athletes start some sports at the age of 5 or 6 years old too early and that coaches dedicated much more time on teaching the sport technique than on developing motor sport abilities.

CONCLUSION: From the results obtained by the administered test and by the proposed questionnaire, the following tendency emerges: during the training sessions, coaches work few on the development of the motor abilities and very on the technique, in individual sporting disciplines the analytical work.The start of teaching technique and selection are preponderant. This research offers very important data in order to reflect about the formulation of a correct methodology of training when a boy or a girl is going to practice a sport.

REFERENCES

A.A.V.V. I test motori nei C.A.S., C.O.N.I. 2007

INTERNATIONAL COOPERATION IN PHYSICAL EDUCATION HIGHER EDUCATION: THE CASE OF THE PALESTINIAN TERRITORIES.

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Background: In June 2008 the Brazilian Ministry of External Relations organized a multidisciplinary mission to the Palestinian Territories. I was responsible for the areas of Physical Education and Leisure. The first step of the cooperation took place in Ramallah and East Jerusalem. The main goals were to gather information of the Palestinian higher educational system in the areas above and establish contacts with the local authorities in order to set a frame of cooperation between the two national entities. This qualitative study has been carried out through interview and participant observation. Meetings were set with the Palestinian representatives from June 2nd to the 6th. The most important meeting was with Mr. Ibrahim Sabbah, the Minister of Sports and Youth. I also had meetings with leaders from related institutions, such as a youth center in the Al-Amari refugee camp located in Al-Bireh, north of Jerusalem, and representatives from Birzeit and An-Najah Universities. The An-Najah University is located in Nablus, north of Ramallah. I was able to find out that this university was the only one in the Palestinian Territories to offer a Physical Education undergraduate curriculum but has no graduate courses yet. Right away, we went to this university and were hosted by Dr. Kherieh Rassas-Kharouf, President Assistent for International Affairs. After visiting the university facilities, including those specifically related to the Physical Education field, we talked about the possibility of creating a graduate course in this area, since they already had nine professors with PhD involved in it. Birzeit University, located on the outskirts of the West Bank town of Birzeit, about 20 kilometers north of Jerusalem and 7 kilometers north of Ramallah, was the next place visited. The campus has very good facilities in Leisure and Sports, used mainly for community physical activities. It could very easily offer an undergraduate course in P.E., in the short term, and a graduate one with the cooperation of the university, concerning the building of labs and invitation for visiting professors from countries that have structured graduate courses in P.E. and related areas. These findings suggest that the improvement of the Physical Education and Leisure higher educational system in the Palestinian Territories could lead to a more qualified and professional approach towards public policies. This would create important possibilities for the population that has been suffering severe constraints in the context of the Israeli occupation, as well as the international financial embargo, since 2006. One of the conclusions of this study is that the Palestinians have already a good infrastructure in P.E and Leisure, and also universities that could highly benefit from international cooperation initiatives in its higher educational system in the fields above.

PHYSICAL EDUCATION AND GLOBALIZATION: COMPARISON OF PHYSICAL SKILLS DEVELOPMENT IN MULTIETHNIC CLASSES IN ITALIAN SCHOOL

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Introduction: The 10% of scholastics population in Italian school is multiethnic, from east Europe and north Africa. PE is a compulsory subject from the primary to secondary school for two hours per week.

Aims: The survey wants investigate the physical skills in the multiethnic PE class and understand if there is a different development in the Italian, east Europe and north Africa students attending the Italian school.

Methods: the physical skills development is analyzed with long standing jump thank to quality test (Test Gross Motor, Dale A. Ulrich) and a quantity test (Motor FIT- AAHPERD). The data analyses is descriptive and use percentile and percentage comparison for differences ethnic groups in the scholastic from years 2007-2009.

Results: the data come from 30 PE physical education classes. The students involved in the survey are 750, the PE teachers are 30. The complete data will be 1500.

Discussion: The heterogeneity ethnic culture has been influence by the physical skills development in the multiethnic Italian PE classes. The culture of the body, the religion believes, the socioeconomics status are important factor for participation at the PE lessons and the physical skills development.

Conclusion: In the multiethnic PE class the cohesion is going towards difference and the inclusion and integration of difference based on exchange between people of difference culture, country, religion, economic status

Reference.

Dale A. Ulrich (1995) Test TGM, Erickson

Council of Europe, Eurofit- Assesment of health-related fitness (1995)

AAHPERD Report and Assesment (1992)

Hardman K. & Marshall J. (2000) Wolrld-Wide survey of the State and Statys of School Physical Education a report to the International Olympic Committee, Manchester, University of Manchester

THE 'SWITCHING' WORK LIVES OF HONG KONG PRIMARY SCHOOL PHYSICAL EDUCATION TEACHERS

SUM, K.W., DIMMOCK, C.

THE CHINESE UNIVERSITY OF HONG KONG

The aim of this study is to investigate the work lives of Primary School Physical Education Teachers (PSPETs) in Hong Kong. The central research questions are how do PSPETs describe their work and how do they feel about their typical daily work lives.

The study carried out through the inductive development of a theory, based on grounded theory methods. The researchers employed theoretical sampling in order that data collection be purposively directed towards informants and towards situations thought likely to provide data that promised to be relevant to and able to develop and build the emergent theory. PSPETs in Hong Kong have been defined by the researchers as professionals who specialize in teaching physical education in primary schools in Hong Kong.

Through snowball sampling, the researchers identified suitable participants for study. Participants for this study were from a variety of backgrounds and were able to enrich the contexts for analysis. The researchers used semi-structured interviews, together with documentary sources (diaries) for conducting data collection. Eleven PSPETs were participated. Data collection was conducted over a 11-month period and ceased upon data saturation, which was when nothing new could be added to the data. The transcribed interviews were analyzed using open coding, axial coding and selective coding procedures. Member checks, audit trails and triangulation were used to ensure trustworthiness.

The concepts of (1) multi-dimensional knowledge, (2) acclimatization to the organization, (3) reconcilable scope of work, (4) multi-level job specification, and (5) irregular work hours and workloads are clustered into the Switching (Work Lives) category, which describes the PSPETs' work and their feelings toward their daily lives.

Switching (work lives) refers to how PSPETs must equip themselves with infra-structural abilities in order to tackle their everyday challenges and routines. PSPETs have to adjust to a broad scope of work that has multiple levels of job specifications and that demands possession of multi-dimensional knowledge. Irregular work hours and workloads also have a great influence on their working lives. To acclimatize to the ever-changing organizational environment, from time to time, PSPETs must "switch" their scope of work effectively and efficiently.

ATTITUDE TO PHYSICAL EDUCATION AND PARTICIPATION IN ORGANIZED YOUTH SPORTS DURING ADOLESCENCE RELATED TO PHYSICAL ACTIVITY IN YOUNG ADULTHOOD: A 10-YEAR LONGITUDINAL STUDY

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Abstract

We examined the relationship between participation in organized youth sport and attitude to physical education (PE) during adolescence and physical activity in young adulthood. The sample comprised 630 subjects who completed questionnaires from age 13 and over a 10-years period. Analysis of variance and regression were used to examine the relationship between attitude to PE and participation in organized sport at age 13 years and physical activity at age 23 years. Both genders had a consistent and positive attitude toward PE at age 13–16 years. More boys participated in organized youth sport, and participation rates declined from age 13 to 16 years. Participation in organized sport was the strongest predictor of physical activity at age 23 years in males, whereas attitude to PE was the strongest predictor in females. Participation in sport and physical activity in different arenas during adolescence may affect participation differently in young adult men and women.

10:15 - 11:45

Oral presentations

OP-SM04 Sports Medicine 4

"NORMAL" BODY MASS INDEX DOES NOT NECESSARILY INDICATE A HEALTHY BODY COMPOSITION IN ELITE FEMALE ATHLETES AND NONATHLETES

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Introduction: Body composition and body weight may impact health and performance. While the most used classification of body composition in non athletes is the Body Mass Index (BMI), no studies have assessed the relationship between BMI and body fat percent (BF%) in elite female athletes and compared with normal-active controls. Therefore, the aims of this study were to assess the relationship between BMI and BF% in elite female athletes representing several sports, and to compare with non-athlete controls.

Methods: This two-phase study included: 1) a questionnaire regarding training patterns, menstrual-, dietary-, and weight history, nutritional factors, oral contraceptive use, pregnancy, stress fractures, and disordered eating behaviours, and 2) measurement of body composition with dual-energy X-ray absorptiometry using a full body scan on a LUNAR-Prodigy. In part I, all female athletes representing the national teams of Norway at the junior or senior level, aged 13-39 years (n=938) and a same-age random sample control group (n=900) were invited.. The questionnaire was completed by 88% of the athletes and 70% of the controls. Based on these initial data, a random sample of athletes (n=300) and controls (n=300) were selected and invited to participate in part II. A total of 186 athletes (62%) and 145 controls (48%) participated in part II. Overfatness was defined as a BF% ≥33% (Ode et al. 2007).

Results: The athletes had a significantly lower BMI (21.7 ± 2.4 kg/m2) and BF% (24.2 ± 7.2%) compared with the controls (24.0 ±4.2 kg/m2 and 35.5 ±7.1%) ($p<0.001$). The correlation between BMI and BF% was 0.671 ($p<0.01$) for athletes and 0.813 ($p<0.01$) for controls. Of those athletes with normal BMI values (n=150), 6,7% were classified as overfat. Seven athletes were classified as overweight based on their BMI values, but not overfat. For the controls with normal BMI values (n=96), 50,0% were classified as overfat. A total of 63,4% of the controls had a BF ≥33%, a level several times higher than that of the athlete group (11.3%) ($p<0.001$).

Discussion: As expected, the athletes had lower BMI and BF% than the controls. The correlation between BMI values and BF% is acceptable for both athletes and controls. However, of those athletes and controls with normal BMI values, 7% and 50% of the sample respectively, had a BF ≥33%, and were classified as overfat. On the contrary, 4% of the athletes were classified as overweight without being overfat. Thus,BF% should be preferentially used over BMI as a tool for validly classifying body composition in young female athletes and in the general female population. We recommend future studies to develop a classification of BF% values for health status and ranges of BF%. Furthermore, recommended levels of BF% for different sport groups are needed.

References

Ode JJ, Pivarnik JM, Reeves MJ, Knous JL. Body Mass Index as a Predictor of Percent Fat in College Athletes and Nonathletes. Med. Sci. Sports Exerc, 39 (3): 403–409, 2007

WEIGHT RULES, WEIGHT REDUCTION, PERFORMANCE AND ATHLETE'S HEALTH. - A REVIEW OF THE LITERATURE.

STORNÆS, A.

NORWEGIAN SCHOOL OF SPORTS SCIENCE

Purpose: The aim of the project was 1) to evaluate current weight rules (weight categories, weight-in schedule) in sports, 2) to review studies aiming to examining the prevalence of weight loss methods practised by elite and national team athletes, 3) to determine health and performance related outcomes related to use of weight loss methods 4) should weight-rules be changed in any of the sports?

Methods: The literature search was conducted in PubMed, Sport Discus and EMBASE Ovid. 25 studies from 1993-2007 were included. The studies included elite/national level athletes, surveys of weight loss methods, health and performance related aspects of weight loss methods and possible effects of changing the weight-rules.

Results: 1) The weight rules vary in the different sports. 2) Most (64-94%) athletes are dieting and losing weight prior to competition. The average weight reduction is 5-9% of their body weight. Gradual, energy restriction and increased exercise, and rapid weight reduction methods such as sauna, fluid restriction, and sweat suit are reported (by athletes who reduce weight prior to competition).

3) Most studies aiming at examining the health aspects of weight reduction methods have methodological limitations. Rapid and significant weight reduction seems to have negative health effects, and weight regain seems to reverse the negative effects.

The performance related effects seems to be related to the weight loss methods reported and the recovery strategies between weigh-in and competition. The results indicate that rapid, one week or less, or short 6-8 weeks, and a significant weight loss (>5%) is associated with a decrease in performance. However performance level seems to be maintained in those athletes practising longer weight reduction strategies (16-17 weeks), adequate rehydration strategies after weigh-in and by following a diet that is well planned. Finally, this review also indicates that athletes competing in weight class sports more often than other athletes suffer from eating disorders.

4) Rule changes with the intention to be in the benefit of the athletes health is done only in high school/college wrestling in USA and ski jumping. The rule change in ski jumping indicates positive health effects since the number of underweight athletes with BMI <18.5kg/m² were reduced from 22.8% in 2002 to 8.7% in 2004/2005.

Conclusions: Research investigating the short and long term health effects of using different weight loss techniques to meet the requirements in their sports is needed. Athletes who consider weight reduction should receive close guiding related to optimal strategies to meet the requirements. Considering a higher weight class should be discussed with athletes. The weight categories in some sports should be changed. Also the weight rules needs to be further considered, such as weigh-in the same day as competition for all the "Weight-rule sports".

PHYSICAL ACTIVITY AND AEROBIC FITNESS IN A SAMPLE OF CHILDREN LIVING IN TIBET

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Background: The physical activity and aerobic fitness levels in children living in Tibet are largely unknown. The present study aimed to determine objectively measured physical activity levels and aerobic fitness using direct measurements of peak oxygen consumption in a sample of children living in Lhasa, Tibet.

Methods: Forty-six 9-10 yr old children (20 boys) living in Lhasa (3658 metre above sea level), Tibet, performed maximal cycling on an electronically-braked cycle ergometer with oxygen consumption measurements. Peak oxygen consumption was defined as aerobic fitness. The participants also wore an activity monitor, SenseWear*TM* Pro2 Armband (BodyMedia, Inc., Pittsburgh, PA, USA) for six consecutive days.

Results: All children fulfilled the physical activity recommendations which recommend children to be daily physically active for at least 60 minutes. Moderate physical activity was significantly higher (p=0.001) in boys (Mean and 95%CI; 5.46 (4.24, 6.68) hours per day) vs. girls (3.40 (2.96, 3.84) hours per day). Also vigorous physical activity was significantly higher (p=0.003) in boys (0.83 (0.38, 1.28)) hours per day) vs. girls (0.24 (0.13, 0.35) hours per day). The boys had significantly higher (p<0.001) aerobic fitness compared to the girls (46.5 (43.2, 49.8) vs. 39.5 (37.5, 41.6) ml/min/kg. Vigorous physical activity was positively associated with aerobic fitness and explained 17% of the variability in aerobic fitness (p=0.02).

Conclusions: The children living in high altitude included in the present study were fit and physically active.

RECOVERY METHODS FOR ELITE TEAM ATHLETES-ARE WE ADDRESSING THEIR NEEDS?

VENTER, R.

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Introduction: Recovery is seen as an essential component of athletic training, and it is often stated that elite performance is only achievable if athletes balance training and competition stress with adequate recovery. A diversity of means to recover have been suggested throughout sports literature due to the supposed physiological and psychological benefits for the athlete. Although the implementation of recovery strategies has become popular amongst athletes, no information exists on the actual reasons why elite team athletes would want to use recovery methods. Therefore, the aim of this study was to determine the main reasons why elite team athletes use recovery methods during the competitive phase of the year.

Methods: A total of 890 club-, provincial- and national-level players from field hockey (n=214), netball (n=213), rugby union (n=317) and soccer/football (n=145) participated in the study. Data were collected once-off by means of a questionnaire specifically compiled for the study. Players had to indicate their main reasons for using various recovery methods after training and after matches.

Results: Although physical recovery methods (such as cryotherapy and contrast temperature therapy) are often emphasised more, results indicated that the team athletes rated methods relating to their social and emotional recovery as more important. A number of reasons why the athletes used physical recovery methods also became clear, such as relieve from muscle soreness, pain and inflammation. Results showed statistically signicifant differences between players from the various sport codes, as well as players from different levels of participation.

Discussion: Two main issues with regard to recovery methods for team athletes are raised. Firstly, team athletes train and compete under unique circumstances and have specific needs with regard to recovery. Are we really addressing their needs in terms of social and emotional recovery? Secondly, controversy surrounds the use of many of the physical recovery methods for the physiological complaints athletes have. Are the use of these methods in a team setting worth the money, time and effort?

HOW DOSE TIMING TRAINING AFFECT GOLF PERFORMANCE?

SOMMER, M., RÖNNQVIST, L.
UMEÅ UNIVERSITY

Introduction: Timing in terms of intra- and inter-limb coordination and control is an important factor for motor skills. It's also a well-built belief in the golf branch that timing is crucial for optimal golf performance. However, it is surprisingly few empirical studies investigating the timing properties of the golf swing and its effect on the outcome accuracy. Hence, the main purpose of this study was to investigate if training by means of synchronized metronome training (SMT), do affect golf performance accuracy. An additional purpose was to investigate the effect of a task-specific swing training method (Explanar®) in comparison with the non-task specific SMT training method.
Methods: Twenty-six experienced male golfers (mean age 27 years; mean golf hcp 12.6) completed pre- and post-test of golf performance. Investigations were made by use of a P3ProGolf simulator and measurements made from the outcome of golf shots and by use of three different golf clubs (investigating the overall accuracy, length versus direction accuracy and outcome variability). The golfers were randomized into two groups: one non-task specific metronome training group, and one task-specific swing training group. Golfers in the metronome group completed a 4-week intervention (Interactive Metronome, 2008) designed to improve their timing/rhythmicity by reducing the latency in their response to a synchronized metronome beat. Golfers in the swing group completed training designed to improve their golf swing characteristics during the same period.
Results: It was found that he golfers' in the non-task specific metronome training group showed a significant effect of SMT training by means of improvements in their motor timing and synchronizations. Additionally, they significantly improved their scores on selected golf accuracy variables and with evidently decreased variability after the 4-week training period. No such improvements were found for the golfers in the swing training group.
Discussion: In agreement with previous findings by Libkuman et al. (2002), this study provides further evidence that timing training leads to improvements in golf performance accuracy. One possible explanation is that SMT increased accuracy because the temporal properties of the golf swing were improved. An alternative explanation is that SMT training does improve the golfers' ability to concentrate and stay in focus. The online motor correction based on feedback may contribute to optimization of timing and organized actions. Thus, IM training seems to affect the person's abilities to inhibit irrelevant stimuli and distracters. These findings have interesting implication for developing complementary "timing training methods" also associated to other sports than golf.

References
Interactive Metronome [Equipment]. (2008).(www.interactivemetronome.com)
Libkuman TM, Otani H, Steger J. (2002). J Gen Psy, 129, 17-20.

CARDIOVASCULAR RISK FACTORS ASSOCIATED WITH SOCIO-GEOGRAPHIC ENVIRONMENT IN AFRICAN CHILDREN AND YOUTH FROM MOZAMBIQUE

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FACULTY OF PE AND SPORTS SCIENCES, UNIVERSIDADE PEDAGÓGICA

Associated with abrupt changes in lifestyle, the importance of cardiovascular disease in morbidity and mortality in Africa is increasing, which recommends surveillance in school-age children and youth. The aim of the present study was to describe, interpret and establish age, sex and socio-geographic trends for cardiovascular risk factors in school age population from Mozambique. Three cross sectional surveys were carried out in the year 1992, 2000 and 2005. Studies were done in an urban and a rural area from Mozambique. Sample's includes a total of 1 939 boys and 2 037 girls , aged 7 to 17 years, classified in 4 socio-geographic groups namely ELITE, URBAN, PERYPHERY and RURAL. Cardiovascular risk factors include BMI, % of FAT, Blood pressure (BP), Cholesterol (CHOL), Cardiorespiratory fitness (CRF) were measured at the three studies using the some standard protocols. Standard criteria for risk classification were used for each variable. Physical activity (PA) was measured by a questionnaire. Prevalence of risk was: BMI =5.4%, FAT=9.6%, CHOL=1.2% and CRF=9.6%. Higher prevalence was in BP (SBP = 16.4; DBP = 11.8). Patterns of CVRF were different according to age, gender and socio-geographic groups and variable. Trend from urban sample's from 1992 to 2000 indicates increasing risk for excess of FAT, BP and low CRF while no changes in CHOL have been observed. PA were significantly associated with CRF and FAT although interacting with socio-geographic position. It was conclude that CVRF are already present in this young age group of sub-Saharan African country, indicating that a rapid epidemiological transition is taking place.

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Oral presentations

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LOW CORE BODY TEMPERATURE DURING ENDURANCE CYCLING: ASSOCIATED NON-OSMOTICALLY REGULATED CHANGES IN URINARY OUTPUT

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Introduction: Our previous field study identified the possibility of different mechanisms contributing to hydration status when cycling in hot and cold environmental conditions (Rose and Peters, 2008). This cross-over laboratory study therefore examined selected vasopressin-induced cardiovascular and renal adaptations to differences in core body temperature during endurance cycling when serum osmolality remained constant.
Methods: After voiding their bladders, 13 well-trained male road cyclists (age: 29.2 ± 6.5 yrs) completed two 90-minute trials at 60 - 65% VO2 max in warm (28.2°C), humid (72.1% relative humidity) and cool (18.3°C), windy (4- 5 m/s) conditions. Subjects were required to

maintain a constant power output in the two trials and ad libitum fluid intake was permitted. Body mass, serum osmolality and concentrations of sodium, potassium, cortisol and glucose as well as urine osmolality and volume were measured pre-and post-trial. During the trials, tympanic temperature, heart rate, blood pressure, blood glucose concentration and serum osmolality were monitored at 15 minute intervals.

Results: Mean power output was insignificantly different (247 ± 25.9 vs. 249 ± 26.2W; $p > 0.05$) between warm, humid and cool, windy trials. Mean post-trial serum osmolality (283 ± 3.8 vs. 285 ± 6.1 mOsm/L), body mass (72.8 ± 9.8 vs.73.5 ± 9.3 kg), haematocrit (45.6 ± 2.6 vs. 46.1 ± 2.8%) and circulating concentrations of sodium (138.4 ± 2.6 vs. 140.9 ±2.7 mmol/L), potassium (4.4 ± 0.4 vs. 4.6 ± 0.4 mmol/L) and glucose (5.2 ± 0.9 vs. 5.1 ± 0.9 mmol/L) were not different between the trials ($p > 0.05$). Mean peak tympanic temperature (38.8 ± 0.7 vs. 35.2 ± 0.8°C), heart rate (174.2 ± 15.3 vs. 149.0 ± 11.3 b/min) and post-trial serum cortisol (717 ± 144 vs. 306 ± 147 nmol/L) were higher in the warm trials ($p < 0.05$). During the cool trials, elevations in systolic and diastolic blood pressure did not differ from those in the warm trials, but urine volume after the trials was significantly greater (488 ± 301 vs. 57 ± 31 ml) and more dilute (osmolality: 435 ± 269 vs. 832 ± 191 mOsm/L), despite a lower fluid intake during these trials ($p < 0.001$).

Discussion: The unchanged body mass, haematocrit and serum electrolyte concentrations and osmolality following both 90-minute trials indicate that euhydration was maintained during the trials. Of greatest interest is the association between the decrease in urine osmolality from pre- to post-trial, the increase in free water excretion and lower serum cortisol concentrations after the cold trial. This suggests possible thermal and/or cortisol–induced non-osmotic regulation of urinary volume and concentration, but not blood pressure. The potential effect of core body temperature on vasopressin release and the likelihood that vasopressin-2 receptors are implicated in the non-osmotic regulation of vasopressin during exercise, require further examination.

Reference

Rose S, Peters EM (2008), British J Spts Med, Published on line:6 June

NO EFFECT OF A DOPAMINE/NORADRENALINE REUPTAKE INHIBITOR ON FIXED INTENSITY AND SELF-PACED CYCLING PERFORMANCE IN THE HEAT.

ONUS, K.J., MARINO, F.E., LIBERTS, E., CANNON, J.

CHARLES STURT UNIVERSITY

Maintaining central neurotransmission is essential in providing the required drive to motoneurons during exercise performance. Recent evidence indicates that inhibiting dopamine and noradrenaline (DA/NA) reuptake by the use of Bupropion (BUP) improves power output during cycling in the heat with an augmented core temperature (Tcore) and similar perception of effort and thermal stress compared to placebo (1). The purpose of this study was to examine the effect of a DA/NA reuptake inhibitor during fixed and self-paced exercise in HOT (32.04±1.1°C, 65.8±1.7% relative humidity) and COOL (20.09±0.5°C, 47.9±2.7% r.h.) conditions. Eight healthy, active male subjects (22.1±5.4 years) completed a 30 min fixed power cycling trial with 30 s sprints at each 9.5 min interval, followed by a 30 min self-paced time trial (TT) with 30 s sprints at similar intervals. The study was single blind, placebo controlled, crossover design with groups referred to as: Bupropion (BUP) or Placebo (PLA) in a single blind fashion.

There was no significant difference in distance cycled for the fixed power output trial (16.09 – 17.03 km, $p > 0.05$) nor for the self-paced performance trial (12.36 – 13.0km, $p > 0.05$) among conditions. Tcore increased significantly over time for each condition during the fixed-power trial. However, Tcore was significantly higher for BUP in both the HOT and COOL condition during the fixed power trial compared to PLA. Tcore continued to rise during the subsequent TT for BUP only in the HOT condition, whereas Tcore declined for BUP in the COOL condition, to values similar to pre-exercise. Skin temperature increased significantly during HOT to ~ 35.5°C and was significantly different from COOL (~31°C, $p > 0.05$). Rating of thermal sensation increased over time for both fixed-power and TT but was significantly higher for the HOT condition. Heart rate increased similarly for each condition during the sprints in both the fixed-power and TT. Perceived exertion (RPE) increased in each condition and peaked during the sprints but was significantly higher for BUP at the end of the TT in the heat.

These findings suggest that the use of a DA/NA reuptake inhibitor alters thermoregulation, but this alteration does not provide for enhanced performance either in HOT or COOL conditions and that performance at least over 30 min in a self-paced mode is possibly independent of thermoregulatory responses.

1. Watson, P., et al. Acute dopamine/noradrenaline reuptake inhibition enhances human exercise performance in warm, but not temperate conditions. J Physiol. 565:873-883, 2005.

UTILITY OF THE PHYSIOLOGICAL STRAIN INDEX WHEN APPLIED TO OUTDOOR DISTANCE RUNNING IN A WARM-HUMID ENVIRONMENT

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UNIVERSITY OF EXETER

The physiological strain index (PSI) based on core temperature (Tc) and heart rate (HR) has been proposed as a universally acceptable means of quantifying, on a scale of 0-10, the combined load on the thermoregulatory and cardiovascular systems during exercise in environmental heat (Moran et al., 1998). The aim of this study was to quantify and assess the utility of the PSI during outdoor mass-participation distance running in a warm-humid environment. Twenty four heat-acclimatized professional soldiers competing in the Singapore Army half-marathon volunteered with informed consent to participate in this ethics committee approved study. The runner's mean (SD) age, stature, body mass, and maximal oxygen uptake were: 26 (3) y; 1.72 (0.05) m; 65.4 (6.3) kg; and 59 (5) ml/kg/min, respectively. Each runner wore a heart rate monitor and ingested a telemetric temperature sensor for the continuous measurement of HR and Tc, respectively. The PSI was calculated at minute intervals by the standard formula: $PSI = [5(Tct - Tc0) / (39.5 - Tc0)] + [5(HRt - HR0) / (180 - HR0)]$; where Tct and HRt are simultaneous measurements at any time and Tc0 and HR0 are the initial measurements. Ambient temperature and humidity during the race were 26.4 (0.4)°C and 81 (1)%, respectively. All volunteers finished the race asymptomatic of heat illness in a duration of 107 (10) min, corresponding to a mean velocity of 11.7 (1.0) km/h. Peak Tc was 39.7 (0.5)°C, with 66% of runners experiencing Tc greater than the PSI formula maximum of 39.5°C. Peak HR was 186 (6) beats/min with 83% of runners experiencing HR greater than the PSI formula maximum of 180 beats/min. The PSI was 6.9 (0.7) at 15 min and increased significantly (up to 90 min) and progressively throughout the race i.e. 8.3 (0.9) at 30 min ($P<0.001$), 9.1 (1.4) at 60 min ($P=0.003$), 9.8 (0.3) at 90 min ($P=0.011$), and 10.3 (1.8) at race finish ($P=0.067$). Fifty eight percent of runners experienced a PSI greater than the theoretical maximal value of 10. Our results suggest the Tc and HR constraints of PSI (i.e. 39.5°C and 180 beats/min) are too low for the current application involving trained heat-acclimatized distance runners competing in environmental heat. Calibration of the PSI formula with an individual's true maximum HR and

a more realistic maximal Tc is likely to improve the utility of the index. For the latter, a value of 41°C represents a more realistic maximal Tc for trained and acclimatized distance runners competing in environmental heat (Byrne et al., 2006).

Byrne C, Lee JKW, Chew SAN, Lim CL, and Tan EYM. Continuous thermoregulatory responses to mass-participation distance running in heat. Med Sci Sports Exerc 38: 803-810, 2006.

Moran DS, Shitzer A, and Pandolf KB. A physiological strain index to evaluate heat stress. Am J Physiol 275: R129-R134, 1998.

EFFECT OF A LOWER BODY COMPRESSION GARMENT ON RUNNING PERFORMANCE IN COLD AND HOT ENVIRONMENTS

GOH, S., NOSAKA, K., DASCOMBE, B., LAURSEN, P.

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Introduction: Lower body compression garments (LBCG) are popular attire worn amongst high performance athletes and the general sporting population. Only two previous studies have investigated the effect of LBCG on endurance running performance. One study [1] showed improvement in running economy with LBCG; the other [2] did not find an effect on 10 km running performance. Due to the potential insulatory and thermal effects that LBCG could have during exercise, LBCG should be examined under different ambient temperatures. The purpose of the present study was to investigate the effect of LBCG on sub-maximal and maximal running performance in hot and cold environments.

Methods: Ten male recreational runners (19 - 44 y, VO2max: 56 - 64 ml/kg/min) performed 4 running performance tests (20 minutes at first ventilatory threshold [VT1], followed immediately by a run to exhaustion at VO2max running speed [v.VO2max]) under 4 different conditions (10°C with LBCG, 10°C without LBCG, 32°C with LBCG, 32°C without LBCG) in a random order. Changes in oxygen consumption (VO2), heart rate, rating of perceived exertion (RPE), blood lactate and skin and rectal temperature were compared with (LBCG) and without LBCG (CONTROL) for each temperature separately using a two-way repeated measures ANOVA. Time to exhaustion (TTE) was compared between conditions with a paired t-test. Significance was set at $p<0.05$.

Results: TTE was not significantly different between LBCG and CONTROL at either 10°C (158  74 vs. 148  73 s) or 32°C (115  40 vs. 97  33 s). Most physiological parameters examined during sub-maximal and maximal running were not significantly different between conditions for both ambient temperatures. However, RPE during sub-maximal running at 32°C was significantly lower for LBCG (13.8  2.0) compared with CONTROL (14.5  2.7), and skin temperature following the 10°C maximal running trial was significantly higher ($p=0.007$) in the LBCG (27.9  0.8°C) versus CONTROL (26.4  1.2°C) condition.

Discussion: The present study found no significant influence of LBCG on TTE and running economy irrespective of ambient temperature. The lower RPE found for the LBCG condition is difficult to explain, as we hypothesized that LBCG would have an adverse effect in a hot environment as a result of an assumed insulatory effect. It is possible that athletes might 'feel better' when wearing LBCG, even in the heat. In conclusion, LBCG had no beneficial or adverse effects on maximal or sub-maximal running performance in hot or cool environments.

References

1. Bringard, A., Denis, R., Belluye, N., & Perrey, S. (2006). Effects of compression tights on calf muscle oxygenation and venous pooling during quiet resting in supine and standing positions. J Sports Med Phys Fitness, 46, 548-54.

2. Ali, A., Caine, M.P., & Snow, B.G. (2007). Graduated compression stockings: physiological and perceptual responses during and after exercise. J Sp Sci, 25, 413-9.

URINARY EXCRETION OF 8-HYDROXY-2´-DEOXYGUANOSINE <8-OHDG> AS A BIOMARKER OF OXIDATIVE STRESS IN ULTRA-MARATHON RUNNERS

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Introduction: During the resting state the human body continuously produces reactive oxygen species (ROS), but in healthy individuals these ROS are produced at levels well within the capacity of the body's antioxidant defence system. Strenuous physical activity increases oxygen uptake which may result in the production of ROS at rates that exceed the body's capacity to detoxify them. DNA, proteins and lipids are known to be the biological targets of oxidative damage [1]. In a recent study we have shown that mRNA levels of cell protective (Hsp70 and Hsp32) as well as pro-apoptotic (Bax) genes increased whereas Bcl-2 mRNA (anti-apoptotic) decreased in monocytes of ultra-endurance runners. Levels of cell-free plasma DNA were significantly increased immediately post race [2]. The present study was designed to investigate whether the stress of a six hours ultra-marathon running event can induce oxidative DNA damage in trained runners as assessed by comparing urinary 8-hydroxy-2´-deoxyguanosine (8-OHdG) pre- and post race.

Methods: Resting and post-exercise spot urine were sampled from 13 healthy hobby ultra-endurance athletes, all non-smokers (age: 47.5 ± 5.5 years) that had been engaged in endurance training and competition for 10.5 ± 6.4 years before submitted to the trial. Urinary 8-OHdG was measured by an enzyme-linked immunosorbent assay according to the assay kit instructions provided by the manufacturer (Japan Institute for the Control of Aging, Fukori, Japan).

Results: Baseline urinary levels of 8-OHdG were within the normative range of healthy people and increased significantly from pre- to post-race (pre-race: 4.5 ± 1.4 nmol/mmol creatinine; post-race: 6.3 ± 1.4 nmol/mmol creatinine; $p<0.001$). In 12 out of 13 subjects, post-race elevations were within the physiological reference range as provided by the manufacturer.

Conclusion: Strenuous endurance exercise in middle-aged recreational runners induces a significant elevation of urinary 8-OHdG indicating the challenging of the body's antioxidant defence system. Although elevated, 8-OHdG levels did not exceed the normal physiological range.

References:

[1] Powers SK, Jackson MJ. Exercise-induced oxidative stress: cellular mechanisms and impact on muscle force production. Physiol Rev. 2008;88(4):1243-76.

[2] Atamaniuk J, Stuhlmeier KM, Vidotto C, Tschan H, Dossenbach-Glaninger A, Mueller MM. Effects of ultra-marathon on circulating DNA and mRNA expression of pro- and anti-apoptotic genes in mononuclear cells. Eur J Appl Physiol. 2008;104(4):711-7.

DOES EXERCISE IN HOT ENVIRONMENTAL CONDITION IMPAIR DETECTION OF ERYHROPOIETIN DOPING?

CAILLAUD, C., TROUT, G., HOWE, C., SIMAR, D., FATSEAS, G., KAZLAUSKAS, R.

THE UNIVERSITY OF SYDNEY

The abuse of recombinant erythropoietin to stimulate red blood cells synthesis and to improve physical performance is a major concern and improving rHuEPO detection is a real challenge. The current detection method approved by the World Anti-Doping Agency (WADA) is based on the analysis of erythropoietin (EPO) isoforms distribution in urine. A concern has recently been raised as whether strenuous prolonged exercise performed in hot environmental conditions may or not alter native EPO synthesis, EPO excretion or urine isoform distribution. This study was designed to test whether intense exhaustive exercise performed in hot condition will: change haematological parameters; modify EPO isoforms distribution in urine; impair rHuEPO detection via increased excretion of basic isoforms and/or increased protein concentration.

After an initial maximal exercise test, 6 highly trained cyclists (26.5 (5) yrs, VO2max:61.1 (4) ml/kg/min) performed 1 hour's cycling at 70% VO2max in the heat (35oC, 40% rh). The participants then started the acclimatisation period: during 6 consecutive days they did 60 min of cycling exercise at 70% VO2max in hot condition. Blood and urine samples were collected pre and 1hr post exercise during the first and the last exercise session. Haematocrit (Hct), Haemoglobine concentration ([Hb]), EPO were measured and ON-hes and OFF-hre models were calculated. Urine was analysed for EPO isoforms according to current recommendations by wada and updated by wada technical document TD2007EPO. Pre acclimatisation, exercise did not significantly changed [Hb], Hct or models scores ([Hb]: 149.7 (13.6) vs 150.8 (7.5) g/l; Hct: 0.459 (0.04) vs 0.461 (0.03); ON-hes: 171 (22) vs 173 (22); OFF-hre: 84.5 (9) vs 86.3 (4). Post acclimatisation all variables declined post exercise ([Hb]: 148.2 (11.4) vs 141.2 (11.6) g/l; Hct: 0.452 (0.04) vs 0.426 (0.03); ON-hes: 171 (17) vs 163 (13); OFF-hre: 78.8 (5) vs 74.1 (9)). None subjects reached critical cut off levels for identification of EPO doping. Our haematological data support previous reports and demonstrate that 6 days of intense exercise in hot condition do not significantly change variables used in the indirect detection of rHuEPO doping. Some of the changes observed are opposite of those expected to be induced by rHuEPO abuse. Results from urine samples were analysed using both the current peak ratio criteria (B2:E) and the older criteria consisting in the percentage of basic isoforms. We did not find any sample approaching the criteria required for the identification of rHuEPO. The results do not support a hypothesis that acute or chronic exercise in hot environment might impair rHuEPO detection through shifts in the distribution of EPO isoforms. In conclusion this study shows that vigorous aerobic exercise performed in the heat for several consecutive days does not lead to false positive cases of EPO doping.

10:15 - 11:45

Oral presentations

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FREELY CHOSEN CADENCE AN GROSS EFFICIENCY DURING ERGOMETER AND FREE BICYCLING

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Introduction: Freely chosen cadence (FCC) may be regarded a fixed parameter, robust for many conditions. The effect of work rate on FCC is unclear: Some studies provide evidence for a modest increase, while others report FCC not to change with work rate. Many laboratory studies are performed on a bicycle ergometer, using a fixed work rate that is independent of the cadence that is chosen. The mechanism that links cadence and work rate differs from the mechanism that applies in free cycling, where both cadence and gears can be used for attaining a certain work rate. The purpose of this study was to examine the effect of the type of regulation of work rate on the relationship between this work rate and FCC and gross efficiency.

Methods: 18 male well trained cyclists participated in the study. One group, free cycled (FC) on their own competition bike mounted on an electromagnetic roller, could use gearing and cadence to achieve each power output level, imitating outdoor cycling. The other group (EC) performed the same protocol on an ergometer with a computer controlled electro-magnetic brake mechanism that generates a constant work rate, independent of cadence. Subjects performed an increasing work rate protocol from 100W up to exhaustion, with a 50W increment every 2 minutes. Pedal rate, oxygen consumption, and heart rate were measured continuously.

Results: Statistical analysis showed a strong interaction between group and work rate on cadence ($p<0.001$). In the FC group work rate affected cadence ($p<0.001$), cadence increasing from 72 rpm at 100W to 106 rpm at 350W. For the EC group, no work rate effect was present (average FCC 92 rpm). Gross efficiency increased with work rate for both groups. The efficiency-cadence relationship was strongly affected by the protocol. At a given work rate, very similar efficiency values was obtained at highly different cadences.

Discussion: The discrepancy in the FCC-work rate relationship between the EC group and the FC group in the present study may be related to the manner in which one can regulate work rate. FCC does not only depend on work rate but is affected considerably by the manner work rate can be (or not) controlled by cadence. This finding may have important implications for the interpretation of the preferred pedaling rate, especially how this is related to optimizing metabolic cost. Thus, a mismatch between the most efficient and preferred cadence, as found in some studies, may be caused by the way cadence on work rate are controlled. Some suggest that the most efficient cadence increases with work rate and that the preferred one does not. Thus, at relatively high work rates, when metabolic costs become a critical factor, the preferred cadence may be similar to the most efficient. However, this hypothesis is based on results mainly from ergometer studies. The present study indicates a different situation for free cycling: cyclists may prefer a higher than most efficient cadence also at high intensity.

THE KINETIC OF QUADRICEPS MUSCLE FATIGUE DEVELOPMENT DURING CONSTANT-LOAD CYCLING

VERGES, S., DECORTE, N., LAFAIX, P.A., MILLET, G., WUYAM, B.

JOSEPH FOURIER UNIVERSITY AND GRENOBLE UNIVERSITY HOSPITAL; JEAN MONNET UNIVERSITY, SAINT-ETIENNE

Introduction. Exercise-induced muscle fatigue has been Introduction. Exercise-induced muscle fatigue has been mostly investigated at exhaustion, i.e. reporting the reduction in force immediately after exercise compared to resting measurements. The kinetic of fatigue development during exercise remains however unclear and may help to better understand the mechanisms of fatigue and task failure. To study the kinetic of quadriceps fatigue development, we used the magnetic stimulation techniques we recently validated (1) during an intermittent constant-load cycling exercise performed until exhaustion.

Methods. Thirteen subjects cycled at 80% of maximal power output with, every 6 min of exercise, a 4 min break to assess quadriceps fatigue with maximal voluntary contractions, single (1Hz), paired (10 and 100Hz) potentiated and interpolated stimulations of the femoral nerve. Electromyographic signal (EMG) of the quadriceps was recorded during stimulations and during cycling. Handgrip strength as well as ventilation, gas exchange, blood lactate and rate of perceived exhaustion during cycling were also measured.

Results. Subjects cycled for a total of 31.2 ± 7.5 min. The force ratio of stimulations at 10/100Hz was significantly reduced after the first 6 min of cycling compared to rest (0.84 ± 0.14 vs 1.03 ± 0.16; $p < 0.001$) while it did not decrease significantly anymore until exhaustion (0.74 ± 0.14). Maximal voluntary activation was significantly reduced compared to rest at exhaustion only (86.3 ± 6.5% vs 92.3 ± 4.2%; $p < 0.001$). Handgrip strength did not change significantly throughout the protocol ($p > 0.05$). Root mean square of the vastus lateralis EMG was significantly increased compared to the first minute of cycling from the end of the second 6 min bout (last min of second bout: +63 ± 101%; last min of exercise: +91 ± 100%; $p < 0.001$). The amplitude of force decrement and EMG increases during cycling did not correlate throughout the protocol.

Conclusion. We concluded that peripheral low frequency fatigue mainly developed early during constant-load intense exercise, while central fatigue seems to be rather associated with task failure.

1. Verges S, Maffiuletti NA, Kerherve H, Decorte D, Wuyam B and Millet GY. J Appl Physiol 106:701–710, 2009

HEART RATE RECOVERY AS A GUIDE TO PREDICT FATIGUE AND CHANGES IN PERFORMANCE PARAMETERS.

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UNIVERSITY OF CAPE TOWN

Background

Determining the optimal balance between training load and recovery is part of achieving peak performances in well-trained and elite athletes. In the process of monitoring this balance, the measurement of heart rate recovery (HRR) after exercise has shown to be responsive to recently applied training loads (1,2). However, the link between a decrease in HRR, fatigue and an impairment in performance, has not been confirmed. Therefore, the aim of this study was to monitor HRR and cycling performance in a group of well-trained cyclists who participated in a 4 week high intensity training (HIT) program.

Methods: Fourteen well-trained cyclists participated in a 4 week program consisting of 8 HIT sessions. Before and after the training period peak and endurance parameters were measured. HRR was measured after each HIT session (HRRHIT) and expressed a relative change compared to after the first HRRHIT. Retrospectively cyclists were assigned to a group that continuously increase their HRRHIT (GIncr) or a group that showed a decrease in HRRHIT (GDecr).

Results: The relative peak power output improved in both groups had (GIncr; $P = 0.001$ and GDecr; $P = 0.016$, respectively), as did parameters of endurance performance ($P = 0.001$ and $P < 0.048$, respectively). A significant interaction effect of Group X Time was found for 40-km TT power ($P = 0.010$), indicating that GIncr improved significantly more than GDecr after the HIT period. Improvement in 40-km TT time showed a similar tendency and although effect size statistics showed a "moderate" to almost "large" chance that this difference is clinically meaningful, this effect was not statistically significant ($P = 0.059$).

Conclusions:

This is the first study show that a decrease in HRR after exercise, during a HIT training period, is associated with a blunted improvement in endurance performance. However, changes peak performance seem initially to be unaffected. This suggests that a decrease in HRR, which possibly reflects accumulative fatigue (3,4), initially compromises endurance performance rather than peak performance. Therefore, HRR has the potential to monitor changes in endurance cycling performance and contribute to a more accurate prescription of training load in well-trained and elite cyclists.

References

1.Buchheit M, Papelier Y, Laursen PB, et al. Noninvasive assessment of cardiac parasympathetic function: postexercise heart rate recovery or heart rate variability? Am.J Physiol Heart Circ.Physiol 2007;293, H8-H10.

2.Lamberts RP, Swart J, Noakes TD, et al. Changes in heart rate recovery after high intensity training in well-trained cyclists. Eur.J Appl.Physiol 2008; (Ahead of Publication)

3.Borresen J, Lambert MI. Changes in heart rate recovery in response to acute changes in training load. Eur.J.Appl.Physiol 2007;101, 503-511.

4.Halson SL, Bridge MW, Meeusen R, et al. Time course of performance changes and fatigue markers during intensified training in trained cyclists. J.Appl.Physiol 2002;93, 947-956.

RELATION OF MYOELECTRIC AND OXYGENATION CHANGES DURING FATIGUING ISOMETRIC CONTRACTIONS

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Introduction: Near infrared spectroscopy (NIRS) allows to study local muscle oxidative metabolism in a noninvasive way. By combining NIRS measurements with surface EMG data, we investigated the relation of electromyographic and oxygenation changes during isometric contractions in various muscles.

Methods: 33 athletes from three different sport disciplines (rowing, volleyball and karate) participated in the study. The athletes were asked to perform isometric exercises with different muscles at 50% of maximal voluntary contraction force as long as possible. Task failure was assessed by visualization of force output level on a computer screen. NIRS and EMG recordings were obtained from the flexor digitorum superficialis, biceps brachii and vastus lateralis muscles. For evaluation of the lower back muscles a modification of the Bier-

ing-Sorensen muscular endurance test with 15 degrees forward bend was used: NIRS and EMG were recorded bilaterally from the center of the erector spinae muscle at the level L3.

For analysis of the NIRS data, least square regression lines were computed and inflection points between different slopes were identified. For analysis of the EMG the median frequency (MDF) of the power spectrum was computed by the Fast Fourier Transform on sequential epochs. Additionally, we used a novel nonlinear approach by tracing the changes of the instantaneous frequency with maximum power (MPF) in the Morlet wavelet based time-frequency distribution (mTFD).

Results: An identical pattern was found in all NIRS and EMG measurements. Muscle oxygenation showed an initial rapid decrease (RD) followed by a long lasting plateau (LP). During the RD phase both MDF and MPF remained constant on a high frequency level. During the LP phase both MDF and MPF showed a linear decrease, mostly beginning at half time of the entire contraction. The time ratio of RD/LP was significantly correlated to the frequency decrease.

Discussion: Our results contradict studies reporting coincidence and correlation of the decay of oxygenation during the RD phase and decrease of MDF in the EMG (1). In our study, during this first phase (RD) the decay of oxygenation was not correlated with myoelectrical activity. Only during the second LP phase of the fatiguing isometric contractions the EMG power spectrum shifted to lower frequencies. Although the local tissue oxygen content now remained constant, the developing fatigue was characterized by this myoelectrical alteration. Thus, we strongly recommend the use of nonlinear time series analysis, e.g. wavelet power spectrum, for tracking the instantaneous frequency changes in the EMG.

References

1) Felici F, Quaresima V, Fattorini L, Sbriccoli P, Filligoi GC, Ferrari M. J Electromyogr Kinesiol 2009; 19(2), e1-e11

EFFECTS OF INCREASED EXTRACELLULAR POTASSIUM AND LACTIC ACID ON DYNAMIC MUSCLE CONTRACTIONS IN ISOLATED RAT SOLEUS MUSCLES

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Introduction: It is well known that in muscles, increased extracellular potassium concentration ([K+]o) reduces excitability and isometric force. [K+]o is, therefore, considered an important factor in muscle fatigue. The effects of [K+]o on dynamic muscle function parameters such as maximal power or maximal unloaded velocity (Vo) are, however, not extensively studied. Knuth et al. (2006) observed that a reduction in muscle fiber pH to 6.2 gave a larger decrease in maximal power than expected from the loss of isometric force. This was explained by pH affecting maximal unloaded velocity (Vo) and the curvature of the FV relation. In contrast, the effects of high [K+]o on muscle isometric force and excitability have been shown to be alleviated by lowering pH with lactic acid (LA) (Nielsen et al., 2001). The present study was undertaken to investigate the effects of [K+]o and combinations of [K+]o and LA on dynamic muscle function.

Methods: Soleus muscles from 4 wk old Wistar rats were isolated and incubated in standard K.R. buffer at 30°C initially containing 4 mM K+ and equilibrated with 95% O2/5% CO2 (pH 7.4). Muscles were mounted on a force/length controlled dynamometer (305B, Aurora inc., Canada) at Lo. Muscles were stimulated every 10 min with 1.5 sec pulse trains (60 Hz) to obtain tetanic activation. Muscles were held isometric until force was fully developed, where after the resistance was reduced to preset force levels in brief steps (0.2s sec) and length changes were recorded over time. Data points for force and velocity were used to construct FV curves by fitting to the Hill equation. Maximal power was calculated from the Hill plots. During the experiment [K+]o was increased from 4 to 9 mM and subsequently 20 mM LA was added (reducing buffer pH to 6.9).

Results: Increasing [K+]o from 4 to 9 mM reduced maximal power by 64±7% (mean±sd), which was significantly more than the 50±10% reduction seen in isometric force ($P<0.05$, n=4). The Vo obtained from extrapolation of the Hill curves was not significantly changed by increased [K+]o (18,4±2,0 mm/s vs 19,0 ±2,1 mm/s, $P>0.05$). When 20 mM LA was added to the 9 mM K+ buffer, the isometric force and maximal power recovered completely to the level initially obtained in 4 mM K+. LA did not significantly affect Vo.

Discussion: Maximal power was substantially decreased by increasing [K+]o and this decrease was relatively larger than the reduction in isometric force. Since Vo was not reduced by 9 mM K+ the relatively large reduction in power may be due to an increased curvature in the FV relation. The effect of 20 mM LA added to muscles in 9 mM K+ was a complete recovery of dynamic contractile function. At the concentrations used here, LA protects dynamic muscle function against the deleterious effects of high [K+]o, and no fatiguing effects of LA were found in muscles contracting dynamically.

References

Nielsen OB, de Paoli FV, Overgaard, K. (2001). J Physiol, 536, 161-166.

Knuth ST, Dave H, Peters JR, Fitts RH. (2006) J Physiol, 575, 887-899.

TRAINING INDUCED CHANGES IN TENDON MECHANICAL AND MATERIAL PROPERTIES ARE RELATED TO MUSCLE HYPERTROPHY, NOT TO STRENGTH GAINS.

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The design of tendinous structures determines their interaction with the muscle (2) and the coordination of the changes occurring in both structures is critical to the preservation of muscle-tendon unit function. To get a better understanding of the effect of chronic overloading on human tendon, we investigated the relationships between the structural and mechanical adaptations of the patellar tendon and of the quadriceps femoris muscle in response to strength training.

Fifteen healthy male subjects (20 ± 2 yrs) underwent 9 weeks of knee extension resistance training. Tendon load-deformation properties were measured with ultrasonography during a ramp maximal isometric contraction, and tendon cross-sectional area (CSA) was determined along the entire length of the tendon by using magnetic resonance imaging (MRI). Maximal isometric force was measured at the optimal knee joint angle of force production. The physiological CSA (PCSA) of the quadriceps femoris muscle group was obtained by combining measurements of muscle volume (MRI) and architecture (ultrasound).

Following training, muscle force and PCSA increased by 31% ($P < 0.0001$) and 7% ($P < 0.01$), respectively. Increases in tendon CSA were observed in regions corresponding to 20%, 30%, 60%, 90% and 100% of the tendon length (5-6%, $P < 0.05$), and tendon stiffness and modulus increased by 24% ($P < 0.001$) and 20% ($P < 0.01$), respectively. None of the changes in tendon mechanical properties or CSA were related to the increase in maximal force. However, we observed a positive correlation between the increase in quadriceps PCSA

and the increases in tendon stiffness (r = 0.68, P < 0.01) and Young's modulus (r = 0.75, P < 0.01). Unexpectedly, the increase in muscle PCSA was inversely related to the mean increase in tendon CSA (r = -0.64, P < 0.05).

These data show that patellar tendon hypertrophy is prominent near but not limited to osteo-tendinous junctions. The positive relationships between increases in tendon stiffness and modulus and muscle PCSA, but not with maximal force, suggest that changes in tendon mechanical and material properties to overloading are closely related to the loading history, rather than to the increase in maximal stress that can be exerted upon the tendon. The inverse correlations between changes in tendon mean CSA and in muscle PCSA, or lack thereof, implies that the mechanisms underlying acute tendon hypertrophy are different than those responsible of the increase in tendon dimensions with development (1).

1. Elliott DH, and Crawford GN. The thickness and collagen content of tendon relative to the cross-sectional area of muscle during growth. Proc R Soc Lond B Biol Sci 162: 198-202, 1965.

2. Lieber RL, and Friden J. Functional and clinical significance of skeletal muscle architecture. Muscle Nerve 23: 1647-1666, 2000.

10:15 - 11:45

Invited symposia

IS-SS10 Physical Education, Obesity and Health - Critical Perspectives

GOVERNING BODIES: BIO-PEDAGOGIES AND THE OBESITY EPIDEMIC

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The idea of an 'obesity epidemic' has taken hold internationally with widespread media attention, government health initiatives and interventions at a range of levels (from health to education) and changes in school policies and practices. In this presentation I will make the argument that the 'obesity epidemic' and associated practices depend on a range of pedagogies that affect contemporary life at both the level of the individual and the population. The concept of 'bio- pedagogies' will be introduced as a means to conceptualise how these pedagogies function. The notion of bio-pedagogies is drawn from Foucault's (1987) concept of 'biopower', the governance and regulation of individuals and populations through practices associated with the body. Bio-pedagogies not only place individuals under constant surveillance, but also press them towards increasingly monitoring themselves, often through increasing their knowledge around 'obesity' related risks/issues, 'instructing' them on how to eat healthily, and stay active and contributing to affective investments in the ways children and young people come to think about themselves and their bodies. The presentation will report on the first steps in the theorising of the results of a joint UK, Australian and New Zealand project, which investigated the impact of the new 'health imperatives', or as we have come to call them 'biopedagogies', associated with the rhetoric of the 'obesity epidemic' on schools and school students. The shared purpose of the project is to explore how schools have taken up and recontextualised the new health imperatives within their policies and practices, and how this has impacted upon students' lives.

SAVING YOUNG PEOPLE FROM OBESITY - FOR THE GOOD (?) OF THE SOCIETY

QUENNERSTEDT, M.

ÖREBRO UNIVERSITY

Over the past two decades there has been a worldwide reappearance of interest in health education and the health of young people both from educators and from politicians. In the light of the western world's growing population of aging people and the difficulty with obesity and other health problems, focus has been given to education as a tool for creating healthy citizens in terms of ready-made lifestyles and healthy behaviours.

Although the evidence about young people's health and participation in physical activities is inconclusive, young people, as "the coming future", have become a principal target of government initiatives aimed at countering the perceived trend of increasing ill-health.

In the presentation media texts, video games (exergaming), school curricula and research on health education is used to illustrate a possible shift towards a more individualistic, instrumental, biomedical, but also a more morally normative health approach directed towards behavioural change, disease prevention, individual lifestyle choices and in that sense teaching young people to be healthy. The consequences of this is now revealing itself in schools regarding running 'fat laps' for overweight children (Australia), special PE for overweight students (Sweden), governmental health surveillance through BMI (USA, UK) and daily physical activity in schools using unfounded walks without content where energy in/out constitute the central rationale for the implementation of the activity.

However, an alternative to conceiving good health as something that can be defined by politicians, researchers, public health policies, sport federations and the media, set up as an aim for young people to achieve, is instead to conceive health in the context where they live, learn and flourish in terms of learning health. Learning health, then, is something you continuously do, as a practice and not as an outcome. To overcome individualism and instrumentalism in health education we need to discuss learning as situated in young peoples lives as well as in a wider social, cultural, political context. In this way health is also regarded as a societal responsibility in terms of that the wider context provides opportunities to be healthy and to learn healthy living. This way of conceiving health and health education is clearly supported by school curricula in several countries (e.g. New Zealand and Sweden). However, the national curricula also opens up for health education reduced to consumerism practices where we turn over the health messages to young people to private enterprise, media, sports organizations, fitness people and TV programs like 'down size me'.

In research, if we are to understand the construction of school health knowledge, we have to go beyond the instrumentalism and individualism of health education and health policy and as researchers take an interest in how young people learn health and in what ways they have the possibility to be healthy and to develop health.

WHAT MESSAGES ARE YOUNG NORWEGIANS LEARNING ABOUT HEALTH AND FITNESS IN SCHOOL PE?

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NORWEGIAN SCHOOL OF SPORTS SCIENCES

In 2005, the Norwegian government launched an action plan designed to increase the population's physical activity levels due to evidence that Norwegians are "succumbing to the health-impairing lifestyle of post-modern society …that among other things involves a decrease in the level of activity"(NM, 2005:2). The strategy document was the product of eight ministries' efforts to produce a "national mobilisation in order to promote improved public health through increased physical activity" (NM, 2005:3), not least with the intention of reducing incidents of coronary heart disease and an acknowledgement of the World Health Organisation's declaration about a global obesity epidemic. Schools were seen as prime sites for providing knowledge about, and influencing attitudes towards, regular physical activity because they represent an arena in which children and adolescents participate irrespective of socio-economic inequalities, which are known to affect activity levels. As the action plan states, "Society is able to affect individual decisions … and it should indeed exploit every opportunity of positive persuasion" (NM, 2005:6). A revised national curriculum for Physical Education (PE) was passed the following year, echoing many of the sentiments of the action plan. PE lessons should provide all pupils with positive experiences of play, sport, dance and outdoor pursuits with the aim to nurture lifelong active lifestyles, and from aged 13 years, pupils should in particular learn (both theoretically and practically) about how to get fit and remain fit, as well as learning about the relationship between physical activity, lifestyle and health. Indeed, one third of curricular time should be allocated to learning about training and lifestyle.

This paper will explore how a sample of young people has experienced the teaching of health and fitness in the upper secondary school system. It draws upon qualitative data generated from in-depth interviews with ten pupils, which were tape-recorded and later transcribed verbatim. Using a critical discourse analysis approach (MacLure, 2003) it aims to problematise the taken-for-granted nature of the 'truths' about physical activity and health which are described above, because as critical pedagogues we fear that the dominance of exercise science and neo-liberal individualist discourses in the texts, together with a lack of socio-cultural perspectives, can too easily result in young people being exposed to so-called 'perfection codes' which stress autonomy, self-responsibility, self-surveillance and control, rather than nurturing 'good' health.

References

Norwegian Ministries, (2005) The Action Plan on Physical Activity 2005-2009. Oslo: Government Publications.

MacLure, M. (2003) Discourse in Educational and Social Research. Buckingham: Open University Press.

PHYSICAL EDUCATION AND HEALTH IN SWEDEN – A TENSION BETWEEN PUBLIC HEALTH DISCOURSES ABOUT PHYSICAL HEALTH AND SCHOOL DISCOURSES ABOUT LEARNING OUTCOMES

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In Sweden, as in several countries world wide, the school subject Physical education and health (PEH) is often viewed as a part of a strategy to solve acute public health problems, such as the alleged emerging obesity epidemic (for an overview, see Wright [Ed.] 2008). As such, a PEH lesson is primarily viewed as successful from the point of view of the duraton and intensity of the physical activity.

At the same time, Swedish school policy is emphasising knowledge and (assessable) learning outcomes in all school subjects – also in subjects that were conventionally seen as practical-asthetical. This creates a tension between the public health discourse, where a 'good pupil' participates – and preferably gets sweaty with a smile in his/her face – and the school discourse, where a 'good pupil' is supposed to learn something.

Of course, there is no 'natural' opposition between public health discourses and school discourses. Pupils learn certain things from being physically active, and being physically active also, arguably, promotes learning. However, recent research within the research program School-Physical education-Health (SIH-program; Larsson & Redelius 2008) show that a rather one-sided emphasis on physical activity in terms of public health has made it very difficult for physical education teachers and pupils to engage with the issue of formulating what learning is supposed to come out of being physically active during a PEH lesson.

A preliminary interpretation of this situation is that the public health discourse 'works well' with both a physiology discourse and a sports discourse – ways of reasoning about physical activity within PEH that used to dominate the subject during the latter part of the 20th century – in a way that is not significant for the relation between public health discourses and school discourses of learning. While the latter embraces constructivist perspectives on pupils (the body) and learning (movement, physical literacy), the former all embrace positivist notions about the body and physical activity.

References

Larsson, Håkan & Redelius, Karin. 2008. Swedish physical education research questioned. Current situation and future directions. Physical Education and Sport Pedagogy, Vol.13, No.4, pp. 381-398.

Wright, Jan (Ed.). 2008. Biopolitics and the Obesity Epidemic. Governing Bodies. London: Routledge.

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Oral presentations

OP-ST04 Sports 4

THE EFFECT OF BODY ORIENTATION ON CYCLING TECHNIQUE

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The present study was undertaken to test the hypothesis that the pedal technique in cycling is unaffected by body configuration and orientation factors like seat position and climbing conditions. To test this idea, we performed two cycling protocols with well trained

cyclists at constant submaximal work rate on a bicycle ergometer. It was hypothesised that crank cycle characteristics at joint level (i.e., relationship between crank position and joint power and - moment) would merely shift according to the rotation of the lower extremity with regard to a fixed coordinate system.

1. Level and uphill cycling (11% or 6.3 degrees) were compared at three different cadences: self chosen preferred (PR), PR-10 rpm, and PR+10 rpm. In this protocol, the entire system (bicycle and rider) was rotated relative to gravity. That is, the rider position with regard to the bicycle was unaltered.

2. Seat and handlebars were repositioned around the preferred seat position, such that the lower extremities were rotated around the crank with regard to gravity, whereas the upper body's orientation was unaltered (only translated with the hip joint). Three positions, preferred (0 degrees), 3 degrees backward, and 3 degrees forward were tested in the self chosen cadence at the preferred position.

Pedal force and kinematics of lower extremity and trunk position were recorded for at least 45 crank cycles during steady state cycling at 80% of maximal heart rate (about 200W) in all conditions. Power and moment for hip, knee, and ankle joint were calculated with inverse dynamics. Crank angle phase shifts between conditions were calculated by means of cross-correlation adapted for circular data.

For both protocols, the phase shift of joint power and moment was in accordance with the systems' rotation. In other words, when rotating the lower extremity backward a certain number of degrees, be it in uphill cycling or by moving the seat backward, the power (and moment) profile shifts with the same amount of degrees, when analysed in a fixed coordinate system. Generally, the cross-correlations amounted to very high values (often well above 0.9), indicating that the crank cycle profile was very similar among conditions. These findings were similar for all cadences explored in the first protocol on uphill cycling.

Even though the present data confirm the main hypothesis in general terms, i.e., that the crank cycle technique is invariant and does not depend on body orientation with regard to gravity, a more detailed analysis revealed some small differences between joints: in level-uphill cycling, the knee joint showed a larger phase shift, particularly for the moment characteristic. Furthermore, the amplitude of the hip power crank cycle profile was higher in uphill cycling than in level cycling. This may be explained by that the dynamic interaction between pelvis-hip and seat is strongly affected by body orientation, thereby influencing the power generated at the hip.

A PRELIMINARY INVESTIGATION INTO THE INFLUENCE OF RECOVERY DURATION ON SPRINT CYCLING PERFORMANCE FOLLOWING HEAVY RESISTANCE EXERCISE

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Introduction: Chatzopoulos et al. (2007) highlighted acute adaptations following Prior Heavy Resistance Exercise (PHRE) may improve subsequent performance during sprint activities via a transient increase in muscle contractile performance known as postactivation potentiation (Sale, 2002). The majority of research has focused on jumping activities and to date there is little research that has addressed the influence of PHRE on sprint performance. The aim of the current study was to examine the influence of recovery duration following PHRE on sprint performance.

Methods: Seven healthy male participants gave informed consent to participate in the study which was given clearance by the institutional ethics committee. Following 3 familiarisation visits during which 1 repetition maximum (1RM) was determined for the deadlift exercise (visit 1) and 30 s Wingate sprints performed on a cycle ergometer (visits 1, 2 and 3) participants performed 5 experimental trials. Trials involved performing 5 deadlifts at a pace of 1 repetition every 10 s at 85% of 1RM. Participants then rested for 5, 10, 20 or 30 min before performing a 30 s Wingate sprint, a control trial was also included which did not involve any lifts. Expired air was collected for the duration of the 30 s sprint and blood sampled for lactate prior to the warm-up and 7.5 min following completion of the sprint (LPOST). Values were recorded for Peak Power (PP), Time to Peak Power (TPP), Mean Power Output for 5 s (MPO5), 10 s (MPO10), and 30 s (MPO30) and oxygen uptake (VO2). Statistical analyses were performed using repeated measure ANOVA and significant differences explored via paired t tests with Bonferroni correction.

Results: Following PHRE peak power increased to values of 104%, 108%, 101% and 101% of the control value following 5, 10, 20 and 30 min of recovery respectively, ($p>0.05$) while TPP was 94%, 89%, 94% and 103% of the control value ($p>0.05$). Mean power outputs for the first 5 s of the sprint were 95%, 108%, 104% and 96% ($p>0.05$), the first 10 s of the sprint were 104%, 110%, 104% and 103% ($p>0.05$) and the first 30 s of the sprint were 102%, 106%, 102% and 103% ($p>0.05$) of control values following 5, 10, 20 and 30 min of recovery respectively. Oxygen uptake increased to 115% ($p<0.05$), 122% ($p<0.05$), 106% and 106% of control value, while LPOST values were 113% ($p<0.05$), 107% ($p<0.05$), 103% and 89% of control value.

Discussion: These preliminary finding suggest that the use of PHRE is beneficial to performance in sprint activities inline with the suggestion by Chatzopoulos et al., (2007). Furthermore the significant changes in oxygen uptake and lactate suggest that the prior activity can change the energy pathways employed during sprint exercise possibly by changes to the oxygen uptake kinetics.

References

Chatzopoulos DE, Michailidis CJ, Giannakos AK, Alexiou KC, Patikas DA, Antonopoulos CB, Kotzamanidis CM (2007). J Strength Cond Res, 21, 1278-1281.

Sale DG (2002). Exerc Sport Sci Rev, 30, 148-153.

EFFECT OF LEG MASSAGE WITH DIFFERENT DURATIONS ON ANAEROBIC PERFORMANCE AND RECOVERY FROM HIGH INTENSITY CYCLING EXERCISE

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Introduction: Sport massage, a manual therapy for muscle and soft tissue pain and weakness (Moraska 2005), is a widely used modality for recovery after intense exercise. In literature it is seen that sport massage is applied with a variety of durations and conflicting results was found (Robertson et al., 2004; Hemmings et al., 2000). Hence the purpose of this study was to determine the effects of leg massage applied with different durations on anaerobic performance and recovery from high intensity cycling exercise.

Methods: Ten male university students participated in this study voluntarily. Subjects were investigated on four occasions with a massage therapy (10 or 20 minutes) or passive recovery (10 or 20 minutes) in random order. Subjects participated in Wingate anaerobic power test (WAnT) before and after the recovery interventions. In addition heart rate and blood lactate responses were determined at rest, after the first WAnT, at 10th and 20th minutes of recovery periods and after the subsequent WAnT.

Results: 2 (pre/post) x 4 (recovery interventions) ANOVA with repeated measures indicated significant time x recovery intervention interaction in average power (F(3,27): 5.297, p=.032) and follow up one way ANOVA with repeated measures indicated that there was a significant difference in average power between 20 minutes of massage intervention and 10 minutes of passive recovery. No significant differences or interactions were observed in other measured anaerobic indices (p>.05). Results also indicated no significant differences among resting heart rate and blood lactate levels measured before four testing occasions (p>0.05). Significant differences were found in heart rate at the end of recovery interventions (F(3,27)=6.875; p=.001) and bonferroni post hoc analysis indicated this significant difference was as a result of 20 minutes of massage intervention. In addition results also revealed significant differences in lactate levels at the end of recovery interventions (F(3,27)= 4.734; p=.009) and post hoc analysis showed that this difference was due to 20 minutes of massage intervention. No significant differences were obtained in other measured recovery indices (p>.05).

Discussion: Our results indicated that 20 minutes of leg massage was effective in improving average power and recovery from high intensity cycling exercise. Given that many of researches have found no effect of leg massage on subsequent performance (Robertson et al., 2004; Goodwin et al. 2007), these findings suggest that in determining the effects of leg massage on various performance indices, duration of massage should be taken into account.

References

Goodwin JE, Glaister M, Howatson G, Lockey RA, McInnes G. (2007) J Strength Cond Res, 21, 1028-1031

Hemmings B, Smith M, Graydon J, Dyson R. (2000) Br J Sports Med, 34, 109-115.

Moraska A. (2005) J Sports Med Phys Fitness, 45, 370-380.

Robertson A, Watt JM, Galloway SDR. (2004) Br J Sports Med, 38, 173-176.

EVALUATION OF A FIELD TEST TO ASSESS AEROBIC ENDURANCE AND PERFORMANCE IN ELITE CYCLISTS

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Introduction: The assessment of endurance performance is usually conducted during laboratory ergometer tests. In field tests, time to complete a given distance is often the chosen performance measure. Since external conditions can largely influence these measures, the aim was to evaluate the reliability of power output in a field test and validate performance measures obtained from a traditional laboratory ergometer test.

Methods: Fifteen competitive male cyclists (age: 25.6 ± 5.2 y; height: 180.6 ± 4.5 cm; weight: 70.6 ± 4.4 kg; VO2max: 67.1 ± 5.0 ml/min/kg) completed an incremental graded exercise test (GXT) to determine ventilatory threshold, respiratory compensation point (VT, RCP) and lactate turn points (LTP1, LTP2) and two maximal aerobic power 4-min (MAP 4) and 20-min (MAP 20) time-trials, during which power output was measured with mobile power cranks (SRM).

Results: Power (W) was 263 ± 37, 344 ± 38, 243 ± 27, 344 ± 37 and 440 ± 38 W, for LTP1, LTP2, VT, RCP and Pmax, respectively. Average power during the 4-min time-trial (412 ± 53 W) was significantly higher ($p < 0.001$) than during the 20-min time-trial (347 ± 42 W) and was correlated with ($r = 0.791$ to 0.878, $p < 0.001$) but significantly different from ($p < 0.001$) performance markers obtained during GXT. No significant differences were observed between the 20-min time-trial, LTP2 ($p = 0.946$) and RCP ($p = 0.853$). Strong test-retest correlations for MAP 4 (ICC = 0.976, $p < 0.001$) and MAP 20 (ICC = 0.985, $p < 0.001$) were observed.

Discussion: The test-retest reproducibility was in agreement with the results of a 40-km outdoor time-trial reported by Smith et al. (2001). The reliability of a 3-min laboratory all out test has been published by Burnley et al. (2006) where typical error was found to be ± 7 W or 3 %, which is similar to the results of the 4-min time-trial (± 8 W or 2.2 %). Measures of aerobic performance explained 65 % - 77 % of the variance in MAP 4 and MAP 20. The 4-min time-trial was on average 93 % of Pmax from GXT, reflecting the ability of high-level athletes to tolerate intensities of 95 % - 105 % over 4-15 min. Average power during 20-min time-trial was 79 % of Pmax, which is in accordance with exercise intensities during time-trials in professional cyclists (Lucia, et al., 2001). In conclusion the 4-min and 20-min time-trials are reliable measures of aerobic endurance. The 20-min time-trial is valid to predict RCP and LTP2.

References

Burnley, M., Doust, J. H., & Vanhatalo, A. (2006). A 3-min all-out test to determine peak oxygen uptake and the maximal steady state. Med Sci Sports Exerc, 38(11), 1995-2003.

Lucia, A., Hoyos, J., & Chicharro, J. L. (2001). Physiology of professional road cycling. Sports Med, 31(5), 325-337.

Smith, M. F., Davison, R. C., Balmer, J., & Bird, S. R. (2001). Reliability of mean power recorded during indoor and outdoor self-paced 40 km cycling time-trials. Int J Sports Med, 22(4), 270-274.

CAN CYCLING PERFORMANCE IN AN EVENING LABORATORY-BASED CYCLE TIME-TRIAL BE IMPROVED BY EXERCISE OR HABITUATION THE DAY BEFORE?

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The normal circadian rhythm of performance can be altered by the habitual timing of performance. Whether this is due to a resetting of the body clock or due to a habitualisation of the time of training is unknown. Therefore, we investigated if evening time-trial performance was affected by the time at which moderate exercise was performed the previous day (at 12:00 or 18:00 h) or by the subjects attending the laboratory at 18:00 h with the intention of exercising but, in fact, just sitting on the ergometer for 30 minutes. Eight male cyclists (Mean±SD: VO2 peak = 54.7±7.7 ml.kg.min-1, age = 19±1 years, body mass = 77.7±8.2 kg and height = 183.7±5.2 cm) took part in the study. The local Ethics Committee of the University approved the study. The subjects completed three familiarisation trials to the best of their ability at a self-selected pace. The subjects then completed three separate pre-time-trial sessions of sub-maximal cycle ergometry (60% VO2 peak for 30 minutes) on the day before the time trial: at 12:00 h and 18:00 h, and a condition of no exercise at 18:00 h (where the subjects were told that no exercise was to be undertaken after having completed the resting part of the experiment and spent the same amount of time sitting on the cycle ergometer). The time trials themselves were 16.1 km and always took place at 18:00 h. The design of the study was such that the pre-time-trial sessions were counterbalanced in order of administration and a standardised 5-min warm-up at 130 W was completed prior to each time-trail. Heart rate, power output, ratings of perceived exertion, RPE, and rectal temperature were measured at rest, every 5-min in the pre-time-trial exercises, and every 1.61 km (split times) during the time trials. Fingertip blood samples were taken at rest and immediately after the time trials for estimations of haematocrit, haemoglobin and lactate. The 95% ratio limits of agreement for the 16.1 km time-trial performances were */÷ 0.46, assessed in a prior test-retest study. Data were analysed

using an analysis of variance model (condition [3 levels]) for performance times and blood lactate. A two-way analysis of variance model (condition [3] x pre-post [2]) was used for blood variables and (condition [3] x time-trial distance [10]) was used for RPE, rectal temperature, heart rate, power output and split times. There was no statistical difference in the finishing times for the time trials (P=0.253); the time trial performed after the 12:00 h pre-time-trial exercise was completed in 1714±113s (95% CI=1619-1808s) compared to 1756±137s (95% CI=1641-1870s) and 1723±124s (95% CI=1619-1827s) for the time trials performed after the pre-time trials at 18:00 h and when no exercise was undertaken, respectively. None of the variables during the time trials showed a main effect for condition or a condition by time or distance interaction. In summary, unlike morning time-trial performance, no advantage is gained by performing exercise or being prepared to undertake exercise at the same time as evening competition on the previous day.

EFFECT OF WARM-UP ON MUSCLE OXYGENATION AND METABOLISM IN SUPRAMAXIMAL CYCLING

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UNIVERSITY OF ESSEX AND UNIVERSITY COLLEGE LONDON

The effect of a warm-up induced increase in blood lactate prior to performance is unclear and may be unwarranted in severe exercise where a reduced glycolytic rate may compromise performance. PURPOSE To examine the effect of warm-ups which raised blood lactate concentration (BLC) to different levels on muscle oxygenation and metabolism in a supramaximal cycling sprint test. METHODS 8 trained male cyclists undertook a 30s sprint test from stationery seated start (load 0.09 x body mass (kg)) preceded by one of 3 warm-up protocols: WE 6 min at 40% peak aerobic power (PAP); WM 5 min at 40% PAP + 1 min at 80% PAP; WH 5 min at 40% PAP + 1 min at 110% PAP – each followed by 10 min seated recovery. Pulmonary oxygen uptake (VO2p), and muscle oxygenation as measured by near infrared spectroscopy (oxyhemoglobin (O2Hb), deoxyhemoglobin (HHb), total hemoglobin (Hbtot) and tissue oxygenation index (TOI)), were measured throughout. The responses of HHb and TOI during the sprint were analysed using a monoexponential model with time delay. The off kinetics of VO2p were analysed using a biexponential model. Blood lactate kinetics of the sprint were analysed with a biexponential model predicting extravascal lactate generation. RESULTS Mean power during the sprint was reduced in WH compared to WE (WE 672±54 WM 666±56 WH 655±59 W $p<0.05$) and was primarily due to lower mean power during the first 5s. BLC was different prior to the start of each sprint (WE 0.9±0.4 WM 1.9±0.6 WH 4.4±0.9 mmol.L-1 $p<0.05$) and extravascal lactate generation during the sprint was reduced by each increment in warm-up (WE 12.4±1.7 WM 11.0±1.5 WH 9.5±1.8 mmol.L-1 $p<0.05$). VO2p was higher than rest prior to each sprint but not different between conditions and with no difference in mean VO2p during the sprint (WE 1.5±0.2 WM 1.5±0.2 WH 1.5±0.3 L $p>0.05$). There was no difference in the area under the fast component of VO2p off kinetics though this tended to be higher for WH compared to WM and WE (WE 2.2±0.4 WM 2.3±0.4 WH 2.6±0.6 L). NIRS data indicated that oxygen delivery was increased prior to sprints but not different between conditions. There was no difference between warm-ups for the on kinetics of HHb or TOI. However there was a tendency for the TOI time delay for WH to be shorter (WE 3.7±1.6 WM 4.0±0.5 WH 2.9±1.2 s $p<0.06$). CONCLUSION An apparent increased PCr hydrolysis as indicated by the higher area under the fast component of VO2p off kinetics could not fully compensate for the reduced glycolytic rate in the sprint following WH which was itself indicated by a reduced extravascal lactate generation. All warm-ups increased muscle oxygenation to the same extent prior to the sprint and there was no difference in oxygen delivery/utilisation or VO2p during the sprint despite WH tending to increase apparent PCr hydrolysis. It appears that warm-up may reduce glycolytic rate and for harder warm-ups other energy sources may not be able to fully compensate in severe intensity exercise.

12:00 - 13:15

Plenary sessions

PS-PL04 Sport and the Environment: Towards an Environmentally Sound Movement Culture

CAN SPORT BECOME ECOLOGICALLY SOUND?

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The debate about global warming has brought new fuel to the discussion of an environmentally sound lifestyle and a sustainable development of human societies. Sport is certainly a part of the problem and also of the solution, since "with few exceptions, sport as it is practiced is not sustainable" (Chernushenko, 1994:4). The winter Olympic Games at Lillehammer 1994 and the summer Olympics in Sydney 2000 focused on "green ideals", but without much lasting effects. The goal of the presentation is to show how environmental concerns need to be addressed in the future. I will raise the following questions:

1) Gregory Bateson (1973) thought that the ecological crisis was due to three root causes: a) technological progress, b) population increase, c) hubris: man against nature. The systemic interaction of these three factors constitutes the threat to a sustainable future. How is modern sport involved in this interaction?

2) Modern sport is built on a combination of three ideas: a) competition, b) progress, c) ethical values, like fair play. International elite sport has seen a decrease in ethical focus and an increase in hard competition and quest for records. Supported by advanced technology and economic growth elite sport, according to some, has become the spearhead of a reckless consumer culture that is going in the opposite direction of sustainability. Other would succinctly respond that the concept of 'sport' includes not only elite sport but also more sustainable sports like jogging, hiking, eastern martial arts, fitness, lifestyle sport. The movement culture has many faces and not all of them are environmentally ugly. I will present examples of this diversity.

3) Arne Næss (1973) distinguished between shallow and deep ecology. Without doubt shallow ecology focusing on a mild redressing and ecological haul over of present consumer culture can be useful for most sports. Sport is tapping ecological resources and polluting the environment in many ways (travel, equipment, facilities). How could sport organizations contribute to a 'greening of sports' in all these areas?

4) A more radical solution would be to go to the roots of the problem and develop a form of sport that was built on "richness in ends, simpleness in means" (Næss, 1990). Such sports would not focus on relentless record-setting, winning at all costs and with the most

cutting-edge equipment. The question is whether the deep ecological attitude is a realistic one. How far can "homo oecologicus" (Seewald, Kronbichler, Groessing, 1998) be developed in sport settings?

References

Bateson, G. (1973) Steps to an Ecology of Mind. St. Albans: Paladin.

Chernushenko, D (1994) Greening our Games. Ottawa: Centurion.

Næss, A. (1973) "The shallow and the deep, long-range ecology movements" Inquiry 16, 95-100

Næss, A. (1990) Ecology, Community and Lifestyle. Cambridge University Press, Cambridge

Seewald, F., Kronbichler, E. and S. Groessing (1998) Sportökologie. Wiesbaden: Limpert Verlag.

CLIMATE CHANGE AND OUTDOOR SPORT – A DISCUSSION OF IMPACTS AND ADAPTATION STRATEGIES

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Introduction: Climate Change is perceived as one of the major challenges to tourism on a local and global scale. In the case of winter tourism with its crucial reliance on snow and ice, climate change effects are obvious; however, the phenomenon may also affect lake tourism, recreational fishing, and even hiking and many other forms of summer or all season tourism. In the meantime, many studies have investigated the effects of climate change on such tourism activities, and also explore adaptation strategies. An overall pattern indicates that these adaptation strategies follow similar principles. In this overview paper, results from several studies using social science research methods to investigate user reaction to and acceptance of several tourism related adaptation strategies are analysed in order to determine similarities and differences.

Methods: The presentation will focus on downhill-skiing, cross-country skiing in Austria and Finland, summer tourists in the alpine Area, water related sport activities at the step lake Neusiedlersee in Austria, hikers and climbers in high mountainous areas with respondents from Austria, Germany and other European countries. The presented results are summarizing the findings of several studies (see Unbehaun et al 2008, Landauer and Pröbstl 2008, Pröbstl et al. 2008, Pröbstl and Jiricka 2007).

Results: Already in all analysed activities we found impacts due to climate change. There are less hours suitable for artificial snow making, the level of the step lake is reduced in hot summers and the danger of rockfall and other forms of erosion for hikers and climbers in the high mountains has increased as well. The sport and tourism offers are already reacting on these changes. Overall, adaptation strategies in out door sport may take one of these three directions:

1)Focussing on technical solutions involve aspects such as artificial snow in the case of winter sport destinations, man-made ponds in the case of the lake tourism, or skiing tunnels in case of cross country skiing.

2)Adding service improvements and new offers like indoor sport and alternative entertainment

3)Shifting to new products and activities also in other seasons.

Discussion: The results show that the reaction on climate change is not predominantly affected by the change itself and natural shifts but the motives and desired experiences of the sportsmen and tourists. More than the financial adaptation capacity the societal acceptance as well as tradition and local habits are mainly influencing the possible future development.

14:15 - 15:15

Poster presentations

PP-PH11 Physiology 11

THE EFFECTS OF TWO DIFFERENT STRENGTH TRAINING MODALITIES ON SATELLITE CELLS, MYONUCLEI AND MYOFIBER SIZE IN ELDERLY – PRELIMINARY DATA FROM A RANDOMISED CONTROLLED TRIAL.

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Introduction: Muscle mass and strength decline with age (sarcopenia). This reduction in muscle mass is mainly due to the atrophy in myofibers, especially the type 2 myofibers (Andersen, 2003). Since its discovery in 1961, the satellite cell has been shown to play a key role in myofiber repair, maintenance and growth (Hawke & Garry, 2001). Physical exercise is a potent activator of the satellite cells, both in the young and elderly (Kadi et al., 2005), and thus thought to be an effective inhibitor of sarcopenia. The aim of this study was to investigate the effect of two different strength training modalities on satellite cells, myonuclei and myofiber size in elderly.

Methods: 11 healthy elderly women and men (70-88 yrs) were randomised into two training groups; functional strength training (FT) or strength training (ST). The groups exercised 3 times a week for 12 weeks. The ST group followed a strength training program that included 8 exercises (3 leg exercises) each consisting of one to three 4-12 RM sets. The FT group performed 8 exercises (4 leg exercises) with one to two 12-15 RM sets simulating everyday activities (e.g. stair climb). Muscle strength was assessed before and after the training period through the determination of the one-repetition maximum of knee extension. Biopsies were obtained from m. vastus lateralis, immediately frozen and later analysed with fluorescence microscopy with antibodies against NCAM (satellite cells), dystrophin and myosin heavy chain II (SC71). DAPI was used to identify myonuclei.

Results: At the end of the 12 week training period, the ST and FT groups had increased their maximal strength significantly by 36 % and 24 %, respectively. The preliminary analyses signaled an increased number of satellite cells from 0.06 to 0.08 cells per myofiber in the ST group; and an increased number of myonuclei in type 2 myofibres in the FT group (2.26 to 2.49 p=0.06). No changes were observed in the myonuclear number in type I myofibres in either group.

Discussion: The preliminary data indicate increased number of satellite cells in the ST group and a tendency to increases myonuclear number in type 2 myofibres in the FT group. In addition to these preliminary data we will further analyse the data to show the possible changes in myofiber size and myofiber type specific changes in the satellite cell pool within the training groups.

Reference List

Andersen, J. L. (2003). Muscle fibre type adaptation in the elderly human muscle. Scand.J.Med.Sci.Sports, 13, 40-47.
Hawke, T. J. & Garry, D. J. (2001). Myogenic satellite cells: physiology to molecular biology. J.Appl.Physiol, 91, 534-551.
Kadi, F., Charifi, N., Denis, C., Lexell, J., Andersen, J. L., Schjerling, P. et al. (2005). The behaviour of satellite cells in response to exercise: what have we learned from human studies? Pflugers Arch., 451, 319-327.

EFFECTS OF AGING AND LONG-TERM RESISTANCE TRAINING ON TESTICULAR TESTOSTERONE PRODUCTION CAPACITY

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Introduction: Testosterone production is regulated by the function of the hypothalamic–pituitary–testicular (HPT) axis. The hypothalamus releases gonadotrophin-releasing hormone (GnRH), which in turn stimulates pulsatile release of luteinizing hormone (LH) from the anterior pituitary gland, and this subsequently, induces testicular testosterone production. The HPT axis can be assessed using exogenous GnRH agonist as well as human chorionic gonadotropin (hCG) that mimics the normal surge of LH. Previously it has been shown that acute and chronic endurance training induces suppressed testosterone responses to GnRH agonist and hCG (1,2,3). However, the effects of resistance training on the HPT axis have not been examined. Therefore, GnRH and hCG stimulation were used to investigate training-induced changes in testicular production of testosterone before and after long-term systematic resistance training.

Methods

Healthy untrained young (28.0 (2.9) yrs., n = 5) and old men (69.5 (2.3) yrs., n = 8) volunteered to the study. Before and after the 1-year resistance training (2-3/wk) the nasal solution of GnRH agonist (Synarela 200 mikrog) or hCG injection (Pregnyl 5000 IU) were dosed in a randomized order with a two week interval. Basal serum total testosterone (T) and sex-hormone binding globulin (SHBG) concentrations were measured before and 24h after the administration of GnRH as well as before and 48h, 72h and 96h after the administration of hCG.

Results: Serum free androgen index (FAI; T/SHBG) was greater ($p<0.01$) in young than older men before the hCG and GnRH tests. The hCG tests induced significant increases (mean of 48h, 72h and 96h, $p<0.05$) in T and FAI before and after the training period in both young and old men. The GnRH tests induced increases ($p<0.05$) in T and FAI before the training period in young and older men, but after the training period T and FAI increased significantly ($p<0.05$) only in old men. The relative T and FAI responses to hCG were greater ($p<0.05$) in young than old men after the training period. No significant changes were observed in hCG and GnRH induced T and FAI responses due to resistance training in young or old men.

Discussion: The main finding of the present study was that the exogenous stimulated testicular production of testosterone is suppressed in older men compared to young men. Furthermore, the present results indicate that the function of HPT axis of old men was impaired in the testicular rather than in pituitary component. It could be speculated that this age related attenuation in testosterone production may have an effect on muscular characteristics and training-induced muscular adaptations. However, the present results showed that training-induced adaptations did not occur in testicular capacity to secrete testosterone neither in young nor in older men.

References

1. Hackney et al. Eur J Appl Physiol (2003) 89:198–201
2. Kujala et al. Clin Endocrinol (1990) 33:219-25
3. Vasankari et al. Acta Endocrinol (1993) 129:9-14

THE EFFECT OF TWO DIFFERENT TRAINING MODALITIES ON MUSCLE STRENGTH, MUSCLE MASS AND POWER MEASURES IN ELDERLY – PRELIMINARY DATA FROM A RANDOMIZED CONTROLLED TRIAL

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Introduction: When we grow older, strength and muscle mass will decline. This might make it more difficult to perform different activities of daily living. It is well documented that strength training can counteract these changes (Hunter et al. 2004), but there have been few studies on how functional strength training affect strength and muscle mass. The aim of this study was to investigate the effects of a functional strength training program compared to a more traditional resistance program on muscle strength, muscle mass and power measures in elderly.

Methods: 11 elderly men and women (age 70-88) were divided into a resistance training group (RTG) and a functional strength training group (FTG). The RTG trained a progressive resistance program consisting of 8 exercises (three leg exercises) with one to three 4-12 RM sets three times a week for 12 weeks. The FTG trained 8 exercises (four leg exercises) simulating everyday activities with additional loading in one to two 12-15 RM sets. All subjects were tested in isokinetic and isometric strength in knee extension, and counter movement jump (CMJ). Rate of force development (RFD) was also calculated in the knee extension. The thickness and fascicle pennation angle of m. vastus lateralis were measured by ultrasound in the mid-portion of the muscle belly, and fascicle length were calculated. The cross sectional area (CSA) of the quadriceps was measured by MRI.

Results: Isometric strength increased significantly in the FTG at 90˚ (1.8%) and in the RTG at 30˚ (8.1%). Isokinetic strength increased significantly in the FTG at 240˚/s (29%) while both groups had a non significant increase at 60˚/s (RTG: 9%, $p=0.11$, FTG: 7%, $p=0.07$).

No statistically significant changes were observed in RFD and CMJ. Both groups increased thickness (RTG: 21%, FTG: 14%) of m. vastus lateralis and pennation angle increased in the FTG (20%). Fascicle length remained unchanged in both groups. The CSA of quadriceps in the mid-portion of the thigh increased in FTG (4.1%), but the increase in the RTG was not statistically significant (2.9%). There was no significant difference between the two groups in any of the variables measured.

Discussion: Both groups increased strength in some of the strength measures, and had a tendency to increase in the other. When it comes to the explosive strength measures we did not observe any significant increase. This might be due to the training not being done in an explosive manner. However, the measures of CSA and muscle thickness show that both groups increased muscle mass. Both resistance and functional training improved strength and muscle mass, but did not have any detectable impact on explosive force production measures in this study.

References
Hunter GR, McCarthy JP, Bamman MM. (2004). Sports Med, 34(5), 329-348

EFFECTS OF THE CROSS SECTIONAL AREA ON PASSIVE LEG RAISING AFTER EXERCISE

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Purpose: We demonstrated that the cross sectional area of inferior vena cava during passive leg raising after high intensity ergometric exercise was less than that of at rest with passive leg raising (European College of Sports Science, in Lisbon, 2008). We implied that inferior vena cava after high intensity exercise was regulated by the some modulation system, in order to maintain the blood flow to the atrium. We hypothesized that the cross sectional area of inferior vena cava during passive leg raising after exercise change in according to exercise intensity. The purpose in this study was to clarify the effects of cross sectional area of inferior vena cava on passive leg raising after ergometric exercise at the low and high intensities. Methods: Seven healthy young Japanese males volunteered to participate in this study. All subjects signed the informed consent forms prior to participation in this study. The age, height, body weight and body fat of subjects were 21 (SD:2) years, 172.3 (SD:6.6) cm, 66.0 (SD:6.4) kg and 16.6 (SD:3.3)%, respectively. Each subjects performed ergometric exercise after the rest in the supine position with passive leg raising. Moreover, each subjects maintained the supine position with passive leg raising for 15 minutes after exercise. The exercise intensity in high intensity condition was 80% of peak oxygen uptake, and that in low intensity condition was 40% of peak oxygen uptake, respectively. The exercise duration were 15 minutes in high intensity condition, and 10 minutes in low intensity condition. We measured the cross sectional area of inferior vena cava using ultrasound, at rest and every five minutes during recovery period after exercise. We determined the cross section of inferior vena cava at the level of processus xiphoideus. After recording the images of the cross section of inferior vena cava to a computer, we calculated the cross sectional area of inferior vena cava using a computer. Furthermore, we measured heart rate throughout experiment. Results and Discussion: The cross sectional area of inferior vena cava in low intensity condition was no difference between at rest and after exercise. But, cross sectional area of inferior vena cava after exercise in high intensity condition was significantly less than at rest ($P<0.05$). These results suggested that the cross sectional area of inferior vena cava change in depending on the exercise intensity, and this change contribute to the modulation of blood flow. Furthermore, we imply that the inferior vena cava is regulated partially by autonomic nervous system because the cross sectional area of inferior vena cava is depending on the exercise intensity.

ROLE OF CENTRAL COMMAND IN THE RENAL ARTERIAL BLOOD FLOW RESPONSES DURING SATIC ELBOW FLEXION

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PURPOSE. The role of central command in the renal flow regulation has remained elusive. A prior study reported that central command was not essential for producing the renal vasoconstriction during exercise because the renal vascular resistance was almost identical during voluntary and electrically induced (involuntary) contractions (3). However, the studies in conscious animals demonstrated a significant role of central command during voluntary static and dynamic exercises (2, 4). One reason for the discrepant data was due to insufficient works studying this topic "non-invasively" during exercise in humans. The magnitude of involvement of the central command during exercise can be non-invasively decreased without altering the muscle mechanoreflex activation by tendon vibration to assist an exercising muscle in developing a given force (1, 5). Using this manipulation, we examined in the present study whether a decreased involvement of central command resulting from applying the tendon vibration produced a concomitant decrease in renal flow responses during exercise.

METHODS. Ten healthy female volunteers whose mean age was 22 (SD=3.3) yr participated in the present study. After 10-min resting, the subject performed a 2-min static elbow flexion at a constant load of 30% of maximum voluntary contraction with vibration (EX+VIB) and without vibration (EX). The vibration (frequency, 100Hz; amplitude, 0.8 mm) was applied to the distal tendon of the biceps brachii in the exercising arm. Time-averaged mean blood flow velocity (MBV) in the renal artery (RA) was measured by using Doppler method. Muscle fatigue sensation of the subject, as an index of the magnitude of central command (6), was monitored. Heart rate (HR: ECG) and arterial mean blood pressure (MAP: Finometer) were continuously measured. The conductance in RA was calculated as MBV/ MAP.

RESULTS. Muscle fatigue sensation in the exercising arm and the increase in HR were significantly lower during EX+VIB than those during EX indicating the vibration manipulation substantially decreased involvement of central command during EX+VIB. The MAP responses during EX+VIB also tended to be lower than those during EX. In contrast, the conductance in RA was identical during both EX+VIB and EX suggesting that the decreased central command was not effective in the renal flow regulation.

CONCLUSION. It seems likely that central command was not essential for regulating blood flow responses in RA but the actual work load of force production was more important during static exercise in humans.

1. Goodwin GM et al: J Physiol (Lond), 226: 173-190, 1972.
2. Matsukawa K et al: J Physiol (Lond), 434: 453-467, 1991.
3. Momen A et al: Am J Physiol, 285: H1247-H1253, 2003.
4. O'Hagan KP et al: J Appl Physiol 74: 2099-2104, 1993.
5. Ogoh S et al: Physiol 543: 349-364, 2002.
6. Saito M et al: J Appl Physiol, 67: 980-984. 1989.

GENDER DIFFERENCE IN NITRIC OXIDE EMANATING FROM HUMAN SKIN

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Introduction: Recent study (Wangensteen et al., 2004) has reported gender difference in the role of endothelium-derived relaxing factors (EDRF) modulating smooth muscle tone. Nitric oxide (NO) is one of the most important EDRF (Moncada S. and Higgs E., 2006), however, no one has confirmed gendrer difference in NO emanating from human skin. Therefore, the present study examined gender difference in human skin-gas NO concentrations would exist or not.

Methods

Sixteen healthy male (21.8 ± 1.5 years; mean ± SD) and female students (21.5 ± 1.1 years) volunteered as the subjects. The skin-gas samples were obtained by the covering index fingertip for 30 sec with a polyfluorovinyl bag (Tedlar bag; GLScience, Tokyo, Japan) in which pure nitrogen gas was introduced, and collected in a sampling bag at rest. The skin-gas NO concentration was measured by a chemiluminescence analyzer (Pico-Device Co., Ltd., Nagoya, Japan). Forearm blood pressure was measured with a Vascular Screening System (VaSera VS-1000, Fukuda Denshi Co., Ltd, Tokyo, Japan).

Results: A significant higher ($p<0.05$) skin-gas NO concentration was observed in males (15.4 ± 2.7 ppb) than in females (13.4 ± 2.9 ppb). Systolic blood pressure and pulse pressure were significantly higher in males than in females, although there was no significant difference in diastolic blood pressure.

Discussion: Menopause is accompanied by a dramatic rise in the prevalence of hypertension in women, suggesting a protective role of endogenous female hormone on blood pressure (Ashraf and Vongpatanasin, 2006). In this study, higher blood pressure was found in males than in females. Jungersten et al. (1997) have suggested that NO is increased with increased cyclic wall stress associated with increased pulsatile blood flow. Therefore, gender difference in skin-gas NO concentrations may depend on the difference in endothelial NO production.

References

Ashraf MS and Vongpatanasin W. (2006) Curr Hypertens Rep, 8, 368-76.

Jungersten L et al. (1997) J Appl Physiol 82, 760-4.

Moncada S and Higgs E. (2006) A Br J Pharmacol, 147, S193-201.

Wangensteen R et al. (2004) Eur J Pharmacol, 483, 281-8.

ENHANCED MYOCARDIAL PEAK SYSTOLIC CAPACITY IN ELITE ENDURACE ATHLETES DURING EXERCISE

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Introduction: Conflicting theories discuss whether or not endurance training improves heart contractility, even though most studies have found no changes (Pluim et al., 1999) Traditionally, echocardiography has been used to show ejection fraction (EF) and fractional shortening (FS) to reflect myocardial contractility. However, the sensitivity of EF and FS has been debated, using the argument that these methods only provide indirect measurements of contractility, due to the influence of hemodynamic conditions. Tissue Velocity Imaging (TVI) has been developed in order to provide a more direct measurement of contractility. Based on measuring longitudinal myocardial systolic velocities (PSV), TVI has been found to reflect contractility better than EF (Bach 1996) and also provides analyses during exercise. As TVI has been found a more sensitive method for measuring contractility, this study attempts to investigate whether TVI can prove the Hypothesis that endurance trained athletes (ETA) have enhanced myocardial contractility, at rest and during exercise.

Methods: Ten elite male cross-country skiers and ten untrained subjects (US) (mean; age: 28 respectively 28 yr; body height: 180 resp.181 cm; body mass: 76 resp. 70 kg; VO2max: 72 resp. 46 ml kg-1 min-1) performed a progressive combined arm and leg (ratio 25:75) upright sitting cycle work to exhaustion. The protocol was designed to provide registrations at every 10% level from 50 to 100% of VO2max with continued work. In the last 30 s of each 3 min step, measurements were taking using echocardiography (GE vivid7 Pro; Horten, Norway), sphygmomanometer (TriCUFF WA DS55, AJ Medical, Stockholm, Sverige) and oxygen uptake device (Oxycon Pro, Jaeger, Würzburg, Germany). Statistical significance was set to $P<0.05$.

Results: No changes in PSV were found at rest between the two groups (7,6 cm/s vs. 7,4 cm/s). During exercise at 70% to 100% of VO2max ETA had a higher PSV than the US, a difference which increased continuously (from 18% to 36%). From rest through every level of exercise to maximal exhaustion, PSV increased continuously in the ETA. The PSV in US increased from rest to 60% of VO2max, followed by small but not significant increases between the levels. The ETA had 11% to 16% higher blood pressure from 60% to 100% of VO2max.

Discussion: TVI revealed that the ETA had higher PSV than that of the US during exercise at 70% to 100 % of VO2max, but not at rest and during mild exercise. PSV might be enhanced for two reasons, either increased contractile capacity or lower peripheral resistens. In view of the fact that the athletes' blood pressure was higher during exercise, this experiment indicates that endurance athletes may have enhanced contractile capacity, only observable during exercise.

References:

Pluim B, Zwinderman A, van der Laarse A, van der Wall E. (1999). Circulation, 100, 336-344.

Bach D. (1996). Int J Card Imaging. 12(3), 191-195.

SUB-MAXIMAL EFFICIENCY DURING ROLLER SKI SKATING

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Introduction: Movement economy and efficiency are regarded as important parameters for endurance performance. Whereas movement economy is used in movements where it is difficult to calculate external work rate (e.g., running), efficiency is often used in movements where the opposing forces can be measured and external work rate can be calculated (e.g., cycling, rowing). During roller skiing on a treadmill, the opposing forces can be measured. In present study we investigated the effect of gender, discipline (cross-country, biathlon and Nordic combined), level of performance (world class vs. national class) and technique (V1 and the V2 skate technique) on sub-maximal efficiency.

Methods: This study include 9 male and 8 female biathletes, 22 male and 6 female cross-country skiers and 14 nordic combined skiers. All subjects were skiers of high national and international level. Sub-maximal average efficiency was calculated for a multiple set of steady state 5 min workload steps below 4 mmol/l blood lactate, for which gas exchange was measured. V1 was tested at 12% incline and the V2 at 5-8% incline, on a large treadmill. Velocity was set to each individual's physical level in order to obtain sub-maximal measurements. External work rate was calculated using the roller friction forces, incline, subjects' mass, and velocity. Metabolic rate was calculated based on gas exchange data. Efficiency was calculated as the ratio of external work rate and metabolic rate. The results were statistically analyzed using ANOVA for repeated measures.

Results: We found a highly significant difference between the V1 and V2 for both men and women and for all disciplines (17.18% vs 15.63%, $p<0.001$). Overall, gender differences were extremely small and not significant. We found no discipline differences. Biathlon had a smaller difference in efficiency between techniques than cross-country and Nordic combined skiers ($p=0.031$). World class skiers had

significantly higher efficiency than national class skiers in V2 (16.28% vs 15.23%, p<0.001), and a trend in the V1 (17.58% vs 16.98, p=0.07). Furthermore, a strong inter-individual correlation was found between V1 and V2 efficiency (r=0.734, p<0.001).

Discussion: Efficiency is lower during roller ski skating than in bicycling (20-25%), but it is close to speed skating (16%) and slide board skating (15%). The higher V1 efficiency might be a result of this technique being slower and relying more on concentric muscle action, as well as being more continuous in power generation, than V2. Biathlon skiers have less difference between V1 and V2 efficiency which might be a result of training and technique differences. Efficiency seems to differ between performance levels in ski skating. Also, the inter-individual correlation shows that the two skating techniques are biomechanically and/or physiologically closely related.

14:15 - 15:15

Poster presentations

PP-PH12 Physiology 12

MODEL-GENERATED DECOMPOSITION OF UNFUSED TETANI OF FAST AND SLOW MOTOR UNITS EVOKED BY STIMULATION AT RANDOM INTERPULSE INTERVALS

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During voluntary contractions active motoneurones generate successive action potentials at variable interpulse intervals. The importance of these individual potentials for the force generated by single motor units was analyzed. Unfused tetani of motor units (MUs) evoked by stimulation at variable interpulse intervals at mean frequencies of 20, 25, 33, 40 and 50 Hz were studied using fifteen functionally isolated fast and slow type MUs from the medial gastrocnemius muscle of adult Wistar rats. A previously proposed algorithm and computer program for mathematical decomposition of unfused tetani into a series of twitches, representing responses to individual pulses, were used (Raikova et al. 2007). Analysis of the parameters of the decomposed twitches showed considerable variability in force of successive contractions. These twitches were extremely variable with up to over 2-fold (fast MUs) or 6-fold (slow MUs) higher forces and considerably longer contraction times than a single twitch evoked by one stimulus. However, when the temporary stimulation frequency was decreased, the decomposed twitches became similar to the single twitch with respect to amplitude and contraction time. It was found that the basic contractile parameters of decomposed twitches could be predicted with high accuracy on the basis of the tetanus force level at which the next contraction begins. This analysis of the parameters of decomposed twitches demonstrated that the contractile responses of the muscle fibers to successive action potentials generated by motoneurons are highly variable and depend on the previous MU state.

R. Raikova, J. Celichowski, M. Pogrzebna, H. Aladjov, P. Krutki. Modeling the summation of individual twitches into unfused tetanus for various types of motor units. J. Electromyogr. Kinesiol. 2007, 17, 121-130

EFFECTS OF 7-DAY DRY IMMERSION UPON CONTRACTILE PROPERTIES OF POSTURE AND DYNAMIC MUSCLES

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INTRODUCTION: "Dry immersion" (head-out water immersion with waterproof fabric separating body from the water) is the effective method for ground simulation of microgravity conditions. It was shown that gravitational unloading induces in motor system an acute decrease of support afferentation, which in its turn triggers suppression of activity in postural extensor muscles. The dynamic muscles seem to be affected to a lesser degree. The calf muscles (ankle extensors) are of special interest as they include posture slow m.soleus and dynamic mixed m.gastrocnemius. Noteworthy, the contribution of these muscles into total ankle torque depends on the angle in knee joint: at an angle of 90˚ muscle effort is performed mainly by m.soleus, and at higher angles m. gastrocnemius is involved as well. Thus the discriminative analysis of force-velocity characteristics of these muscles is possible.

METHODS: 16 volunteers were exposed to 7 days dry immersion. The force-velocity characteristics of knee and ankle extensor muscles were determined under isokinetic (angular velocity of 30-300 °/s) conditions. Calf muscles were tested at two different knee angles (90º and 160º) for discrimination of the effects of m. soleus and m. gastrosnemius.

RESULTS: After 7 days immersion the decrease of force-velocity characteristics for knee extensors equaled 10% in the whole range of angular velocities. During testing of calf muscles with the knee angle 160º the decrease of force-velocity characteristics was similar to that – no more than 6% for all tested velocities. But when tested in the same movement with a knee angle of 90º the decrease of force was noticeably greater – about 20% of initial value.

DUSCUSSION: As was expected the maximal decrease of force-velocity properties was demonstrated for postural m. soleus (knee angle - 90º). The decline is apparently connected with reduced support afferentation affecting mostly posture soleus muscle with high content of slow muscle fibers. The decreases of force-velocity characteristics for ankle extensors as a whole group (knee angle 160º) and for knee extensors were less pronounced – 6 to 10%. This result may be connected with compensatory increase of dynamic muscles involvement in motor activity in response to essential decrease of contractile properties of posture synergists. Thus using special approach to evaluate force-velocity properties of mixed muscle group we confirmed the previous results obtained by different methods: the most pronounced decrease of contractile properties during simulated microgravity conditions is demonstrated by pure postural slow muscle.

EFFECT OF HISTORY OF MUSCLE FORCE PRODUCTION ON THE PASSIVE TORQUE

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Purpose: It had been clarified by animal studies that the passive mechanical properties in skeletal muscle were affected by not only muscle length but also the muscle's previous history of force production (Whitehead et al., 2001). The purpose of the present study was to investigate to what extent the muscle previous force production affect passive torque of plantarflexion in humans.

Methods: Five subjects (four males and one female) participated in this study. The subject's foot was fixed to the foot plate of an electrical myometer (VMP-004, VINE, JPN). The passive torque was measured in two conditions; the long condition (LC) and the short condition (SC). In both conditions, initial ankle joint angle was set at anatomical position (AP). First, the ankle joint angle was slowly changed from AP to 15 deg dorsiflextioned (15DF) by the tester in the LC, then the subject exerted maximum voluntary contraction (MVC). After MVC, joint angle was changed to AP again and kept 1min. Finally, joint angle was changed to 15DF and kept 1min. In SC, the MVC was exerted in AP. After the ankle joint angle was kept AP in 1 min, the joint angle was changed 15DF. Subjects maintained the relaxation except the exerted the maximum voluntary contraction (MVC). All sessions were repeated 5 times. Each of the trials was separated by 2min rest at 15DF of ankle joint angle. Surface electromyogram (EMG) was recorded from medial and lateral gastrocnemius, soleus and tibialis anterior using bipolar electrode (SX-230, DKH, Japan). The data of plantarflexion torque and EMG were stored on a personal computer by using an analog-to-digital converter (PowerLab/16sp, ADInstruments). Passive torque was measured at the end of 5sec in AP following MVC and in 15DF.

Results and Discussion: During measurement of passive torque, we confirmed that there was no significant EMG activity. The passive torque was different according to the ankle joint angle in which the MVC was exerted. Although the passive torque at AP was significantly smaller in LC than in the SC ($P<0.05$), the difference was relatively small (8% smaller than in the SC). There was no significant difference in the passive torque measured at 15DF between in the LC and the SC. The passive torque was significantly smaller when it was measured after MVC at longer muscle length than the shorter muscle length. However, this difference of passive torque did not remain after the following stretching. These results were in accordance with the results of animal studies. It was suggested that the history of muscle force production could change the passive torque in human. The change in the passive torque was relatively small, and hence might be practically ignored, for example, when measuring the passive torque as the reference of joint flexibility.

Reference

N. P. Whitehead, J. E. Gregory, D. L. Morgan and U. Proske (2001) J. Physiol. 536: 893-903.

MECHANISMS OF MANAGEMENT OF SPORTS MOVEMENTS IN CONDITIONS OF DEVELOPING FATIGUE

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Introduction: Management of movements represents a complicated multi-level neuronal system functioning on hierarchical principle (G. Courtine et al,2007). Specific mechanisms of management of complete motor actions of a human depend on the level of skills of the motor response, its difference from natural locomotions, time and amplitude parameters of the performed movement, its particular parameters and other factors. Detection of mechanisms of coordination of sport movements is of considerable interest as their performance is connected with exact time and amplitude parameters, development of great muscle efforts and high speed of working muscle contraction.

Methods: 82 athletes-wrestlers (judo) participated in the research aimed at investigation of biomechanical and EMG parameters of skeletal muscles during motor actions of different coordination complexity. Besides, there were studied changes of the structure of a «leg grip» throw in the process of fatigue caused by two kinds of physical activities. The following loadings were applied: 1) technique - performance of techniques within 5 minutes; 2) competitive - 6 competitive fights with a 5-minute interval. Biomechanical parameters and electrical activity were registered by the programme complex Star Trace (Video Motion, 2005) and electromyography «Neuro- MBP-8» (Russia. 2006), correspondingly.

Results/Discussion: It is revealed, that performance of techniques of different biomechanical parameters is determined by specific EMG patterns of the working muscles which parameters depend on coordination complexity of the performed motor action, subjects' sports qualifica-tion, as well as the character of counteraction of a rival, using counter-attacking and defensive techniques. Developing of muscle fatigue was accompanied by natural changes of duration of the tested technique (a «leg grip» throw), its kinematic parameters - speed, acceleration, movements of an athlete's parts of the body, dynamics of angular parameters, and also specific electromyography signs - change of the sequence of working muscles involvement, duration and amplitude of their electric activity. The quantitative changes and direction of dynamics of kinematic and electromyography parameters depends on a kind of physical activity. The greatest changes of the parameters of a «leg grip» throw are registered under the influence of the muscle loading – a model of wrestling competitive activity.

Conclusion.

In the process of muscle fatigue development the efficiency of a performed technique is achieved by means of specific changes of its biomechanical parameters and those of electric activity of skeletal muscles.

References.

Courtine G. et al. J Physiol. 2007; 582: 1125-39.

COMPARISON OF THE DECREASE IN MUSCLE POWER AND RATIO BETWEEN HAMSTRINGS AND QUADRICEPS AFTER TWO DIFFERENT AEROBIC DANCE PROGRAMS

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Introduction: Muscular power is one of the most important components of sport, both for high performance and for injury prevention. Fatigue represents a reduction in the capatibility of muscle to generate force. An imbalance in the agonist/antagonist ratio has been identified as a pathological factor. This study assessed the decline in power of the hamstring and quadriceps muscles with fatigue after two different aerobic dance programs and comparison of hamstring to quadriceps ratio.

Methods: Subjects from the first group (n=10, age 20,4yrs±1.3, body height 177.6cm±5.8, body weight 72.9kg±8.4) performed 45 min aerobic dance lesson for beginners with constant intensity of exercise during the main aerobic phase within the 60-75% of estimated maximal heart rate (HRmax). Subjects from the second group (n=10, age 20,6yrs±1.4, body height 175.8cm±6.2, body weight 71.2kg±7.7) performed 45 min aerobic dance advanced lesson with the rope. During the main aerobic phase the subject alternated 2-min high intensity intervals (80–90% HRmax) of rope jumping (5 times) and 2-min low to moderate intensity intervals (70–75% HRmax) of low-impact aerobics (5 times), 10 intervals in total. Muscle power of the knee extensors and knee flexors was measured by a specific tensiometer (Fitro, Slovakia) on two occasions. First measurement was done after warm-up and pre-stretching phase, and second after main aerobic phase and cool down phase in subjects of two different groups. Depending on a statistical marker, measurement scale

and type of distribution, the following tests were used: Student's t-test, Mann-Whitney U test, the Wilcoxon rank sum test, and the Wilcoxon test for paired samples.

Results: There was no significant difference in maximum muscle power of hamstring (224.8W±15.1 pre vs. 214.8W±15.4 post; p>0.05) and quadriceps (348.3W±31.8 pre vs. 343.4W±26.1 post; p>0.05) after lesson in the first group. Further, there was no significant difference in hamstring to quadriceps ratio (0.64 pre vs. 0.63 post; p>0.05). In the second group there was a significant difference in maximum muscle power of hamstring (311.3W±21.3 pre vs. 280.3W±20.9 post; p<0.05) and quadriceps (526.5W±32.6 pre vs. 472.4W±27.2 post; p<0.05) after lesson, but hamstring to quadriceps ratio (0.59 pre vs. 0.6 post; p>0.05) was not changed.

Discussion: Our findings suggested that although the more intensive exercise induced statistically significant decreases in maximal muscle power of hamstring and quadriceps, hamstring to quadriceps ratios were unaltered by the rope jumping and high-intensity exercise. We concluded that intensive aerobic dance lesson with the rope does not cause the imbalance in the agonist/antagonist ratio, so that it can be safely used in training.

References

Costa PB, Ryan ED, Herda TJ, DeFreitas JM, Beck TW, Cramer JT. (2009). Int J Sport Med, 30(1), 60-65.

Jennigs CL, Viljoen W, Durandt J, Lambert MI. (2005). J Strength Cond Res, 19(4), 859-863.

Sangnier S, Tourny-Chollet C. (2007). Int J Sport Med, 28(11), 952-957.

PHYSICAL ACTIVITY LEVEL MAY AFFECT VOLUMETRIC BONE DENSITY AND BONE GEOMETRY OF PREPUBERTAL GIRLS

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DEMOCRITUS UNIVERSITY OF THRACE

Introduction: Numerous cross-sectional studies suggested that intense physical activity (PA) is beneficial for the load-bearing sites of the human skeleton (1). Physical activity, specifically sporting participation during growth, seems to be effective in reducing

the prevalence of osteoporosis-related fractures (2). However, an increased sedentarism in children (3) has also been described, which is even more alarming in girls because they are usually less active than boys (4). Although, the impact of intense physical training on growth and pubertal development has been adequately studied (5), it is not clear whether various levels of PA affect positively or negatively prepubertal bone geometry as this is assessed by peripheral quantitative computerized tomography (pQCT). The goal of the present investigation was to study bone geometry in prepubertal girls exhibiting different PA levels.

Methods: This was a cross-sectional study. After completing a PA questionnaire (Μαρία βάλετο ερωτηματολόγιο), 60 prepubescent girls were assigned to one of three groups: high PA level (HA, n=20), moderate PA level (MA, N=20), and low PA level (n=20). Participants' tibias were scanned at midsite by using pQCT to determine volumentric bone density, periosteal circumference, pericortical circumference, cortical thickness, polar moment of inertia, strength strain index. Clinical evaluation included body composition (percent body fat assessed by skinfold measurement), body mass index (BMI), and breast and pubic hair assessment development according to Tanner's stages of prepubertal development. Skeletal maturation was determined by x-ray of the left hand and. Bone age was determined according to Greulich-Pyle standards (14). Data were analyzed with ANOVA (P<0.05).

Results: The three groups had comparable bone age and prepubertal development. There were no differences between groups in body composition and BMI. HA had higher volumetric bone density (8%), pericortical circumference (6%), cortical thickness (10%) polar moment of inertia (16%) and strength strain index (10%) than that of MA. MA demonstrated higher volumetric bone density (5%), pericortical circumference (4%), cortical thickness (7%) polar moment of inertia (10%) and strength strain index (8%) than LA.

Discussion: Data from the present study suggest that increased PA activity level affects positively the mechanical properties of prepubescent girls bone and this response may be related to adaptations of bone's geometry.

References

1. Lima F, et al. (2001) Med Sci Sports Exerc, 33, 1318–1323.

2. Nordstrom A, et al. (2005) J Bone Miner Res, 20, 202-207.

3. Andersen RE, et al. (1998) JAMA, 279, 938-942.

4. Lindquist CH, et al. (1999) Prev Med, 29, 305-312.

5. Georgopoulos N, et al.1(999) J Clin Endocrinol Metab, 84, 4525–4530.

EFFECTS OF EXERCISE ON COGNITIVE FUNCTION

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WASEDA UNIVERSITY

Introduction: There are many studies that investigate the effect of acute aerobic exercise on cognitive function. Tomporowski (2003) has reviewed these studies, and shown that submaximal aerobic exercise for periods up to 60 min facilitates specific aspects of information processing. However, most of these studies have only focused on the effect of cognitive function immediately after the exercise. Therefore, the aim of this study was to investigate the long-term effect on cognitive function after the exercise.

Methods: Ten subjects (23.0±2.4years; mean ± S.D) visited the laboratory at the same time of day on two separate occasions with more than six days between experimental conditions (exercise and rest). Subjects performed 3 tasks of cognitive functional tests (e.g.; Go-no/go, Stroop, Wisconsin card sorting) in pre-exercise session. In exercise condition, subjects again performed tasks immediately after and 3-, 6- and 9-hour after the 30-minute moderate (60% of VO2max) cycling exercise. In the rest condition, subjects rested quietly for 30-minute.

Results: Reaction time (RT) of the stroop task immediately after the exercise was faster than RT of pre-exercise ($p < 0.05$), and faster than after the 30-minute rest ($p = 0.07$). However, there was no difference between exercise condition and rest condition on 3-, 6- and 9-hour after the exercise. In Go-no/go and Wisconsin card sorting tests, no significant improvements were seen after the exercise.

Discussion: These findings suggest aerobic exercise improves cognitive processing temporarily but not for a long period in behavioral performance. This may be due to the relationship between exercise-induced arousal and cognitive performance improvement (Grego et al., 2004), thus effects of exercise may not last for a long period. In addition, these findings suggest effect of acute aerobic exercise on cognitive processing is sensitive to task variety and difficulty (Kamijo et al., 2007).

Reference

P.D. Tomporowski. (2003). Acta Psychologica, 112, 297-324.
Fabien Grego et al., (2004). Neuroscience Letters, 364, 76-80.
Kamijo K, Nishihira Y, Higashiura T, Kuroiwa K. (2007). Itn J Psychophysiology, 65, 114-121.

EXERCISING WITH RESERVE: EVIDENCE THAT THE CNS REGULATES PROLONGED EXERCISE PERFORMANCE.

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Introduction: A central debate in the exercise sciences is the nature of the fatigue that determines exercise performance under different conditions. Two opposing theories are currently popular. The first holds that exercise is limited principally by metabolic changes in the exercising skeletal muscles, so-called peripheral fatigue. An opposing model [1] holds that exercise performance is regulated by the central nervous system (CNS) to ensure that homeostasis is maintained. Recently we [2, 3] and others [4] have shown that the rating of perceived exertion (RPE), a marker of "fatigue", rises as a linear function of the duration of exercise that remains. The model also predicts that agents which interfere with these central regulatory controls in the central nervous system (CNS) could enhance exercise performance by allowing the body to approach more nearly its metabolic and cardio-respiratory limits. Accordingly, the purpose of this study was to measure the effects of an amphetamine (methylphenidate) on exercise performance at a fixed rating of perceived exertion of 16.

Methods: Eight elite cyclists ingested 10mg Methylphenidate in a randomized, placebo controlled cross-over trial.

Results: Compared to placebo, subjects receiving methylphenidate cycled for ~ 32% longer before power output fell to 70% of the starting value. At the equivalent time at which the placebo trial terminated, subjects receiving methylphenidate had significantly higher power outputs (19%), oxygen consumptions (13%), heart rates (12%), ventilatory volumes (11%) and blood lactate concentrations (43%) although EMG activity remained unchanged.

Discussion: Thus the ingestion of a centrally-acting stimulant allowed subjects to exercise for longer at higher cardiorespiratory and metabolic stress indicating the presence of a muscular reserve in the natural state. This suggests that endurance performance is not only "limited" by mechanical failure of the exercising muscles ("peripheral fatigue"). Rather performance during prolonged endurance exercise under normal conditions is highly regulated by the CNS to insure that whole body homeostasis is protected and an emergency reserve is always present.

1 St Clair GA, Noakes TD. Evidence for complex system integration and dynamic neural regulation of skeletal muscle recruitment during exercise in humans. Br J Sports Med 2004;38:797-806.
2 Noakes TD. Linear relationship between the perception of effort and the duration of constant load exercise that remains. J Appl Physiol 2004;96:1571-2.
3 Tucker R, Rauch L, Harley YX, Noakes TD. Impaired exercise performance in the heat is associated with an anticipatory reduction in skeletal muscle recruitment. Pflugers Arch 2004;448:422-30.
4 Joseph T, Johnson B, Battista RA, Wright G, Dodge C, Porcari JP et al. Perception of fatigue during simulated competition. MSSE 2008;40:381-6.

CARDIOVASCULAR ADJUSTMENTS TO AND FROM PROLONGED DRY AND IMMERSED APNOEA IN RESTING BREATH-HOLD DIVERS

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Introduction: Diving response is characterised by peripheral vasoconstriction, with increased blood pressure (BP), decreased heart rate (HR) and decreased cardiac output (Q'). Breath-holding "per se" has been shown to elicit similar responses, although of lesser intensity. Scarce descriptions of the time courses of cardiovascular adjustments to prolonged apnoea can be found. Data on HR and BP dynamics after apnoea are even less. Our aim was to describe the cardiovascular changes in the recovery of maximal static apnoea.

Methods: Static apnoea to volitional exhaustion was performed by 8 breath-hold divers (age: 32.5±4.5 yrs) in air (DRY) and by 6 divers (30.5±2.4 yrs) while immersed below the surface of 27 °C water (IMM). BP profile was continuously recorded (Portapres) and beat to beat values of systolic and diastolic pressures (Ps and Pd), HR and stroke volume (SV; Beatscope®) were obtained. Ps, Pd, HR and SV, and hence Q', were calculated before (ctrl), every 30 s and in the last 10 s (end) during apnoea, and 5 s, 10 s, 20 s, 30 s, 60 s, 120 s and 180 s after the resumption of breathing.

Results: Apnoea lasted 134.2±35.05 s in DRY and 179.3±34.4 s in IMM ($p>0.05$). After 30 s of breath-holding, HR was about 20 b/min below ctrl in both groups and did not further change, being at end 60.7±13.7 b/min in DRY and 56.1±16.2 b/min in IMM ($p>0.05$). At 30 s of apnoea, both Ps and Pd were significantly above ctrl by 15-20 mmHg and 18-20 mmHg, respectively, with no difference between groups. Then, a continuous slight increase occurred in DRY, being Ps and Pd at end 146.3±39.2 mmHg and 93.3±13.6 mmHg, respectively. In IMM, Ps and Pd remained stable for 90 s, then increased and reached 206.0±23.9 mmHg and 111.8±11.4 mmHg at end, respectively ($p<0.05$ vs DRY). In both groups, SV was unchanged and Q' was 25% below ctrl during the entire apnoea. With the resumption of breathing, both in DRY and IMM, HR immediately increased, attaining ctrl values after 5 s, while Ps and Pd decrease showed a 5 s delay. Ctrl values of both Ps and Pd were resumed after 30 s. No subsequent changes were found. No change in SV occurred, so that Q' was restored in the first 5-10 s of recovery.

Discussion: The observed time-courses of cardiovascular parameters suggest a main role of breath-holding "per se" in eliciting the initial bradycardia and hypertension of apnoea. The successive adjustments, at least in static apnoea, seem to be limited to a further vasoconstriction, being the vascular response greatly enhanced by water immersion. Recovery of both HR and BP is extremely rapid in any case, being complete within 1 min. We conclude that: a) cardiac and vascular adjustments during and immediately after prolonged apnoea are distinct; b) chemorereceptor stimulation may induce the vascular response as breath-holding goes on; c) water immersion plays a prominent role in eliciting hypertension; d) the rapidity of HR recovery is compatible with the notion of withdrawal of increased vagal tone.

14:15 - 15:15

Poster presentations

PP-PH13 Physiology 13

ANALYSIS OF SOMATOTYPE CHARACTERISTICS OF ELITE MALE AND FEMALE ATHLETES IN CYPRUS

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Introduction: Somatotype has been used to demonstrate similarities and differences between several groups of individuals including athletes of different sports. Since 1967, the Heath-Carter somatotype method has been utilised successfully by several investigators (Carter, 1970). Mostly, studies on somatotyping have been carried out on athletes of European and North American countries Data are lacking, however, on somatotype studies of Turkish Cypriot athletes.

Also, Somatotype has a great role in reaching the sportive success. In athletes selection, it is important to select athletes which have the right somatotype for the target field of sport. At this selection it is also necessary to know the pecularities of the somatotype needed for the mentioned sport. For these reasons, the aim of this research is to find differences between somatotype pecularities of elit female and male athletes.

Methods: In this research, 56 male and 40 female 20-32 years of age were examined to determine physique fitness. Physique was determined by using the Heath-Carter anthropometric somatotype.

The athletes taken into examination are training at least 4 days a week with their teams and the trainings are continuing avarage 90 minutes. Measures are taken from 10 different areas of the body. Skinfold thicknesses (triceps, suprailiac, subscapula and calf), diameter (humerus and femur) and circumference (biceps, calf), weight and height of the athletes were measured. This research was completed within three months (February-April 2008). All statistical data (mean and Standart deviation) were evaluated on SPSS software programme.

Results: In this research, the lowest endomorph value is measured as 1.8 in football team, the lowest mesomorph value is measured as 3.6 in female basketball players and the lowest ectomorph value is measured as 1.2 in handball men team. In this research, the highest endomorph value is measured as 5.2 in tennis men team, the highest mesomorph value is measured as 6.9 in handball men team and the highest ectomorph value as 2,7 is measured in tennis women team.

Discussion: When the somatotype values of Turkish Cypriot elit athletes are examined, it is seen that there are differences in these values between Turkish Cypriot athletes and other country athletes.

References

1) M.O. Rosser. (2002). Sports Therapy An Introduction to Theory and Practice. Scotprint, London.

2) Carter, J. E. L., 1970 'The somatotypes of athletes - a review'. Human Biology 42: 535-569.

RELIABILITY OF A NON-TRADITIONAL POSITION FOR IN VIVO ULTRASOUND MEASUREMENT OF HUMAN MUSCLE FIBRE PENNATION ANGLE.

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Twelve physically active individuals had consecutive images taken of their Vastus lateralis using B-mode ultrasound at 10MHz with a linear array probe. Measurements were taken in the traditional, closed kinetic chain position with the hip, knee and ankle flexed at 90 degrees, with the foot supported and all muscles in a relaxed state (10 images) and in the novel, open kinetic chain position with the hip and ankle flexed at 90 degrees and the knee flexed at 85 degrees via the minimal extensor muscle contraction necessary to maintain the open kinetic chain position (10 images).

In an effort to 'reset' the muscle architecture between measurements and to reduce the chance of creep deformation (Lederman 2005) from repeated contractions, series of 10 box steps, dominant limb leading, were completed between measurements as a correlate to the activity of daily living (ADL) of stair climbing. Box height was 19.2 cm, and a tempo of 100 steps per minute (1 beat being 1 leg movement, the equivalent of 25 complete box steps per minute) was regulated by metronome (SQ44, Seiko (UK) Ltd, Berkshire, UK). Two of the subjects volunteered for further testing and measurements were re-taken on five days, over a period of eight, to determine intra-subject variability.

Inter-subject reliability showed an improvement of ~30%. Intra-subject reliability showed an improvement of ~28%. The variability in the measures at 90 degrees (SD = 1.52 degrees) were more than twice that recorded at the 85 degrees (SD = 0.74 degrees) position. These results indicate that measurements taken at the novel position are ~30% more reliable and this improved reliability will allow for a ~76% reduction of sample size, while maintaining similar statistical power, in future studies.

Reference:

Lederman, E. (2005) The science and practice of manual therapy. (2nd edn.) Elsevier, London.

THE EFFECT OF MOTIVATIONAL AND RELAXATION MUSIC ON AEROBIC PERFORMANCE, RATING PERCEIVED EXERTION AND SALIVARY CORTISOL IN ATHLETE MEALS

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Introduction: Music is a source of motivation and inspiration that is much valued within the realms of sport and exercise. Relationship between music and physiological and mental change of human body traditionally was in considering of scientists. Likewise, listening of music during submaximal exercise resulted lower increase of salivary cortisol.

Methods: Thirty male physical education college students (ages: 25.66±3.89 yr, height: 176.65±7.66 cm, weight: 78.45±16.20 kg, body fat percent: 12.86±5.74 and Vo2max: 38.36±9.19 ml/kg/min) voluntarily participated in this study and divided to three groups: motivational music, relaxation music, and no music. All subjects run to exhaustion with 80-85 percent of maximal heart rate on the treadmill. For measuring of cortisol, not stimulated samples of saliva collected, 15 minutes before and 5 and 30 minutes after the exercise. RPE was obtained every 5 minutes during exercise.

Results: Based on the findings, aerobic performance during the motivational music treatment was significantly higher than the relaxation and no music treatment. Furthermore, RPE and cortisol concentration significantly were lowered 5 minutes after exercise for relaxation music treatment than motivational music and no music treatment. But there were no significant differences in salivary cortisol concentrations at 30 minutes after exercise between three groups.

Discussion: The first finding of present study showed that listening of music during exercise, regardless of its type; determine higher running time for measure of aerobic performance. This findings corresponding with results of (2,3) but is contrast to finding of (1). Based on present study findings, although during listening of music increased running time and decreased rating of perceived exertion, no significant differences was found between this variable after listening of motivational and relaxation music. Furthermore, although in both groups of motivational and relaxation music, aerobic performance was better, it is noted that operation of every type of music has special characteristic. Mark et al (4) found that muscles stress change with music kinds so they stimulant music increase and relaxation music decrease muscles stress. This study provided some support for the hypothesis that listening motivational and relaxation music reduce physiological and psychological arousal during submaximal exercise and increase aerobic performance.

Reference

1. Beacker, N., Brett, S., Chambliss, C., Crowers, K., Haring, P., Marsh, C,. (1994).Perceptual and Motor Skills 79, pp. 1043–1046

2. Copland,B.L.; D. Franksb (1991). Med.physic .Fit .1,pp:100-103.

3. Kayoko, U. & Y. Kazuhito (2005). The Tohoku J of Experimental Medicine. 3 : 213-218.

4. Mark, I.; J. Alpert.; I. Elliot.; N. Maltz (2005). J.Business Research,58,pp:369-376.

CHANGES IN THE CROSS SECTIONAL AREA OF INFERIOR VENA CAVA AND STROKE VOLUME DURING SITTING CROSS-LEGGED

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Purpose: Zen meditation in water is the exercise program of a pregnant woman. Zen meditation in water is the program that the pregnant women sit cross-legged down under the water with breath-hold. It is known that heart rate decreased during Zen meditation in water. It was considered increase of venous return by physical characteristics of water caused the decrease of heart rate. We hypothesized that decreases in heart rate were caused by not only physical characteristics of water but also the posture of sitting cross-legged. The purpose in this study was to investigate the venous return during Zen meditation on land. In addition, we evaluated the stroke volume during Zen meditation on land. Methods: Eleven healthy young male volunteered to participate in this study. All subjects signed the informed consent forms prior to participation in this study. The age, body weight and body height of subjects were 21 (SD: 1) years old, 65.6 (SD: 7.0) kg and 171.8 (SD: 6.1) cm, respectively. This study was consisted in two conditions. One was sitting cross-legged condition (Cl-condition), the other was sitting the chair condition (SC-condition). Each subjects performed sitting cross-legged and sitting the chair for three minute, respectively. We measured the cross sectional area of inferior vena cava using ultrasound during sitting cross-legged. We determined the cross section of inferior vena cava at the level of processus xiphoideus. After recording the images of the cross section of inferior vena cava to the computer, we calculated the cross sectional area of inferior vena cava in computer. Furthermore, we measured heart rate throughout experiment. In addition, we measured stroke volume of six of all subjects, using ultrasound Doppler. The age, body weight and body height of six subjects were 21 (SD: 1) years old, 63.4 (SD: 7.4) kg, 14.8 (SD: 3.3) %, respectively. Results and Discussion: The cross sectional area of inferior vena cava of Cl-condition was 5.05 (SD: 1.10) cm2. The cross sectional area of inferior vena cava of SC-condition was 4.03 (SD: 1.14)cm2. A numerical value of Cl-condition was higher than that of SC-condition ($p<0.05$). Heart rate in Cl-condition was 63.5 (SD: 6.4) bpm. Heart rate in SC-condition was 67.5 (SD: 10.2) bpm. Furthermore, stroke volume in CL-condition was 76.3 (SD: 11.2) ml, and that was 72.3 (SD: 11.6) ml in SC-condition. Heart rate and stroke volume were no difference between SC- and CL-condition. These date suggest that increases of the cross sectional area of inferior vena cava of Cl-condition was caused by defuse of development at both way of a vein. Because, it was considered that it was not possible to recruit the milking action during sitting cross-legged. Furthermore, we imply that the decrease of heart rate during Zen meditation in water is caused by not the posture but the increase of venous return that breath-hold and water pressure induce.

GENDER INFLUENCE ON POST-RESISTANCE EXERCISE HYPOTENSION AND HEMODYNAMICS

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UNIVERSITY OF SÃO PAULO – UNIVERSITY CENTER FIEO – SANTO AMARO UNIVERSITY

Introduction: Post-resistance exercise hypotension has been extensively described in men and women. However, gender influence on this response was not studied yet. Thus, the aim of this study was to compare post-resistance exercise hypotension and its hemodynamic mechanisms in men and women.

Methods: Twenty-two normotensive subjects (9 male and 13 female) underwent two sessions: control (C - 40 min of rest) and resistance exercises (E - 40-50% of 1 RM, 6 exercises, 3 sets, 20 repetitions). Before and after interventions, blood pressure (BP- auscultatory), heart rate (HR-ECG), and cardiac output (CO – CO2 rebreathing) were measured. Changes observed in each session were compared between genders by a three-way analysis of variance ANOVA for repeated measures. Data are presented as mean±SE.

Results: BP responses were similarly in both genders, systolic BP reduced in the E (-6.4 ± 1.0 mmHg, $p<0.05$), and did not change in the C. Diastolic and mean BP decreased in E (-1.8 ± 0.5 and -3.1 ± 0.6 mmHg, $p<0.05$, respectively), and increased in C (3.4 ± 0.5 and 1.8 ± 0.4 mmHg, $p<0.05$, respectively). Hemodynamic mechanisms differed between genders. In women, CO decreased similarly in both sessions, while SVR increased less after E than C session (4.1 ± 1.8 and 6.6 ± 1.7 units. $p < 0.05$). On the other hand, in males, CO decreased more in the E than C session (-0.9 ± 0.3 and -0.4 ± 0.1 L/min, $p < 0.05$), while SVR increased similarly in both sessions. Stroke volume decreased in the E session in both genders, but this decrease was more pronounced in the males, while heart rate increased similarly after exercise in both genders.

Conclusion: In conclusion, post resistance exercise hypotension was similarly in both men and women. However, its mechanisms differ between genders, depending more upon a decrease in CO in men, and in a deficiency to increase SVR in women.

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JUMP TRAINING INDIRECTLY PROMOTES MARROW FAT VOLUME REDUCTION BY PROMOTING OSTEOBLAST DIFFERENTIATION OF MARROW STROMAL CELLS

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Introduction: Marrow stromal cells can differentiate into osteoblasts and adipocytes. While jump training is known to increase bone formation in rats and human, its effect on adipogenesis is unclear. In the present study, we assess the effects of jump training on bone marrow adipocyte lineage differentiation in comparison to osteoblast lineage differentiation.

Methods: 4-week-old Fischer 344-strain rats were divided into a control group (Control n = 6) and jump training group (Jump, n = 5). The rats were trained for 4 weeks at a jumping rate of 20 repetitions per day for 5 days/week. The training began with an initial jump height of 20 cm, after which the height was progressively increased up to 35 cm by the fourth week. After the training period, the animals were sacrificed and the tibiae were excised. The tibiae were rapidly frozen in isopentane and cooled using liquid nitrogen for carboxymethyl cellulose (CMC) gel block preparation. The frozen tibiae were re-embedded in 5% CMC gel and frozen. Each CMC block was covered with a polyvinylidene chloride film coated with synthetic rubber cement. Serial longitudinal sections (4 - 20 μm) were cut using a cryostat with a disposable tungsten carbide blade at -25°C. The fat volume and bone volume were assessed by Oil Red O staining and Alizarin red S staining, respectively. Immunohistochemical analysis was performed to assess the cellular localization of the proteins runt-related transcription factor 2 (Runx 2) and peroxisome proliferator-activated receptor γ2 (PPARγ2), which play an important role in the regulation of osteoblast and adipocyte differentiation. Quantitative microscopic analysis was performed using a digital microscope equipped with a video monitor and a personal computer with image analysis software (Image J ver. 1.38). The mRNA extracted from the marrow was analyzed using a real-time polymerase chain reaction.

Results: Jump training increased the bone volume and decreased the lipid droplet number ($p<0.05$). The number of cells expressing Runx2 and the Runx2 mRNA levels were significantly increased in the Jump group compared to the controls ($p<0.05$). Conversely, there were no significant differences in the number of cells expressing PPARγ2 and the PPARγ2 mRNA levels between the Control and Jump groups.

Conclusion: These findings suggest that jump training does not directly inhibit adipocyte lineage differentiation but decreases marrow fat volume indirectly by promoting osteoblast lineage differentiation.

RELATIONSHIP BETWEEN MUSCLE FIBER DISTRIBUTION, NEUROMUSCULAR AND METABOLIC RESPONSES DURING LEG PRESS EXERCISE

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Aim of the study: To examine the relationships between muscle fiber distribution, neuromuscular [muscle power and surface electromyography activity (sEMG)] and metabolic (blood lactate and ammonia concentration) responses during a high-intensity leg press exercise [5 sets of 10 repetition maximum (10RM), with 2-min rest].

Methods: Twelve physically active males were biopsied from the vastus lateralis muscle to determine their percent distribution of type I, type IIa and type IIx muscle fibers as identified through myofibrillar adenosine triphosphatase activity. Two groups were selected on the basis of high (73.5±8.5 % type I fibers; HST group) or low (50.3±7.7 % type I fibers; LST group) percentage of type I fibers. A bilateral leg extension exercise machine was instrumented to measure one repetition maximum (1RM) and power output during the concentric phase of the leg extension. sEMG of the vastus medialis and lateralis muscles (FInsm5 spectral index)(1) was measured. In addition, the subjects performed a graded cycle ergometer exercise to estimate their maximal oxygen uptake (VO2max)(3).

Results: No significant differences were found between groups in estimated VO2max (58.2±3.9 and 57.5±6.3 ml·kg-1·min-1), 1RM (178.7±37.2 and 200.5±14.7 Kg) and 10RM (148.2±34 and 166,7±14.1 Kg) for HST and LST, respectively. At the end of the exercise, peak power output in LST decreased by 33.7±21.1 % (from 862.6±182.5 to 558.7±180.5 W, $P<0.05$), whereas no significant changes were observed in HST (from 708.2±264 to 690.3±228.6 W). The average peak blood ammonia and lactate concentrations were significantly higher ($P<0.05$) in LST (120.3±30.3 µM and 11.4±2.5 mM) compared with HST (58.8±25.9 µM and 8.7±1.9 mM), respectively. The individual percentage of IIx type fibers correlated positively with peak power output decrease ($p<0.05$; $R2=0.58$), blood ammonia ($p<0.01$; $R2=0.47$) and blood lactate ($p<0.05$; $R2=0.37$) peaks, as well as with the individual increases in FInsm5 spectral index ($p<0.01$; $R2=0.62$).

Discussion: The results of this study show that the subjects with higher % of IIx fibers present higher peak blood ammonia and lactate values, higher peak power output decrease, as well as higher changes in FInsm5 spectral index. The higher increase in peak blood ammonia observed in subjects with a higher % of type IIx fibers suggests that the decline in the energy state of the muscle is more pronounced in subject with higher percentage of type IIx fibers (2). The correlation observed between % of type IIx fibers and FInsm5 spectral index, could reflect a changes in the motor unit recruitment pattern. These results suggest that differential exercise-induced neuromuscular and metabolic responses may be related to muscle fiber type composition.

References

1. Dimitrov, et al. (2006). Med Sci Sports Exerc;38:1971-1979

2. Jansson, et al. (1987). Clin Physiol;7:337-345

3. Storer, et al. (1990). Med Sci Sports Exerc;22:704-712.

Acknowledgments

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EFFECT OF SHORT-TERM SUPPORTLESSNESS UPON PERFORMANCE OF LOCOMOTION TEST WITH VOLUNTARY ION OF SPEEDS AT A STABLE AND UNSTABLE TREADMILL

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INTRODUCTION: Step-wise locomotion test with voluntary selection of speeds is used for evaluation of physical fitness in a Russian system of counter measures for preserving health and efficiency of cosmonauts under unfavorable conditions of microgravity. Test consists of 4 steps with rising intensity at a passive treadmill. Speed at each step is selected by the subject individually according to following wording: walking, jogging, moderate running, fast running. The duration of each step and friction of a treadmill are fixed. According to the technical requirements for International Space Station equipment the treadmill is to be vibro isolated from the body of the Station, that is the treadmill is unstable.

The aim of the study was to evaluate the efficacy of locomotion exercise at the unstable treadmill under control conditions and after 6 hours of "dry immersion" (head-out water immersion with waterproof fabric separating subject from water) mimicking the conditions of supportlessness.

METHODS: 8 healthy young male subjects gave their informed consent to participate in a study. They performed test at the stable and unstable treadmill both under control conditions and after 6-hours dry immersion.

RESULTS AND DISCUSSION: Total way covered by a subject during test was significantly lower at unstable treadmill than at stable. After dry immersion the total way covered at a stable treadmill did not change and at an unstable treadmill – decreased. Under control conditions maximal running speed at the unstable treadmill in comparison with stable was unchanged and after immersion was decreased. Sensation of the perceived exertion during test did not change in all cases except one. It is understandable as the test is organized in such a way that the subject is choosing the speeds according to his perceived exertion. The impact loads significantly decreased at an unstable platform apparently because of damping. After dry immersion impact loads at the stable treadmill did not affect, but significantly enforced at an unstable treadmill.

Energy cost of exercise was evaluated as an increase of energy consumption in response to an increase of locomotion speed during jogging-running part of the test. Energy cost of locomotion had a tendency for an increase during exercise at an unstable treadmill. After immersion the energy cost of exercise at unstable treadmill increased both in comparison with the cost at stable and unstable treadmill. EMG-activity of m. soleus and m. rectus femoris increased during exercise at unstable treadmill. That means maintenance of vertical posture became more difficult. After immersion activity was redistributed between different muscles.

CONCLUSION: Thus changes in energy cost of exercise at unstable treadmill and after immersion may be connected with redistribution and increase of activity for different muscle groups under conditions of unstability and as a result of short-term period of supportlessness.

14:15 - 15:15

Poster presentations

PP-PH14 Physiology 14

THE EFFECT OF NAHCO3 INGESTION ON POWER OUTPUT DURING EXERCISE AT A CONSTANT LEVEL OF PERCEIVED EXERTION.

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Manipulation of acid-base status has been demonstrated to influence RPE during exercise (Kostka & Cafarelli 1982), suggesting that shifts in blood [H+] are linked to sensory processes. Ingestion of NaHCO3 has been demonstrated to reduce RPE during supra lactate threshold (>LT) intensity exercise (Robertson et al 1986) indicating that ingestion could also result in increased muscular power output during exercise at similar RPE's. The purpose of this study is therefore to investigate the effect of NaHCO3 ingestion on power output during cycling at an RPE associated with >LT exercise.

Ten recreationally active male participants (26+2.4 years) performed an incremental exercise test on an electronically braked cycle ergometer for identification of LT and RPE at a range of submaximal workloads using the Category Ratio Scale (Borg 1982). Participants performed four further experimental trials, two at an RPE associated with >LT exercise, and two at an RPE associated with <LT exercise following ingestion of either 0.3 g.kg-1 NaHCO3 or a CaCO3 placebo. Participants cycled at a constant cadence (60-70 rpm) and controlled resistance to pedalling themselves using large buttons on the ergometer console. On commencing exercise, three minutes were given to adjust power output to equate with the required RPE which was then maintained for a further 4 minutes. Power output, heart rate, and breath by breath respiratory gas exchange measures were collected throughout the 4 minutes, and capillary blood samples were taken for blood lactate and blood gas analysis immediately pre- and post- exercise. Differences in power output and respiratory gas exchange measures were identified using a two-way ANOVA for repeated measures, and paired sample t-tests were used to identify differences in pre- and post-exercise blood parameters.

Power output was higher ($P<0.05$) following NaHCO3 than following CaCO3 at all times during >LT, but not <LT exercise. No significant differences in respiratory gas exchange measures or HR were observed at any time during >LT or <LT trials.

These results suggest that manipulation of acid-base status influences muscular power output at a fixed RPE during >LT but not <LT exercise. Further work is required to ascertain the effects of acid-base manipulation on performance and pacing strategy during self paced maximal exercise trials as it seems as though the strategy used during such activity results from both peripheral physiological feedback and knowledge of the endpoint of exercise (St. Clair Gibson et al 2006). Although the present study indicates that alteration of a peripheral physiological variable can influence power output at a given RPE, the requirement to maintain a submaximal level of exertion means that the activity performed is not representative of athletic competition.

THE ACUTE EFFECT OF TAURINE INGESTION ON 3KM RUNNING PERFORMANCE AND FORCE IN TRAINED MIDDLE DISTANCE RUNNERS

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Introduction: Taurine (TA) can increase force production of isolated mammalian skeletal muscle tissue while depletion of it decreases muscular function (Bakker and Berg, 2002; Hamilton et al., 2006). Although prolonged TA administration appears to benefit endurance performance in trained endurance athletes (Lee et al, 2003), little research exists examining the acute effects of TA on performance (Rutherford et al, 2006).The current study investigated the acute effect of 1000mg of TA on maximal 3km time trial (3KTT) performance and lower limb muscular force production (MFP) in well-trained, competitive middle distance runners (MDR).

Methods: Six male MDR (age: mean 20.10, s = 1.11 years; 800m personal best times: mean 123.03, s = 5.18 seconds) participated in a double blind, randomised, crossover designed study. Following a standardized warm-up, participants completed a laboratory-based self-paced, maximal 3KTT on a treadmill ingesting either TA or placebo (PL), two hours prior to testing. Capillary blood lactate (LAC), glucose (GLU) and MFP during three countermovement jumps (without arm swing) were measured pre- and post-3KTT. Respiratory exchange ratio (RER), heart rate (HR), rating of perceived exertion (RPE), and split times were recorded at 500m intervals. Wilcoxon's test was used to analyse overall 3KTT performance. All other variables were analysed using Friedman's test, followed by Wilcoxon's test with Bonferroni adjustment, if differences were found.

Results: No significant differences ($P > 0.05$) were found for any of the variables between conditions. However, the TA condition demonstrated better performances in 3KTT but not MFP (TA: mean 650.00, s = 56.68 seconds; PL: mean 655.50, s = 68.22 seconds and TA: mean 1196.37, s = 133.08 N; PL: mean 1289.53, s = 243.08 N, respectively).

Discussion: The failure to detect significant differences in performance between conditions indicates acute ingestion of TA may have no effect on 3KTT performance or peak lower limb MFP of well trained endurance runners in middle distance events. The findings of this study provide an insight into the acute effects of TA on both endurance and MFP performance, as previous studies indicated TA benefiting performance in longer duration exercise trials and after prolonged administration (Lee et al., 2003). The results also raise questions over the potential influence of TA on MFP in vivo (Bakker and Berg, 2002). More research is required to establish potential effects of different TA dosages on endurance performance of different duration.

References

Bakker AJ & Berg HM. (2002). Journal of Physiology, 538, 185-194.

Lee HM, Paik IY, Park TS. (2003). Korean Journal of Nutrition, 36(7), 711-719.

Hamilton EJ, Berg HM, Easton CJ, Bakker AJ. (2006). Amino Acids, 31, 273-278.

Rutherford J, Stellingwerff T, Lawrence L. (2006). Medicine and Science in Sports and Exercise, 38(5), S127.

EFFECTS OF A 24-H FASTING AND A SUBSEQUENT MODERATE AEROBIC CYCLING ON BLOOD ADIPONECTIN CONCENTRATIONS AND NEUTROPHIL RESPONSES

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The combination of exercise and fasting is a popular way in weight reduction. Adiponectin is produced by adipose tissue and has been shown to associate with body mass index (BMI), insulin resistance, and inflammation. The purpose of this study was to investigate the influence of a 24-h fasting and a subsequent moderate aerobic cycling on blood adiponectin levels and neutrophil responses.

With local ethics committee approval, ten male volunteers (age 22.0±0.6 years, height 1.69±0.02 m, body mass 72.7±2.5 kg, BMI 25.2±0.6, VO2max 35.15±2.91 mL•kg-1•min-1; means ± SEM) participated in this study. After a preliminary trial of VO2max measurement, subjects completed two main trials (fasting and control) in a counterbalanced order. Subjects dined a standardized dinner (1082±38 kcal•kg-1: CHO 137±5 g, protein 53±2 g, fat 36±1 g) between 18:00-18:30 in both trials. Subjects kept fasted status henceforward in fasting trial, whereas subjects ate standardized breakfast at 09:00 (216 kcal•kg-1: CHO 54 g, protein 25 g, fat 16 g) and lunch at 12:00 (identical meal to dinner) in control trial, before completing a 1-h cycling at 50% VO2max between 18:30-19:30 the following day. Blood samples were taken at pre-dinner (Pre-DN), pre-exercise (Pre-EX), and post-exercise (Post-EX). Haematological analysis was performed using an automated cell counter. Plasma adiponectin levels were determined using ELISA kits. fMLP induced neutrophil oxidative burst (OB) activity was measured using a chemiluminescence assay. Results were analysed using a two-way repeated measures ANOVA with post hoc Tukey test. Statistical significance was accepted at $P<0.05$.

The main findings of this study were: (1) the blood counts of leukocytes were not affected by fasting but exercise ($P<0.01$); (2) neutrophil OB activities were not affected by either the 24-h fasting or the 1-h moderate cycling; (3) adiponectin levels were lower in fasting trial than that in control trial at post-EX ($P<0.05$). In conclusion, the findings suggest that a 24-h fasting prior to moderate aerobic cycling does not appear to affect neutrophil responses but plasma adiponectin concentrations.

EFFECT OF TRAINING STATUS ON ADIPONECTIN CONCENTRATIONS

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Introduction: Several studies exploring the effects of acute exercise on adiponectin concentration have resulted in conflicting results (Simpson and Singh, 2008). Jurimae et al., (2005) and Jurimae et al., (2006) showed delayed increases (after 30 min) in adiponectin concentrations, respectively following maximal exercise and following a constant intensity exercise performed by trained rowers. The purpose of this investigation was to analyse the effect of sub-maximal acute exercise at different intensities on plasma adiponectin and insulin concentrations in trained and untrained subjects.

Methods: Seven trained (elite handball players) and eight untrained subjects participated in this study. Subjects performed two submaximal cycling exercises of 20 minutes each: moderate and heavy. The intensity of exercises was respectively at 60% and 80% of maximal oxygen consumption (VO2max). Blood samples were obtained before, at the end, after 30, 60 and 90 min of recovery.

Results: Adiponectin concentrations were unchanged after both exercises and during recovery in trained and untrained subjects. Insulin concentrations were significantly lowered ($P<0.05$ and $P<0.01$) at the end and during recovery in both protocols and groups. The comparison between groups indicated that trained subjects presented lowered control adiponectin and insulin concentrations than untrained

counterparts during the moderate and the heavy exercise: -51.2%, P<0.05 and -44.4% P<0.05, respectively for adiponectin and -35.2%, P<0.05 and -35.2% P<0.05, respectively for insulin.

Discussion: In accordance with our results, Kraemer et al., (2003) and Ferguson et al., (2004) reported no significant changes in adiponectin concentrations after respectively, a strenuous intermittent running exercise in well-trained runners and a 60 min sub-maximal aerobic exercise in healthy normal weight males and females. In our study, we supposed that the handball elite players undergo a heavy training that can induce significant changes in adiponectin receptors and explain the lowered control adiponectin levels. Our results suggested that 1) 20 minutes acute aerobic exercises not stimulate the production and the release of adiponectin during 90 minutes recovery in trained and untrained subjects, 2) it appears that adiponectin is not associated with insulin modifications and 3) handball athletes showed significantly lower resting adiponectin and insulin response with respect to untrained subjects. This result is probably the consequence of increased level of receptor expression induced by training.

References

Jurimae J, Hofmann P, Jurimae T, Mäestu J, Purge P, Wonisch M, Pokan R, von Duvillard SP. (2006) 27, 272-277.

Jurimae J, Purge P, Jurimae T. (2005), 93, 502-505.

Kraemer RR, Aboudehen KS, Carruth AK, Durand RT, Acevedo EO, Hebert EP, Johnson LG, Castracane VD. (2003). Med Sci Sports Exerc, 35, 1320-1325.

Simpson KA, Singh MA. (2008) Obesity (Silver Spring), 16(2), 241-256.

QUANTIFICATION аND NORMALIZATION OF TRAINING LOADS BY USING THE CRITERIONS OF EXERCISE PULSE COST

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Introduction: Adaptation to influence of physical loads in sports training may be quantitatively described by relationship "dose-effect" . The value of trained function increase for the period of observation is assumed as a parameter of achievable effect. A dose of influence of physical load is defined as the product of intensity of exercise energy expenditure on the period of the physical load action.

The energy cost in exercise can be estimated on the basis of direct recording of metabolic shifts at physical work, and also by an exercise pulse cost derived from the analysis of heart rate change dynamics during work and recovery (Volkov et all 2005).

Methods: 26 well-trained male swimmers, middle-distance runners and skaters (age 18-24 years, height 162-186 cm, body mass 62-83 kg), ranging from club to international level, volunteered to take part in the study. All subjects performed 5 all-out tests - 10 s, 30 s, 60 s, 120 s and 360 s duration without preliminary warm-up. The gas volume, the O2 and CO2 fractions in the expired air were measured using a monitor system (Meta-Laizer 3B-R2, Cortex, Germany). O2-intake, O2-debt, O2-requirment, aerobic and anaerobic energy output were calculated with a special computer program. The blood lactate concentration is determined using an enzymatic method Dc Lange. Acid-alkaline balance parameters were determined using a pH and blood gases microanalyzer (AVL-800, Radiometer, Denmark).

Results: Changes of parameters total pulse cost in dependence with values of exercise limiting time close reproduce appropriate relationships for parameters oxygen requirement and energy cost of exercise. Thus, pulse cost indices may be used as objective criteria for quantification physical loads as well at the development of programs of optimization of training in various kinds of sports. In exercises 10-s duration power was 850 (108) W, pulse cost of exercise 222 (59) beats, oxygen requirement rate 32.4 (5.2) l min(-1), maximum lactate accumulation 8.63 (1.93) mmol l (-1). In exercises 60-s duration the corresponding data were 380 (37) W, 450 (136) beats, 11.01 (1.28) l min(-1), 15.11 (0.96) mmol l (-1). In exercises 3-min duration the corresponding data were 170 (14) W, 870 (182) beats, 4.4 (0.34) l min(-1), 15.67 (1.49) mmol l (-1). As a criteria of achived training effect is used a increase of physical performance and as a criteria of physical load dose is used a product of relative power and total pulse cost of exercise.

Conclusions: Calculations of exercise pulse costs allow precise and specific selection of training loads for each athlete. The standards for training and competition loads based on parameters of exercise pulse cost should be defined differentially for athletes specializing in different sports with different training regiments.

References

Volkov N.I., Popov O.I., Gabrys T., Shmatlyan-Gabrys U. (2005). Human Physiology, 31(5), 606-614.

OXYGEN UPTAKE DURING SIMULATED FIREFIGHTER-WORK: THE TRONDHEIM FIREFIGHTER-TEST

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Introduction: Firefighting and rescue work may be physically very demanding [1]. Therefore, testing of firefighters' physical ability is needed. Trondheim fire brigade has developed a standardized test (Trh-test) for examining whether their firefighters are suited to serve as smoke divers. The Trh-test test consists of three main parts: First, emergency where the firefighter complete seven tasks to arrive at the scene of fire (solving a small puzzle, balance, hose pulling, connecting and disconnecting hoses, carry heavy cans, crawling thru a tunnel, walk to the scene of fire). Second, physical work in a heat chamber (120-140 °C; carry 20 blocks of concrete, each weighing 18 kg). Third retreat, repeating all tasks in part 1 in opposite order. The whole set of tasks should be carried out as fast as possible and within 21 min. This study's aim was first to measure the oxygen uptake directly throughout the Trh-test. A second aim was to compare the performance with the subjects' maximal oxygen uptake and lactate threshold attained when dressed up like a firefighter.

Methods: 21 professional firefighters (20 men, one woman) in Trondheim fire brigade served as subjects. Each firefighter was dressed up for smoke diving, wearing 28 kg as the basic equipment plus 4 kg of instruments for the present experiments. Oxygen uptake was measured by the portable Metamax II analyzer. Because of a hot and polluted environment, the subjects inspired from bottles with pressurized air and expired thru the Metamax II analyzer that was modified to work for the present experiments [2].

Results: The subjects completed the whole test in 11–22 min, and the fastest subjects where those with the highest maximal O2 uptake and the highest O2 uptake during the Trh-test. The O2 uptake during the Trh-test test averaged 67% of the maximal, and the peak O2 uptake, seen near the end of work in the heat chamber, was 80% of the maximal. For faster and well fit subjects the O2 uptake exceeded that corresponding to the lactate threshold during physically demanding parts of the test, but not so for less fit subjects. The heart rate reserved averaged 15 bpm with little difference between fitness level, and the heart rate was above that corresponding to lactate threshold during most of the test. Consequently, the post-test blood lactate concentration averaged 9 mmol/L.

Conclusion

The Trh-test is physically demanding and discriminates between physically fit and less fit subjects. The O2 uptake during the test is higher for physically fit subjects and varies between different tasks.

References

1. Heimburg E von, Rasmussen AKR, Medbø JI. Physiological responses of firefighters and performance predictors during a simulated rescue of hospital patients. Ergonomics 2006; 49: 111–126.

2. Synnes OM, Medbø JI, Heimburg E von. Technical modification of the Metamax II metabolic analyzer for measurements on firefighters in the heat. Abstract for ECSS 2009.

THE EFFECTS OF HIGH FREQUENCY LOCAL VIBRATION TRAINING ON HORMONAL REPONSE AND MUSCLE CONTRACTILE PROPERTIES IN MEN.

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Objective. The aim of this study was to evaluate the acute and cumulate reponse of the muscular performance and blood hormone concentrations following local high intensity vibrational (HLV) treatment in men.

Materials and Methods. To test the acute effects of HLV on muscular performing and hormonal profile, 9 subjects, moderately trained, were studied in two different occasion with (vibration) and without (control) HLV treatment (VISS Circle, San Pietro in Casale, Bologna, Italy), the protocol was the same on the same days. In second occasion, after 3 day, the subjects performed HLV treatment for 30min at 300Hz (f =300Hz; A=4mm). The protocol consisted of performing jumping (CMJ) on force platform, maximal isometric voluntary contraction (MVC) of leg extensor muscle, as well as blood collection for analysis, before, immediately after and again 1 hour later HLV treatment.

To test the cumulate effects of HLV, 36 subjects were randomly assigned to two training programs: a vibration group (cV group) which performed HLV, 12 session 3days/wk, and a resistance training group (cR group) which performed leg extention exercice, 12 session 3days/wk. Before, after and again 2 month later the end of training program the subjets performing a MVC test and isokinetic (100°/sec) testing of knee flexing-extension movement on leg extention exercice.

Results. The acute effects: results showed a significant increase in the growth hormone (GH) and CPK ($p<0.05$,$p>0.05$), whereas cortisol (C) and LDH levels decreased ($p<0.05$). No change in testosterone (T) plasma concentration was observed. GH, CPK, C, T and LDH levels didn't change in control group (1). Muscular strength improved, as indicated by increase in MVC performance ($p<0,05$), it could have been induced by an increase in the syncronisation activity of the motor units. CMJ performance doesn't show significant change.

The cumulate effects showed a significant improved in muscular strength performances, both MVC and Isokinetic test increase ($p<0.01$;$p<0.05$) at end of treatment, our results showed an long term effect in HLV treatment, increase persist after 2 month the end of treatment.

Conclusion. Acute effects of HLV training causes a modification in hormonal plasma concentration, increase GH and decrease C, but increases in neuromuscular system were independent response. MVC increase of 7.0% seems to be related with high frequency vibration stimulus able to improve MUs synchronization. 4weeks HLV training causes an increment of muscle contractile force, as much as in the case of a resistance training. The improvement obtained persist 2 months after training. In conclusion, The methodical of high vibratory stimuli are a valid tool to be used in a sport training and rehabilitative therapies context in order to maintain and improve muscular strength.

1)Kvorning T, Bagger M, Caserotti P, Madsen K. Effects of vibration and resistance training on neuromuscular and hormonal measures. EurJApplPhysiol. 2006 Mar;96(5):615-25.

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Poster presentations

PP-PH15 Physiology 15

RELIABILITY OF ELECTRICAL TRAIN STIMULATION TO INDUCE MUSCLE CRAMP IN THE CALF MUSCLES

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Introduction: Muscle cramp is a forceful, involuntary skeletal muscle contraction, but its underlying mechanisms are not well understood. The lack of understanding of muscle cramp may in part arise from its unreliable occurrence with traditional protocols. It has been reported that electrical train stimulation (ETS) can be used to induce cramp in the small flexor muscles of the foot, and a relationship exists between the threshold frequency (TF) of ETS to induce cramp and the susceptibility to muscle cramp from muscular exertion (1). However, no previous studies have used ETS to induce muscle cramp in lower leg muscles. In an attempt to establish a quantitative measure of muscle cramp, the present study examined the test-retest reliability of the TF of ETS to induce calf muscle cramp.

Methods: Using a Compex 2 stimulator, ETS was applied to the calf muscles of both (dominant and non-dominant) legs in 10 men (19-44y) who reportedly experienced prior cramp during training or competition. Each leg was treated separately, and the order was counterbalanced amongst subjects. Subjects were supine with their legs supported by a specially designed bench while the ankle was at maximal plantarflexion. ETS consisted of 2 s (with 500 ms ramp time) of 300 µs square pulsed waves followed by 30 s rest; current was set to maximum tolerable intensity (35-60 mA). Stimulation commenced at 10 Hz and increased by 3 Hz until cramp occurred, as confirmed by a spontaneous EMG signal. The protocol was repeated 30 min after the first test and seven days later. Reliability of TF at cramp occurrence was analysed using the intraclass correlation coefficient (ICC), limits of agreement (LOA) and coefficient of variation (CV).

Results: Muscle cramp was induced in all subjects, but the TF varied amongst subjects (13-55 Hz). Mean TF value to induce muscle camp for the dominant leg was 25.0 ± 7.6 Hz for the first test and 23.7 ± 5.0 Hz for the second test. The non-dominant leg also showed similar values. Test-retest reliability, as indicated by ICC, LOA and CV, were 0.94, 5.4 % and 9.2 %, respectively for the dominant leg, and 0.72, 9.8 % and 15.4 %, respectively for the non-dominant leg.

Discussion: This study showed that ETS can induce muscle cramp to the calf muscles, and that the TF of ETS was a reliable measure to assess the risk of calf muscle cramp susceptibility. Most subjects cramped within a 3 Hz difference between tests, but some had up to a 15 Hz difference. Interestingly, those who reported a lower susceptibility to cramp had a greater difference in TF between tests, suggesting that the test is more reliable in those who are more susceptible to cramp. Factors thought to influence muscle cramp, such as electrolyte disturbance, dehydration, environmental conditions and fatigue should be examined using ETS.

1. Bertolasi L, et al. (1993) Ann Neurol, 33, 176-180.
2. Minetto M, et al. (2008) Muscle Nerve, 37, 90-100.

LOCALLY CONFINED CALCIUM DEPENDENT MORPHOLOGICAL CHANGES TO MITOCHONDRIA OF THE MOTOR END-PLATE DUE TO CARBACHOL STIMULATION.

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Disturbance of the motor end-plate calcium homeostasis for hours leads to vacuolisation of the mitochondria in the vicinity of the motor end-plate (MEP) and necrosis of muscle fibres. Little is known, however, about the onset of these morphological changes due to this disturbance. To improve our understanding of the MEP calcium homeostasis, it would be beneficial to temporally and topographically pin-point the first visible signs of morphological changes to mitochondria. In order to disturbe the MEP calcium homeostasis, omohyoid muscles of mice were stimulated for 1 to 30 minutes with the acetylcholine agonist carbachol which leads to an inward current of free calcium in the MEP. The fibre-type-specific morphological changes to the MEPs and mitochondria were evaluated using light- and electron-microscopy and compared with laser-scanning live-recordings of Rhod2-AM labeled mitochondria of MEPs during carbachol stimulation. Localised calcium dependent contractures of different severity underneath the motor end-plate were observed within some but not all muscle fibres depending on the duration of carbachol incubation. But the most prominent contractures were confined to slow muscle fibres. The mitochondria in the MEP as well as in the contracture zone underneath the MEP of those muscle fibres with strong contractures i.e. mostly of type I fibres manifested electro-translucent spots in the matrix whereas the mitochondria outside the contracture zone looked normal. The live-recordings during the carbachol stimulation showed sequestering of calcium into the mitochondria of the MEP area wherease the calcium content of the mitochondria outside the MEP did not change. We interpret this as a first sign of calcium overload of the mitochondria and as a hint towards differences in the handling of the calcium homeostasis in different muscle fibre types.

ACTIVATION OF THE HUMAN PRIMARY AND SECONDARY SOMATOSENSORY CORTEX FOLLOWING TACTILE STIMULATION

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Introduction: Our goal is to examine the sensory feedback from periphery to generation of the movement evoked cortical magnetic fields. We reported that the first component of the movement evoked magnetic fields (MEF 1) was due not to the onset of joint movement but to that of muscular contraction. However, the generators of the second and third components of MEF (MEF 2 and 3) that observed with long latency after electromyographic onset are not fully understood. In this study, MEG recordings were performed to investigate the neural mechanisms following the tactile stimulation of the index finger.

Subjects and Methods: Ten healthy male subjects (mean age 29.2±10.3 years) participated in this study. All subjects had given their written informed consent, and the study was approved by the ethics committee at our university. For MEG measurement, we used a 306ch whole-head MEG system (Neuromag, Elekta, Finland) and tactile stimulator that was made of non-magnetic materials (KGS, Japan). MEG signals were sampled at 1000Hz with band-pass filtering from 0.03 to 330 Hz. The averages of above 300 epochs for SEFs were obtained. Tactile stimuli were applied to the tip of right index finger. Tactile stimulation was used the four teeny pins with 1.3mm diameter and 0.7mm high. The distance of each top of pins was set at 2.4mm. Inter stimulus interval was set at 2 second and the pressurization was continued during 1 second. For analysis of SEF, the bandpass filter was set from 0.5 Hz to 50 Hz. The sources of the components of interest in the SEFs were estimated as the equivalent current dipoles (ECD). The ECD locations and moments were calculated using a spherical conductor model of 3D axes determined with the fiducial points, i.e. the nations and bilateral preauricular points. We accepted ECDs with a goodness-of-fit > 90% for analysis.

Results: Clear SEF signals were recorded from contralateral hemisphere for all subjects at around 57ms and 140ms after pressurization (57.4±12.7 ms and 140.0±14.6 ms) or depressurization (56.9±13.3 ms and 144.0±17.0 ms), and these ECD locations were in area 3b. Moreover, long latency responses (169.4±33.0 ms after pressurization, and 172.2±36.7 ms after depressurization) were identified in ipsilateral hemisphere, corresponding to secondary somatosensory cortex (S2).

Discussion: In this study slight intensity of tactile stimuli was used, and a clear SEF signal was recorded from bilateral hemisphere after pressurization and depressurization. The long latency activation was detected clearly at ipsilateral S2. S2 was speculates to serve a higher level of cognitive function in somatosensory information processing, such as attention, objective recognition and integration of nociceptive and non-nociceptive inputs. In this study, we could record S2 activation without attention or recognition. These methods and results may clarify the S2 function and the generator of MEF2 and 3 during voluntary movement.

A METABOLOMIC APPROACH TO INVESTIGATE THE METABOLIC CHANGES INDUCED BY ACUTE AND CHRONIC PHYSICAL EXERCISE IN YOUNG WOMEN

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Metabolomic is a comprehensive method for metabolite assessment, measuring the overall metabolic signature of biological samples. We used this approach to investigate biochemical changes due to acute and chronic physical exercise.

Twenty-two women using the same oral contraceptives were allocated to an untrained group (n=10) or a trained group (n=12), depending on their physical training background. The subjects performed a short-term intensive exercise test (Wingate anaerobic test). Urine specimens were collected before and 30 min after the test. The samples were analysed by 1H NMR spectroscopy and multivariate statistical techniques were utilized to process the data.

Clear separations of the urine profiles from the specimens collected before vs. 30 min after the test and from the untrained vs. trained subjects were observed. The main metabolites in response for the changes in the urinary profiles were creatinine, lactate, pyruvate, alanine, β-hydroxybutyrate, acetate and hypoxanthine. For each of those metabolites the excretion rate was calculated and statistical analysis was performed (two-way analysis of variance followed by Tukey post-hoc analysis when appropriate). Higher creatinine excretion was observed in trained compared with untrained women. In both groups, the excretion of lactate, pyruvate, alanine, β-hydroxybutyrate and hypoxanthine increased similarly after the completion of the Wingate-test ($p<0.03$). However, a significant interaction (group by time) was observed for acetate, suggesting that the excretion of this metabolite increased in a lower extent in trained than in untrained subjects. These metabolic changes may be concerned with the redox status and the oxidative stress of muscular cells.

In conclusion, metabolomic studies in the field of clinical studies, pharmacology, toxicology, etc, …, should consider intense physical activity as an important biological factor influencing the outcome of the test. Moreover, metabolomic is a promising tool to profile urine of athletes, to make a deep insight into physiologic states and clarify the changes induced by short-term intense physical exercise.

ON MUSCLES, TENDONS AND HIGH HEELS

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Introduction: Animal experiments have shown a remarkable remodeling of skeletal muscle when placed at short length for long periods of time (1). One common condition that places human plantarflexor (PF) muscles in a shortened position is high-heel wearing. In the present study we tested the hypothesis that regular use of high heels leads to changes in the architecture of the leg muscles by decreasing the fascicle length of the PF while increasing that of the dorsiflexor (DF) muscles. Furthermore, since placing tendon in chronic slack position, as in prolonged bed rest, has been shown to cause a decrease in tendon stiffness (2), long-term high-heel wearing was expected to alter also tendon mechanical properties. Eventually, we wished to demonstrate the effects of chronic use of high-heels on skeletal muscle functioning.

Methods: To test these hypotheses, we examined a) the torque-angle relationship of the PF and DF muscles by Cybex dynamometry, b) fascicle length and pennation angles in the gastrocnemius medialis (GM) and tibialis anterior (TA) muscle by ultrasound, c) tendon length by ultrasound, d) triceps surae muscle volume and joint moment arms (MA) by magnetic resonance imaging (MRI) and d) Achilles tendon mechanical properties evaluated by ultrasound and dynamometry, in habitual high-heeled (HH) shoe wearers and in aged-matched controls (CTRL) habitually wearing flat shoes.

Results: The results of this pilot study show similar GM:TA fascicle length ratios, as measured in a standing position. However, greater fascicle lengthening in the GM could be observed in HH during passive rotation of the foot. As MA were found to be equal in both groups, these findings suggest that the total compliance of the GM muscle-tendon unit may be altered in HH. Although previous investigations have shown that during passive changes in joint angle, tendons contribute to the total length change of the muscle-tendon unit by up to 73% (3), in the present study resting tendon length and passive tension, as measured in different ankle positions, were found to be similar in both groups. One potential mechanism that may account for the higher rate of length change of GM fascicles in HH is an increased stiffness of the series elastic component between the heel and the GM muscle fascicles (tendon plus aponeurosis) or part of it. Furthermore, our data suggest differences in torque-angle relationships, indicating that muscle function may be influenced by high-heel wear.

References

1. Tabary J.C. et al. (1972). Physiological and structural changes in the cat's soleus muscle due to immobilization at different lengths by plaster casts. J Physiol, 224:231-44

2. Reeves, N.D. (2006). Adaptation of the tendon to mechanical usage. J Musculoskelet Neuronal Interact, 6(2): 174-80.

3. Herbert, R. D. et al. (2002). Change in length of relaxed muscle fascicles and tendons with knee and ankle movement in humans. J Physiol, 539 (Pt 2): 637-45.

BEHAVIOR OF BLOOD LACTATE IN PUBERTAL AND POST-PUBERTAL SPORTSMEN AFTER AN INTERMITTENT MAXIMAL EFFORT

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JUNTA DE ANDALUCIA - CENTRO ANDALUZ DE MEDICINA DEL DEPORTE

INTRODUCTION: The ability of undergoing anaerobic work throughout infancy and adolescence has been the aim of several studies. Nevertheless, the results of such studies on the relationship between maturational status and anaerobic metabolism have been rather controversial (Praagh and Doré, 2002). The aim of the present study was to analyze the anaerobic response in male sportsmen (children and adolescents) to an intermittent maximum progressive test (Yo-Yo IR1), with regards to blood lactate behavior.

METHOD: Fifty-nine sportsmen with ages ranging from 9 to 17 voluntarily participated from the study. The subjects were federated basketball players, with a weekly training frequency of three to four sessions, and regularly participating in competitions. They were categorized according to Tanner criteria (Marshall and Tanner, 1970), into pubertal (age = 10.97 ± 2.05 yr; body mass = 49.16 ± 12.46 kg; height = 156.56 ± 14.86 cm), and post-pubertal (age = 14.73 ± 1.71 yr; body mass = 70.94 ± 13.15 kg; height = 179.75 ± 8.67 cm). A sexual maturation self-assessment was performed in two different occasions (intraclass correlation coefficient = 0.90); the reproducibility and concordance with the medical assessment of this method has been previously proven (Matsudo and Matsudo, 1994). In addition, the sportsmen underwent a Yo-Yo IR1 test to voluntary exhaustion and blood lactate concentrations were measured at different timepoints (1 minute, 3 minutes, and 5 minutes during recovery).

RESULTS: The absolute values for peak lactate were not statistically significant ($p > 0.05$) among pubertal and post-pubertal sportsmen (8.81 ± 2.25 and 8.86 ± 2.03 mmol/l, respectively). On the other hand, relative values of lactate, as expressed with regards to body mass, and to achieved work (0.18 ± 0.07 and 0.13 ± 0.03 mmol/kg; 0.00035 ± 0.00023 and 0.00010 ± 0.00005 mmol/kgm/min, respectively) were significantly greater ($p < 0.05$) in pubertal subjects than in post-pubertal subjects.

CONCLUSION

Despite the fact that absolute values of blood lactate were not different among pubertal and post-pubertal subjects, relative values evidenced a greater role of anaerobic metabolism in pubertal subjects.

REFERENCES
Praagh EV, Doré E. Short-term muscle power during growth and maturation. Sports Med. 2002; 32(11): 701-28.
Marshall WA, Tanner JM. Variations in the pattern of pubertal changes in boys. Arch Dis Child. 1970; 45(239):13-23
Matsudo SMM, Matsudo VKR. Self assessment and physician assessment of sexual maturation in Brazilian boys and girls: concordance and reproducibility. Am J Hum Biol. 1994; 6:451-5.

PLASTICITY OF MOTOR UNIT CONTRACTILE PROPERTIES EVOKED BY ONE MONTH TREADMILL AND WHOLE BODY VIBRATION TRAINING IN THE RAT MEDIAL GASTROCNEMIUS MUSCLE

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Increased physical activity considerably affects the neuromuscular system and changes in morphological, biochemical and metabolic parameters of skeletal muscle depend from the frequency, intensity and duration of employed training programme. The aim of the study was to compare the effect of endurance and whole body training on motor unit contractile properties in rat medial gastrocnemius muscle. Two kinds of 4-week trainings - treadmill and whole body vibration trainings were applied. 23 Wistar rats were divided into three groups: trained on a treadmill (n=7, locomotion speed 27 cm/s, 1 km daily, 5 days weekly, for 4 weeks), trained on vibratory platform (n=5, Power Plate®, 50 Hz vibration of 2 mm amplitude, 30 s daily, 5 days weekly, for 4 weeks) and control (n=11). The contractile properties of isolated motor units were studied. Functional isolation of units was achieved by electrical stimulation of filaments of the ventral roots. A total of 400 motor units were studied (157 in the treadmill and 101 in the vibration group, and 142 in the control group). They were divided into: fast fatigable (FF), fast resistant to fatigue (FR) and slow (S) types. Following treadmill training, percentage number of FF units decreased whereas FR units increased. The distribution of the fatigue index changed within these two types of fast units. The population of FF units exhibiting outmost fatigue indices was reduced whereas proportion of FR with high fatigue resistance increased. The twitch and tetanus forces increased considerably in fast motor units, mainly in those of the FF type what was probably due to short running periods following moments when animals stopped on a moving belt. During short running periods FF type motor units were recruited into activity. The contraction and relaxation times shortened in the FR and S motor units. The vibration excited mainly muscle spindles and increased activity of motor units through the stretch reflex loop. Results of the whole body vibration study reveal that changes in motor unit properties were different from obtained after treadmill training. The distribution of motor units did not change. Force increased substantially only in FF motor units. The contraction and relaxation times shortened in fast motor units. No changes in contractile parameters of slow units were noted. In conclusion, contractile parameters changed differently in response to two applied forms of training. This can be related to differences in recruitment strategy of motor units used during locomotion and vibratory training and differences in the duration of activity (one hour locomotion versus 30 second vibration evoked activity). It is shown that moderately increased daily physical activity, i.e., locomotion with low speed and short lasting whole body vibration, can considerably change motor unit properties. Of three unit types, FF motor units seem to exhibit the greatest plasticity in response to "extra physical activity" induced by training.

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Poster presentations

PP-NU03 Nutrition 3

THE EFFECT OF SKIMMED MILK ON THE HYDRATION STATUS OF MALE COLLEGIATE ATHLETES DURING AND AFTER SUB-MAXIMAL CYCLING

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Milk could be seen as an effective hydration solution due to its naturally high electrolyte content and the presence of carbohydrate in a concentration similar to that of commercial sports drinks (Sherreffs et al. 2007). Whilst the macronutrients (carbohydrate and protein) found in milk have been used as a recovery aid following exercise (Karp et al. 2006), little evidence currently exists regarding the potential role milk could have on the hydration of athletes during and after exercise (Sherreffs et al., 2007). Therefore the purpose of the present study was to investigate the effect of skimmed milk on the hydration status of male collegiate athletes during and after sub-maximal cycling. Twelve healthy male collegiate athletes (age 22 ± 2 years; body mass 97.8 ± 15.2 kg; height 178 ± 18 cm) who were lactose tolerant volunteered to take part in the present study. Subjects completed one familarisation trial followed by two experimental trials. Using a randomised cross-over experimental design subjects performed two separate steady-state cycling trials at 60% VO2max for 40 minutes. Subjects ingested either skimmed milk (0.2% fat) or water. Subjects ingested 100ml of fluid every 10 minutes during exercise and then 200ml of fluid every 15 minutes for an hour following exercise. Blood haematocrit, urine volume and urine osmolality were measured at the start of exercise, at the end of exercise and one hour following exercise. The blood haematocrit level of subjects ingesting water rose significantly ($p<0.001$) from the start to the end of exercise when compared to the consumption of milk. The urine output of subjects ingesting water was significantly higher ($p<0.001$) than that of subjects when they consumed milk. The greatest difference was found at one hour post exercise where urine output was 461 ± 195ml and 298 ±185 ml, respectively. Pre-exercise urine osmolality was not different between trials ($p>0.05$). One hour following the end of exercise there was a significant decrease ($p<0.05$) in urine osmolality following water ingestion, however this did not occur following the ingestion of milk ($p>0.05$). Skimmed milk could be suggested as an effective hydration drink during exercise and as a post-exercise re-hydration drink for individuals that are lactose tolerant.
References
Sherreffs, S., Watson, P. and Maughan, R. (2007). Milk as an effective post exercise rehydration drink. British Journal of Nutrition, 98, 173-180.
Karp, J., Johnston, J., Tecklenburg, S., Mickleborough, T., Fly, A. and Stager, J. (2006). Chocolate milk as a post exercise recovery aid. International Journal of Sport Nutrition and Exercise Metabolism, 16, 78-91.

BASKETBALL COACHES KNOWLEDGE ABOUT HYDRATION

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Introduction: Water is the nutrient a basketball player needs the most, about 2-3 L/day. As the most largely represented substance in the human body water is a medium where metabolic reactions occur, but it also participates in some.

There has been evidence that even dehydration which reduces the body mass by only 2% causes problems during physical activity and a 5% loss of body mass through dehydration decreases the physical working capacity by 30 % (Armstrong and cow; 1985; Saltin & Costill, 1988). Dehydration has proved to have a negative impact on aerobic activities and sprint, to speed up fatigue and, what is particularly significant, affects the ability to play (Burke, Hawley, 1997; Casa and cow; 2000).

The aim of this study was to test the basketball coaches' knowledge of hydration.

Methods: The sample consisted of 52 Croatian basketball coaches at the age 26 to 53. For this investigation a questionnaire was composed with ten questions regarding the basic principles of hydration. The questionnaire was completed anonymously. The obtained data were analyzed by standard statistical procedures, with statistical software package SPSS 13.0.

Results and Discussion: According to the results it is obvious that knowledge about hydration of the coaches is not on adequate level. In general coaches are aware that establishing the balance of body fluids upon activity is a very important part of recovery, and that this is even more important in hot and humid conditions. Fast and full rehydration is extremely important when it comes to tournaments. Rehydration during recovery implies not only the compensation for the lost volume, but also for the lost electrolytes, primarily sodium, that are lost through perspiration during the game. On the other hand most of the coaches have no idea of the amounts or the content of sport drink and they think that thirst is a good parameter of the fluid needs. Very few of the investigated coaches make connection about the rehydration and refilling energy sources. They never heard about the possibility of excessive liquid intake and the possibility of related hyponatremia.

References

Armstrong LE, Costill DL, Fink WJ. (1985). Influence of diuretic - induced dehydration on competitive running performance. Med Sci Sports Exerc, 17: 456-461.

Bonci LJ. (2003). Nutrition guidelines for basketball. U: McKeag, D.B. (ur) Basketball. Oxford: Blackwell Publishing Ltd.

Burke LM, Hawley JA. (1997). Fluid balance in team sports: guidelines for optimal practices. Sports Medicine 24, 38-54.

Casa DJ, Armstrong LE, Montain SJ, Rich BSE, Stone JA. (2000). National Athletic Trainers' Association position statement: fluid replacement for athletes. J Athletic Training, 35: 212-224.

Saltin B, Costil DL. (1988). Fluid and electrolyte balance during prolonged exercise. In: Horton ES, Terjung RL. (ed) Exercise, nutrition and metabolism. New York: Macmillan. (150-158.)

EFFECTS OF HYDRATION ON ELITE SURFING PERFORMANCE

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Sports performed in hot ambient conditions with minimal reliance on fluid ingestion are likely to be affected by the physical, cognitive and skill performance decrements attributed to exercise-induced dehydration. PURPOSE: To determine whether surfing performance is affected by dehydration and whether fluid ingestion can attenuate any performance decrements. METHODS: Twelve male national (Australia) and international level surfers completed two 100-min surfing sessions, in wetsuits, separated by seven days. Following a randomised cross-over design, one trial required the consumption of 3 ml•kg-1 body mass (BM) of water at 20 min intervals (FL) whilst in the other trial no fluid was consumed (NF). A battery of cognitive tests, upper and lower-body muscular endurance tests and hydration status were assessed prior to and immediately following the surfing session. Performance was assessed, in accordance with the Association of Surfing Professionals (ASP) World Tour guidelines, for two 20 min periods during each trial. Ambient conditions and wave quality were consistent with those expected at Sydney's northern beaches and were similar between trials.

RESULTS: BM loss was greater in NF than in FL (3.9 ± 0.7% vs. 1.6 ± 0.7%; $P<0.05$). Surfing performance was significantly impaired in NF with lower scores (20.3 ± 7.1%) in this trial. Cognitive function, upper- and lower body muscular endurance were impaired in NF ($P<0.05$) whereas only upper-body muscular endurance decreased following FL ($P<0.05$). CONCLUSIONS: Body mass losses during surfing are severe enough to significantly impair surfing performance, cognitive function and muscular endurance. Consumption of 3 ml•kg-1 BM water every 20 min may attenuate these decreases in performance.

RELATIONSHIPS AMONG WEEKLY AMOUNT OF PHYSICAL EXERCISE PRACTICE, DIETARY HABITS AND BODY COMPOSITION IN WOMEN.

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Introduction: Literature indicates that the amount of physical exercise is inversely related with percentage body fat (%BF) in men while the same relationship was not well observed in women (Westerterp et al., 1997). Hypothesis is linked both to energy intake and macronutrient composition of daily meals in relation with physical activity energy expenditure and gender (Paul et al., 2004). The aim of the study was to investigate the relationships among the amount of physical exercise practice, dietary habits and body composition in women.

Methods

We recruited 52 female (24.49±3.63 yrs) university students. Nobody had gone on a diet during the last 2 years. Qualitative and quantitative characteristics of daily meals were assessed by a dietician using 3-day dietary records, by WinFood-due software (Medimatica, I). Physical activity was investigated by International Physical Activity Questionnaire (IPAQ), while physical exercise practice by a structured questionnaire requiring information about weekly min of training, frequency and consecutive years. Body composition was estimated by single-frequency electrical bioimpedance (Akern, I). We created 3 sub-samples according to the terziles of total weekly min of training. No physical exercise (1st), 0-180 weekly total min (2nd), and > 180 weekly total min (3rd) of exercise were the 3 groups. MANCOVA and post-hoc analysis were performed twice. The first, to assess differences in dietary habits among groups using variables of IPAQ as covariate; the second, to assess differences in body composition among groups using daily macronutrient distribution as covariates.

Results: The first post-hoc analysis showed high lipid (p=0.019) and low carbohydrate (p=0.003) intake in the 3rd respect to 1st and 2nd group. The second post-hoc analysis showed that 3rd had a best muscle mass (p=0.027) and body cellular mass (p=0.05) than the other groups, while no differences were found in %BF. Both 3rd and 2nd had the same consecutive years of exercise practice.

Discussion: Our results suggest that, in women, if high weekly min of training elicit body anabolic response, on the other hand, only physical exercise practice is not enough to decrease fat mass due to the high lipidic diet associated with high weekly min of training. Further studies are needed to know the main causes of data observed.

References

Westerterp KR, Goran MI (1997). Int J Obes Relat Metab Disord, 21, 184-188.

Paul DR, Novotny JA, Rumpler WV (2004). Am J Clin Nutr, 79, 385-389.

ANTHROPOMETRIC PROFILE AND HABITUAL FOOD INTAKE OF BRAZILIAN CHILDREN AND ADOLESCENTS WITH LOW SOCIOECONOMIC LEVEL

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Background: The nutritional transition is marked by a change in food intake habits and reduced leisure time and physical activity leads to a rapid increase in overweight and obesity.

Methods: This study included 289 children and adolescents (51.9% boys), aged 7-14 years (10.8 ± 2.0) of one public school from Passos, Minas Gerais. The nutritional status was assessed by anthropometric data (body mass index for age (BMI-for-age) (WHO, 2006) body fat percentage for age (BFP-for-age) (Guedes & Guedes, 1998)) and the habitual food intake was analyzed by a food frequency questionnaire consisting of a food intake table worked out in detail according to alimentary standard of this aged group. Differences between genders with anthropometric data were performed by Mann-Whitney test.

Results: As assessed by BMI-for-age 2.4% of children and adolescents were classified as underweight, 72.0% as healthy weight, 13.5% as overweight and 12.1% as obese. According to BFP-for-age, 22.5% were classified as low body fat, 32.2% as healthy body fat and 45.3% as high body fat. With regard to habitual food intake it was verified inappropriate habits, since there is a high daily food intake of products with high energy density and nutritional poor value such candies (43.1%), soda (33.0%), cookies (26.0%), fried foods (20.6%), chips (17.4%) including the addition of sugar to milk, juices and other beverages practiced by 63.9% of children. On the other hand, it was verified a lower daily intake of nutritive and healthy foods like fruits (41.7%) and vegetables (33.3%) important for child growth and development. There was no statistical difference in the nutritional status of boys and girls.

Discussion: This nutritional profile is typical of the nutritional transition that occurs in developing countries with an epidemiological overlap which overweight and obesity coexist with malnutrition, with a trend towards decreased rates of protein-energy malnutrition and increased incidence of obesity and chronic-degenerative diseases.

Conclusion: Childhood is a great development period which child learns quickly to organize cultural, cognitive, social and physically. The lifestyle acquisition occurs in this period as eating habits and physical exercise practice. Monitoring health during childhood has a great importance for the health control in adulthood. In this context, assess the prevalence and incidence of nutritional disorders in childhood becomes an important strategy to propose effective measures and action plans aiming to promoting health and integrated control of major risk factors.

References:

Guedes, JERP & Guedes, DP. Controle de peso corporal: composição corporal, atividade física e nutrição. Londrina: Midiograf, 1998.

World Health Organization. WHO Child Growth Standards: Length/height-for-age, weight-for-age, weightfor-length, weight-for-height and body mass index-for-age. Methods and development. WHO (nonserial publication). Geneva, Switzerland: WHO, 2006.

CHILDHOOD PREVALENCE OF OVERWEIGHT, OBESITY AND THINNESS IN RIO MAIOR, PORTUGAL.

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Introduction: Childhood obesity as well as thinness are two major public health concerns (Cole et al., 2007). The World Health Organisation (WHO) recommends the use of the Body Mass Index (BMI) for the assessment and establishes the cut-off points to the definition of both conditions. In Portugal, the study conducted by Padez et al. (2004) in 7 to 9 years old children, of both sexes, revealed a prevalence of overweight/obesity of 31.5% (20.3% overweight, 11.2% obesity). Compared with boys, girls generally presented higher percentages in overweight and in obesity. Another study in Portugal, with children 6 to 10 years, from Sintra, showed 35.6% of overweight/obesity, but no differences were found between sexes (Ferreira & Marques-Vidal, 2008). Concerning thinness, we have no knowledge of studies in Portugal. Therefore, the aim of this study is to assess the prevalence of overweight, obesity and thinness in children from Rio Maior, Portugal, using the WHO standards from 2007.

Methods: We assessed 643 children (332 boys), 5 to 9 years old, from the Rio Maior county's public and semi-public school network. Informed consent and assent were obtained. Height and weight were measured according to the International Society for the Advancement of Kinanthropometry (Marfell-Jones et al., 2006). BMI z-scores and percentages of overweight, obesity and thinness (for age and sex) were calculated.

Results: In the total sample, we found 20.1% of overweight, 12.9% obese and 1.5% thin children. Boys and girls revealed similar percentages of overweight plus obesity (33.8% and 32.1%, respectively). Thinness is almost inexistent in girls (only 2 girls at age 8) and residual in boys (2.4%, n=8). Boys show higher percentages of overweight than girls, except at 7 and 8 years and also in obesity, except at age 5.

Discussion: Children from Rio Maior show identical percentages of overweight and obesity that those found in Padez et al. (2004) and Ferreira and Marques-Vidal (2008) studies. Our sample reveals the same tendency find in the developed countries. Life styles should be studied to better understand the results. Thinness is virtually inexistent in this sample and therefore does not seem to constitute a major health concern.

References

Cole TJ, Flegal KM, Nicholls D, Jackson AA (2007). Body mass index cut offs to define thinness in children and adolescents: international survey. BMJ, 335, 194-201.

Ferreira RJ, Marques-Vidal PM (2008). Prevalence and Determinants of Obesity in Children in Public Schools of Sintra, Portugal. Obesity, 16(2), 497-500.
Marfell-Jones M, Olds T, Stewart A, Lindsay Carter, JE (2006). International Standards for Anthropometric Assessment. The International Society for the Advancement of kinanthropometry, Australia.
Padez C, Fernandes T, Mourão I, Moreira P, Rosado V (2004). Prevalence of Overweight and Obesity in 7-9 Year-Old Portuguese Children: Trends in Body Mass Index from 1970-2002. Am J Hum Biol, 16, 670-678.
WHO. www.who.int/growthref/en

NUTRITIONAL STATUS AND SEDENTARY LIFESTYLE OF BRAZILIAN CHILDREN FROM A PUBLIC AND PRIVATE SCHOOL SYSTEM

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Background: Socioeconomic status is linked to health condition. It is therefore important to investigate the extent of socioeconomic differences in nutritional status and the possible behavioral predictors of these changes.
Methods: This study included 99 children (51.2% girls), aged 8-10 years (9.0 ± 0.8), randomly selected from one public (n=49) and one private school (n=50) from Franca, São Paulo. The nutritional status was assessed by anthropometric data (body mass index for age (BMI-for-age) (WHO, 2006) body fat percentage for age (BF%-for-age) (Guedes & Guedes, 1998)) and the habitual food intake was analyzed by a food frequency questionnaire. The sedentary lifestyle was assessed by asking the children directly the time daily of computer use and watching TV. Differences between genders and school system with anthropometric data and sedentary lifestyle were performed by Mann-Whitney test.
Results: According to BMI-for-age 61.2% and 56.0% of children from public and private school were classified as normal range, respectively, 14.3% and 22.0% as overweight, 24.5% and 20.0% as obese. Only one (2.0%) child from a private school was classified as underweight. As assessed by BF%-for-age, 6.1% and 12.0% of children from public and private school (respectively) were classified as low body fat, 28.6% and 22.0% healthy body fat, 65.3% and 66.0% as high body fat. Regarding to habitual food intake It was observed the presence of inappropriate habits, since there is a high food intake of products with high energy density and low nutritional value such candies (34.7% and 46.0%), soda (18.4% and 32.0%), cookies (14.3% and 18.0%); fried foods (8.2% and 2.0%), fast food/chips (2.0% and 24.0%) including the addition of sugar in beverages practiced by 32.7% and 20.0% of children from private and public school, respectively. On the other hand, it was verified a lower intake of nutritive and healthy foods like fruits (26.5% and 36.0%) and vegetables (34.7% and 46.0%). Children of the public school spent more time watching TV ($p<0.000$). No statistically significant associations were found in any others comparisons performed with nutritional status (BMI-for-age and BF%-for-age) and sedentary habits in relation to gender or school system.
Conclusion: The school environment has been considered optimum space for the nutritional assessment and interventions, moreover, it is a great agent to promote the nutritional education, since infancy is the period of habits acquisition that perpetuate until the adulthood, as well as propagating the concept of healthy lifestyle, therefore it makes of the child a multiplier of its knowledge.
References:
Guedes, JERP, Guedes, DP. Controle de peso corporal: composição corporal, atividade física e nutrição. Londrina: Midiograf, 1998.
WHO Child Growth Standards: Length/height-for-age, weight-for-age, weightfor-length, weight-for-height and body mass index-for-age. Methods and development. WHO. Geneva, Switzerland: WHO, 2006.

14:15 - 15:15

Poster presentations

PP-CO03 Coaching 3

EXAMINING THE TRAVELLING RULE IN EUROPEAN BASKETBALL: A DISCUSSION OF THE PEDAGOGICAL AND FAIRPLAY IMPLICATIONS OF YOUTH BASKETBALL INSTRUCTION

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Introduction: As a primary rule in basketball, the teaching and understanding of the travelling rule serves as a centerpiece for the pedagogical instruction of children and youth. The rule's interpretation is fairly straight forward as presented in the FIBA rules and regulations manual (2005, 2008), yet one could argue that not an organized basketball game is played which does not contain som element of controversy regarding the travelling rule. To this end, travelling, or the "lack" of travelling in top level European basketball has clearly warranted the attention of several researchers and basketball instructors alike (Fosnæs, 2009). The purpose of the present paper is to focus on the study by Fosnæs and colleagues (2009) by discussing the potential pedagogical conflict and fair play issues by teaching the travelling rule as regulated by FIBA.
Method: Dvds of 4 games of the European championship in Basketball in Serbia 2005 were analyzed. Regarding the travelling rule (FIBA, 2005, 2008) we examined situations when offensive players gained possession of the basketball, started to dribble, and/or stopped to attempt a jump-shot. The movements were examined utilizing frame by frame analysis.
Results: As presented by Fosnæs and colleagues (2009), on the average100 touches of the ball occurred in every period, meaning roughly 400 actions in every game. In our analysis 30 % - 40 % of the actions or movements with the ball were in fact in violation of the travelling rule. The interesting thing that we found was that considerably often the violation was not called a travelling violation, but rather overseen or simply 'missed' by the official in position to make the call.

Discussion: Clearly, an argument can be made for officials simply not making the proper violation call, officials are in fact human. However, it may very well be that officials are simply not as likely to make the travelling violation call. This issue will be discussed from a pedagogical perspective where teaching the travelling rule and its understanding among youth may in fact be a deviation from the understood act of travelling in organized basketball. Furthermore, the travelling theme will be discussed from a fair play perspective (Reddiford, 1998) in that if the assumption is that travelling is a more subjective violation among officials, the outfall may in fact create a sense of self-deception among players in order to gain an unfair advantage in games where officiating of the act of travelling is subjectively liberal.

THE TECHNICAL DEMANDS OF ATTACKING AND DEFENDING IN COACHED AND UNCOACHED RUGBY LEAGUE SMALL-SIDED GAMES

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Introduction: In recent years, small sided-games (SSGs) have emerged as a multi-component training method which can achieve aerobic conditioning and skill development simultaneously. However, whilst the physiological demands elicited within SSGs have been studied (Hoff et al., 2002; Hill-Haas et al., 2008) the technical demands of skills performed within SSGs have not been analysed. Furthermore, the effects of coaching on the skills within SSGs have not been previously examined, despite studies stating that coached SSGs increase player motivation (Impellizzeri et al., 2006). Accordingly, the purpose of this study was to examine the technical demands of attacking and defending in coached and uncoached SSGs in junior rugby league players.

Methods: Following ethical approval, 17 junior players from a professional club (age 13.4 ± 1.1 years, stature 1.68 ± 0.11 m, body mass 61.5 ± 14.9 kg) volunteered to participate in eight, four-minute conditioned SSGs. Players engaged in both attacking and defensive roles (non-contact) and in coached and uncoached conditions. An analysis of attacking and defending skills was carried out using a hand notation system. Analysis included: game statistics (frequency of tries scored, errors made and set completion percentages), attacking variables (frequency of attacking involvements derived from the frequency of passes and attacking runs, i.e. dummy runs, hit ups and pass plays; Eaves and Broad, 2007), defending variables (frequency count of the number of touches). The success rate of passes and touches was also conducted, taken as the skill outcome and if the skill met pre-set coaching criteria.

Results: Statistical analysis revealed similarities in the mean percentages of successful passes and touches between the coached (84.3 ± 8.4 and 83.8 ± 7.0) and uncoached (79.5 ± 13.2 and 84.4 ± 6.5) conditions, respectively. Moreover, independent t-tests revealed no significant ($P>0.05$) differences between the coached and uncoached SSGs for any of the game statistics or attacking or defending variables.

Discussion: Whilst the presence of a coach might be expected to increase the frequency and success rate of both attacking and defending skills, this study has demonstrated no difference in the skill frequency or success rate between coached and uncoached SSGs. This finding may reflect the players' habituation to SSG training and that players possess high skill levels and require no additional motivation. Furthermore, the findings of this study indicate that skills used in matches and practised traditionally in a closed environment can be carried out successfully in SSGs in a pressurised game environment.

References

Eaves, S. and Broad, G. (2007). Int. J. Perf. Analysis Sport. 7: 54-66.

Hill-Haas, S, et al. (2008). J Sci Med Sport 11: 487-490.

Hoff, J, et al. (2002). Br J Sports Med 36: 218-221.

Impellizzeri, FM, et al. (2006). Int J Sports Med 27: 483-492.

THE RELATIVE AGE OF ELITE JUNIOR SOCCER AND ICE HOCKEY PLAYERS IN SWITZERLAND

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Purpose: Identifying talented athletes at an early age has become one of the major issues in many competitive sports (Abbott & Collins, 2004). The relative age, which refers to the difference in age between children in the same selection year, has a significant influence in the talent identification process for many sports (Musch & Grondin, 2001). The primary purpose of this study was to determine, if the relative age effect (RAE) exists in elite junior soccer and ice hockey players in Switzerland.

Methods: 344 Swiss male elite junior ice hockey (age 15.3±1 yr.) and 183 soccer players (age 15.2±1.4 yr.), members of the national teams U15-U20, were evaluated. The year was divided into four quarters (Q1: January, February, March; Q2: April, May, June; Q3: July, August, September and Q4 October, November, December). The percentage of players born in the respective quartiles was compared to the distribution of male births in Switzerland (expected frequencies), which were obtained from the Swiss Federal Institute of Statistics. Statistical comparisons were calculated using the chi-square test.

Results: The RAE was found with a distribution of Q1=53.0%, Q2=18.0%, Q3=19.7%, Q4=9.3% for soccer and Q1=42.4%, Q2=27.6%, Q3=19.5%, Q4=10.5% for ice hockey. The month of birth distribution differed statistically significantly from that of the general Swiss male population for the respective years in both groups ($p<0.001$). The data concerning Q1 highlighted an over-representation of players, whereas a decreasing number of players were born in the subsequent months.

Discussion: The RAE that exists in many competitive sports worldwide is clearly evident in the selection process of elite junior soccer and ice hockey players in Switzerland. In particular, the chance of being selected to a national team is 5-fold higher for Q1 compared to Q4. Our results suggest, that a significant part of what coaches see as early talent may be explained by the relative age advantage. To avoid this effect in the future, we propose a more equitable slotting system into age divisions with three rotating calendar cut-off dates.

References

Abbott, A., & Collins, D. (2004). Eliminating the dichotomy between theory and practice in talent identification and development: considering the role of psychology. Journal of Sports Sciences, 22(5), 395-408.

Musch, J., & Grondin, S. (2001). Unequal Competition as an Impediment to Personal Development: A Review of the Relative Age Effect in Sport. Developmental Review, 21(2), 147-167.

DIFFERENCE BETWEEN THE ROTATIONAL THROW AND THE GLIDE THROW TECHNIQUES ON SHOT PUT EVENT

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Introduction: In recently, many shot put throwers performing the rotational throw technique is increasing in shot put event. What are some of the advantage and disadvantage of the rotational throw and the glide throw techniques. The purpose of this study was to clarify the difference of technical factors between the rotational throw and the glide throw techniques for design of skill training program.

Methods: Subjects were seven male Japanese right-handed elite shot put throwers who can use the rotational throw and the glide throw techniques (age:22.7±2.3yrs, height:176.6±6.8cm, body weight:107.6±15.1kg, rotational throw:14.1±1.3m, glide throw:13.4±1.5m). All the subjects performed total six throws that three rotational throw technique and three glide throw technique same as a competition rules. Rotational throw technique and glide throw technique were measured by 3-D analysis (APAS) that was analyzed for release speed, release angle, release high, shot acceleration (horizontal, vertical and total acceleration) and shot movement speed. Throwing movement was divided by turn-phase and push-phase during shot put movement.

Results: Shot put performance was significantly related to the release speed in both throw techniques (rotational throw: r=0.501, glide throw: r=0.579). Shot acceleration of vertically and total acceleration in rotational throw technique were significantly higher than glide throw technique during the push-phase. Similarly, shot moved speed in the rotational throw technique was significantly higher than the glide throw technique during the on turn-phase.

Discussion: From these results, it was cleared that developing of the release speed is most important factor in shot put for both throwing techniques. The rotational throw technique to the pushing vertical direction may important factor during the push-phase. And also, the rotational throw technique may energy stored on lower limb and trunk during the turn-phase in the rotational throw skill training.

References

Luhtanen P, Blonqvist M, Vanttinen T. (1997) New studies in athletics 12 (4), 25-33

Redding J.A. (1988) Track and field quarterly review 3 15-18

KINEMATIC ANALYSIS OF THREE DIFFERENT SPRINT START POSITION IN NOVICE ATHLETES

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KINEMATIC ANALYSIS OF THREE DIFFERENT SPRINT START POSITIONS IN NOVICE ATHLETES

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Introduction: The kinematic patterns of elite athletes performing the sprint start in the track received considerable attention (1-5) in attempt to provide coaches and athletes an invariant biomechanical model for training; however, little information regarding novice athletes is available. Novice athletes tend to stand up too soon when leaving the blocks, thereby gaining little benefit, if any, from the original block position. This study was aimed at examining whether changing the angle at the knee joint in the rear leg in the set position, influence step length and velocity of the centre of mass (COM) in the first two steps. Results would help defining the best start position of novice sprinters.

Methods: Eleven novice sprinters (6 males and 5 females, age 23,5 ± 2,12 yrs, height 1,72 ± 0,05 m, weight 60,9 ± 5,52 kg) took part in this study. Participants were asked to perform the sprint start at three different knee angles of the rear leg (90°, 115°, 135°). The block was placed at a medium block spacing according to Schot & Knutzen (1992). Each subject performed 10 trials at each knee angle. Kinematic analyses were performed with a VICON (8 cameras, 250Hz) system and software to yield the traveled distance and the COM velocity in the two first steps in the horizontal direction.

Results: The results indicate that horizontal velocity of COM at the first step is greater at 90° (p=0,019 and p=0,05 vs 115° and 135°, respectively); at the second step, the COM velocity was greater at 90° than 115° or 135°; however, a significant difference was only present at 115° vs 135° (p=0,020). No significant difference was found in the length of the first two steps, although the greatest value was at 90°.

Discussion: These preliminary results indicated that novice sprinters produce greater velocity and step length with a rear leg knee angle between 90° and 115°. It can be hypothesized that, in novice athletes and in the given block setting, lower angles allow to develop larger force in the muscle groups involved in sprint start. Analysis of EMG data is presently being undertaken to validate such hypothesis. Further, analysis of the thrust angle will show whether lower angles at the knee make the novices' performance closer to that of experienced sprinters. This would help coaches in choosing the more effective angle at the knee of the rear leg, which is currently suggested in the 134° -145° range.

References

1. Mero et al. (1983). Scand J Sport Sci, 5(1) 20-26

2. Schot & Knutzen (1992). Res Q Exerc Sport, 63(2), 137-147

3. Harland & Steele (1997). Sports Med, 23(1), 11-20

4. Coh et al. (1998). Gymnica, 28, 33-42

5. Coh & Tomazin (2006). New Studies in Athletics, 21(3), 23-33.

THE RELATIONSHIP BETWEEN VISUAL ACUITY AND GAME PERFORMANCE IN WATER POLO

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Introduction: Recently the number of people who are shortsighted have increased in Japan. Likewise the number of reports on the importance of correcting visual acuity from the standpoint of game performance and safety in sports have also increased. Players of water polo are unable to correct their visual acuity since players are prohibited from using glasses or swimming goggles during play. Thus low visual acuity players use contact lenses in the water. Disposable type lenses are becoming popular with those players who use contact lenses. However, players without corrected visual acuity are also playing the game even though their uncorrected visual acuity is below 0.1 (Komori, 1998.) It is known that a decline of vision affects game performance in baseball and table tennis. However, the relationship

between visual acuity and game performance in water polo is undocumented. Thus the present study focuses on the effect of corrected visual acuity in game performance during water polo play.

Methods: Five male water polo players (age: 18.0±3.4 yrs) participated in the study. The participants played games in two conditions; in the first game the players were using contact lenses and in the second game they were not. Their corrected visual acuity with contact lenses was between 0.8 and 1.0. The uncorrected visual acuity of players was 0.01 and 0.1. The indicators of game performance were (1) the rate of errors; (2) the rate of contributed play; and (3) the rate of ball contacts. The indicators of errors and contributed plays followed the results reported by Enomoto et al. (2001). The participants completed self-evaluations regarding their play.

Results: The results showed the significant difference in the rate of errors committed by players with corrected visual acuity using contact lenses and those with uncorrected visual acuity. According to their responses of questionnaire, there was a significant difference in aspects of the game related to vision between players with corrected visual acuity and those with uncorrected visual acuity. For example, players felt that they could more clearly see their opponents, the goal, and the ball movements in corrected visual acuity conditions as compared with those playing in uncorrected visual acuity condition.

Conclusion: These findings showed that corrected visual acuity using contact lenses led to a decrease in errors committed; clear vision during games led to significant improvements in game performance. In conclusion, the study suggested the corrected visual acuity is an important factor in scoring and winning.

References

Komori Y., Kono I., Tsukuda F., Saito M., Sakata I., and Kono K. (1998) Wearing contact lens might prevent corneal damages and keep visual functions during water polo play. Med Sci sports exerc, 30, s157.

Enomoto I., Minami T., Takahashi M., Takahashi J., Suga M., and Komori Y. (2001) Game analysis of team contribution for water polo player. Jpn J Sport Method, 14, 23-30.

DEVELOPMENT OF BIA EQUATIONS FOR ESTIMATING BODY COMPOSITION OF ELITE MALE WRESTLERS

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Introduction: Body composition is associated with successful participating in elite wrestling. Although, BIA is relatively simple, quick, portable and noninvasive method for estimating body composition (Wagner and Heyward, 1999), use of inappropriate equations in BIA measurements can lead systematic prediction errors (Heyward and Stolarczyk, 1996). Therefore, the purpose of this study was to develop bioelectrical impedance equations for estimating body composition (fat free mass) of elite male wrestlers.

Methods: Hundred and eleven highly active elite male senior wrestlers (mean ± SD, age: 21.054±2.993yr, height (H): 171.852±7.518cm, body weight (BW): 78.362±15.931kg) were participated in this study as volunteers. H, BW, bioelectrical impedance analysis (BIA) and hydrostatic weighing (HW) measurements with residual volume were performed at least four hours after breakfast between 11:00 and 13:00 o'clock. Each subjects resistance (R), reactance (Xc) and impedance (Z) values were recorded by BIA and fat free mass (FFM) was calculated by using the hydrostatic weighing (HW) measurements as the reference variable. Pearson Correlation Coefficient was used to measure the interrelationship between reference variable (FFM) and independent variables. Then, Multiple Linear Regression Analysis was performed using the FFM as the reference variable and other measured items as the explanatory variables in order to form prediction regression equations (EQ) for BIA. Finally, validity of the equations was examined with Cross Validation Method.

Results: Five equations were derived for FFM to use in BIA measurements. The explanatory variables of the equations were BW, R, height squared (Hsqr), Xc, Z, resistance index (Hsqr/R) and impedance index (Hsqr/Z). The multiple coefficient of determination (R square= Rsqr) and standard error of estimate (SEE) of the equations are given as followed: Rsqr =0.98384, SEE =1.45821kg (EQ1); Rsqr =0.98375, SEE =1.46214kg (EQ2); Rsqr =0.98543, SEE =1.37370kg (EQ3); Rsqr =0.98533, SEE =1.37825kg (EQ4) and Rsqr =0.98613, SEE =1.36336kg (EQ5). By the use of Stepwise Linear Regression Analysis, the results of this study indicated that BW, R, Hsqr, and Xc as ideal explanatory variables to estimate FFM of elite male wrestlers in BIA measurements. Final prediction equation and its Rsqr and SEE are given as followed: FFM= 19.69292 + 0.5233 (BW) – 0.05256(R) + 0.00085(Hsqr) + 0.11211(Xc); Rsqr = 0.98613, SEE= 1.36336.

Conclusion: Finally, cross validated prediction equations with high Rsqr and low SEE were derived for FFM of elite male wrestlers to use in BIA measurements. Population specific equations should be developed for accurate estimation of body composition in specific homogeneous groups.

References

Heyward VH, Stolarczyk LM (1996). Applied Body Composition Assessment, 54. Champaign, IL; Human Kinetics, USA

Wagner DR, Heyward VH (1999). Res Q Exerc Sport, 70, 135-49.

GAME PERFORMANCE AND ACTIVITY PROFILE OF WHEELCHAIR BASKETBALL PLAYERS

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Introduction: The specific rule in wheelchair basketball is the Player Classification System in which players are classified into classes (Class I, II, III, and IV) based upon the players' functional capacity to play (Class I is the most disabled). The players are required to have good skills for controlling wheelchair as well as for playing basketball. However, there is little study that analyzed both game performances and activities. The aim of this study was to compare these two abilities between a Japanese top team and a team in the medium level.

Methods: We recorded video images of players of the team C (the men's top team in Japan) and the team K (medium level) in the preliminary game of the Japan wheelchair basketball championship in 2007. From the video images we measured the wheelchair basketball performances and compared each data of team C and team K. The wheelchair basketball performances were classified the game performance and the activity profile which was divided into high, middle, low intensities of pushing the wheel (high being fast rotation of the wheel and low being slow rotation).

Results: The number of screen plays per one offence period was also higher in the team C than in the team K. In the team C, field players almost equally played for passing, dribbling and screening, however the number of attempted shots and rebounds were higher in Class III and IV players. In the team K, players of Class III and IV held possession for the majority of the offence. As for the control of wheelchair, the rate of high intensity in total playing time was higher in the team C than in the team K. The average time of high intensity in team C was longer than in team K.

Discussion: It was reported that the players' moving distance of high intensity in one game became longer as the league was proceeded to higher level in soccer (Bangsbo, 1994). Our result also showed similarly that the rate and time of high intensity in the top team in Japan was longer. These results indicate that players in the top team can keep high physical strength through the game. On the other hand, it has shown that the game performances in basketball are highly position-dependent, especially in wheelchair basketball (Wang et al., 2005). We observed that players of team C played almost equally, but Class III and IV players played in the lane under the basket predominately. In addition, all players of the top team in Japan handled the ball out side of the lane and screened for their team player regardless of the functional class. These suggest that the players of the top team in Japan have high basketball skills in order to make chances for other player and can maneuver the wheelchair as an individual, also team.

References

Bangsbo J. (1994). Fitness Training in Football, 57-70. August Kroph Institute.

Wang YT, Chen S, Limroongreungrat W, Change L-S. (2005). Med Sci Sports Exerc, 37(1), 130-137.

ANTHROPOMETRICAL PARAMETERS AND BODY COMPOSITION INFLUENCE SWIMMING PERFORMANCE IN YOUNG SWIMMERS.

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Introduction: Participating in a competitive sport at a young age has been associated with specific body proportions (Damsgaard et al., 2001). The present study analysed the development of the anthropometrical parameters and body composition in young swimmers and assessed the effect of these parameters on swimming performance during biological maturation.

Methods: Main anthropometrical parameters and biological age were measured in 55 young swimmers (29 males and 26 females). Maximal 400-m front-crawl swimming test was performed in a 25-m swimming pool, where the energy cost of swimming (Cs) was assessed. Peak oxygen consumption (VO2peak) was assessed by means of the backward-extrapolation technique recording VO2 during the first 20 sec of the recovery period after a maximal trial of 400-m distance. Body composition parameters were measured using dual-energy X-ray absorptiometry (DXA).

Results: During the 2-year follow-up study period, the age, height, body mass, fat free mass (FFM), bone mineral mass (BM), arm span, and biological maturation values for all swimmers, body mass index (BMI) and spine BMD for boys and body fat% and total BMD for girls significantly increased during each year ($p<0.05$). Partial correlation analysis revealed that 400-m swimming performance time was elated ($p<0.05$) to body height ($r>-0.468$) and arm span ($r>-0.397$) values, VO2 was related to body height ($r>0.395$) and arm span ($r>0.394$) at all three measurements after controlling for age and pubertal status in boys. In addition, the Cs of the 400-metre swimming performance was related ($p<0.05$) to the body mass ($r>0.411$), BMI ($r>0.412$), and spine BMD ($r>0.500$) values at all three measurement points in girls. Tracking of the measured physical characteristics over the two year study period was very high for boys ($r>0.880$) and relatively high for girls ($r>0.694$).

Discussion: Swimmers usually start serious training at a very early age, and anthropometrical parameters affect swimming performance in young swimmers (Jürimäe et al., 2007).The result of present study also found that swimmers with good anthropometrical characteristics also have a better swimming time. . The tracking coefficients of the physical parameters were high; hence it is important to pay attention to the selection process of young female swimmers. Anthropometric parameters track highly during puberty (Leppik et al., 2006) and the early biological maturation of swimmers has been attributed to sport-specific selection (Baxter-Jones et al., 1995).

References

Baxter-Jones AD, Helmes P, Maffulli N, Baines-Preece JC, Preece M (1995). Ann Hum Biol, 22, 381-394.

Damsgaard R, Bencke J, Matthiesen G, Petersen JH, Müller J (2001). Scand J Med Sci Sports, 11, 54-60.

Jürimäe J, Haljaste K, Cicchella A, Lätt E, Purge P, Leppik A, Jürimäe T (2007). Pediatr Exrec Sci, 19, 70-82.

Leppik A, Jürimäe T, Jürimäe J (2006). Coll Antropol, 30, 753-760.

MATURITY-ASSOCIATED VARIATION IN THE GROWTH AND FUNCTIONAL PROFILE OF SOCCER PLAYERS 13-14 YEARS OF AGE

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The literature suggests that youth soccer players advanced in biological maturity tend to be more successful as the transition from early (10-12 years) to mid-adolescence (13-15 years) occurs. The present study considers variation in body size and proportions, functional characteristics and soccer-specific skills associated with maturity status in youth soccer players 13-14 years of age.

The sample consisted of 72 male players with chronological ages (CA) 13.1-14.9 years (14.1±0.6). Somatic characteristics included weight, height, sitting height and four skinfolds. Leg length was estimated as height minus sitting height and the ratio of sitting height to height was calculated. Hand-wrist radiographs were taken and skeletal age (SA) was assessed with the Fels method (Roche et al., 1988). Players were classified as late, on time (average) or early by the difference between SA and CA. Functional status was assessed with the 10x5-meter agility test, vertical jump (squat, counter-movement), 7x30-meter sprint (anaerobic test, Bangsbo, 1994), YO-YO intermittent endurance test – level 1 (Bangsbo, 1994). Four ball manipulation soccer skills were measured.

Distribution of players by maturity status was: late 4 (6%), on time 45 (62%) and early 23 (32%). Given the small number of late maturers, comparisons were limited to on time and early maturing players. Weight ($p<.01$), height ($p<.01$), sitting height ($p<.01$), estimated leg length ($p<.01$), sitting height ratio ($p<.01$), squat jump ($p<.01$) and counter-movement jump ($p<.01$) differed significantly between the two maturity groups. Other functional tests and soccer-specific skills did not differ by maturity status.

In conclusion, results suggest that boys advanced in biological maturation are larger in size with a distinct advantage in muscular power of the lower limbs compared to players on time in maturation. Performances in aerobic, anaerobic and soccer-specific skill tests did not differ among youth players of contrasting maturity status. The results suggest that soccer-specific training may function to reduce maturity-related variation among adolescent players.

Results of the study are relevant to talent development, and highlight the need to perhaps selective guide the small, later maturing skilled player.

References

Bangsbo J (1994). Journal of Sports Science. 12: 48-52

Roche AF, Chumlea WC, Thissen D (1988). Assessing the skeletal maturity of the hand wrist – FELS method.

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INFLUENCE THAT WALKING SPEED EXERTS ON YOUNG PERSON'S WALKING EFFICIENCY

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BACK GROUND:As for walking, various human movements and their relation are deep. So walking is an important basic movement for humans. Especially, walking is one integral part of human movement in senior citizens, it is an index for revealing the actions of everyday life. Recently we can see a lot of studies about walking movement for senior citizens. According to a precedent study, Fuchimoto et al.(2003) issued a report on the oxygen uptake per unit distance increase when walking at speeds less than 3.7km/h or more than 4.6km/h. Furthermore, Tanaka et al.(2003) issued a report to the time of speed of around 4.0km/h, a vertical direction and the conversion rate of the kinetic energy of the flat direction became the largest. PURPOSE:In this study, we assumed the work efficiency of walking. And we aimed to clarify the influence that a difference in walking speed gave to walking efficiency. METHOD:The subjects were five healthy adults. We affixed reflection markers to 18 physical characteristic points on the body. We analyzed image and gas analysis while walking. Walking conditions were 3.0km/h condition(S-condition), 4.2km/h condition(N-condition) and 5.4km/h condition (F-condition). Potential energy, kinetic energy and mechanical energy were measured for 10 cycles while walking. The energy consumed was measured using gas analysis. RESULTS:The external work is the difference of the maximum and the minimum of mechanical energy during 1 cycle. The external work shows the amount of energy that a source spent while walking. The external work showed that the S-condition was 28.7±15.1J, the N-condition 25.1±6.3J, and the F-condition 37.5±24.9J. Significant differences were not recognized between each condition. We thought that the external work grew larger with increases in the speed. But between 3.0km/h and 5.4km/h, the external work at this speed did not have any influence. Energy consumed per 1 cycle showed that the S-condition was 149.7±52.9J, the N-condition 163.1±69.4J, and the F-condition 225.7±79.0J. This shows the significant difference between S-condition and F-condition, N-condition and F-condition. Like a precedent study, the energy consumed had a tendency to become larger with the increase in speed. Walking efficiency in that S-condition was 15.4±5.9%, the N-condition 12.1±2.1%, and the F-condition 13.1±8.3%. Significant differences were not recognized between each condition. Elsewhere, walking is the same repetition of left and right movement. So we thought that the change of the mechanical energy would stay constant. But the laterality was large and small for persons split up into two groups. This reason was because of habit when walking and an anamnesis of the subjects. CONCLUSION:In this study, the influence that walking speed gives to walking efficiency from 3.0km/h to 5.4km/h used as a setting range, was not recognized. And laterality of mechanical energy was large and small for persons split up into two groups.

APPLICABILITY OF FUNCTIONAL METHODS FOR DETERMINATION OF HIP JOINT CENTRE - A PILOT STUDY

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Introduction: In order to estimate joint moments of the hip, precise determination of hip joint centre (HJC) is necessary. In the literature two approaches of determination of HJC are discussed: functional and predictive methods (Ehrig 2006). Functional methods consist of individual computation of HJC based on a recorded calibration movement and mathematical models (Ehrig 2006, Gamage 2002). Predictive methods estimate HJC with a fixed mathematical term and individual anthropometrical data (Bell 1990, Seidel 1995). Predictive methods are commonly practiced in movement analysis, although they demonstrate errors of 2-3cm (Kirkwood 1999, Leardini 1999, Seidel 1995). Computer simulation and mechanical modelling demonstrate lower errors in functional methods (Ehrig 2006, Gamage 2002, Halvorsen 1999). From the literature it remains unclear if functional methods are more precise than predictive methods in authentic testing conditions.

Methods: 8 subjects were recruited for the study. HJC was determined by MRI for each subject. Functional calibration movements were recorded by 12 infrared highspeed cameras (VICON, 120Hz). From these recordings HJC was computed using two different functional approaches: algebraic sphere-fit method (S4) and a transformation technique (symmetrical centre of rotation estimation, SCoRE, Ehrig 2006). Errors of the two implemented functional methods were determined by comparing computed HJCs to MRI results.

Results: Mean errors of S4 were 16.1mm (SD 6.3mm), mean errors of SCoRE were 12.4mm (SD 8.6mm).

Discussion: Errors found in this study were higher than errors of functional methods reported in literature from tests based on computer simulation and mechanical linkages (1-5mm error, Camomilla 2006, Ehrig 2006). Testing conditions, especially movement of skin and resulting artefacts may explain this result. Data indicate that HJC can be determined more precisely by functional methods than by predictive methods even in authentic testing conditions: errors found in this study are lower than reported errors of predictive methods (20-30 mm, Kirkwood 1999, Leardini 1999, Seidel 1995). Further studies with increased number of subjects are needed to systematically evaluate the implemented algorithms in authentic testing conditions in order to establish a precise method of HJC determination for accurate gait analyses.

References

Bell AL, Pedersen DR, Brand RA (1990). J Biomech, 23, 617-621.

Camomilla V, Cereatti A, Vannozzi G, Cappozzo A (2006). J Biomech, 39, 1096-1106.

Ehrig RM, Taylor WR, Duda GN, Heller MO (2006). J Biomech, 39, 2798-2809.

Gamage SS, Lasenby J (2002). J Biomech, 35, 87-93.

Halvorsen K, Lesser M, Lundberg A (1999). J Biomech, 32, 1221-1227.

Kirkwood RN, Culham EG, Costigan P (1999). Clin Biomech, 14, 227-235.

Leardini A, Cappozzo A, Catani F, Toksvig-Larsen S, Petitto A, Sforza V, Cassanelli G, Giannini S (1999). J Biomech, 32, 99-103.

Seidel GK, Marchinda DM, Dijkers M, Soutas-Little RW (1995). J Biomech, 28, 995-998.

THE INFLUENCE OF EXHAUSTING SSC EXERCISE ON THE LOWER LIMB NEUROMECHANICAL BEHAVIOUR <PRELIMINARY STUDY>

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Introduction: This pilot study is the first part of an investigation about changes and re-organization of the musculoskeletal system when subjected to cyclic load exercise, and the aim was to assess and analyze changes in temporal, kinematic, kinetic and electromyographic data during an exhaustive jumping exercise.

Methods: One healthy adult performed a sequence of 10 unilateral hops, followed by 25 drop jumps. The sequence was repeated ten times (until task failure). Motion capture was collected with 8 cameras (Ocqus-300) at 200Hz. Synchronously, ground reaction force (GRF) was collected, EMG data (tibialis anterior (TA), gastrocnemius medialis (GAS), biceps femoris (BF), vastus lateralis (VL)), transmitted by telemetry and collected at 1kHz and A/D converted. 3D Joint moments were calculated by inverse multibody dynamics. Kinematic and kinetic data were calculated with Visual 3D software for biomechanics modeling. 5 jumps of each sequence were averaged after time normalization and the results for the variables under study were plot for qualitative comparison.

Results: During the last hop sequence, the maximal plantar flexion increased 20.3%, the maximal knee angle 19.2% and the hip angle also increased 44.4% in comparison with the first sequence. While ankle and knee moments of forces increased 10%, and 25.3% respectively, the hip moment of force decreased 34.5%. The EMG for the pre-activation phase is not conclusive because there isn't a visible tendency being least marked on the case of VL. During the contact phase similar patterns of muscle activation were observed between first and last sequence for GAS and BF. TA burst appear latter on the last sequence changing from 10% of support time to 30%. VL presented a clear increase on the activation level from the first to the last sequence showing a 30 % difference.

Discussion: The different joint moment results may be a good indicator that the muscle-tendon structures that cross these joint are affected by fatigue (Kuitunen,2007). Those changes occur mainly by alterations in the hop pattern, with an increased participation of the knee extensor muscles to produce the required mechanical power. It is clear the influence of exhaustion in the re-organization of the mechanical production by the musculoskeletal system (Winter,1991). These effects are also noticed in the kinetic results, especially in the vertical GRF, when it starts to appear some impact force peaks and with the "trade" of knee and hip moments of force results. Our results could suggest that the changes in the musculoskeletal system are related to the levels of fatigue, and these changes should be taken in to account when modeling the musculoskeletal system.

References

Kuitunen, S., Kyrolainen, H. et al. (2007). Scand J Med Sci Sports, 17, pp.67-75.

Winter D. (1991). The Biomechanics and Motor Control of Human Gait, 35-52. University of Waterloo Press

DOES THE EXAMINER AND THE MARKER PLACEMENT TECHNIQUE AFFECT THE GAIT KINEMATIC DATA?

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Introduction: Motion capture using a video-based optoelectronic stereophotogrammetric system (OSS) allows the assessment of the instantaneous positions of markers located on the surface of the skin and, thus, a kinematics analysis of movement. Cereatti et al (2006) states 3 sources of error affecting motion analysis techniques: instrumental errors, soft tissue artifacts (STA) and anatomical landmark (AL) misplacement. The purpose of this study was to analyze the influence of the examiner (exm) and of two anatomical landmark (AL) placement techniques (real AL (RAL), fixed on the skin, vs vitual AL (VAL), created with a pointer) on lower limb length and maximal ROM on the sagital plan.

Methods: Six students of the University (age: 20.12±0.78), without any gait pathology, participated on the study. The later procedures were followed: (1) antopometric data assessment, (2) palpation and fixation of the real ALs, (3) data collection I - static and dynamic (gait) trial. A 10 camera (Oqus 300) OSS, from Qualisys Motion Capture System at a sample frequency of 200Hz was used, (4) palpation and creation of the virtual ALs using Visual 3D from C-motion inc, (5) data collection II - static and dynamic (gait) trial (6) Repetition of steps 1 to 5 for 3 examiners. In Visual 3D right lower limb lengths, segment lengths residuals and angular displacement in the sagital plan were collected. Statistical analysis was done with with SPSS 16.0.

Results: Differences between methods were only significant for thigh length assessed by exm 1 (~7.8mm which corresponds to ~2% of thigh length) and hip maximal ROM in sagital plan for exm 3 (~0.3º which corresponds to ~0.75% of maximal ROM). Differences between examiners were only significant between exm1 and 3 with RAL for foot length (~5.9mm which corresponds to ~4.6% of foot length) and between exm1 and 3 with RAL for hip ROM (~0.5º which corresponds to ~1.35% of maximal ROM). Segment lengths residuals were: 5mm for the foot (~4.3% of foot length), 2mm for the shank (~0.6% of shank length) and 3mm for the thigh (~0.8% of thigh length).

Discussion: Neither the method nor the examiner seemed to have a great influence in the tested gait kinematic variables. The value of the error obtained through the segments residuals for both methods is superior for the foot (~4%) and does not reach 1% for the shank and the thigh. This was probably because of the camera set up, since none of the cameras was at the foot level. In order to obtain more accurate kinematic data, previous studies about the best data collection procedures should be made and, even with the best possible conditions achieved, error assessment and compensation should be performed for each evaluated task.

References

Cereatti, A., et al; Journal of NeuroEngineering and Rehabilitation, 3, 2006

Chiari, L., et al. Gait and Posture, 21, 197-211, 2005.

Della Croce, et al. Gait and Posture, 21, 226-237, 2005.

MODELING THE FORCE – VELOCITY RELATIONSHIP IN ARM MOVEMENT

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MODELING THE FORCE – VELOCITY RELATIONSHIP IN ARM MOVEMENT
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Introduction: Modeling the force-velocity dependence of a muscle-tendon unit has been one of the most interesting objectives in the field of muscle mechanics. The so-called Hill's equation (Hill 1938 and 1970) is widely used to describe the force-velocity relationship of muscle fibers. Hill's equation was based on the laboratory measurements of muscle fibers and its application to the practical measurements in muscle mechanics has been problematic. Therefore, the purpose of this study was to develop a new explicit calculation method to determine the force – velocity relationship, and test its function in experimental measurements. This study continues the development of earlier study (Rahikainen 2004).

Methods: Herein the force-velocity relationship has been given as an equation of motion. The model was based on the motion analysis of arm movements. Experiments on forearm rotations and whole arm rotations were performed downwards and upwards at maximum velocity. According to the present theory the movement proceeds as follows: start of motion, movement proceeds at constant maximum force, movement proceeds at constant maximum power, stopping of motion. The measurements of arm movements were performed by a special motion camera system which represents the movement as a series of object images. Between these images the paths of the mark light attached to the moving object can be seen as a broken light-line.

Results: Theoretically derived equation, in which the motion proceeds at a constant maximum power (hypothesis), fitted well the experimentally measured results. The values of friction coefficient C and power and friction coefficient ratio P/C were obtained within the curve fitting, whole arm rotation downwards C = 2.83 kg m / s^2, P/C =360 1/s^2, whole arm rotation upwards C = 2.83 kg m / s^2, P/C =250 1/s^2 and forearm rotation downwards C = 2.38 kg m / s^2 and P/C =285 1/s^2. The constant maximum force hypothesis did not seem to fit the measured results.

Conclusions: A further development of Hill's force–velocity relationship was derived, in which Hill's model was transformed into a certain kind of a constant maximum power model. The results of the present study were compared with the mechanics of Hill's model. For the constant maximum force hypothesis a different kind of equation was suggested which would better fit the measured results.

References

Hill A, (1938). Proc. Royal Soc. London. 126 (B), pp. 136-195.

Hill A, (1970). Cambridge University Press, Cambridge.

Rahikainen A, Luhtanen P, (2004). Russian Journal of Biomechanics, Vol. 8, No 2: 78-93.

DEVELOPMENT OF BIOMECHANICAL MODELS WITH ADAMS LIFEMODELER SOFTWARE

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Mechanical loading is related with the magnitude of the external and internal forces; with the frequency of forces applied on the body; with the repetition of load application; and with the way musculoskeletal structures deal with the internal forces. Computer models using ADAMS Lifemodeler software (Mechanical Dynamics, In.) are being developed in order to study the complex movements of the joints and the mechanical loads in specific anatomical structures. These models simulate the dynamic behaviour of a rigid multibody system and allow recreate various conditions of movement performance, allowing the analysis of daily physical activities, several sports and individual motor performance. This software derivates a series of movement equations for the model, applying the methods of Lagrangian dynamics. The resulting motion equations are integrated, resulting in a model simulation. Mathematically, the inverse dynamics solves the movement equations that define the model to obtain the joints reaction forces and joints moments. The main goal of this study is the development of biomechanical models that simulate physical locomotion activities of high and low intensity with a moderate speed which allow characterize the biomechanical effect, caused by applied external loads. For the construction of models, the transfer of data between software is a key to facilitate the process of modelling. This is the main focus of the present study. Three-dimensional multibodies mechanical dynamic models will be created, allowing simulating the motor tasks in real conditions. The internal forces can be calculated after the ground reaction forces and kinematics data are obtained, using an inverse dynamics solution and anthropometric information. Muscle forces can be determined using electromyography and anthropometric information. Inverse dynamics is the specialised branch of mechanics that bridges the areas of kinematics and kinetics. It is the process by which forces and moments are indirectly determined from the kinematics and inertial properties of moving bodies. In this work, the main tool in the modeling process and dynamic simulation is the inverse dynamics. Two areas of research are of major interest: the quantification of mechanical load acting on the biological structures of the young and the elder woman; and the simulation of conditions of practice.

3D ANALYSIS OF SWITCH LEAP TO RING POSITION ACCORDING TO THE INTERNATIONAL CODE OF POINTS

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Introduction: Gymnastics disciplines are characterized by its high technical demands. To check the results of technical training it's necessary to measure if the skill achieve the requirements exposed in the International Code of Points (FIG, 2009). For this purpose it´s useful to applied biomechanics tools to carry out a completed 3D video analysis of each skill. But kinematics variables must be translated to these requirements to make these results more interesting to coaches. The aim of our study was to define a comprehensible card including kinematics results that can help coaches to know if the skill achieves the requirements exposed in the International Code of Points.

Methods: A 3D video analysis of switch leap to ring position was performed. 10 gymnasts from Junior and Senior Spanish national team were filmed. Two synchronized DV video cameras at 50 Hz and 1/1000 exposure time were used. The area was calibrated with a prism (4x2x2 m) that defined 12 control points. A 17 segment body model was used to calculate temporal, angular and spatial variables. 20 body points were manual digitized in all frames. The raw position data were smoothed by the fifth order splines (Woltring, 1986).

Results: The mean results of this leap were: The impulsion phase duration was 0.13±0.01 s. The take off velocity was 3.21±0.13 m•s-1 and the angle of release was 59.31±4.15º.The amplitude of the swing leg was 61.2±12.4º. During this phase gymnasts perform a 34.44±11.56º knee extension.

The mean flight phase duration was 0.53±0.02 s flight. During the flight gymnasts reached a maximum split angle of 179.3±18.90º. The foot tip achieved a height of 8.7±12.6 cm above shoulder. The angle between the front leg and the horizontal was 12.4±8.9º.

Discussion: According to the Code of points the switch leap to ring position have five specific requirements: free leg swing minimum of 45°, reach an amplitude of 180° split, front leg has to reach the horizontal, back foot above shoulder height and arch position of the back (FIG, 2009). This variables except the arch position could be calculated with the 3D analysis kinematics results. As the results of this analysis we detected that 4 gymnasts didn't reach the requirements of the leap. The principal handicaps to perform all the requirements were: front leg has to reach the horizontal (4 cases) and amplitude of 180° split (2 cases). The designed card exposed these aspects so it can help coaches to focus attention to these specific aspects to achieve a correct leap.

References

FIG (2009) International Code of Points. International Gymnastics Federation. Switzerland

WOLTING, H.J. (1986) A Fortran package for generalized, cross-validatory spline smoothing and differentiation. AVD. Eng. Software, 8(2): 104-113.

KINEMATIC AND FORCE COMPARISON BETWEEN WALKING AND NORDIC WALKING. A PILOT STUDY

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Introduction: Nordic walking has become a popular fitness sport in the recent years. This exercise is often recommended to orthopaedic patient and obese people as it is believed that the use of walking poles could reduce lower limb loading. Controversial results have been found in the literature that investigate these aspect and the absence of coherence were often related to insufficient skill of the subjects. The aim of this study was to develop and test an experimental protocol for the comparison of kinematic and force parameters between walking and Nordic Walking.

Methods: Two highly expert Nordic Walking trainers (S1 and S2) participated to the study. They were asked to perform walking (W) and Nordic Walking (NW) on a large treadmill at two different speeds (4 km/h and 7 km/h) and 4 different slopes (-20%, -10%, 0%, +10%). Mean ground reaction force (MF) and peak force at contact phase (PF) and center of pressure (CoP) were measured at 100 Hz by means of Novel Pedar insoles. For NW condition, the forces applied trough the poles were recorded by load cells inserted under the handgrip. Trunk inclination, knee angle, and pole inclination were measured at 100 Hz by a 6 cameras Qualysis Motion Capture system and were considered during the first part of the stance phase. The vertical component for pole force was calculated by total force and poles inclination. Mean data over at least 20 cycles were obtained for each condition.

Results: No significant differences were found in MF between W and NW condition for both athletes. Mean values for vertical component of pole force assumed values always lower than 3% of the plantar forces. Greater PF values were found in NW condition respect to W for S1 at the slopes of -10% and 0% at both speed and for S2 at every speed and slope. On flat slope, PF for S1 were 804 ± 34 N for W and 909±23 N for NW and for S2 PF were 650 ± 27 N for W and 713±20 N for NW. Lower knee angle were found for NW condition respect to W particularly at high speed and downhill condition. The trunk inclination values were higher for NW at every speed and slope for both subjects. At 0% slope the trunk flexion for S1 was 88.5 ± 0.8° for W and 84.75 ± 0.4° for NW and for S2 was 88.7 ± 1.2° for W and 81.5 ± 0.6° for NW.

Discussion: The results of this study demonstrate that the use of the walking poles do not lead to a decrease of vertical ground reaction force. The amount of the force exerted vertically trough the poles confirm moreover that their use can not contribute significantly to support body weight. Changes in the knee joint and trunk kinematic suggest that a positive effect of Nordic Walking on the knee loading could arise from a different transfer of the plantar force through the joints. This hypothesis can be further investigated applying inverse dynamic analysis to compare the two forms of locomotion.

References

Hansen L., Henriksen M., Larsen P., Alkjaer T., Scan J Med Sci Sports. 2008 Jan 14

DEVELOPMENT OF BIOMECHANICAL MODELS USING ADAMS LIFEMODELER SOFTWARE <CORRECT MODEL>

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INTRODUCTION: Computer models are being developed in order to study the complex movements of the joints and the mechanical loads in specific anatomical structures. These models simulate the dynamic behaviour of a rigid multibody system and allow recreate various conditions of movement performance, allowing the analysis of daily physical activities, several sports and individual motor performance. The main goal of this study is the development of biomechanical models that simulate physical locomotion activities of high and low intensity with a moderate speed which allow characterize the biomechanical effect, caused by applied external loads.

METHODS: To obtain the kinematic data it was used a high resolution optoelectronic system, working in the infrared spectrum (Qualysis Q-Trac, Motion Capture System). Through the Visual 3D C-Motion software, Inc., by inverse dynamics, it is possible to do a kinematic and kinetic analysis of the movement. The next proceeding was to exporting the kinematic data of each marker that define the segments of the lower limbs. The internal forces can be calculated after the ground reaction forces and kinematics data are obtained, using an inverse dynamics solution and anthropometric information. Muscle forces can be determined using electromyography and anthropometric information. To construct the model, this ADAMS Lifemodeler software (Mechanical Dynamics, In.) derivates a series of movement equations for the model, applying the methods of Lagrangian dynamics. The resulting motion equations are integrated, resulting in a model simulation. Mathematically, the inverse dynamics solves the movement equations that define the model to obtain the joints reaction forces and joints moments.

RESULTS: With a kinematic data file, it was possible to simulate the swing movement using generic anthropometric proprieties. The model under development aims to simulate the activity of Step exercise with a 135 beats per minute of speed, on a 15 cm heighted platform.

DISCUSSION: In the modeling process, joints stiffness and damping proprieties influence rigidity the model. Also for the contact surfaces should be considered these two properties, as well as the motion influencers of the movement model. In this work, the main tool in the modeling process and dynamic simulation is the inverse dynamics. For the construction of models, the transfer of data between software is a key to facilitate the process of modeling. In this work, the main tool in the modeling process and dynamic simulation is the inverse dynamics. It is the process by which forces and moments are indirectly determined from the kinematics and inertial properties of moving bodies. Two areas of research are of major interest: the quantification of mechanical load acting on the biological structures of the young and the elder woman; and the simulation of conditions of practice.

OPTIMISATION OF A BICYCLE CHAINRING FOR LOWEST MAXIMUM MUSCLE ACTIVITY USING THE COMMERCIAL SOFTWARE ANYBODY

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Introduction: A cyclist's bike is set up in the configuration which they find the most comfortable, with it being generally assumed that this yields the most efficient position. This study investigates the effect of configuration on efficiency and numerically optimises the set up using an AnyBody musculoskeletal model. Multivariable optimisation of cycling biomechanics has been done before (Hull M L & Gonzalez H, 1989) with similar variables being explored, however this study utilises the more advanced mechanism of specific muscle force resolution available in AnyBody. With an optimum position for the rider obtained we then consider the chain ring. A bicycle drive train is extremely efficient (~ 98%) although the rider interface is subject to noticeable losses , partly due to the "one size fits all" nature of the circular chainring. As such the computational model will be used to assess the effects of varying the local radius to improve the total efficiency for a specific athlete.

Methods: Experimental torque data for varying power and cadence is collected, for a competitive cyclist, using a stationary bicycle fitted with instrumented cranks mounted on a trainer, which enables power output to be controlled at varying cadences. Fourier analysis of the experimental data is used to create a surrogate model for torque to be utilised in the computer model. A parameter study followed by numerical optimisation is carried out using a 2D model and initial variables of seat height, seat longitudinal position, cadence and crank arm length. The chain ring shape is then manipulated so as to affect better muscle efficiency in powering the bike.

Results: Experimental data from the instrumented cranks shows the torque profiles to be asymmetric in nature. This indicates that calibration of the model using experimental data must be carried out. The data also shows a large dependency on the cadence for the "purity" of the torque profile with smoother profiles being produced closer to the optimum cadence.

Visual inspection of the parameter study results and screening plot produced shows a large variation in maximum muscle activity depending on configuration. A high dependency on cadence, crank arm length and seat height is also shown, with seat longitudinal position revealed to be less important. Values of 170mm for the crank arm length and 90rpm for the cadence are found to be optimal. These coincide with values which are generally accepted in cycling.

Discussion: The results clearly show that variable interaction occurs (particularly with cadence) and that configuring the bicycle correctly and pedalling at the right cadence can lead to a large decrease in the maximum muscle activity. This should increase the efficiency and delay the onset of fatigue. The results show that a personalised set up based on rider specific data will prove more successful in competition.

References

Hull M L, Gonzalez H(1989). Journal of Biomechanics, 22, 1151-1161

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Poster presentations

PP-PH18 Physiology 18

INDUCTION OF LYMPHOCYTE DEATH BY SHORT AND LONG DURATION TRIATHLON COMPETITIONS

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Purpose: The effect of triathlon competitions on death of lymphocytes from elite athletes was investigated. Methods: Blood was collected from sedentary volunteers and triathletes at rest and after a short duration triathlon (SDT) and after a long duration triathlon (LDT-half ironman) competitions. Results: The training to both triathlon competitions reduced lymphocyte proliferative capacity by 59% as compared to sedentary volunteers. Long and short duration triathlon competitions decreased ConA-stimulated lymphocyte proliferation by 41% and 61%, respectively, when compared with the sedentary group. Both triathlon competitions did not change lymphocyte proliferation as compared to rest condition. There was no difference in the parameters associated with lymphocyte death when sedentary volunteers were compared with triathletes at rest. Lymphocytes from triathletes after SDT competition showed an increase in DNA fragmentation (2.2-fold), phosphatydilserine externalization (2.9-fold) and mitochondrial transmembrane depolarization (2.4-fold) and did not alter membrane integrity when compared to cells from athletes at rest. In contrast, the LDT competition raised the proportion of lymphocytes with loss of membrane integrity by 22% when compared to cells from athletes at rest and did not change the apoptotic parameters. The LDT competition induced an increase of ROS production lymphocytes by 1.6 fold as compared to triathletes at rest. However, short duration competition did not alter ROS production by lymphocytes when compared to cells from triathletes at rest. ROS production by lymphocytes after LDT competition was 60% higher than in SDT. The fatty acids concentration was increased by 3.3 and 1.5 fold by LDT and SDT, respectively. The plasma levels of oleic, linoleic and stearic acids were increased by 1.6, 1.6 and 2.4-fold, respectively, in triathletes when compared with sedentary volunteers. The plasma concentration of these three fatty acids found after a triathlon competitions stimulated ROS production in lymphocytes and was toxic for 24 h cultured lymphocytes obtained from healthy volunteers as previously demonstrated by our group. Conclusion: Evidence is presented herein that a LDT competition caused lymphocyte death by necrosis. On the other hand, SDT induced lymphocyte apoptosis. The mechanism for lymphocyte death induced by the triathlon competitions may involve an increase of ROS production at different extents and increase in plasma levels of oleic, linoleic and stearic acids. Financial support: Fapesp, CNPq and CAPES.

EFFECTS OF BLOOD FLOW AND VOLUME ON EDEMA INDUCED BY EXERCISE AND VENOUS-STASIS

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Exercise and venous-stasis affect to the local blood circulation and volume in the limb. However, it is unknown how limb volume changes induced by exercise and venous-stasis are related to peripheral skin and muscle blood flow. Therefore, the purpose of the study was to investigate how dynamic exercise (DEx) and venous-stasis (VS) affected to the local volume and peripheral skin and muscle blood flow of hand and forearm. We hypothesized that the increase in hand and wrist volume (HWV) after both dynamic exercise and venous-stasis would be differently responded to microvascular system. Six men (age, 34.7±7.0 yr; height, 172.5±6.4 cm; body mass, 68.2±6.9 kg, mean±S.D.) volunteered for this study. Before and after DEx and VS, HWV was measured with a hand volumeter, and on the separate day, peripheral blood flow (PBF) was measured with photoplethysmography at the surface of flexor carpi radialis muscle (FCR) and index fingertip. PBF at FCR were further detected to the blood flow of skin (SBF) and muscle (MBF) and blood volume of skin (SBV) and muscle (MBV). Initially during rest, HWV and PBF were measured after the hand was passively hung for 5 minutes. Venous-stasis was created by a 14.5-cm-wide pneumatic arm tourniquet, which was inflated to 60 mmHg, around upper arm for 5 minutes. Dynamic handgrip exercises were performed at 20% of the maximum voluntary contraction (MVC) with an ergonomic hand exerciser by repetitive contraction and relaxation of the hand at a maximum frequency, consisted of 6 sets of 30-second exercise with 10-second rest interval between exercises. In order to determine intensity of handgrip exercises, maximum isometric handgrip strength was measured with a handgrip dynamometer. Data are presented as means±S.D. Both after DEx and VS, HWV increased significantly from 445.2±40.6ml to 455.8±44.0ml ($p<.01$) and from 451.8±39.1ml to 464.8±40.2ml ($p<.01$), respectively. These increases represent 2.3±0.8% ($p<.001$) and 2.9±1.5% ($p<.01$) of resting HWV after DEx and VS, respectively, and no significant difference was seen between these ($p>.05$). PBF at index finger was decreased after DEx, but not significantly changed after VS. SBF and MBF both after VS and DEx were not significantly changed but tended to increase after DEx. SBV and MBV were increased after VS, but not significantly changed after DEx. These results suggest that the higher HWV after dynamic exercise is likely to be caused by increase in blood inflow, while the higher HWV after venous-stasis is caused by decrease in blood outflow, thereby increased venous volume.

EFFECT OF PRIOR ECCENTRIC EXERCISE ON THE VO2 KINETICS DURING HEAVY CYCLING EXERCISE IN MALE BASKET-BALL PLAYERS

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Introduction: The oxygen uptake (VO2) kinetics may vary with work rate or under different conditions of exercise e.g. prior exercise. The aim of this study was to examine the influence of prior drops without jumps on VO2 kinetics during heavy cycling exercise in male basketball players.

Methods: Eight male basketball players of national level (age 19,5 ± 0,53 yr, height 191,0 ± 5,8 cm, and weight 86,5 ± 9,78 kg) volunteered to participate in this study. Subjects completed four protocols on separate days. During the first day they performed continuous increasing cycling exercise (ICE). In the second examination the subjects performed constant cycling exercise (CCE) with which consisted of 3 min unloaded cycling, 9 min cycling with intensity in the middle between maximal oxygen uptake (VO2peak) and first ventilatory threshold (79.5 ± 2.5 % of VO2max) and 3 min of unloaded cycling. In the third examination the subjects performed one hundred drops from 0.47 m height with eccentric contractions of thigh muscles at the end every 20 s (D), rested passively for one hour and then performed CCE. Following 24 hours the fourth examination was performed using the same protocol as in the second one. Testing was performed on mechanically braked cycle ergometer (Monark 834E) while cycling at 70 rpm. At the end of each 9 min CCE, a blood sample was collected from the finger tip for immediate analysis of blood lactate concentration ([lactate]). Rating of perceived exertion was evaluated by the subject at the end of each CCE, and muscle pain was assessed on the next day after eccentric exercise. Pulmonary gas exchange was measured breath-by-breath throughout all tests. VO2peak was determined as the highest value in 15 s period before the subjects' volitional termination of the ICE. The VO2 response during exercise and recovery periods of CCE was fitted the bi-exponential function. The first 20 s were always removed from the analysis. In addition the slow component was calculated as the difference between the end exercise VO2 and the 3rd min VO2.

Results: Prior eccentric exercise had no effect on time constants of VO2 response during on- and off-transitions during CCE. The VO2 values at the 3rd, 6th and 9th min of CCE did not change significantly during all examinations. The rating of perceived exertion was slightly but not significantly elevated at the end of CCE one hour and 24 hours after eccentric exercise. The subjects felt moderate muscle pain (4,0 ± 2,9) 24 hours after eccentric exercise.

Discussion/Conclusion

The prior eccentric exercise did not cause any change of VO2 kinetics during heavy CCE in male basketball players despite augmented efforts and muscle pain. This may be associated with adaptation of basketball players to such kind of activities which are often involved in their training process.

RELIABILITY AND CONCURRENT VALIDITY OF MAXIMAL SPRINT RUNNING PERFORMANCE MEASUREMENTS ATTAINED ON A NON-MOTORISED TREADMILL

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Introduction: The use of non-motorised treadmill (NMT) ergometry to assess sprint running performance allows the measurement of variables which are potentially useful to researchers and coaches (e.g. power, peak running speed). However, the use of NMT ergometry is only appropriate if its results are both repeatable and indicative of performance in the field. Accordingly, the aims of this study were to assess the inter- and intra-day reliability of sprint performance variables attained on a NMT over distances associated with multiple-sprint sports and to statistically assess the concurrent validity of sprint times attained on a NMT against those attained during maximal over-ground sprint running.

Methods: Following habituation, 12 male team-sport players (age 22.3 ± 3.6 y, stature 1.79 ± 0.57 m, body mass 80.3 ± 8.44 kg) performed 3 maximal sprints over 30 m on the NMT (Woodway, Force 3.0) on two occasions and a further assessment of over-ground running performance over 30 m in a random order, each separated by 24 h. Performance variables measured during each trial included time to 10, 20 and 30 m (s), peak and mean power (W), peak and mean speed (m•s-1), time to peak speed (s) and force (N).

Results: No significant differences (P > 0.05) were observed for performance variables attained on the NMT on the same day or between days, demonstrating that no systematic bias was present. For intra-day measurements, ratio limits of agreement indicated that split times over 10 (0.99 */÷ 1.14), 20 (0.99 */÷ 1.07), and 30 m (0.99 */÷ 1.06), peak running speed (1 */÷ 1.05) and force (1 */÷ 1.04) demonstrated the least variance. The highest levels of agreement between days were observed in 10 (1.04 */÷ 1.16), 20 (1.02 */÷ 1.09) and 30 m (1.02 */÷ 1.07) split times, mean (0.99 */÷ 1.07) and peak (1 */÷ 1.06) running speed. The coefficient of variation was < 9% for all variables for intra- and inter-day measurements except time to peak running speed (11.9 and 13.5% respectively). Significant differences (P < 0.05) were observed between split times over 10, 20 and 30 m on the NMT and over-ground running, with times consistently lower by approximately 30% during over-ground running over all distances. However, a significant correlation (r = 0.8, P < 0.05) between over-ground and NMT sprint times indicated that faster sprinters over-ground were predominantly faster on the NMT.

Conclusions: This study demonstrates that measurements of sprint time and peak running speed provide the most reliable measures of sprint performance on a NMT. Measurements of both power and force demonstrate acceptable levels of agreement and may also provide useful information for sprint-related research studies and the assessment and monitoring of multiple-sprint sport athletes. Whilst agreement between sprint performance over-ground and on the NMT was poor, NMT ergometry may provide a viable indication of over-ground sprint performance by identifying slower and faster athletes.

NANDROLONE EXCRETION IN SEDENTARY VERSUS PHYSICALLY TRAINED YOUNG WOMEN

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We investigated the effects of the menstrual cycle, oral contraception and physical training on exhaustive exercise-induced changes in the excretion of nandrolone metabolites (19-norandrosterone (19-NA), and 19-noretiocholanolone (19-NE)) in young women.

Twenty-eight women were allocated to an untrained group (n=16) or a trained group (n=12), depending on their physical training background. The untrained group was composed of nine oral contraceptive users (OC+) and seven eumenorrheic women (OC-), while the trained group was entirely composed of OC+ subjects. Three laboratory sessions were conducted in a randomised order: a prolonged exercise test, a short-term exercise test and a control session. Urine specimens were collected before and 30, 60 and 90 minutes after the exercise test and at the same times of the day during the control session. Urinary concentrations of nandrolone metabolites were determined by gas chromatography coupled to mass spectrometry.

Urinary concentrations of 19-NA and 19-NE ranged from undetectable levels to 1.14 ng/mL and 0.47 ng/mL, respectively. Nandrolone excretion was not affected by the menstrual cycle phase (early follicular vs. mid-luteal), prior physical training, oral contraception or acute physical exercise. Therefore, a urinary concentration of 2 ng/mL of 19-NA appears to be fair as the upper acceptable limit in doping control tests for female athletes.

EXAMINATION OF BLOOD HEMOGLOBIN CONCENTRATION MEASURED BY THE OSM2 INSTRUMENT

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Introduction: Blood hemoglobin concentration is regularly measured by automatic instruments that report the value in around 1 min. This may be convenient, for example when testing athletes for possibly too high concentrations. The OSM2 from Radio-meter is an example of such instruments. Results from that instrument have been compared with those of a time-con-suming but very accurate reference method using the hemi-globin-cyanide principle. It was of particular interest to see to what extent OSM2 reports the hemoglobin concentration accurately and precisely. Moreover, possible sources of bias were examined. It was also examined whether arterial and femoral-venous blood were affected similarly.

Methods: Four healthy, moderately trained young men (nonsmokers) cycled for 2 min to exhaustion. Blood samples were drawn from indwelling catheters in the femoral artery and vein before exercise, during exercise, and in the 1 h recovery. Blood hemoglobin concentration was analyzed using both the OSM2 and the hemiglobin-cyanide method of Baxter Dade. In addition blood acid-base parameters were measured [1].

Results: Blood hemoglobin concentrations reported by the OSM2 were linearly related to those of the control method with a random variation of 0.14 mmol/L (1.5%). For arterial blood OSM2 showed a constant bias of –0.36 mmol/L (–4%). For femoral-venous blood the bias varied by the hemoglobin concentra-tion, being negative at low concentrations and positive at high concentrations (–3 to +2%). Consequently, the arterio-venous (a-v) difference differed systematically between the two methods. The varying bias in the results of OSM2 for femoral-venous samples correlated with blood pH, pCO2, O2-saturation of hemoglobin (sO2), and with the hemoglobin concentration itself (cHb). Partial correlation analyses sug-gest that only the latter two correlations were independent, while correlations of the bias with pH and pCO2 were removed when correcting for the effect of sO2 and cHb.

Conclusions: OSM2 measures blood hemoglobin concentration quite precisely, but there is a variable bias of up to 4% in absolute value. At high hemoglobin concentration the instruments reports too high values for femoral-venous blood. The instru-ment does not report a-v differences reliably. A review of the literature suggests that problems identified here may be present in other instruments using similar principles too.

References

1. Medbø JI, Hanem S, Noddeland H, Jebens E. Acta Physiol Scand 2000; 168: 311–326.

2. Medbø. Scand J Clin Lab Invest 2009; 69: 92–101.

EFFICIENCY AT HIGH WORK RATES IN WORLD CLASS SKIERS

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Introduction: Energy delivery and mechanical efficiency, a measure related to technique, are key factors in endurance performance. Efficiency is normally measured at low intensities to obtain steady state aerobic conditions. However, in competitive skiing, efficiency is important at higher intensities with a combination of aerobic and anaerobic energy delivery. Therefore, the present study aimed to study efficiency at relatively high, and up to maximal, work rates. Furthermore, we aimed to investigate the effects of performance level by

comparing World Class and National level athletes. Methods: Eight world class (26.1±3.5 yr, 184.8±5.6 cm, 83.3±6.4 kg, fat percent 8.8±2.6%, FIS-points 20.5±13.1) and eight national class (24.5±2.3 yr, 186.4±6.6cm, 82.8±6.6 kg, fat percent 9.9±1.5%, FIS-points 87.4±27.7) Norwegian male cross country skiers participated in the study. After a preliminary warm up, all athletes performed three 5-min stages at 14, 16 and 18 km h-1 on a 5% inclination using the skating V-2 technique while roller skiing on a treadmill. Furthermore, the athletes performed an incremental treadmill velocity test at a 5% incline, leading to a maximal obtainable speed after 5-7min. Gross efficiency was calculated by external power output divided by internal power. External power was calculated taking into account both work rate against gravity and frictional rolling forces. Internal power was calculated using gas exchange and blood lactate values. The effect of velocity on efficiency and group differences with regard to this was tested using a one-way ANOVA for repeated measures. Furthermore, the groups were compared for efficiency at their own maximal speed during the incremental test. Results: Compared at absolute work rates (i.e., the 3 velocities) the world class skiers showed higher efficiencies than the national class (15.17±0.37%; 15.15±0.43%; 15.21±0.63% vs 13.95±0.71%; 14.43±0.58%; 14.54±0.57%, at 14, 16 and 18 km h-1, respectively). The group differences were highly significant (P=0.002). The statistical analysis showed that the velocity effect was not significant (P=0.073). The apparent small trend was caused by the difference between 14 and 16 km h-1 in the national class group. Compared at relative work rates (maximal speed during the incremental test) the 2 groups seemed to have a similar difference in efficiency, as at absolute work rates, but it did not reach statistical significance (15.58±1.04% vs. 14.78±0.62%; P=0.083). Discussion: The current results indicate that, in addition to the higher energy delivery capacity, world class athletes also utilise a more effective technique at an absolute work rate (i.e., velocity) than national level athletes. However, at the same relative work rate, these differences, at least statistically, are less clear.

NUTRITION STRATEGIES FOR A 3-WEEK SOLO DESERT CROSSING: A CASE STUDY

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INTRODUCTION: Under extreme conditions such as during expeditions, nutrition may become a limiting factor for the extremist's health and performance. The diet should provide sufficient energy in order to minimize the use of endogenous stores such as adipose tissue and muscle protein.

In the present case, a dietary regimen was prepared for an unsupported solo crossing of the Atacama desert (Chile/Peru). During the designated route of approximately 700 km altitude varied from 600 to 4300 m. Due to restricted transport capacity, it was necessary to closely calculate the energetic requirements of marching under varying conditions (load, inclination, altitude).

METHODS: All measurements were performed on the same subject (35 y, 197 cm, basal weight: 80 kg). Treadmill walking tests were conducted with speed increasing from 2 to 7 km/h. A total of 8 tests were performed a) with and without an inclination of 7.5 %, b) with and without additional weight of 30 kg and c) at sea level and in a hypobaric chamber at simulated altitude of 3500 m.

During each walking test, indirect calorimetry was performed to calculate energy expenditure (EE). Furthermore heart rate was recorded, capillary lactic acid was determined and steps were counted using the SenseWear Pro3 Armband. In simulated altitude, oxygen saturation was also measured.

During the desert crossing, the SenseWear Pro 3 Armband was worn during all wake periods and used to calculate walking speed. EE was extrapolated using an algorithm previously determined with treadmill data. Additionally, the subject recorded his diet and used global positioning system (GPS) to confirm his position occasionally.

RESULTS & DISCUSSION: EE during the simulation increased exponentially with walking speed, at sea level without inclination and without additional weight from 1.9 +- 0.1 (2 km/h) to 3.9 +- 0.2 kcal/min (7 km/h). In average, EE was increased by the additional weight (30 kg) by 3.5 +- 0.2 kcal/min, by simulated altitude by 1.7 +- 0.2 kcal/min and by an inclination of 7.5 % by 2.6 +- 0.2 kcal/min.

Maximal EE of 11.1 +- 0.7 kcal/min was reached at simulated altitude with additional weight and inclination at a speed of 5 km/h, when the subject aborted due to exhaustion. Under these conditions, peak values of heart rate (165 /min) and lactic acid (3.8 mmol/L) were reached and oxygen saturation was reduced to 76 %.

The most efficient walking speed was 5 km/h. At this speed EE lay in the range of 32 +- 2 kcal/km (sea level, no additional weight, no inclination) and 133 +- 8 kcal/km (3500 m altitude, additional weight, 7.5 % inclination).

During the crossing the subject walked a total 597 km (26 +- 7 km/d) during 158 h (6.9 +- 1.8 h/d) in an average speed of 3.8 +- 0.4 km/h, which was later verified by GPS data. Daily EE (4646 +- 963 kcal/d) was substantially higher than energy intake (1873 +- 761 kcal/d). The difference of 2772 +- 1390 kcal/d was in good agreement with the actual weight loss of 10.5 kg.

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Poster presentations

PP-ML02 Motor learning 2

FIFTEEN-YEAR EXPERIENCE OF USE OF PHYSICAL CULTURE DEVICES DURING SCOLIOTIC DISEASE TREATMENT

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Present research actual continuity. At the present moment developmental physiology focuses its particular interest on a very important part of vital activity: infantile motor activity. Children and teenagers physiological activity has multiple forms and motor actions. Two forms of hypodynamia (enforces and spontaneous) are observed in its functional structure. From the point of view of physical culture, the enforced form of hypodynamia is more common for sclerotic disease.

Study methods and management. The research presents analysis of fifteen-year experience of children and teenagers locomotor apparatus multifunctional changes during the scoliotic disease treatment with the use of physical culture devices.

Research results and their discussion. The reasonability of abandonment of traditional orthopedics prohibition system to use all range of physical culture devices providing natural development of central motor programs with accurate exercise selection excluding asymmetry according to the principle of individual load dosage was proved. We made new methodological approaches towards physical exercise

application ensuring body structure visual deviation smoothing, posture correcting, satisfying the need of scoliotic patients in motor activity, reducing psychological stress caused by cosmetic body deformity. The differentiated analysis of functional correction of infantile scotiotic disease (different severity levels) was made. The necessity of use of a new method applying different physical culture devices was justified. It is based not on prohibiting but on accurately dosing of physical load according to structure analysis of spine motor functions, posture pathologic stereotypes (sitting, stretching and walking manners), physical development and exercise performance assessments at different ontogenesis stages. The method is used to prevent evident body deformations disabling young women, limiting their genetic capacities as for reproductive performance and causing psychological stress.

Conclusions.

1. Sanative physical exercise valuation assumption was baed on initial importance of motor-viscerogenic reflex. Bilateral communication of motor and vegetative activities were not equal in the study analysis: the motor function was considered to be the fundamental.

2. The force of movement, its adequate rate and direction were used to solve the set problems. Whereby, we applied the most conformable, biologically justified methods of stimulating of adaptive, protective and compensatory organism properties to prevent and treat scoliotic processes.

3. The application of the present study results in the children`s sanitary and pedagogical institutions (secondary and high schools, colleges, heal-improving summer camps, etc) as well as domiciliary helped to obtain efficient vertebral deformity (kyphoscoliosis) prevention and correction at the stage of intense bone growth, as well as rehabilitation of children and teenagers with progressing scoliotic disease in different ontogenesis periods.

THE PARAMETERS OF MULTISEGMENTAL MONOSYNAPTIC RESPONSES OF LEG MUSCLES IN SUBJECTS WITH LUMBAR NERVE COMPRESSION

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Introduction: The subject of the present study is condition of patients with signs of lumbar nerve compression. The disorder is widespread among athletes who perform exercises loading the lumbar area.

Methods: The reflex motor responses of 16 symmetrical leg muscles (m. biceps femoris, m. vastus lateralis, m. rectus femoris, m. medial head of the gastrocnemius, m. soleus, m. tibialis anterior, m. extensor digitorum brevis, m. flexor digitorum brevis) were evoked percutaneously by electric stimulation of the spinal cord at the L2- L3-L4 level in condition of rest (G.Courtine, S.J. Harkema, Ch.J Dy et al., 2007).

Results: The research revealed a significant decrease of multisegmental monosynaptic responses' (MMRs) maximal amplitude of the left and right m. soleus in comparison with that of healthy subjects. It testifies that in the background of the studied disorder it is reflex excitability of alpha-motor neurons of the muscles with the greatest amount of the slow motor units that is low. And m. soleus is the slowest of all and it is distal to the compression area.

It is evident that there is an electric impulse speed decrease in monosynaptic nerve circuits of the studied shin and foot muscles which are more distal in comparison with thigh muscles. It should be noted that all the muscles with statistically significant increase of the latent period of MMRs, compared with the control group parameters, have a similar function, they are all flexors either of shin, feet or toes, and besides they have a great number of slow motor units.

The significant increase of the MMRs' threshold for most of the studied muscles allows to assume that lumbar nerve compression mostly affects low threshold afferents of the corresponding peripheral nerves, innerving both proximal and distal leg muscles. The large muscles, regardless of their composition and function, have a higher degree of impairment.

Discussion: The results of the research allow to suppose the presence of a number of inter- and intra - muscle coordination peculiarities in the background of lumbar nerve compression. Consequently, they lead to a change of voluntary motor pattern.

References

Gregoire Courtine, Susan J. Harkema, Christine J. Dy, Yuri P. Gerasimenko, Poul Dyhre-Poulsen (2007). Modulation of multisegmental monosynaptic responses in a variety of leg muscles during walking and running in humans. The Journal of Physiology, 582 (3), 1125–1139.

THE EFFECT OF RESTRICTING THE PERCEPTUAL TASK IN TEMPORAL ORGANIZATION OF THE SWIMMING CRAWL: SURFACE CHARACTERISTICS

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Introduction: Research into motor coordination has sought to discuss the occurrence of temporal organization in motor skills, in order to understand the nature of their representations (variances and constants). However, there have not been studies that manipulate perception maintaining surface characteristics constant. This study's hypothesis was to see if there are significant differences between the flexible parameters of the crawl, maintaining the stroke's rhythm and distance after restricting the task in the field of perception. The objective of this study was to observe how restricting the ability to swim can influence the superficial parameters of the crawl.

Method: Descriptive and experimental methods were used. There was mixed random-systematic sampling among 5% of high-ability swimmers (n=6) from São Caetano do Sul enrolled with DETUR in 2008 (n=106). A Seiko chronometer watch with a 100 (25 meter) lap memory was used. The process was also filmed. Perturbation was carried out by light shone onto the retina, forming a configuration according to the degree of complexity (paper was used in swimming goggles), at a natural rhythm. The option of the parametric test statistic was allowed by verifying normality of distribution through the Kolmogorov-Smirnov test. Data were analyzed using Mauchly's Test of Sphericity and ANOVA was used for repeated measures (Contrast). Probability was 5% ($p<0.05$). Data were analyzed using SPSS.vs.13.0.

Results and Discussion: We observed significant differences ($p<0.05$) in the flexible parameters (time, speed, extent and swimming strategy) of the crawl after perception was manipulated, even when maintaining both the distance to be executed and what was considered a normal swimming rhythm. It thus confirmed our experimental hypothesis. No significant differences were observed (p≥0.05) in the frequency of movement due to restrictions, thus remaining a constant. This behavior has been observed in high-ability swimmers, but without perceptual restriction (Freudenheim et al., 2005). One possible explanation for this behavior is that these swimmers maintain the same rhythm in their structure due to their conscious perception of the environment (Capacity to determine parameters – Brito, 2008).

References

Brito, C. A. F. (2008) Natação - Teoria Gestalt: uma nova concepção pedagógica. São Paulo: Phorte.

Freudenheim, A. M.; Basso, L.; Xavier Filho, E.; Madureira, F., Silva, C. G. S.; Manoel, E. J. (2005) Temporal organization of stroke in the swimming crawl: beginners' versus' skilled. R. Bras. Ci Mov., 13 (2): 75-84.

THE INFLUENCE OF RESTRICTING THE PERCEPTUAL TASK IN TEMPORAL ORGANIZATION OF THE SWIMMING CRAWL: SIGNIC REPRESENTATION

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Introduction: Research into motor coordination has sought to discuss the occurrence of temporal organization in motor skills. Thus there has been an effort to understand this structure and discover the nature of its representations, in its variances and constants. The central task of this research was to describe how the behavior of swimming can be controlled (synchronization), but with its representation described after its action. The objective of this study was to observe signic representation in regard to its auto-organization after restricting visual perception.

Method: Descriptive and experimental methods were used. There was mixed random-systematic sampling among 5% of high-ability swimmers (n=6) from São Caetano do Sul enrolled with DETUR in 2008 (n=106). Perturbation was carried out by light shone onto the retina, forming a configuration according to the degree of complexity. The rhythm was called natural – six attempts for each swimmer. The symbolic representation was related through open questions (a structured questionnaire). All subjective reports were described in an individualized and separate form a week after the experiment. Subjective answers were grouped according to categories. The non-parametric correlation of Spearman's rho was used. Probability was 5% ($p<0.05$). Data were analyzed using SPSS.vs.13.0.

Results and Discussion: The results of this study corroborate the idea that temporal organization of the swimming crawl, in its varying aspects, is dependent on a perceptive structure in terms of its synchronization. This structure consciously and unconsciously exercises a function in its perceptual representation, as pointed out in motor behavior studies (Freudenheim, et al., 2005). We found a negative correlation (-0.812; p≤0.05) between the level of experience and its density in responses. While the correlation appears contradictory this field of perception was perceived differently, in its signic quality, to descriptions of forces and restrictions. A more experienced swimmer commented on difficulty in swimming in the second and third phases of the experiment and that in the fifth and sixth "there was almost no vision in the pool (…)", but only at the deep end, as pointed out in other studies (Brito, 2008).

References

Brito, C. A. F. (2008) Natação - Teoria Gestalt: uma nova concepção pedagógica. São Paulo: Phorte.

Freudenheim, A. M.; Basso, L.; Xavier Filho, E.; Madureira, F., Silva, C. G. S.; Manoel, E. J. (2005) Temporal organization of stroke in the swimming crawl: beginners' versus' skilled. R. Bras. Ci Mov., 13 (2): 75-84.

A PHENOMENOLOGICAL STUDY ABOUT OCCURRENCE OF FACTORS FOR SENSUOUS CONSCIOUSNESS

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Introduction: An outward change of a movement is the central theme on that acquisition. For example, if a movement has three segmental structures such as A-part, B-Part, C-Part on that acquisition, then A-part will be learned at first, next B-part, and last of all C-part, and then each three parts will be combined together. And in the movement correction, a necessary part for a correction is taken out, then it is corrected and it is incorporated with other parts. However, a learner shapes his movement by sensuous consciousness. This sensuous consciousness is understood as Kineasthese in the meaning of phenolmenologist Husserl, E. (Husserl, 1973). Kineasthese is a coinage of Husserl, E.. Kaneko defines ability to generate such Kineasthese as ability for emergence or occurrence, and systematized the factor of this ability(Kaneko, 2005). Therefore, the aim of this study was investigated the development of some factors constituting a sensuous consciousness in a learning-process of the movement vertically.

Method: To clarify the development of these factors, Flick-flack by two beginners in artistic gymnastic was selected as object. And it was from 28th April 2004 till 10th September 2005 for the investigation period. I was used the questionnaire and VTR photography of learning situation as materials of an investigation. Four factors (image how about own body, image for execution result, image about the possibility to success of Flick-flack and the possibility of a movement correction) were investigated as questionnaire items.

Result: Two learners got possible to do stable execution finally. Until learner 1 and 2 reach stable execution, they showed three characteristic changes in this investigation. In these changes, they lost much ability in these factors by some causes.

Conclusion: Factors of a sensuous consciousness disappear and occur by various causes on acquisition of a movement. This shows at the same time that an acquisition of a movement can not be made up of mosaic from external viewpoint of the movement. Coaches, trainers and sport teachers should consider an internal point of view, especially a sensuous consciousness of athletes.

References

Husserl, E. (1973), Ding und Raum, Vorlesungen 1907, Hua.ⅩⅥ., S.161.

Kaneko, A. (2005), Sintaichi no keisei, 317-344

VIRTUAL GOLF PUTTING: CORTICAL ACTIVATION DURING REAL GOLF PUTTING COMPARED TO NINTENDO WII PUTTING PERFORMANCE

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Purpose: Motor Learning in a virtual reality environment is often used in today`s surgical education as well as in rehabilitation settings. In this context video games like the Nintendo Wii system may also play a role in motor learning related to sports and exercise. While energy expenditure has been compared in virtual and real situations less is known about differences in cortical activity. EEG is able to observe the load of working memory related to focused attention (Theta frontal) and sensory information processing (Alpha 2 parietal). The aim of this pilot study was to examine differences of working memory functions between real and Wii based virtual sports situations using the golf putt as a model. Therefore EEG was measured during real and virtual putting in reference to resting situations in order to find an alternative training method for goal-directed sports performance like golf.

Methods: Ten male golfers (26.0±0.7 years; 81.8±5.6 kg; 184.5±6.0 cm; handicap 30.0±10.0; 2.9±1.0 years of golf experience) were asked to putt twice for 2min each in both the real and the virtual Wii situation. A rest in sitting position (2min) followed each performance.

Cortical activity was recorded continuously at 6 electrode positions using international EEG standards (10:20 System). Fast Fourier transformation determined power at two frequencies: Theta (4.75-6.75 Hz) at Fz, F3, F4 and Alpha-2 (9.75-12.5 Hz) at Pz, P3, P4. ANOVA with repeated measures was computed in a 2 (real/virtual) x 2 (performance/rest) x 2 (trials) design.

Results: Compared to virtual putting Theta spectral power was significantly higher during real performance at F3 (F1,9=9.618; p<.02; part. η²=.517) and F4 (F1,9=5.856; p<.04; part. η²=.394). In reference to rest Theta power demonstrated significantly increased values during performance at Fz (F1,9=18.191; p<.01; part. η²=.669), F3 (F1,9=19.012; p<.01; part. η²=.679) and F4 (F1,9=15.319; p<.01; part. η²=.630).

Increased Alpha-2 power during real and virtual performances compared to rest reached significant level at Pz (F1,9=6.063; p<.04; part. η²=.403), P3 (F1,9=6.260; p<.04; part. η²=.410) and P4 (F1,9=6.122; p<.04; part. η²=.413).

Conclusion: In the concept of working memory increased frontal Theta power generated in the anterior cingulated cortex (ACC) indicates higher focused attention. That may lead to the idea that the attention level during real putting seems to be higher. In contrast the quantity of sensory information processing inversely related to parietal Alpha-2 power showed no differences between real and virtual putting. Furthermore activational patterns during real and virtual performance were different compared to resting conditions. In summary there are some similarities in cortical activation patterns between putting on a green and with the Nintendo Wii system which may support the idea to use virtual performance as an alternative training method. Further studies are needed to confirm these first results.

STATIC AND DYNAMIC BALANCE BETWEEN GENDERS FROM 4 TO 18 YEARS OF AGE

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UNIVERSITY RAMON LLULL

Introduction: To end of years 70, has been an increasing interest inside of psychology to observe the evolution of the different human capacities so as Baltes (1981) mentioned. The aim of this study was to look at the differences with respect to age and gender for static and dynamic balance in children and adolescents aged 4 to 18 years.

Method: A sample of 2420 subjects (1289 male and 1131 female) aged from 4 to 18 years old volunteered for the study. A one-leg static balance test and a Gesell dynamic balance test were performed to obtain balance data in both, males and females. Both gender groups were stratified by 1 year increments, starting from age 4 until 18 years old. Descriptive statistics and a one-way ANOVA for all stratified groups were run.

Results: The results demonstrated significant ($p<0.05$) gender differences for static balance at 11 y (male: 135.38 ± 6.07s vs female: 154.04 ± 5.52s). Meanwhile for dynamic balance gender significant differences ($p<0.05$) were found at: 12 y (male: 3.66 ± 1.68s vs female: 4.30 ± 2.25s), 13 y (male: 2.85 ± 1.46s vs female: 3.56 ± 1.75s), 14 y (male: 2.56 ± 1.34s vs female: 3.26 ± 1.74s), 15 y (male: 2.39 ± 1.05s vs female: 2.89 ± 1.07s), 16 y (male: 2.28 ± 0.99s vs female: 2.89 ± 1.30s), 17 y (male: 2.03 ± 0.94s vs female: 2.37 ± 0.82s), 18 y (male: 2.07 ± 1.02s vs female: 2.44 ± 1.43s).

Discussion: The results demonstrated significant differences in relation to static balance only at 11 years of age, where better balance was demonstrated in females compared to males. A different pattern of results emerged for dynamic balance, from 12 to 18 years of age, where statistically significant differences with regard to gender were identified for all age groups. All values for dynamic balance were greater in males compared to females. It is known that static balance is related to muscle strength, and dynamic balance to coordination. More research is needed to understand why so few differences exist between males and females from 4 to 18 years of age for static balance

References:

Baltes, P.B., Reese, H.W., Nesselroade, J.R. (1981). Métodos de investigación en psicologia evolutiva: Enfoque del ciclo vital. Madrid. Ediciones Morata.

Haywood, K.M., Getchell, N. (2005). Life span motor development (4a ed). Illinois. Human Kinetics.

Overlock, J.A. (2004). The relationship between balance and fundamental motor skills in childrens. Oregon. Kinesiology Publications. University of Oregon.

Weiss, M.R. (2004). Developmental sport and exercise psiychology: a lifespan perspective. Morgantown. Fitness Information Technology.

THE BALANCE-MEASUREMENT-DISC: A NEW APPROACH TO STUDY POSTURAL CONTROL?

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Introduction: We consider balance to be understood as dexterous postural control in specific situations to facilitate suprapostural tasks (cf., e.g. Stoffregen et al. 2007). It is functional integrated as part of a broader information-movement coupling (Bootsma, 1998). Our experimental setting is founded on a review of studies under different approaches of postural control investigations (moving-room, moving-platform, multi-tasking, multi-link).

Method: In general, our experimental settings in investigating balance performance are similar to those of Stoffregen et al. (e.g., 2007), except that we prefer the more challenging postural control conditions on the balance disc (e.g., Lippens et al., 2008). The utilised data fusion employs the same principle as used in integrated navigation systems, e.g. of airplanes: It comprises a Kalman filter estimating the three Euler angles of the disc and sensor calibration values (Wagner et al., 2003). The dependend variables (tbal., n./RMSxyz) are proofed in an ANOVA.

Analysis/Discussion: On the basis of confirming results in experiment series (2005-2008) we are able to state: Postural sway on the balance-measurement disc is reduced to facilitate perceptual tasks. The adaptive coordination mode depends on specific constraints of person, task and environment (Newell, 1986). The conclusion of our research approach so far (cf., Adler et al., under review) will be discussed under the topics of quasi-static vs. dynamic demands, performance of younger vs. older adults, suprapostural- vs. dual-task, general ability vs. skilled adaptation. Finally, in an outlook we consider the aspects of advanced methods of data analysis (Gottschall et al., 2009).

References

Adler, H., Lippens, V. & Nagel, V. (under review) J Mot Behav.

Bootsma, R.J. (1998) In A.A. Post (Ed.), Models in human movement sciences (pp. 51-63). Enschede: Print Partners Ipskamp.

Gottschall, J., Peinke, J., Lippens, V., & Nagel, V. (2009) Phys Let A, 373, 811–816.

Lippens, V.; Nagel, V.; Gottschall, J. & Peinke, J. (2008) In A. Hökelmann & K. Brummund, M. (Eds.), World Congress of Performance Analysis of Sport VIII (pp. 354-359). Magdeburg: O.-v.-G.-University.
Newell, K.M. (1986). In M.G. Wade & H.T.A. Whiting (Eds.), Motor Development in Children: Aspects of Coordination and Control (pp. 341-360). Dordrecht: Nijhoff.
Stoffregen, T.A., Hove, P., Bardy, B.G., Riley, M., & Bonnet, C.T. (2007) J Mot Behav, 39, 126 – 138.
Wagner, J., Lippens, V., Nagel, V., Morlock, M., & Vollmer, M. (2003) I J Comput Sci i Sp, Sp Ed 1, 96-105.

14:15 - 15:15

Poster presentations

PP-HF12 Health and Fitness 12

PHYSICAL ACTIVITY RELATED TO CLUSTERED RISK FOR CVD IN CHILDREN

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Background: It is biologically plausible that risk factors for CVD cluster in an individual. This study evaluate if accelerometer measured physical activity predicts clustering of risk factors for CVD in children aged 8 to 11 years.

Methods: Cross-sectional study of 156 (81 boys and 75 girls) children aged 8-11 years, recruited from an urban population-based cohort. Total body fat mass (TBF) and abdominal fat mass (AFM) were measured by Dual-energy x-ray absorptiometry. Body fatness was expressed as TBF percentage of total body mass (BF%). Body fat distribution was calculated as AFM/TBF. Maximal oxygen uptake (VO2PEAK) was assessed by indirect calorimetry during a maximal exercise test and indexed for body mass (ml/min/kg). Blood was sampled and analysed for lipoprotein (LDL, HDL and total cholesterol) and triglycerid (TG) concentrations. Resting heart rate (HR), systolic and diastolic blood pressures (SBP and DBP) were measured. Daily physical activity was assessed by accelerometers for four days and daily accumulation of moderate and vigorous physical activity (MVPA) were calculated (defined as above 3500 counts/min with the actigraph accelerometer). Maturity was evaluated according to Tanner. Z-scores (Value for the individual-mean value for group)/SD were calculated. Sum of z-scores for BF%, AFM, AFM/TBF, SBP, DBP, HR, LDL, HDL, LDL/HDL quotient, total cholesterol, TG, and -VO2PEAK were calculated in boys and girls, separately, and used as an indices of clustered risk.

Results: Boys performed significantly more minutes of MVPA per day compared to girls (46±21 vs. 35±13, P<0.001). Person correlation between MVPA versus indices of clustered risk was for boys (-0.15, NS) and for girls (-0.31, P<0.05). Boys and girls were divided according to tertiles of MVPA. One-way ANOVA analysis indicated significant differences in sum of z-scores between tertiles of MVPA, in girls (P=0.006), whereas no significance could be observed for in boys (P=0.40, NS).

Conclusion: In this population-based cohort of children aged 8 to 11 years accelerometer measured minutes of moderate and vigorous physical activity per day predicted clustering of risk factors for CVD in girls aged 8-11 years, no such pattern could be observed in boys, which could be attributed to a higher physical activity level.

GENDER DIFFERENCES IN PHYSICAL ACTIVITY PATTERNS OF CHILDREN AGED 7-9 YEARS

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Introduction: With a decreasing opportunity for children to exercise a contributing factor for childhood obesity [1]; and previous reports of gender differences in activity patterns of children [2], the current investigation examined differences in physical activity patterns of New Zealand girls and boys aged 7-9 years. Activity patterns were examined during a period where the same opportunities to be active were present, and during a period of habitual activity.

Methods: Physical activity data was collect over 5 consecutive school days using Actigraph GT1M accelerometers (60 s epochs). Data from 24 girls and 25 boys recruited from two primary schools was obtained. Total activity counts for the break periods while at school (80 minutes) represented a period of equal opportunity to perform physical activity. Total activity counts for the 120 minute period immediately following school represented a period of habitual physical activity. Total minutes of activity performed for these time periods were determined for the thresholds counts: sedentary (<100), light (101-2999), moderate (3000-5200) and vigorous (>5200) activity [3]. Differences (p<.01) for total activity, and minutes spent in each threshold were assessed between genders (independent) and time periods (paired) using t-tests. All results are reported as means±SD.

Results: Significant differences between genders for total activity counts during the break and after school periods were recorded, with greater counts occurring during school breaks (boys: 1357±341; girls: 1024±320) compared with the after school period (boys: 885±361; girls: 683±224). Threshold analysis revealed gender differences for moderate activity only for both the school (boys: 7.6±4.1; girls: 4.9±3.2), and after school (boys: 5.5±4.7; girls: 2.8±1.9) periods. Sedentary activity was significantly lower and, light and moderate activity significantly higher for both genders while at school with compared with habitual activity after school. On average 9 and 15 minutes (5 and 8%) of the 200 minutes available was spent engaged in MVPA for females and males respectively.

Conclusions: The current results indicated that opportunity to perform activity while at school increased the total activity performed by children compared with habitual activity, with boys performing significantly more moderate activity than girls in both situations. Despite this however, less than 10% of the time available to be active was spent performing MVPA. Therefore, only a fraction of the 60 minutes of MVPA recommended for obesity prevention and a healthy lifestyle was performed in the time available.

References

[1] Sport and Recreation New Zealand. SPARC announces physical activity guidelines for children and young people [online]. Available from URL: http://www.sparc.org.nz/
[2] Mota J, Silva P, Santos MP, et al. J Sports Sci 2005;23:269-75.
[3] Treuth M. Schmitz K, Cattellier, et al. Med Sci Sports Exerc 2004;36:1259-66.

THE RELATIONSHIP BETWEEN AGE, GENDER, BODY COMPOSITION AND CARDIO RESPIRATORY FITNESS IN STUDENTS AGED 8 – 11 YEARS BY USE OF FFMI – FMI REGRESSION MODEL

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Introduction: Age, gender, body composition and genetic affect on cardio respiratory fitness. Variability of physiological responses to exercise in children cause to different interpretation of the effective parameters (Welsman & Armstrong 1996).The aim of the present study was to investigate the association between cardio respiratory fitness and age, gender, body composition as solid, average or slender in students aged 8–11 years.

Methods: This cross sectional study was performed on 685 students (347 boys and 338 girls). Subjects were selected via a multi – level cluster sampling. After adjustment for differences in age, gender and body mass by FFMI – FMI regression model that Fat free mass index(FFMI)(dividing fat free mass to squared stature) predicted by fat mass index(FMI)(dividing fat mass to squared stature) stratified 3 group; Normal , Solid (higher amount of FFM than normal group) and Slender (lower amount of FFM than normal group)(Van Etten et al 1994). 20 m Shuttle run test used for estimation of maximal oxygen uptake (VO2peak) as an indices of cardio respiratory fitness that was expressed in absolute values.

Results: Our study showed solid group had upper values [(Boys: 8yrs =1/42; 9yrs =1/65; 10yrs =1/57; 11yrs =1/80 l/min)(Girls: 8yrs =1/27; 9yrs =1/54; 10yrs =1/44; 11yrs =1/51 l/min)] and slender group had lower values [Boys: 8yrs=0/98; 9yrs =1/05; 10yrs =1/26; 11yrs =1/23 l/min)(Girls: 8yrs =1/02; 9yrs =1/15; 10yrs=1/15; 11yrs =1/16 l/min)] in VO2peak even after controlling for age, gender and body mass($P<0.05$). There are positive significant association between age and VO2peak ($P< 0.05$) and boys were better than girls in cardio respiratory fitness (Boys=1/50 l/min; Girls=1/24 l/min)($P< 0.05$).

Discussion: The total FFM can be considered as the main functional mass which plays a keys role during physical activity (Goran et al 2000); Therefore increase in FFM/FM ratio cause to increase in VO2peak. Increasing VO2peak during growth in children can be explained by increasing muscle mass/body mass ratio and differing developmental stage of aspects of the oxygen transport system (Rowland 2005). Existing gender differences in VO2peak where boys had higher VO2peak than girls can be explained by differences in body composition, physical activity and heart size (Wilmor et al 2008; Fareed et al 2001).

References

Fareed A, Rae-Ellen W, Karey D, Winston kE, Frank S. (2001), J Pediatrics,139(2),284-290.

Goran M, Fields DA, Hunter GR, Herd SL and Weinsier RL. (2000), 24, 841-848.

Rowland TW.(2005) Children's Exercise Physiology, 2nd ed. Champaign: IL, Human Kinetics Inc.

Van Etten L M., Verstappen F T and Westerterp K R. (1994), 57(4), 430-434.

Welsman J R, Armstrong N. (1996). J R Soc Med, 89(5), 281-285.

Wilmor J, Costill D, Larry Kenney W.(2008), Physiology of sport and exercise, Human Kinetics Inc.

ANTHROPOMETRIC PREDICTORS OF AEROBIC ENDURANCE IN 9-10 YEAR OLD SCHOOLCHILDREN

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Introduction: Levels of physical fitness in children have declined in recent years (Tomkinson et al., 2003). These declines may be mediated by the increased prevalence of obesity observed in children (Ortega et al., 2008). Conversely, in Liverpool, levels of aerobic endurance have declined in 9-10 year old children irrespective of BMI (Stratton et al., 2007). The aim of this study was to investigate the relationship between measures of body composition and a marker of aerobic endurance in 9-10 year old schoolchildren to further assess the relationship between measures of adiposity and fitness in children.

Methods: Body mass, stature, subscapular and triceps skinfold thicknesses, waist and hip circumferences, and performance on the 20 metre multi-stage shuttle runs test (20mMST) were collected using the SportsLinx (Taylor et al., 2004) field-based fitness testing sessions. 20mMST performance was used as a measure of aerobic endurance. Stature and body mass were used to calculate BMI. Data were available for 2675 (n = 1336 boys and 1339 girls) 9-10 year old participants. Multiple regression analyses were completed to assess the relationship between anthropometric variables and 20mMST separated by sex.

Results: For boys all anthropometric variables were negatively correlated with 20mMST performance (p≤ 0.01). Triceps (p≤ 0.01, B=-0.49 [S.E.= 0.11], β -0.08) and subscapular skinfolds (p≤ 0.01, B=-0.62 [S.E.= 0.13], β -0.22) were significant predictors of 20mMST performance and the model explained 24.6% of variance. For girls, all anthropometric variables were negatively correlated with 20mMST performance (p≤ 0.01). Triceps skinfolds (p≤ 0.01, B=-0.35 [S.E.= 0.08], β -0.17), subscapular skinfolds (p ≤ 0.01, B=-0.32 [S.E.= 0.08], β -0.17), and hip circumference (p≤ 0.05, B=-0.16 [S.E.= 0.08], β -0.1) were significant predictors of 20mMST performance in girls, the model explained 21.1% of variance. Waist circumference and BMI were not significant predictors of 20mMST performance in boys and girls.

Discussion: Declines in levels of cardiorespiratory fitness in children are often associated with increased adiposity. The findings of this study suggest that skinfolds are more important predictors of aerobic endurance, a marker of cardiorespiratory fitness, in 9-10 year old schoolchildren than BMI or waist circumference. Furthermore, the regression models explained a small proportion of variance, suggesting including variables other than anthropometrics may help improve the prediction of aerobic endurance in boys and girls.

References

Ortega, F. B., Ruiz, J. R., Castillo, M. J., and Sjostrom, M. (2008). Int J Obes, 32(1), 1-11.

Stratton, G., Canoy, D., Boddy, L. M., Taylor, S. R., Hackett, A. F., and Buchan, I. E. (2007). Int J Obes, 31(7), 1172-8.

Taylor, S., Hackett, A., Stratton, G., and Lamb, L. (2004). Education and Health, 22(1), 3-7.

Tomkinson, G., Leger, L., Olds, T., and Cazorla, G. (2003). Sports Med, 33, 285-300.

STUDY ON LIFESTYLES OF A STUDENTS GROUP: "ACTIVE LIFE PLAN" UNDER EVALUATION.

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UNIVERSITY OF CASSINO

Introduction: The presentation is part of the study " Physical Activity and Active Lifestyle. A study on the relation between the practice of physical activity during the past (age 6 to 17) and current lifestyle; stimulus and crossing from "a completely inactive to an active lifestyle" .

The aim of the study is to investigates the current lifestyle and the practice of physical activity during the past (age 6 to 17) of a group of students of the University of Cassino and it is divided into two phases.

The aim of the presentation is to report some findings which emerge from a questionnaire submitted a group of 511 students and then to describe the process used in the second phase of the study.

Methods: The first phase involved students from some Faculties of the University; the questionnaire contains different sections, each of which treats a specific aspect (a lot of PA practice in the past and currently, the kind of PA and the perception relative to lifestyle and active lifestyle).

The second phase of the research consists of different steps and the aim is to build a Process called "Active life Plan" which may lead to an understanding of the perception of the current lifestyle and the individual approach to changes in lifestyle. This phase involved only a part of the students corresponding to the MET LOW profile emerging from IPAQ .

Each step was measured thanks to the completion of specific report cards relative to the aspects of the research

Results: Some of the findings which emerge from the questionnaire tend to show a correspondence between the continuity of activity (in school and outside school) in the past and the current perception of the level of health. The figures are significantly different for the higher levels of health (good and very good).

Relative to the second phase of the study, at the moment the data are being elaborated, but it is possible to highlight the perception relative to the strong motivation that every participant needed to have in order to follow the "Active life Plan".

Discussion: The data emerging from the firth phase of the research gives rise to study in depth about the theme of the study, useful for the realization of the Process.

The Process consists of different steps: in the first one, the student group was submitted to an evaluation of daily routine; in the second step, each aspect of daily routine was analyzed with the aim to develop a specific "Active Life Plan" for each person. The Plan consists of indications/advice on diet, everyday activity in relation to movement, and the achievement of small objectives like the numbers of the steps taken per day. In the third phase, the sample group had to carry out an evaluation of two weeks with the daily routine.

A COMPARISON OF ENDURANCE TESTS FROM 1982 TO 2007 FOR A COHORT OF NORWEGIAN ADOLESCENTS

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UNIVERSITY OF STAVANGER

Purpose: To compare results from a running test between 1982 and 2007 for high school students.Methods: Between 1982 and 2007 a total number of 1133 running tests were collected from one senior high school in Stavanger, Norway. The participants were 568 girls and 565 boys between 16 and 18 years, with the mean age of 17,0 years. The gravelled running trail was flat and 3050 m long. All tests were performed at the same time of year and collected by the same teacher. The test results were divided in three groups; tests from 1982-1989, 1990-1999 and 2000-2007. A one- way ANOVA test was used to reveal any difference between the groups. Results: The average running time for the girls was 16,32 (0,17 SE, n= 210); 16,39 (0,14 SE, n= 261); 17,21 (0,25 SE, n= 97) min in the 1980's, 1990's and 2000's respectively. The increase in running time from the 80's to the 00's was 5,5% ($p<0,01$). The average running time for the boys was 12,83 (0,11 SE, n= 244); 13,08 (0,14 SE, n= 184); 14,22 (0,22 SE, n= 137) min for the 1980's, 1990's and 2000's respectively. The increase in running time from the 80's to the 00's was 10,8% ($p<0,01$). In contrast to the girls, the boys had a greater difference in running time comparing the early 80's to the latest test years. Between 1982/83 and 2006/07 the increase in running time for boys was 13,3% ($p<0,01$, n=190). While 24% of the students in the 1980's did not carry out the test, the same number in 2000's was increased to 31%. The dropout number for girls and boys in the 2000's was 39 and 26%, respectively. Conclusion: The running time for the endurance tests for the boys in this cohort has increased around 11% for the last 25 years, which was twice the increase for the girls. The finding that the boys had a much greater increase in running time could be explained that the dropout number for girls were much higher compared to the boys. It might be the girls with the poorest endurance that missed the running test.

THE INFLUENCE OF MATURITY STATUS ON PRIMARY SCHOOL CHILDREN'S PHYSICAL ACTIVITY

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Gender differences in youth physical activity are commonly reported with boys accepted as being more active than girls (Riddoch et al., 2007). Usually these gender comparisons are made between boys and girls of the same chronological age or school grade. Recent studies have observed how gender differences in physical activity diminish between children and adolescents of the same biological age (Sherar et al., 2007). It is suggested that children's physical activity levels start to decline during the primary school years (Saris, 1986), but most studies of the effects of maturity status have focused on adolescents. The study purpose was to assess the influence of maturity status on primary school boys' and girls' self-reported and objectively measured physical activity.

One hundred and seventy five children (78 boys) aged 10.6 ± 3.1 y completed the PAQ-C and wore an ActiGraph GT1M accelerometer for 5 consecutive days (including two weekend days). Anthropometric measures were completed in order to estimate body composition and maturity status. Following initial exploration of gender differences in PAQ-C (t-test) and ActiGraph data (MANOVA), the analyses were corrected for maturity status using ANCOVA and MANCOVA.

Uncorrected analyses revealed that boys were significantly more active than girls according to the PAQ-C ($p < .0001$, $d = 0.67$) and ActiGraph (MPA: $p < .0001$, $d = 0.64$; VPA: $p < .0001$, $d = 0.91$; VVPA: $p = .002$, $d = 0.48$; MVPA: $p < .0001$, $d = 0.78$; cnt/min: $p = .006$, $d = 0.42$). After controlling for maturity status the differences in PAQ-C scores remained substantial ($p < .0001$, $d = 0.69$), but significant differences disappeared for ActiGraph data at all intensities ($p = .084$).

When the effects of maturity status were controlled there were no longer significant gender differences in objectively measured physical activity, but maturity status did not affect the PAQ-C data. Controlling for maturity status had the effect of reducing MPA, VPA, VVPA, and MVPA values in boys and increasing them in girls. Maturity status appears to influence objectively measured physical activity levels

among pre and peri-pubescent children and should be accounted for in the design of physical activity promoting strategies and initiatives.

Riddoch, C. J., Mattocks, C., Deere, K., Saunders, J., Kirkby, J., Tilling, K., et al. (2007). Archives of Disease in Childhood, 92, 963-969.

Saris, W. (1986). Medicine and Science in Sports and Exercise, 18, 253-263.

Sherar, L. B., Esliger, D. W., Baxter-Jones, A. D. G., & Trembaly, M. S. (2007). Medicine and Science in Sports and Exercise, 39, 830-835.

COMPARISON BETWEEN SEOUL AND CHONAN CAMPUS'S RECOMMENDED LOCOMOTION ENERGY EXPENDITURE GUIDELINE OF SANGMYUNG UNIVERSITY

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1. SANGMYUNG UNIV, 2. SOGANG UNIV, 3. INJE UNIV, 4. KAIST

Purpose : The purpose of this study were to recommend locomotion energy expenditure guideline during walking and running at Seoul and Chonan campuses of SangMyung university.

Methods : The subjects(20 college students) were walked and run 2 rounds depend on their normal pace on Seoul and Chonan campuses. The length of Seoul campuses(585m), the one of Chonan campuses(1,235m) per rotation. The course of locomotion were decided for the circulation of campus. The subjects had been measured energy expenditure by accelerometer, heart rate by monitor(Polar), etc.

Results : The men's relative energy expenditure of Seoul campus were 0.070 kcal/kg/min on walking, and 0.180 kcal/kg/min on running. The ones of Chonan campus were 0.081 kcal/kg/min on walking, and 0.217 kcal/kg/min on running. The women's relative energy expenditure of Seoul campus were 0.071 kcal/kg/min on walking, and 0.182 kcal/kg/min on running. The ones of Chonan campus were 0.090 kcal/kg/min on walking, and 0.190 kcal/kg/min on running. In that case of normal Korean male college students(71kg) for 300 kcal, the walking, period was 60.4 minutes, and the rounds were 6.3 on Seoul campus. On normal Korean female college students(54kg) for 300 kcal, the running period was 29.2 minutes, and the rounds were 3.2 on Chonan campus. This recommendation should be adjusted depend on their weight.

Conclusion : The recommended locomotion energy expenditure guideline of University campus will be used for the composition of exercise and conditioning program.

LIFE-STYLE HABITS IN MALE AND FEMALE „WORLD GYMNAESTRADA" PARTICIPANTS

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1. UNIVERSITY COLLEGE PHYSIOTHERAPY

Aim: This study is a part of the "Gymnaestrada Health Project" (GHP), conducted at the „13th World Gymnaestrada" (Austria, 2007). The aim was to assess life-style habits (fruit and vegetables consumption (F&V), smoking (S) and physical inactivity (PI)) in „World Gymnaestrada" participants.

Methods: Out of 25000 gymnasts 325 males (M) and 948 females (F) volunteers were recruited during the one week event. F&V, S and PI were assessed using questionnaires. Daily F&V portions were summed. Participants were stratified in S and non-S groups. Time spent sitting per day was used as a proxy of PI. Parametric and non-parametric statistics were used for analysis. Significance was set at the 5% level.

Results: Although it was aimed to include subjects from all the participating countries, the majority of the volunteers came from German and English speaking countries. M (42.4±17.5 yrs) were younger than F (45.6±18.0 yrs) (p=0.005). Median daily F&V intake was 2.7 and 3.8 portions in M and F respectively (p<0.001). More than 5F&V portions a day were consumed by 20.0% of the M and 29.5% of the F. Low (0.07<Rho<0.11) significant correlations between age and F&V intake were observed in both genders.

A median time spent sitting of 4 hrs.day-1 was found in M and F (p>0.05).

Smoking frequencies in M and F were 17.0% and 12.4% respectively (p<0.001). Within and between gender groups, smokers had lower F&V intake than non-smokers (Medians: M(S)=2.0, M(non-S)=3.0, F(S)=3.0; F(non-S)=3.9) (all p≤0.004).

Discussion: To ensure healthy nutritional habits, a minimum intake of 5F&V portions per day has been proposed (1). About 20% of the M and 30% of the F participants met these recommendations. Compared to the 20% observed in a Swiss sample (M&F) (2), our findings indicated that more effort is needed to promote healthy nutritional habits even in a physical active population. Higher F&V in F than in M was also observed in the general population by other researchers (1). The positive relationship between age and F&V suggested that promotion of healthy nutritional habits should start already during childhood and adolescence.

Compared to the reference data of 2006 in Germany (M=43%, F=30%), smoking frequencies were considerably lower among GHP-participants (3). As in the general population we equally found a combination of unhealthy habits such as smoking and low F&V intake.

GHP-participants were importantly less inactive than the 74 M and 169 F adults of an Australian study (time spent sitting= 9.8±2.4 respectively 7.5±3.4 hrs.day-1) (4).

Conclusions: Compared to reference data GHP-participants (M & F) showed health enhancing life-style characteristics such as low time spent sitting, low smoking frequencies and somewhat higher F&V intake. However, further efforts are needed to promote F&V consumption to reach the "5-a-day" recommendations even in physical active individuals.

References:

1. Ashfield-Watt et al., 2004

2. Studer et al., 2005

3. Hillier D., 2006

4. Brown et al., 2003

14:15 - 15:15

Poster presentations

PP-HF13 Health and Fitness 13

EVALUATION OF THE TRAINING CONCEPT "INHARMONY" ON RISK FACTORS FOR FALLS IN ELDERLY PEOPLE. A RANDOMIZED CONTROLLED TRIAL.

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Introduction: Falls among elderly people are a serious and common problem. Several studies have shown that physical activity is one of the most important strategies to prevent falls, but the optimal type and dosage of activity still remains unclear (Gillespie et al. 2008). Therefore, the aim of this study was to determine whether the group-training concept "inHarmony" could reduce fall risk in elderly men and women over 65 years old.

Methods: The intervention, "inHarmony" with MBT-shoes, is a group-training concept with focus on dynamic balance, stability and strength. Sixty participants were recruited from the district Nordre Aker in Oslo, Norway, and randomized into the intervention group (n=30) or the control group (n=30) (walking). Both groups exercised 60 minutes twice a week for 16 weeks. Thirty-four participants completed the interventions; 20 in the intervention group and 14 in the control group. The main outcome variable was the short-form of PPA (Physiological Profile Assessment) (Lord et al. 2003), which provides a fall risk index score. Secondary outcome variables were dynamic balance and self-reported occurrence of falls.

Results: The intervention group and the control group experienced a 16,5 % (p=0,470) and 20,2 % (p=0,390) increased fall risk, respectively, after the intervention period. There were no significant differences in fall risk between the two groups after the intervention period (p=0,849). However, the control group obtained significant improvements in dynamic balance (p=0,006), while the intervention group had a tendency to improvements (p=0,052). There were no significant differences between the groups in dynamic balance (p=0,104). None of the groups experienced significant changes in fall occurrence, and there were no changes between the groups (p=0, 216).

Discussion: We found that "inHarmony" seem to have little influence on fall risk, dynamic balance or fall occurrence in elderly people. However, our participants may initially have been too active for the outcome variables. We also experienced a considerable drop-out, especially in the control group, which resulted in non-parametric analyzes. Furthermore, it would have been interesting to also include an inactive control group. Further studies investigating different types and dosage of activity are necessary.

References

Gillespie, LD., Gillespie, WJ., Robertson, MC., Lamb, SE., Cumming, RG., Rowe, BH. (2008). Interventions for preventing falls in elderly people (review). The Cochrane Library, Issue 1.

Lord, SR., Menz, HB., Tiedemann, A. (2003). A Physiological Profile Approach to Falls Risk

Assessment and Prevention. Physical Theraphy, 83:237-252.

MOTIVATIONS AND BARRIERS FOR PRACTICING PHYSICAL ACTIVITY AND SPORT IN LESURE TIME, FOR THE POPULATION OF THE METROPOLITAN AREA OF MADRID

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Introduction: For the design of strategies for overcoming barriers preventing physical activity, authors have declared the need to know the motivations for physical activity in the population (Booth et al, 1997; Sheppard et al, 2003). In the present work (Rodríguez-Romo et al, 2009) we analyze the motives and the barriers perceived by the population of the metropolitan area of Madrid for the practice of physical activity and/or sport in their free time. Also possible relationships are studied between the said motives and barriers and some of the sociodemographic variables that seem to have a greater incident on the physical activity practice levels and/or sport of the population of Madrid: gender, age and social status (Rodríguez-Romo et al, 2005).

Methods: For data collection a descriptive study with cross sectional design was used, utilizing a questionnaire administered through personal interview. The population studied consisted of residents of the metropolitan area of Madrid aged from 15 to 69 years. 625 people was selected, with a margin of error of the + 4% and a confidence interval of 95.5% for the whole population. The sampling was multistage and an ad hoc questionnaire was used. From the data a descriptive analysis and a non-parametric Chi-Square test were performed.

Results: Enjoyment (29.9%), maintenance of shape and condition (26.4%) and health (16.1%), were the motives for practice mentioned most frequently, showing differences according to participants gender [X2 (8) = 19.635; p = 0.009; IC95%: 0.007-0.011] and age [X2 (32) = 55.671; p = 0.006; IC95%: 0.005-0.008]. With respect to the abandonment of the practice, the family and labour demands (24.1%) and the lack of time (22.2%), were the most common causes. These causes were associated with age [X2 (24) = 36.955; p = 0.041; IC95%: 0.037-0.044] and, marginally, with gender [X2 (6) = 11.753; p = 0.069; IC95%: 0.063-0.074]. Finally, the most frequent motives for never having practiced were a lack of time (24.4%) and a lack of enjoyment (24.4%), these motives did not change with gender, age and social position.

Discussion: In our sample the practice of physical activity and sports was mainly recreational and however the maintenance and improvement of health and the acquisition of a good physical shape and condition was also important. The motives that control the practice of physical activity and to its abandonment are related to age and gender. On the other hand, the reasons for never having practiced are independent of the variables analyzed.

References

Booth ML, Bauman A, Owen N, Gore CJ (1997). Prev Med, 26(1), 131-7.

Rodríguez-Romo G, Boned C, Garrido-Muñoz M (2009). Pan Am J Public Health, in press.

Rodríguez-Romo G, Mayorga JI, Merino A, Garrido M, Fernández M (2005). Hábitos deportivos de la población de la Comunidad de Madrid. Consejería de Cultura y Deportes, Madrid.

Sheppard L, Senior J, Park CH, Mockenhaupt R, Chodzko-Zajko W (2003). J Aging Phys Act, 11(3), 286-92.

IMPROVED HEART RATE VARIABILITY AND ENDURANCE PERFORMANCE IN SEDENTARY SUBJECTS

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Introduction: Recent studies suggest that the changes in heart rate variability (HRV) during night sleep could be used to evaluate the training load of the preceding day or cumulated training load of the preceding training period (Pichot et al. 2000; Hynynen et al. 2007). Furthermore, HRV changes may also be related to the changes in physical fitness (Hautala et al. 2004). The purpose of the present study was to investigate the individual performance and HRV responses to aerobic endurance training program in previously untrained subject.

Methods: Sedentary women (n = 12) and men (n = 12) trained four weeks three times per week at the average running intensity of 76 ± 4 % of their heart rate reserve. The R to R ECG-intervals were recorded and HRV indices including high frequency power (HFP) were calculated for the nights following the training days every week. Endurance performance characteristics were measured in incremental treadmill test performed before and after the 4-week training period. The subjects were divided into responders and non-responders according to the changes in the endurance performance (vVO2max). The responders were those subjects who improved vVO2max more than 0.5 km/h (n = 12) and the others were included in the non-responders (n = 12).

Results: The responders improved their vVO2max by 10.9 ± 4.6 % ($P < 0.001$) and no changes were observed in the non-responders (1.6 ± 3.0 %). In the responders nocturnal HFP was significantly higher during the fourth training week compared to the first training week ($P = 0.036$) but no changes were observed in the non-responders. Furthermore, a significant correlation was observed between the change in vVO2max and the change in nocturnal HFP ($r = 0.482$, $P = 0.042$).

Discussion: The 4-week endurance training program was enough to induce 11 % increase in endurance performance in the responders. Despite the same volume and intensity of training in all the subjects the individual training response in the vVO2max varied from -4 % to 21 %. The main result of the present study was that a relationship occurred between the changes in vVO2max and the changes in HFP during the 4-week endurance training period. It was concluded that similar training resulted in different performance responses, which were related to the changes in cardiac autonomic modulation during sleep. Monitoring nocturnal HRV seems to provide useful method in evaluating responses to endurance training and in building up a training program in sedentary subjects.

References

Hautala AJ, Mäkikallio TH, Kiviniemi A, Laukkanen RT, Nissilä S, Huikuri HV, Tulppo MP. (2004) Eur J Appl Physiol 92, 289-297.

Hynynen E, Nummela A, Rusko H, Hämäläinen I, Jylhä R. (2007) In: Linnamo V, Komi PV, Müller E. (eds.) Science and Nordic Skiing. Meyer & Meyer Sport (UK) Ltd., 90-98.

Pichot V, Roche F, Gaspoz J-M, Enjolras F, Antoniadis A, Minini P, Costes F, Busso T, Lacour J-R, and Barthélémy JC. (2000) Med Sci Sports Exerc 32, 1729-1736.

THE EFFECTIVENESS OF EXERCISE ON BODY COMPOSITION AND LUNG FUNCTION IN SEDANTARY WOMEN: CALLISTHENIC OR PILATES?

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Introduction: The aim of this study was to investigate that which type of exercise would be more effective either callisthenic or pilates to relationship between body composition parameters and lung functions including VC, FVC, FEV1, FEV1/VC, and FEV1/FVC in healthy sedentary women.

Methods

104 female participants were voluntarily participated for this study. 34 participants (mean age (X±SD): 41,7±7,8 years) were done callisthenic exercises 3 days/wk for six months, 26 participants (mean age (X±SD): 42,5±9,4 years) were done pilates exercise 3 days/wk for six months and 44 participants (mean age (X±SD): 40,9±7 years) did not take any exercises as control group. All subjects were evaluated pre-training, 3months, and post-training. Anthropometric and body composition (including fat mass (FM), fat free mass (FFM), and percentage body fat (%BF)) evaluated by using the skinfold methods and lung function was examined by using spirometry. 3rd and 6th months exercise periods differences were determined using One-Way ANOVA for repeated measures. Pearson correlation coefficient analyses were performed to analyze the relationship between dependent variables.

Results: There were significantly found a decrease in body weight, fat mass and body mass index values ($p<0.05$) after exercise period only callisthenic exercise group. Also there was significant increase of fat mass values of control group ($p<0.01$) Lung volume and capacity values (VC, FVC, FEV1, FEV1/VC, FEV1/FVC) of both exercise groups were increased significantly ($p<0.01$). There were negatively significant relationship between the body fat percentage and FVC and VC values of women ($p<0.05$, $r = -0.51$, $r= -0.42$) for pilates group; respectively. Also it was found that a negative correlation between BMI and FVC for pilates group ($r = -0.41$, $p<0.05$). There was only one negative correlation found between MVV and fat free mass for callisthenic group ($r = -0.40$ $p<0.05$).

Discussion: In conclusion, there were positive effects as evident on women lung volume and capacity both callisthenic and pilates exercises. This study showed that the decrease level of fat percentage, BMI and fat free mass after exercise would be affected the lung functions increment.

ARE GREEN ELEMENTS PRINCIPAL PULL FACTORS FOR PHYSICALLY ACTIVE COMMUTING?

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THE RESEARCH UNIT FOR MOVEMENT, HEALTH AND ENVIRONMENT

Purpose

The aim of this study is to further the understanding of how environmental factors relate to existing behaviours of walking between home and work/study place in urban settings. For this purpose physically active commuters rated their perceived experience of 10 environmental variables along their individual commuting routes. They also expressed whether the overall route environment stimulated or inhibited their commuting.

Methods: The commuters volunteered to participate in the study after being contacted through advertisements in two morning newspapers in Stockholm. A questionnaire was sent to 1950 persons. The response frequency was 93 %. 335 of the respondents walked in the inner urban area of Stockholm and constitute the basis for this study. The variables studied were exhaust fumes, noise, flow and velocities of motorized vehicles, respectively, congestion of pedestrians, incidence of conflicts between the individual and other road-users (including pedestrians), the extent of green elements, aesthetics, number of red lights, and the perceived distance. Semantic differential 15-point scales for responding were used. Whether the ratings of the environmental variables could explain to what extent the overall route environment stimulated or inhibited their commuting was tested with multiple stepwise regression analysis.
Results: The following variables were statistically significant in explaining variations in the ratings of whether the overall route environment stimulated or inhibited the respondents commuting: 1) aesthetics, 2) noise 3) green elements (nature, parks, trees, plantings). The multiple regression analysis built a regression equation of the form: Y = 5.78 + 0.52 x aesthetics – 0.18 x noise + 0.12 x green elements. The perceived levels of green elements correlated significantly with aesthetics (r=0.496).
Discussion/Conclusion: The present findings point to the importance of different environmental variables in stimulating/inhibiting bicycling commuting in urban areas. The fact that there was a strong correlation between green elements and aesthetics indicate that, to a great extent, green element may constitute the dimension of perceived aesthetics. In such case, green elements can be seen as a major pull factor for being physical active in this context.

LIFESTYLE AND HEALTH BEHAVIOURS OF UNIVERSITY STUDENTS

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Introduction: The onset of unhealthy behaviour is usually rooted during adolescence and young adulthood. The causes of premature morbidity and mortality are frequently attributed to risk behaviours such as inactivity, smoking, excessive drinking and unhealthy diet (Mokdad et al., 2004; World Health Organisation, 2002). It has been reported globally that university students engage in such behaviour (Steptoe et al., 2002). This study was designed to explore the prevalence and association of multiple risk behaviours among university students.
Methods: A total of 410 university students (mean age 22.8+5.8 years) from central England participated in a voluntary and anonymous survey in 2008. The study assessed students' actual health behaviours and perceptions regarding physical activity (PA), body satisfaction, smoking, illicit drug use, binge drinking, eating habits as well as socio-demographic variables.
Results: The prevalence of risk behaviours was high; over 81.7% did not exercise sufficiently, 66.3% ate less than five servings of fruits and vegetables, 56.9% reported binge drinking, 35% were regular or occasional smokers and 22% reported illicit drug taking. Based on Body Mass Index, a third of all students were classified as overweight or obese with half of the females and a third of the males reporting body dissatisfaction. Strong associations were evident between risk behaviours of inactivity, binge drinking, smoking and fatty diet. Generally, females showed slightly more positive patterns of behaviour than males and there were significant gender differences on binge drinking (Chi-Square=20.5; P<0.001), body dissatisfaction (Chi-Square=20.5; P=0.000) and PA (t=5.886, p=0.000). Males were more active than females and the most common form of PA was walking (75%). Although the average frequency of moderate and high level of PA reported over 7 days was just over twice a week, 65% of students considered themselves sufficiently active. This is below the recommended level of PA associated with health benefits (Haskell et al., 2007). While socialising appeared to be the main reason for risky behaviours like binge drinking, smoking and illicit drugs, time was the main barrier to exercise.
Discussion: Students tend to participate in multiple risk behaviours that appear to be associated strongly with socialising. Although unhealthy lifestyle is highly prevalent, it is disturbing to note that those students perceived their lifestyle and behaviours to be healthy. Addressing the health behaviours amongst student population requires programmes that promote behaviour modification, enhance healthy environmental conditions and target multiple risk behaviours.
References
Haskell, W.L., et al. (2007). Med. Sci. Sports Exerc. 39(8), 1423–1434.
Mokdad, A.H., Marks, J.S., Stroup, D.F., Gerberding, J.L. (2004). JAMA 291, 1238–1245.
Steptoe, A., et al. (2002). Prev. Med., 35, 97–104.
WHO (2002). World Health Organisation, Geneva.

RELATIONSHIP BETWEEN DAILY ENERGY EXPENDITURE AND BODY FATNESS, PHYSICAL FITNESS IN CHILDREN AGED 10-11 YEARS.

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Introduction: The prevalence of childhood obesity is on the rise in many developed countries, and it has reached epidemic proportions. In Japan, an epidemiological annual survey revealed that prevalence of obesity in school children aged 6-11 y is approximately doubled over the last two decades. Moreover, physical fitness tests, which was authorized by the Ministry of Education, Culture, Sports, Science and Technology in Japan, disclosed that the overall physical fitness score of children have declined past two decades. Although environmental and cultural changes may be associated with physical inactivity in daily life, the causes of the current childhood obesity and low physical fitness epidemic are not clear. The purpose of this study was to examine the relationship between energy expenditure estimated by doubly labeled water (DLW) method and body fatness, physical fitness in children.
Methods: This research was performed on 30 healthy Japanese children (20 boys and 10 girls) in a public elementary school. The total energy expenditure (TEE) and % body fat were measured by the DLW method over a 6-day period. The physical activity-related energy expenditure (PAEE) was calculated as (TEE × 0.90) – predicted basal metabolic rate (pBMR) using the equation of the Recommended Dietary Allowances for Japanese (Health Promotion and Nutrition Division-Health Service Bureau Ministry of Health and Welfare 1995). The physical activity level (PAL) was also calculated as TEE/pBMR. The physical fitness tests consisted of grip strength, sit up, sit-and-reach, side steps, 20-m shuttle run, 50-m running, standing broad jump, and throwing a softball. Scores of each test were standardized, and total score was calculated as overall physical fitness score.
Results: The TEE was 8.41 ± 1.12 MJ/day (mean ± SD), the PAEE was 2.34 ± 0.85 MJ/day and the PAL was 1.61 ± 0.18. There were no significant relations between TEE, PAEE, PAL and % body fat. In contrast, TEE per weight (TEE/wt) and PAEE per weight (PAEE/wt) was significantly negatively correlated with % body fat ($r = -0.626$, $p < 0.01$; $r = -0.417$, $p < 0.05$, respectively). Most physical fitness tests scores

except for sit-and-reach test were positively correlated with TEE, TEE/wt, PAEE, PAEE/wt, and PAL. The PAEE/wt was most strongly correlated with overall physical fitness score ($r = 0.680$, $p < 0.01$).

Discussion: In this study, the significant negative correlation between body fatness and energy expenditure adjusted individual body size suggests that increasing energy expenditure is important for preventing obesity. Participants who were physically active showed high physical fitness scores. This result indicates that physical fitness tests may predict physical activity in children. It was suggested that physically active lifestyle would be necessary for childhood health.

References

Health Promotion and Nutrition Division-Health Service Bureau Ministry of Health and Welfare. (1995). Recommended Dietary Allowances for Japanese.

TARGETED CAMPAIGN FOR MIDDLE-AGED MEN: THE ESSENTIAL ROLE OF RECRUITMENT

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Introduction: The Fit for Life Program (KKI) inspires adults over 40 years of age to include physical activity in their daily routine. KKI planned and organized the Adventures of Joe Finn campaign to encourage sedentary Finnish middle-aged men to a healthy life-style. The campaign included a handbook of keeping fit, a website, physical training courses, combined courses on cooking and experimentation of different sports and, finally, the national Lorry Tour. The main partner of KKI was Etera Mutual Pension Insurance Company, which traditionally insures employees in branches dominated by men such as building trade. Among these men the risk of premature retirement due to disability is relatively high. It a great matter in which way then working class men could be recruited to health-enhancing programs.

Methods: Each Lorry Tour event took place at the market square being easily accessible. At KKI field lab the men (altogether 6100) had the test for the heart rate variation at rest, the hand compression force and body composition. There were 14 national cooperation partners offering additional health related information, material, advice and tests. Socio-economic status of men was verified by questionnaires.

Results: A magnificent amount of men (51 %) who participated in the Lorry Tours of the Joe Finn Campaign were working class employees of construction industry. These men received an invitation for the event from their employers, and they were allowed to attempt the event during their working hours. The men were slightly overweight having visceral fat too much and were strong enough.

Discussion: With regard to elements of targeted campaigns the following messages are important: 1) a low threshold to start exercise, 2) several advantages offered by sports and even minor physical activity is worthwhile and 3) the fun and adventure-aspect is emphasized rather than health aspects. The campaign managed to get targeted group into the events. The use of pension insurance company as a recruit tool was successful. Altogether, The Joe Finn campaign got ahold of planned population.

14:15 - 15:15

Poster presentations

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PHYSICAL ACTIVITY AND SPORT PARTICIPATION. A GENDER STUDY ABOUT OPPORTUNITIES AND THE INFLUENCE OF THE NEIGHBOURHOOD ENVIRONMENT

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Introduction: Environmental factors may have an important influence on physical activity, but only recently have health researchers become interested in the environmental correlates of physical activity among adolescents. Several studies suggest that the decline of physical activity levels is more evident during adolescence, specially among girls, but little research has examined reasons for differences between boys and girls in commitments with physical activities and sports participation. The purposes of this study are to explore the potential presence of gender issues in the link between perceived neighbourhood environment and physical activity, and to verify the different opportunities for sport participation according to gender.

Methods: Semi-structured interviews were conducted with 54 adolescents from Porto (Portugal). Questions focused on boys and girls perceptions of neighbourhood environment in relation with sports and physical activity participation. All interviews were audio-recorded and transcribed verbatim. Data were analysed using content analysis after data being processed by the program QSRNVivo7.

Results: Participants reported that neighbourhood environment have to be pleasant and safe to promote participation in leisure-time physical activities. Moreover, adolescents that reported regular sports participation considered the quality of facilities and equipment available in the neighbourhood as a facilitator/inhibitor for physical activities. Adolescents also generate ideas about the existence of more opportunities for physical activity within the neighbourhood for boys, but the reasons pointed out by boys and girls were different. While girls reported a lack of opportunities for physical activity participation, boys considered that girls are less interested in sports and physical activity. Nonetheless, boys indicated that, when interested in physical activity and sports, girls might choose "female activities".

Conclusion: This study suggests the presence of gender difference in opportunities for sports and physical activity participation in the neighbourhood. Gender issues are related to adolescents' perceptions and with local community availability of physical activity programs and facilities.

This study was supported by grant FCT/PTDC/DES/72160/2006.

QUANTITY AND QUALITY OF PHYSICAL ACTIVITY IN 4TH GRADE STUDENTS.

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Introduction: Physical activity in childhood is important as it may establish physical and psychological health benefits, but declines in children's physical activity are evident (Biddle 2004). The prevalence of overweight, measured by body mass index (BMI) at or above the 95th percentile for children, adolescents, and young adults of the same age and sex has increased dramatically, from 4% among those aged 6 to 11 years and 5% among those aged 12 to 19 years in 1963 to 1966 to 15% in 1999 to 2000 (Ogden 2002). Recommended physical activity guidelines (AAHPERD Publications 2004) differ according to age group: for children 5 and older (school-aged youth), children should accumulate 60 minutes to several hours of age-appropriate moderate to vigorous physical activity on 5 or more days of the week. The purpose of the present research was to study the quantity and quality of physical activity in 4th grade children of southern Italy and correlate it with anthropometric data, specific ability tests and rural or urban area's life.

Methods: One-hundred-ninety-six 8-9 years old Italian children engaged only in the 2-hr school (S) physical activity (n=96) or in additional extra-scholastic (n=100) sport (ES) activities were tested. Informed consent was obtained from each child and his/her parent(s) after explaining the purpose of the research and its contents. Anthropometric measures and EUROFIT and hip tests were collected following a standard protocol (Weiner and Lourie,1981). A MANOVA verified differences ($p<0.05$) between groups.

Results: No differences were observed in the test results between S and ES. However, MANOVA results showed that children who went in urban schools performed better than those who went in rural schools, (Wilk's Lambda (11;182)=3,284 p<0,001).In particular, the differences were observed in the tapping test, the shuttle run test and the standing long jump.

Discussions: The results of the present study show that 4th grade children who live in urban areas perform better than those who live in rural areas. Moreover, compared to children in the rural areas, the urban area children seem to perform less ES sport, meaning that school appears to be an important context for providing sports participation opportunities across metropolitan status therefore helping the children acquire the reported abilities. However, these data need to be implemented dividing children by typology of practiced sport.

REFERENCES

•Biddle S, Gorely T, Stensel D: Health-enhancing physical activity and sedentary behaviour in children and adolescents. Journal of Sports Sciences 2004, 22:679-701

•National Association for Sport and Physical Education. Physical activity for children: a statement of guidelines for children ages 5-12. AAHPERD Publications; 2004

•Weiner JS, Lourie JA (1981) Practical Human Biology. Academic Press, London

•Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999-2000. JAMA. 2002;288:1728-1732

CONTRIBUTION OF PHYSICAL ACTIVITY TO THE PREVENTION OR PROMOTION OF FALLS IN COMMUNITY-DWELLING ELDERLY

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A fall could happen when demand of a particular task is higher than the person ability to perform it. In order to prevent falls, so frequently in elderly people, is essential to preserve or improve physical, sensorial and cognitive capacity to respond with success to task demands, even in hostile environment, or to reduce the number of tasks to accomplish, decreasing falls opportunity. However, an insufficient physical activity has a negative impact on health-related quality of life, including functional competence.Purpose: The main propose of this study was to analyze physical activity contribution to promote or prevent fall occurrence in older people. Methods: Participants were 506 community-residing old adults aged 50-89 yrs (390 women: 67.7±6.8yrs and 116 men: 69.6±6.6yrs), of which 31.2% were fallers. Body weight (BW) and height (BH), lower and upper body strength (LBS and UBS), lower and upper flexibility (LBF and UBF), agility (Ag), aerobic endurance (AE) and multidimensional balance (MB) were evaluated by the Fullerton batteries. Body fat mass percentage (BFM%) was evaluated by bioimpedence. Physical activity (PA), namely, vigorous, moderate, walking and total PA, was assessed by the International Physical Activity Questionnaire. Health status (HS), defined as the number of diseases and impairments, number of hazards environmental (HE), fear of falling (FES), educational level, and, falls occurrence in the last 12 months were estimated by questionnaire. A faller was identified as a person who felt at least once in the previous 12 months period.Results: Binary logistic regression identified the following predictors for falling: HE OR: 1.12, CI 95% (1.03,1.21); FES OR:1.13, CI 95% (1.05,1.21); HS OR:1.11, CI 95% (1.01, 1.23); MB OR: 0.94, CI 95% (0.91, 0.97); BFM% OR: 1.04, CI 95% (1.01,1.07); BW OR:0.98, CI 95% (0.97,1.00); vigorous PA OR: 1.051, CI 95% (1.016,1.087); total PA OR:0.981, CI 95% (0.966,0.997). Area under the roc curve was 0.745, CI 95% (0.700, 0.791). At a cut-off point of 0.30, sensitivity was 65.8% and specificity was 69.0%.Conclusions: HE, HS, MB, BFM%, BW, vigorous PA, total PA and FES were the most important predictors of fall occurrence. Total PA prevents falls occurrence, even in the presence of a high number of HE, a diminished HS, or a high BFM % and a low BW. Considering physical function, MB was a significant ability that contributes to decrease fall probability. Vigorous PA seems to increases fall probability, eventually due to demand elevation of performed tasks. This model based on tangible risk factors, was twisted by auto perception of the falling risk, evaluated by FES. A higher concerned about falling was related with a higher probability of falling. Thus, it appears that to be active in safety activities could prevent fall occurrence.

RESPIRATORY MUSCLE ENDURANCE TRAINING IN OBESE PATIENTS

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Introduction. Obese patients frequently experience dyspnoea that is usually charged to extra respiratory muscle work, due to reduced chest wall compliance. However, little is known regarding the role of respiratory muscles in dyspnoea and exercise tolerance.

Objective. The aim of this study was to determine the effects of respiratory muscle endurance training (RMET) in obese patients.

Methods. We investigated 20 patients hospitalized who followed a low caloric diet and a physical activity program. Subjects were overweight with BMI > 30 kg.m-2, without respiratory or heart diseases, muscular and skeletal disorders and diabetes. The exercise group (EXP n=10) carried out 10±2 RMET sessions (30 min of voluntary normocapnic hyperpnoea) over 3.3±1.0 weeks. The control group (CON

n=10) did not perform specific respiratory muscle training. We measured before and after training BMI, dyspnoea (MRC questionnaire), lung function, respiratory muscle strength and endurance, exercise tolerance (6 min walking test) and quality of life (SF 36 questionnaire).

Results. Respiratory muscle endurance was significantly improved in EXP group (+52±27.3%; EXP vs CON p<0.001) while respiratory muscle strength did not change (p>0.05). Exercise tolerance was significantly improved in EXP group (+54±34.9 m; p<0.006). Dyspnoea was significantly reduced in EXP group (-1.9±0.9 pts; p<0.047). Quality of life was significantly improved in EXP group (+70±30 pts; p<0.001).

Conclusions. This preliminary study suggests that RMET improve respiratory muscle endurance, dyspnoea, exercise tolerance and quality of life in obese patients. RMET could complete nutritional readjustment and standard physical activity program but further studies are needed to confirm these data.

EFFECTS OF MAXIMAL STRENGTH TRAINING ON ROLLER SKI DOUBLE POLING PERFORMANCE IN TWO HIGHLY TRAINED ELDERLY, MALE CROSS-COUNTRY SKIERS

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Introduction: The effect of maximal strength training with emphasis on improved 1RM on cross-country ski performance is reported (Hoff et al. 2002), but none has so far investigated this in highly trained elderly, male cross-country skiers. The aim of this study was to investigate the effects of maximal strength training in highly trained elderly male skiers on a) double poling performance at short and long distances on roller skis and, b) maximal and submaximal strength.

Methods: Two highly trained male cross-country skiers (60 yr, maximal oxygen uptake (VO2max) 58 and 50mL kg-1 min-1) participated in this study. The subjects had long experience with endurance training, but little experience with strength training. A pretest-posttest design was applied, with a nine week training intervention period between. Strength training and testing was carried out using a modified cable pulley, designed to simulate the double poling technique on roller ski. Force parameters were measured using a force tranducer. Strength training was performed three times a week for nine weeks. The endurance training during the experiment was the same as the last two months before the experiment. Tests performed in pre- and posttest were: 1) one repetition maximum (1RM) in the cable pulley, 2) peak force (PF80) and time to peak force (TPF80) with a workload at 80% of 1RM in pretest, 3) maximal number of repetitions with a workload at 60 and 80% of 1RM in pretest (rep60, rep80), 4) VO2max during treadmill running, and 5) performance tests on roller skis a) 50 m double poling, b) 1.5 km double poling and c) 7.8 km double poling . Accumulated oxygen uptake was measured during the last two roller ski tests. In posttest, PF, TPF, and maximal repetitions with a workload at 80% of 1RM in posttest were measured.

Results: 1RM improved with 35 and 20% in the two subjects. Rep60 improved from 305 to 463 and from 97 to 490 reps, respectively for the two subjects, and rep80 improved from 27 to 77 reps, and from 18 to 78 reps. Maximal repetition whit a workload at 80% of 1RM in posttest was 29 and 35. Minor changes in PF and TPF, as well as accumulated oxygen uptake, were found from pre- to posttest. There was no change in VO2max during treadmill running from pre to post-test. Both subjects had an improvement in all performance tests on roller skis: 50 m (0.47 and 0.21 sec), 1.5 km (6.5 and 8.0 sec), and 7.8 km (40 and 37 sec).

Discussion: It is concluded that maximal strength training with emphasis on improved 1RM, may improve endurance performance in highly trained elderly skiers without changes in VO2max or accumulated VO2. The improvements in strength, submaximal strength and the roller ski performance seemed to be related to the increased in strength per se, and not to changes in PF or TPF.

References:

Hoff JA, Gran A, and Helgerud J. Maximal strength training improves aerobic endurance performance. Sca. J. Med. Sci. Sports. 12:288-295, 2002.

PEAK CARDIORESPIRATORY ASSESSMENT IN OVERWEIGHT PREPUBESCENT CHILDREN

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Introduction: Over the past 30 years, the preponderance of overweight youth has increased (1), this, in part, has been attributed to a decline in physical activity among children and adolescents (2). In order to evaluate peak cardiorespiratory function and accurately prescribe endurance exercise, VO2max and Ventilatory Anaerobic Threshold (VAT), when available, should be assessed (4). The first one indicates the functional capacity of cardiorespiratory function and is often considered as the benchmark indicator of cardiorespiratory fitness (3) and the second one provides a better index of aerobic performance. The purpose of this study was to compare peak cardiorespiratory parameters during a treadmill test between groups of prepubescent children with different Body Mass Indexes (BMI).

Methods: The sample was composed of 33 children and was divided into three groups according to BMI cut-off points proposed by Cole et al. (2000): 11 Non Obese (age: 11,55 ± 0,52; weight: 42,60 kg ± 5,64; BMI: 18,22 ± 1,20), 11 Overweight (age: 11,27 ± 0,64; weight: 50,98 kg ± 5,82; BMI: 22,21 ± 1,05) and 11 Obese (age: 10,91 ± 0,54; weight: 58,49 kg ± 11,05; BMI: 27,96 ± 2,30). A maximal, progressive and incremental test using ergo-spirometry procedures (Cosmed® k4b2) was selected to tested in laboratorial context. Heart rate was measured with the Polar S610. The comparison and descriptive data was analyzed between the groups (SPSS, ver.15.0).

Results: All groups show significant differences in weight and BMI measures. Significant differences were observed for the VAT parameter between Overweight (OV) and Obese (O) group and for the VO2max/kg parameter between Non Obese (NO) and O groups. The VO2max/kg has an inversely relation to the BMI parameter in this groups (NO – 53,18 ml.kg.min-1; OV – 50,48 ml.kg.min-1; O – 46,90 ml.kg.min-1).

Conclusions

The cardiorespiratory condition inversely relates with the body mass and the BMI could be an indicator of the cardiorespiratory status of children.

References

(1) McArdle, W.D., Katch, F.I. and Katch, V.L. (1996). Exercise Physiology: Energy, Nutrition, and Human Performance. 4th edition. Philadelphia: Lea and Febiger.

(2) Troinano, R.P., Flegal, K.M., Kuczmarski, R.J., Campbell, S.M. and Johnson, C.L. (1995). Overweight prevalence and trends for children and adolescents. Archives Pediatrics Adolescent Medicine, 149, 1085-1091.

(3) McGinnis, J.M. (1992). The public heath burden of sedentary lifestyle. Medicine and Science in Sports and Exercise, 24, C196-S200.

(4) Loftin, M., Sothern, M., Warren, B. & Udall, J. (2004). Comparison of VO2 Peak during treadmill and cycle ergometry in severly overweight youth, Journal of Sports Science and Medicine, 3, 254-260.
(5) Cole T.J., Bellizzi, M., Flegal, K. & Dietz, W. (2000). Establishing a standart definition for children overweight and obesity worldwide: international survey. British Medical Journal. 320, 1240-1243.

MEASUREMENT OF CHILDREN'S PHYSICAL ACTIVITY FROM THE WRIST

VIRTANEN, P.
POLAR ELECTRO OY

According to questionnaires children's everyday physical activity has diminished. Objective measurements of children's physical activity as well as technical solutions are needed. Accelerometers have been used in several researches to evaluate oxygen consumption and physical activity. The researches have, however, so far focused on validating devices developed for the measurement of adults. The objective of this research was to create a method based on acceleration measurement on the wrist to evaluate 6-15 y old children's oxygen consumption and physical activity. We wanted to find out how accurately different intensities of children's physical activities could be recognized. Also the effect of children's demographics to the measured acceleration signals and parameters was examined.

Twenty 6-15 y old children were measured in twelve activities using uniaxial acceleration measurement. Simultaneously oxygen consumption was measured with portable analysator (Viasys, Oxygon Mobile). The activities were divided in three classes: 1) sitting activities (sitting on a chair, lego playing, pc playing and table icehockey playing – all activities lasted 5 min); 2) interrupted moving (backpack packing, rope jumping, football dribbling, basketball dribbling – all lasted 5 min); and 3) walking & running. Walking and running were both performed with two speeds on a treadmill. All measurements were performed in laboratory conditions. The acceleration data was transferred to Matlab software and transformed into MET units. The results were compared with those of the gas analysator.

Height of the children was the best demographic parameter to adjust the oxygen consumption evaluated from the acceleration signal. In the sitting activities the METs evaluated from acceleration were (mean±SD): sitting on a chair 1.3±0.0 MET, lego playing 1.5±0.2 MET, pc playing 1.3±0.0 MET, and table icehockey playing 1.5±0.6 MET. In the interrupted moving the MET values were: backpack packing 2.8±0.4 MET, rope jumping 6.7±2.3 MET, football dribbling 7.4±2.5 MET, and basketball dribbling 7.6±2.6 MET. In walking the values were on the average 3.1±0.6 MET and in running 7.0±1.4 MET. METs evaluated from the acceleration signal and calculated from oxygen consumption differed in sitting activities -0.03±0.36 MET. The correlation coefficient was 0.31. In interrupted moving the difference was -0.01±1.19 MET and correlation 0.91. In walking and running (results combined) the difference between evaluated and calculated MET values was 0.10±1.00 MET and correlation 0.91. When METs of all the twelve activities were taken into account, the difference between evaluated and measured values was

-0.07±0.092 MET and correlation 0.95.

It seems that measuring acceleration from the wrist and classifying the activities suits well to evaluate 6-15 y old children's oxygen consumption. Oxygen consumption evaluated from acceleration correlates well with the measured values.

SMOKING CESSATION SHOULD BE ACCOMPANIED BY LIFESTYLE INTERVENTIONS IN PATIENTS WITH RHEUMATOID ARTHRITIS

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Background: Rheumatoid arthritis (RA) is associated with altered metabolism leading to muscle wasting. In the general population cigarette smoking is known to affect body composition by reducing fat and inhibiting muscle synthesis. Even though smoking has been implicated in the pathophysiology and progression of RA, its possible effects on body composition of such patients have not been studied. This cross-sectional study aimed to identify potential associations of smoking with body weight and composition of RA patients.

Methods: A total of 392 patients (290 females) with RA were assessed for body mass index (BMI), body fat (BF), fat-free mass (FFM) and waist circumference. Erythrocyte sedimentation rate, C-reactive protein, Disease Activity Score-28 and Health Assessment Questionnaire were used to assess disease activity and severity. Smoking habit (current smoker: CS; ex-smoker: XS; never-smoker: NS) and intensity (pack-years) were also noted.

Results: CS (male: 25.8, 95% CI: 24.1 – 27.6; female: 26.1, 95% CI: 24.5 – 27.9) had significantly lower BMI compared to XS (male: 28.4, 95% CI: 27.3 – 29.5, $p<0.001$; female: 28.6, 95% CI: 27.4 – 29.7, $p<0.05$) and NS (male: 27.6, 95% CI: 25.9 – 29.2; female: 27.5, 95% CI: 26.6 – 28.4; $p<0.05$ for both genders). Similarly, BF of CS (male: 24.5, 95% CI: 21.1 – 27.9; female: 35.9, 95% CI: 33.4 – 38.3) was lower compared to that of XS (male: 28.8, 95% CI: 26.7 – 30.9, $p<0.001$; female: 39.2, 95% CI: 37.8 – 40.6, $p<0.05$) and NS (male: 27.8, 95% CI: 25.7 – 29.7, $p<0.001$; female: 38.1, 95% CI: 36.9 – 39.2, $p<0.05$). FFM did not differ between groups ($p>0.05$ in all cases). Finally, CS (male: 100, 95% CI: 95.4 – 104.6; female: 90.8, 95% CI: 86.8 – 94.8) had significantly smaller waist circumference only compared to XS (male: 106.2, 95% CI: 103 – 109.4, $p<0.001$; female: 98.6, 95% CI: 95.7 – 101.4, $p<0.05$). Following adjustments for age, disease duration and HAQ, smoking remained a significant predictor for BMI ($p<0.001$), BF ($p<0.05$) and waist circumference ($p<0.05$). Pack-years were inversely correlated with BF ($r=-0.46$; $p<0.001$) and heavy smokers exhibited significantly lower FFM ($p<0.05$) compared to all other participants.

Conclusions: Within the limitations of a cross-sectional study, it appears that cigarette smoking associates with reduced BMI and BF in patients with RA and heavy smoking associates with lower muscle mass. Smoking cessation appears to associate with increased BMI, BF and waist circumference in these patients. These results should be confirmed in prospective studies. Given the numerous adverse effects of smoking on general health and RA, patients should be actively advised against it. However, smoking-cessation regimes in RA may need to include more general lifestyle counselling particularly about weight control.

14:15 - 15:15

Poster presentations

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WHAT IS THE CLINICAL COURSE OF ACUTE ANKLES SPRAINS? A SYSTEMATIC LITERATURE REVIEW

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ERASMUS MC

BACKGROUND: Ankle sprains are one of the most common musculoskeletal injuries. In order to evaluate the effectiveness of therapeutic interventions and to guide management decisions, it is important to have clear insight of the course of recovery after an acute lateral ankle injury and to evaluate potential factors for nonrecovery and re-sprains.

METHODS: A database search was conducted in MEDLINE, CINAHL, PEDro, EMBASE, and the Cochrane Controlled trial register. Included were observational studies and controlled trials with adult subjects who suffered from an acute lateral ankle sprain that was conventionally treated. One of the following outcomes had to be described: pain, re-sprains, instability, or recovery. Two reviewers independently assessed the methodological quality of each included study. One reviewer extracted relevant data.

RESULTS: In total, 31 studies were included, from which 24 studies were of high quality. There was a rapid decrease in pain reporting within the first 2 weeks. Five percent to 33% of patients still experienced pain after 1 year, while 36% to 85% reported full recovery within a period of 3 years. The risk of re-sprains ranged from 3% to 34% of the patients, and re-sprain was registered in periods ranging from 2 weeks to 96 months postinjury. There was a wide variation in subjective instability, ranging from 0% to 33% in the high-quality studies and from 7% to 53% in the low-quality studies. One study described prognostic factors and indicated that training more than 3 times a week is a prognostic factor for residual symptoms.

CONCLUSIONS: After 1 year of follow-up, a high percentage of patients still experienced pain and subjective instability, while within a period of 3 years, as much as 34% of the patients reported at least.

THE EFFECT OF 6 WEEKS OF WHEELCHAIR EXERCISE ON FUNCTIONAL RECOVERY AND HEALTH-RELATED QUALITY OF LIFE IN STROKE PATIENTS

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The purpose of this study was to investigate the effects of wheelchair exercise on functional recovery and health-related satisfaction in stroke patients.

Subjects for this study were stroke patients at a chronic stage (more than 10 months since onset of stroke) and they were divided into 2 groups. Control group was composed of 5 patients who participated in a central nervous rehabilitation program which was routinely applied for stroke patients and the wheel chair exercise group was composed of 12 patients who participated in a wheelchair exercise as well as central nervous rehabilitation program.

Body composition and the functional recovery factors consisted of muscle strength (grip strength), muscle endurance (chair stand test and arm curl test), flexibility (chair sit-and-reach test), agility (reaction time) and PASS (Postural Assessment Scale for Stroke) have been measured. The health-related satisfaction factors were also measured using SF-36 which tests self perceived changes in health. The wheelchair exercise carried out at a seated position was composed of aerobic and resistance exercise with music and thera-band, respectively. The exercise program was composed of warm up (10 min), main exercise (40 min) and cool down (10 min) and performed 5 days per week for 6 weeks. The intensity of exercise was 60~70% of HRR (Heart Rate Reserve) and RPE (Rate of Perceived Exertion) 11~13. All exercise session throughout entire intervention period was carefully monitored and supervised by clinical exercise physiologist.

All the data were analyzed by 2 x 2 ANOVA with repeated measures using SPSS (Version 14.0) and the statistical significance was accepted at the level of $P<0.05$.

Our results showed that there was no significant difference in body composition including muscle mass, fat mass, and visceral fat mass between 6 weeks of wheelchair exercise group and control group. However, most of the functional recovery factors such as muscle strength ($p=0.023$), muscle endurance ($p=0.021$), flexibility ($p=0.028$), and PASS ($p=0.022$) were significantly improved in wheelchair exercise group compared to control group. In addition, among the factors of SF-36 as a measurement of health-related satisfaction, emotional health was significantly improved ($p=0.031$) in wheelchair exercise group compared to control group and most of other factors including energy, social functioning, and general health showed the tendency to increase after 6 weeks of wheelchair exercise participation although statistically not significant due to the limited numbers of participants.

In conclusion, our current findings suggest that 6 weeks of wheelchair exercise improves functional recovery including muscle strength, muscle endurance, flexibility, and PASS as well as health-related satisfaction in chronic stage stroke patients.

SELF-RELATED HEALTH, PHYSICAL ACTIVITY, BMI AND MUSCULOSKELETAL COMPLAINTS - A COMPARISON BETWEEN FOREIGN AND SWEDISH HIGH SCHOOL STUDENTS

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SWEDISH WINTER SPORT RESEARCH CENTRE

Background: Physical activities during leisure time and school hours as well as nutritional habits have changed over the past years by adolescents being less physically active and adopting a sedentary life-style. Aim The aim of the present study was to investigate possible differences between foreign and Swedish high school students in terms of self-related health, physical activity, overweight and possible complaints from the musculoskeletal system.

Methods: 1090 high school students, 450 with foreign background and 640 with Swedish background, aged 16-26 years answered a questionnaire.

Results: A higher percentage of students with foreign background reported poor self-related health compared to students with Swedish background (p= 0.038). Students with foreign background were to a greater extent more physically inactive than students with Swedish background (p= 0.003). There were no differences between students with foreign background and students with Swedish background regarding musculoskeletal complaints. Students with foreign background were more often overweight than students with Swedish background and overweight was more frequent among males than females. Physical activity (moderate and high level) was concluded to be a factor with significant positive effect on self-related general health (moderate level p= 0.042, high level (p< 0.001) and musculoskeletal complaints were
negative factors on self-related general health (p< 0.001).
Conclusion: Based on these results it is suggested that adolescents with foreign background should participate in physical activity in order to prevent overweight and thereby improve physical health.

STRENGTH TRAINING AND THE MENSTRUAL CYCLE: EFFECTS OF FOLLICULAR- AND LUTEAL PHASE-BASED TRAINING ON MUSCULAR STRENGTH AND MUSCLE DIAMETER IN SUBJECTS WITHOUT ORAL CONTRACEPTION

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Purpose: The follicular and the luteal phase of the menstrual cycle (FO and LU) are characterized by a certain profile of different hormones. Menstrual cycle specific regulation of many hormones is not clear so far. This is especially true for the interaction between estradiol (E2), hGH, and IGF-1, all of them possible anabolic hormones on the level of the muscular cell and therefore important supporting factors during strength training. We, therefore, investigated possible different effects of follicular phase-based versus luteal phase-based strength training (FT and LT) on strength parameters and muscle volume.
Methods: 16 healthy eumenorrheic untrained or moderately trained women (age: 24.9 ± 4.8 yrs, height: 162.5 ± 5.3 cm, weight: 56.7 ± 5.1 kg) completed a strength training program of the m. quadriceps femoris for each leg on the Leg Press for 3 menstrual cycles (approx. 12 weeks). The subjects were divided into group A and group B. Group A performed FT with the right leg and LT with the left leg and vice versa for Group B. FT was organized 4 times a week in FO and once in LU, and LT was organized 4 times a week in LU and once a week in FO. Blood samples were taken on 11th day in FO and on 25th day in LU of menstrual cycle to analyze values of E2, progesterone (Prg), FSH, LH, total testosterone (tT), free testosterone (fT), IGF-1, DHEA-S and hGH. Maximum isometric force (Fmax-iso) was measured for each right and left leg prior to, during (2 times per cycle), and after training. Muscle diameters (Mdm) were measured by means of ultrasound for M. quadriceps prior to and after training, and sum of Mdm of M. rectus femoris, M. vastus intermedius and M. vastus lateralis was calulated.
Results: LH, FSH, tT and fT were significant higher in FO as compared to LU, Prg was higher in LU, and E2, DHEA-S, hGH, and IGF-1 were not significantly different between the two phases. Fmax-iso increased significantly by 26.1 ± 11.6 kg (+43.9 %) after FT and by 19.3 ± 10.3 kg (+32.9 %) after LT. The increase of Fmax-iso after 3 month of follicular-based strength training (FT) was significantly greater than the increase after luteal-based training (LT). We found a clear trend (p=0.07) for a higher increase of Mdm after FT as compared to LT (+0.67 ± 0.55 cm (+ 11.7 %) vs. +0.46 ± 0.38 cm (+7.7 %) after FT and LT, respectively).
Conclusions: FT clearly showed more pronounced effects on muscle strength and muscle diameter as compared to LT. This is probably due to the specific hormonal milieu during each phase of the cycle. Further studies including detailed analysis of the hormonal profile though the menstrual cycle are needed in order to understand the underlying mechanisms on the cellular and molecular level of the skeletal muscle.
The study was supported by BISP, Bonn (IIA1/070110/08).

ASYMMETRIES IN MUSCLE RECRUITMENT PATTERNS IN ACLR AND HEALTHY SOCCER PLAYERS DURING HIGH INTENSITY RUNNING

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BACKGROUND: In response to accumulating metabolic fatigue there is a change in muscle recruitment pattern resulting in enhanced EMG activity. Muscles increase their EMG amplitude and/or shift their EMG frequency content towards higher frequencies [1, 2]. However, recent studies have shown that the neuromuscular response to fatiguing exercise, following ACL reconstruction is altered [3].
PURPOSE: The aim of the present study was to evaluate the time course of EMG variables indicating muscle recruitment patterns in a group of ACL reconstructed and healthy soccer players.
METHODS: We evaluated 14 ACL reconstructed soccer players 1-3 years post-operatively and 14 healthy control soccer players. ACLR players had anterior tibial translation difference between reconstructed and intact leg less than 2mm, Tegner activity score 8 and Lysholm score 99. Athletes performed a 10 minute run at intensity ~90% of their VO2max with expired gas analysis. Blood lactate was measured at baseline and at end-exercise. EMG data were recorded at the 3rd, 5th, 7th, and 10th minute from muscles vastus lateralis and biceps femoris bilaterally with a telemetric EMG system. The dependent variables examined were the peak EMG amplitude and the total energy of the high frequency components (>90Hz, HE) of the power spectrum. Repeated measures ANOVA's were used to compare the time course of the EMG variables between legs.
RESULTS: ACL reconstructed group run at 87.6(4.4) %VO2max and control group at 88.7(3.1) %VO2max. End-exercise blood lactate values were 7.6(1.7) mM and 7.9(1.6) mM respectively. For vastus lateralis muscle peak EMG amplitude increased for both the control and intact leg but not the reconstructed leg (F=4.26, p=0.008 and F=6.74, p=0.001 respectively). HE tended to increase for both the control and intact leg but not the reconstructed leg (F=3.97, p=0.011 and F=2.81, p=0.052 respectively). For biceps femoris muscle there was an increase in peak EMG amplitude only when the ACL reconstructed group was considered (F=4.26, p=0.011). HE increased significantly for each of the tested legs and there was no significant interaction.
CONCLUSION: While for both the control and intact leg there was an enhanced EMG activity in order to compensate for the accumulating fatigue, the reconstructed leg shows an inability to alter muscle recruitment patterns. This may indicate greater fatigability for the vastus lateralis of the reconstructed leg. For biceps femoris, both groups showed signs of enhanced EMG activity but this was more pronounced only for the ACL reconstructed group. This may indicate the presence of a protective mechanism under metabolic fatigue.
REFERENCES
1. De Luca. J Appl Biomech 13:135-163, 1997.

2. Borrani et al. J Appl Physiol 90 :2212-2220, 2001.
3. McHugh et al. J Orthop Sports Phys Ther 31:25-32, 2001.
This research work has received funding from the European Social Fund (75%) and the Greek Ministry of Development-GSRT (75%).

THE CLINICAL COURSE AND PROGNOSTIC FACTORS OF ACUTE ANKLE SPRAINS DURING ONE-YEAR FOLLOW-UP

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Background: Ankle sprains are the one of the most common musculoskeletal injuries. About 40% of the patients with such an ankle sprain report persistent complaints after 3 months. About 80% of these patients still report persistent complaints after 12 months follow-up. Factors predicting persistent complaints for ankle sprains are largely unknown.
Aim of the study: Evaluate prognostic factors for incomplete recovery, instability and re-sprains during one-year follow-up in patients who consulted primary care for acute ankle sprains.
Methods: Patients consulting their general practitioner or a first aid department for an acute ankle sprain were invited to participate in this prospective cohort study. Possible prognostic factors assessed at baseline and 3 months follow-up: demographic factors, clinical factors, ankle load factors and factors from the physical examination at 3 months follow-up. Outcome measures assessed at 3 and 12 months follow-up were self-reported recovery, re-sprains, instability and pain intensity. Possible prognostic factors were identified by multivariate logistic and linear regression models.
Results: A total of 102 patients were included in this study. At 3-months follow-up 65% of the patients reported instability and 23% reported one or more re-sprains. After one-year follow-up, still 27.5% reported instability and more than 50% regarded themselves not completely recovered. Baseline factors related to incomplete recovery at 12 months follow-up were not found. Furthermore, prognostic factors from the physical examination for the non-recovered patients at 3 months follow-up could not be identified. However, re-sprains and self-reported pain in rest at 3 months follow-up were related to incomplete recovery for the non-recovered patients at 3 months follow-up.
Conclusion: A physical examination at 3-months follow-up for the non-recovered ankle sprain patients seems to have no additional value in the prognosis for the 12-months outcomes. However, self-reported pain in rest at and re-sprains during 3 months follow-up seem to have a prognostic value for recovery at 12 months follow-up.

MENSTRUAL STATUS DIFFERENCES OF ELITE TURKISH FEMALE ATHLETES FROM VARIOUS TEAM SPORTS

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SELCUK UNIVERSITY

Introduction: The aim of this study was to compare the menstrual state of professional Turkish female athletes who compete in different team sports.
Methods: 133 female athletes (33 football, 29 basketball, 27 handball and 44 field hockey players) from different sports branches who take place in the Turkish Premier League and Turkish Super League by random sampling method participated to this study. The physical characteristics including age, weight and height of the subjects were detected and given in order as following; in handball 23.62±3.04 years and 60.74±5.13 kg, 168.92±6.74 cm in football, 22.21±3.33 years, 54.87±5.75 kg, 164.30±6.29 cm in field hockey 19.93±3.87 years, 52.31±6.25 kg, 164.95±5.56 cm and in basketball 22.72±2.85 years, 64.82±7.21 kg, 177.03±5.38 cm. As a data gathering tool, a questionnaire that was made up of 37 questions was applied to the participants, and the questions were asked face to face to each athletes. One-way ANOVA and Chi square tests were used for statistical analysis.
Results: Although there was not found a significant relation between the menstrual status and the sports branches (χ2=3.893, p>.05), there was a significant relation between the sports branches and sports activities' changing the length of the menstrual period (χ2=12.165, p<.05). Among all the female athletes who pointed on their menstrual irregularity complaints out, the average was 8.3 %. There was not found significant relation between training frequency and menstrual cycle irregularity (χ2=1.178, p>.05). A significant relation was found between sports branches and the effects of menstruation on the sports activities on behalf of the female athletes who pointed out that they were psychologically affected by menstruation (χ2=15.53, p<.05).
Discussion: As a result, menstrual irregularity was detected among Turkish Elite female athletes. This study showed that menstrual period would be significantly affected the performance in terms of psychological aspect. Therefore, this was explained that the length of the menstrual period might be affected the performance during sports activity.

EFFECTS OF EXERCISE-INDUCED MUSCLE DAMAGE ON NEUROMUSULAR AND SENSORIMOTOR PERFORMANCE IN BOYS

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UNIVERSITY OF EXETER

Optimal functioning and timely activation patterns of the musculature facilitates dynamic stabilisation and protection of synovial joints. Exercise-induced muscle damage (EIMD) detracts from neuromechanical performance and sensorimotor performance capabilities in adults. The effects of EIMD on children's sensorimotor performance is unknown and while neuromuscular performance may be affected to a lesser extent compared to adults, little is known of EIMD's effects on muscular activation in children at functional knee joint angles that are proximal to the extreme of the joint's range of motion. The aim of this study was to assess the effects of EIMD on sensorimotor and neuromuscular performance in boys.
Peak force, electromechanical delay, sensorimotor performance (force error (relative to a 'blinded'-target)) and descriptive markers of EIMD (perceived muscle soreness; passive hip flexibility) were assessed in ten boys (age: 12.7 ± 1.3yr; height: 1.56 ± 0.08m; body mass: 46.5 ± 8.7kg (mean ± SD)) prior to and at 0.5h, 24h, 48h, 72h following a strenuous exercise protocol incorporating six sets of 10 isokinetic eccentric contractions of the ipsilateral knee flexors. Neuromuscular and sensorimotor assessments were recorded at 30 degrees of knee flexion.
Results showed that while performance remained constant during the control period and in the contralateral control leg, the EIMD intervention provoked reduced performance of the involved leg compared to pre-intervention levels in peak force (17.3%: 157 ± 45.3 N versus 129.8 ± 34.8 N (pre- versus post-0.5h); $F(4,36) = 3.9$; $p < 0.05$), passive hip flexibility (25.8%: 0.163 ± 0.071 m vs. 0.121 ± 0.065 m (pre- vs.

post-48h]; F[4, 36] = 9.23; p <0.005) and increased delayed onset muscle soreness (DOMS) (1 ± 0.0 vs. 4.33 ± 1.1 m [pre- vs. post-48h]; F[4, 36] = 21.8; p <0.001). Performance capabilities recovered substantially by 72 hours after the damaging protocol (P<0.05). The EMD and sensorimotor performance were preserved throughout the experiment.

The decrease in peak force, passive flexibility and the increase in DOMS indicated that the children in this study experienced exercise-induced muscle damage as a result of the eccentric exercise protocol, but there were no impairments in sensorimotor performance and muscle activation.

ELECTROMYOGRAPHIC ACTIVITIES OF THE VASTUS MEDIALIS OBLIQUE AND MEDIALIS LONGUS MUSCLES DURING SUSTAINED FATIGUING ISOMETRIC CONTRACTIONS

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Introduction: Strengthening of the vastus medialis oblique (VMO) muscle during training programs is an important part of protocols for rehabilitation of patellofemoral disorders (Wise et al., 1984). This study evaluated the activation of this muscle in comparison to the vastus medialis longus (VML) during sustained isometric exercise.

Methods: Multi-channel surface and fine-wire intramuscular EMG signals were concurrently recorded from VMO and VML of the right leg of 9 healthy men during 70-s isometric contractions at 10%, 20% and 30% of the maximal force.

Results: Mean power frequency (MPF), muscle fiber conduction velocity (MFCV), and average rectified value (ARV), computed from the surface EMG (Farina et al., 2004) significantly increased with contraction intensity for both VMO and VML muscles (P < 0.05). However, the rate of change over time in MPF, MFCV, and ARV were significantly greater for VMO than VML (P < 0.05).

Discussion: The changes in EMG features with fatigue were greater in the VMO than VML during isometric contractions. This result can be interpreted as due to greater activity of the VMO (Sczepanski et al., 1991) to stabilize the patella during fatiguing contractions. Therefore, submaximal sustained isometric exercise can be used as part of a training program for strengthening VMO muscle in order to prevent lateral dislocation of the patella.

References

Sczepanski TL, Gross MT, Duncan PW, Chandler JM. (1991. J Orthop Sports Phys Ther, 14(6), 256-62

Wise HH, Fiebert I, Kates JL. (1984). J Orthop Sports Phys Ther, 6(2), 95-103

Farina D, Merletti R, Enoka RM. (2004). J Appl Physiol, 96(4), 1486-95

MOTOR SKILLS OF PRIMARY SCHOOL GIRLS

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Introduction: There are several scientists, who studied the motor performance, however, there are limited publications about birth season, age effect and division of children.

The aim of this study was 1) to evaluate the physical development and motor performance according to birth season and age; 2) to use percentile tables to separate the sport talented, the average and the children of limited ability.

Methods: During the study body height and body weight, 20 m dash, standing board jump, 6 minutes continuous running, throws with stuffed ball and obstacle race-test of 148 seven-, 191 eight- and 87 nine year old, altogether 426 school girls were evaluated. Unitrate analyses of variance, correlation analysis moreover percentile values and 't' test were used applying SPSS programme.

Results: The overall mean value and standard deviation of the three age group school girls were as follows: body height 128.61±9.11 cm; body weight 26.87±6.33 kg; 20 m dash 5.33±1.13 sec; standing board jump 117.47±23.46 cm; 6 minute continuous running 797.14±254.14 m; throws with stuffed ball 3.94±1.29 m; obstacle race test 23.12±6.79 sec.

According to the results the children group in body height was quite homogenous (cv%<10%), however in body weight (cv%>20-30%), and in case of all motoric test results was heterogeneous (cv%>21.20-32.79). Significant (P<0.05) age and birth season effect was found in most of the motor performances. Older girls were better developed, and generally had better motor performance than younger ones.

The physical development and motor performances of the summer and autumn born school girls were generally better than of those born in winter or spring, except the obstacle race-test. Loose or medium relationships were found between different developmental and motor performance traits. It means that sport performances of older, or better developed school girls were generally better than those of younger or underdeveloped ones. Children who were better at some performances than their schoolmates had generally better results in other sport activities, too.

According to the results of percentile analyses, the 5% of the children with worst motor performance can be considered as limited ability children while the 5 percent with best results the talented children.

Discussion: According to the results both the physical development and the motor performance were influenced by the age and birth season of the children.

The results obtained by percentile values there were big differences between the advanced, average and underdeveloped children.

Percentile values seem to be a useful indicator for the selection of children. With using this method the talented, the average and those children of limited ability can be separated at young age.

14:15 - 15:15

Poster presentations

PP-SM08 Sports Medicine 8

THE EFFECTS OF BLOOD LACTATE, BODY COMPOSITION, HEART RATE, AND THE AMOUNT OF EXCRETIONS OF MOUNTAIN BIKER ON THE DRINK TYPES'

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INJE UNIVERSITY, 1. CHANG WON UNIV., 2. SEOUL NATIONAL UNIV. OF EDUCATION, 3. DANKOOK UNIV., 4. SANGMUNG UNIV., 5. SOGANG UNIV.

This study was conducted on five male mountain bikers of a amateur club for four weeks. The research took place once a week at a mountain bike stadium. Its process was as follows: 1) providing them with 300 ml drinks such as sports drinks, red ginseng drink, water or no beverage ahead of the game, 2) with 300 ml drinks by 75 ml four times in four sections (300 m, 1.1 km, 2.4 km, 3.6 km) during playing game, 3) with 300 ml drinks six times after the game. The players drove a bike at the level of 80~85% of their heart rate maximum(HRmax) in the total distance of 19.2 km (4.8 km x 4 times). It was examined the change in body composition variables, heart rate, blood lactic acid concentration and the amount of urinary and excretions before and after the game depending on whether players drink or not and what types of beverages they drink.

In the change in body composition, the result showed that the body weight was affected by correlation between timing and groups. In addition, the greatest weight loss was seen in the no beverages, followed by water, sport drinks and korea red ginseng drink. A significant difference was also found depending on timing. In body fat mass, there was a correlation between timing and groups, but no significant difference occurred in a post investigation.

Depending on timing and groups, there was significant difference in heart rate, but there was no significant difference in the post investigation. Significant difference was shown depending on timing and drinking water were proven to be more effective than having sports drink only during rest in the comparison of the time zone of a day.

In terms of blood lactic acid concentration, no significant difference was found depending on timing and groups, but not having beverage was found to be more effective than having sports drinks in the post investigation, There was a significant difference in timing and having water was more effective than sports drink during rest and no beverage was the most effective followed by sports drinks and water 20 minutes after recovery in the comparison of the time zone of a day.

No significant difference was found in the amount of urinary and excretions. Based on the overall results, sports drinks were found to be the most effective. Not having beverages was more effective in losing weight than having drinks and it is believed that a higher blood lactic acid concentration means a higher fatigue of muscle. Consequently, since there is a great loss of electrolyte in high intensity exercises like mountain bike racing where average heart rate during exercise reaches as much as 90% of the heart rate maximum, we believe that sports drinks would be more effective in enhancing performance of players than ordinary beverages, water or no beverage to maintain physical balance.

ROLE OF THE INTERMITTENT PHYSICAL EXERCISE ON THE FLOW-MEDIATED VASODILATION IN ELITE VOLLEYBALL PLAYERS

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UNIVERSITY OF CATANZARO

Introduction: In literature there are a lot of studies that report the importance of the physical exercise to improve cardiovascular functions (1). Recently, the development of new technologies made possible the not invasive study of vascular functional parameters like the flow mediated vasodilation, valuable only since few years (2). The aim of this study was to evaluate the changes of the flow mediated vasodilatation and of the diameter of the brachial artery, after a programmed training, in a group of young elite volleyball players.

Methods

We enrolled 8 young elite athletes (men, average age 20+6). After informed consent, we have undergone them to the complete cardiovascular evaluation with echocardiographic measurement of the diameter, of the brachial artery of both upper limbs, in diastole before the beginning of the pre-championship training and at the middle of the championship. The measurement of the flow mediated vasodilatation has been performed by the digital pulse volume amplitude (PVA) during reactive hyperemia. The statistical analysis was conducted using t-test, considering significant $P<0.05$.

Results: At the middle of the championship we observed a not significant reduction of the cardiac frequency (59+13/min vs 54+7/min; p=0.102), a significant increase of the systolic blood pressure values (111+6 mmHg vs 121+7 mmHg; p=0.045), a significant increase of the diameter of the brachial artery in the right limb (0.31+0.04 cm vs 0.37+0.04 cm; p=0.016) and in the left limb (0.30+0.03 cm vs 0.38+0.07 cm; p=0.019) and a significant increase of flow-mediated vasodilation (1.7+0.2 vs 2.3+0.8 cm; p=0.038). No significant changes of the diastolic blood pressure were observed.

Discussion: Previous studies have demonstrated a higher flow-mediated vasodilation levels in athletes after aerobic exercise (3-4). Our data, for the first time, demonstrate that also the habitual intermittent physical exercise increases the flow-mediated vasodilation and the diameter of the brachial artery, improving the vascular adaptation.

References

1. Tanaka H., Dinenno F.A., Monahan K.D., Clevenger C.M., DeSouza C.A., Seals D.R. "Aging, Habitual Exercise, and Dynamic Arterial Compliance". Circulation; 102:1270-1275 (2000).

2. Nohria A., Gerhard-Herman M., Creager M.A., Hurley S., Mitra D., Ganz P. "Role of nitric oxide in the regulation of digital pulse". J Appl Physiol 101:545-548 (2006).

3. Libonati J.R. "Aerobic run training improves brachial artery flow-mediated dilation". J Strength Cond Res, Nov; 21(4):1291-1295 (2007).

4. Rognmo O., Bjørnstad T.H., Kahrs C., Tjønna A.E., Bye A., Haram P.M., Stølen T., Slørdahl S.A., Wisløff U. "Endothelial function in endurance trained men: effects of acute exercise". J Strength Cond Res, Mar; 22(2):535-542 (2008).

EFFECT OF EPS® 7630 IN IMMUNE SYSTEM OF RUNNERS

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High-intensity exercises may compromise the immune response as revealed mainly by upper respiratory tract infections. This effect may be related to the decrease in secretory immunoglobulin A in the upper airway mucosa and/or changes in the profile of systemic cytokines as well as local cytokines of the upper respiratory tract. Extract of Pelargonium sidoides (EPs® 7630) is currently used to treat infections that affect the upper airways. The aim of the present study was to evaluate the action of EPs® 7630 extract on the immune response of athletes submitted to an intense running session by analyzing the production of immunoglobulin A in their saliva and of cytokines both locally and systemically, using a placebo as control. The results show that secretory immunoglobulin A levels were increased significantly in EPs® 7630 extract group [213(129.2-1436) ug/mL] in relation of placebo group [41.16 (16.06-85.28) ug/mL] ($p<0.05$), while levels of serum interleukin-15 [94.62(78.59-100)pg/mL, EPs® 7630 extract group and 104.9(100-130.5)pg/mL), placebo group], serum interleukin-6 [82.47(63.67-100)pg/mL, EPs® 7630 extract group and 103.6(100-122.2)pg/mL, placebo group] and interleukin-15 [90.18(69.64-178.1)pg/mL, EPs® 7630 extract group and 122.8(91.85-231.8)pg/mL, placebo group] in the nasal mucosa were decreased ($p<0,05$). Based on this evidence, we suggest that extract of Pelargonium sidoides (EPs® 7630) can exert a strong modulating influence on the immune response associated with the upper airway mucosa in athletes subjected to intense physical activity.

EVALUATION OF KNOWLEDGE AND ATTITUDE LEVEL OF TEACHERS AND SPORT COACHES REGARDING AIDS

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ISLAMIC AZAD UNIVERCITY CENTERAL BRANCH OF TEHRAN

Background & Aim: According to Unaids report, young people(under 25 years old) account for half of all new HIV infect.Furthermore,The probability of exploration of new drug or vaccine isn't possible in the near future so we have to focus on prevention.
Methods: This descriptive and analytical study was carried out on 212 coaches , 186 teacher and 275 general people(that they are occupied other job).Samples were randomly selected and then their knowledge and attitude was determined by questionnaire. level of knowledge and attitude and The relationship between knowledge and attitude were determined by X2 and Chi-square test and Pearson correlation coefficients.
Findings: This results indicated that all groups obtained information on Aids and most of them obtained information only from media and most frequency of knowledge related to weak level in general people and average level in teachers and coaches.60.2% of coaches and 61.5% of teachers and 51.4% of general people had neutral attitude(Neither agree nor disagree).There was a direct relationship between knowledge level and attitude.
Conclusion: teachers and coaches don't have enough knowledge about Aids.It must be given more information to them and suggested to consider this information as a course.

SURVEY OF WORKLOAD ON HEART FROM THREE MAXIMAL AEROBIC POWER TESTS WITH CALCULATION OF DOUBLE PRODUCT

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Purpose: The product of systolic blood pressure (SBP) by heart rate (HR), the double product (DP), is an index on workload on heart. The purpose of this study was to Survey of workload on heart from three maximal aerobic power tests with calculation of double product.
Methods: For this purpose, 13 subjects randomly were selected from the physical education students at Urmia University. They had at least 3 years experience in regular physical activity and sport participation. Measurements were made during four consecutive days (every day from 2 p.m. to 4 p.m.). At 1st day, age (24.7±2.3 yr), height (176.5±2.6 cm), weight (69.4±3.7 kg), rest HR (63.4±2.8 beat/min) and rest SBP (119±4 mmHg) were measured. Subjects did PWC195 test, Katch-McArdle step test and Astrand ergometer test at 2nd, 3rd and 4th days, respectively. For calculating of test's DP, HR and SBP were recorded at end of each test. Finally, DP values (rest and tests) compared by one-way ANOVA. Statistical significance was accepted at $P<0.001$.
Results: Analysis of data detected that there were statistically significant differences between mean DP values of rest and tests (rest: 7636.2±209.1, PWC195 test: 38045.5±1121.8, Katch-McArdle step test: 17092.6±441.5, Astrand ergometer test 21821.7±672.9 mmHg.beat/min, $P=0.000$. $F=4215.582$(.
Conclusion: According to main differences between sport tests at workload on heart, it seems to be logical recognizing of subject's cardiovascular fitness before testing. It is possible to use DP values for determination of exercise limits for patients (particularly cardiovascular diseases) and survey of athlete's cardiovascular response to physical activities.

EXERCISE TRAINING REDUCES INFLAMMATION IN DIABETICS RATS

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Chronic inflammation is a key player in the pathogenesis of diabetes which is characterized by increased plasma levels of Serum Amyloid A (SAA) and pro-inflammatory cytokines such as tumor necrosis factor-alpha (TNF-α), interleukin 1beta (IL-1β), interleukin-6 (IL-6) and cytokine-induced neutrophil chemoattractant in inflammation 2 alpha/beta (CINC-2α/β) [1]. This inflammatory mediators lead to inappropriate activation of neutrophils and macrophages and contribute to tissue damage as well as increased susceptibility to invasive microorganisms [2]. Exercise has beneficial health effects due to anti-inflammatory actions [3]. Regular exercise practice is recommended to diabetic patient, however, the symptoms of vasculopathies, neuropathy and retinopathy decrease the acceptance to exercise by diabetic's persons. The effects of a three week moderate aerobic-training programme at treadmill (50% of VO2 max, 30 min/day, 5-folds per week) on CINC-2αβ, IL-1β, TNF-α and IL-6 serum levels in diabetic rats were investigated. The number of peritoneal resident macrophages and neutrophil migration were evaluated as soon as the ratio of necrosis and apoptosis of these cells. We also evaluated the serum levels of creatine kinase (CK) and lactate dehydrogenase (LDH). Exercises decreased the serum levels of TNF-α (6%), CINC-2αβ (9%), IL-1β (34%), and IL-6 (86%) in diabetic group as compared with diabetic sedentary rats. In both, control and

diabetic, exercise decreased the oyster glycogen induced-neutrophil migration as compared with no exercised group. No alterations were observed in neutrophil and macrophage necrosis and apoptosis ratio in all groups studied. Serum activities of CK and LDH were not modified in the conditions studied. We conclude that exercise training exerts marked anti-inflammatory effects in diabetic rats, suggesting that this may be an important mechanism for exercise to improve insulin sensitivity and to protect against vascular complication in diabetic patients. Supported by Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP) and Conselho Nacional de Desenvolvimento Cientifico e Tecnológico (CNPq).

[1] Hatanaka E, et al. Interaction between serum amyloid A and leukocytes - a possible role in the progression of vascular complications in diabetes. Immunol Lett. 2007;108:160-6.

[2] Hatanaka E, et al., Neutrophils and monocytes as potentially important sources of proinflammatory cytokines in diabetes. Clin Exp Immunol. 2006 146:443-7.

[3] Anne Marie W. Petersen and Bente Klarlund Pedersen. The anti-inflammatory effect of exercise. J Appl Physiol 2005 98: 1154–1162.

EFFECT OF A 1000M KAYAK SPRINT ON REDOX STATUS, MUSCLE DAMAGE AND INFLAMMATION MARKERS IN ELITE MALE KAYAKERS

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Introduction: Sprint kayaking is a demanding exercise that can generate reactive oxygen species (ROS) to a level that surpasses body's antioxidant capacity causing oxidative stress and damage. This study aimed to determine the response of plasmatic antioxidants and markers of lipid peroxidation, muscle damage, inflammation and physiological stress to a 1000m flatwater kayaking simulated race in elite kayakers.

Methods: Superoxide dismutase (SOD), glutathione reductase (Gr), glutathione peroxidase (GPx) and creatine kinase (CK) activities and levels of uric acid, alpha-tocopherol, alpha-carotene, beta-carotene, lycopene, lutein + zeaxanthin, total antioxidant status (TAS), thiobarbituric acid reactive substances (TBARS), interleukin-6 (IL-6), cortisol, lipoproteins and hematologic parameters were determined in 15 male kayakers before and 15min after the kayak bout. Post-exercise measurements were corrected for hemoconcentration.

Results: Both enzymatic and non-enzymatic antioxidants were unaffected by exercise, with the exception of alpha-carotene which decrease (0.22 to 0.18 mmol/L; P = 0.013). The exercise bout caused a decline in TAS (1.46 to 1.13 mmol/L; P = 0.001) and an augment in CK (256 to 304 IU/L; P = 0.023), uric acid (5.0 to 5.4 mg/dL; P = 0.016), TBARS (5.4 to 9.0 mmol/L; P < 0.001) and IL-6 (1.8 to 2.4 pg/mL; P = 0.028). Post-exercise TBARS and TAS were inversely correlated (r= -0.569, P = 0.027). Cortisol levels were not altered by kayaking (188 and 193 nmol/L; P = 0.824).

Discussion: The stability of alpha-tocopherol after kayaking suggests that it was not consumed or mobilized from adipose tissues, which is consistent with the maintenance of triglycerides levels. Also, the lack of change in carotenoids agrees with the maintenance of their main carrier (LDL). The increased post-exercise uric acid likely resulted from the enhancement of purine metabolism or the inhibition of its renal clearance by lactate. Therefore, the observed decrement in TAS after the kayak bout may reflect a compromised status of other aqueous antioxidants, such as ascorbic acid (not measured). This lowering in antioxidant status was associated with an increase in lipid peroxidation following exercise. The augmented post-exercise TBARS reflect the efflux of peroxides from muscles into plasma. ROS attack of polyunsaturated fatty acids increases the permeability of cell membranes causing the efflux of miocellular CK. However, no correlation between TBARS and CK was detected. The modest rise in CK may be explained by the concentric nature of kayaking and the familiarization with the exercise by athletes. The slight augment in IL-6 after exercise may be due to the type (concentric) and duration (234.0 ± 5.8 sec) of the exercise or to the subjects' training status. Our data indicate that a single 1000m kayak bout impair antioxidant status and induce lipid peroxidation, muscle damage and inflammation even in high-level kayakers.

SPERM AND HORMONAL DIFFERENCES BETWEEN PHYSICALLY ACTIVE AND SEDENTARY SUBJECTS.

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UNIVERSITY OF CORDOBA

INTRODUCTION: It has been previously shown that high-load training, whether intensity or volume, might be detrimental for sperm parameters [1,2]. However, it seems that a less demanding physical activity does not promote any sperm alterations. Moreover, we hypothesize that a physically active lifestyle might result in a more favorable environment for fertility-related processes and might improve or, at least, prevent degradation of hormonal and sperm parameters. Sperm velocity is one of the key parameters for male fertility, since sperm need to move in order to reach the egg and for conception to be able to occur [3]. Thus, the aim of this study was to compare sperm and hormone values of sedentary and physically active subjects.

METHODS: Sperm and hormonal values of 16 physically active subjects (PA; VO2max=45.2±4.2 ml/min/kg, age=19.0±1.8yr) and 15 sedentary subjects (SE; VO2max =34.6±3.9 ml/min/kg, age=19.2±1.9yr) were assessed. The exclusion criteria were any factors interfering with semen production. The inclusion criteria were: not having any exclusion criteria, a practice of 2-4 hs/w (at least in two different days) for PA, and not practicing any physical activity for SE. Sperm velocity was assessed after 3-6 days of abstinence (type "a" velocity is ≥20 micron/sec; type "b" is ≥ 5 and < 20 micron/sec; type "c" is < 5 micron/sec; type "d" is 0 micron/sec, static sperm). Hormonal assessment was performed after an overnight fast with subjects refraining from any physical activity during 3 days before the testing.

RESULTS: No significant differences were found for either type "a" or type "c" velocities. However, the percentage of sperm with type "b" velocity was significantly greater ($p<0.05$) in PA than in SE (27.4±7.2 vs. 21.8±6.8, respectively); moreover, the percentage of static sperm (type "d" velocity) was significantly lower ($p<0.05$) in PA than SE (30.6±4.9 vs. 34.8±5.7, respectively). Likewise, the T/C ratio showed significant differences ($p<0.05$), being higher in PA than in SE (0.46±0.11 vs. 0.32±0.07, respectively).

DISCUSSION: The main finding is that PA subjects seem to have both better sperm velocity and hormonal values than SE. PA showed higher values of type "b" velocity and lower values for "d" velocity (static); this seems to be supported by the greater T/C observed. Therefore, it can be concluded that PA may have a healthier microenvironment for the sperm production process.

REFERENCES

[1] Vaamonde D; Da Silva ME; Poblador MS; Lancho JL. Semen Parameters Response to Three Training Modalities. Int J Sports Med 2006; 27: 680–689

[2] Vaamonde D, Da Silva-Grigoletto ME, García-Manso JM, Vaamonde-Lemos R, Swanson RJ, Oehninger SC. Semen Parameters Response to Three Training Modalities. Fertil Steril. 2008. DOI: 10.1016/j.fertnstere.2008.09.010
[3] World Health Organization. WHO Laboratory Manual for Examination of Human Semen and Sperm-Cervical Mucus Interaction. Ed: World Health Organization. 4th ed. Cambridge, UK: Cambridge University Press, 1999

USE OF MEDICATION AND NUTRITIONAL SUPPLEMENTS IN TRACK AND FIELD ATHLETES

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Introduction: High use of medication and nutritional supplements has been reported in several sports. Athletes participating in team sport events seem to have a higher use of painkilling agents than in individual sport events, whereas higher use of nutritional supplements and beta-2-agonists has been reported in individual sport athletes. Several authors have raised the question whether prescription practice corresponds to medical indication. Detailed analysis in track and field athletes is scarce, especially concerning different age groups and disciplines. This study focuses on the use of prescribed medication and nutritional supplements of track and field athletes depending on their sports discipline with special regard to gender, age, and geographic origin.

Methods: 3'887 doping control forms were analysed undertaken during twelve IAAF World Championships (2003 – 2008) and one entire out-of-competitions season (2007) in track and field athletes.

Results: 6'523 nutritional supplements (1.7 per athlete) and 3'237 medications (0.8) were reported by the athlete. Non-steroidal anti-inflammatory drugs (NSAIDs; 0.27, n=884), respiratory drugs (0.21, n=682), and alternative analgesics (0.13, n=423) were used most frequently. Medication use increased with age (0.33 to 0.64 per athlete) and decreased with increasing duration of the event (from sprints to endurance events) (0.11 to 0.60). African and Asian athletes reported using significantly fewer supplements (0.85 versus 1.93) and medications (0.41 versus 0.96) than other athletes. Compared with middle distance and long distance runners, athletes in power and sprint disciplines reported using more NSAIDs, creatine and amino-acids, and fewer antimicrobial agents. The final ranking in the championships was unrelated to the quantity of reported medications or supplements taken.

Conclusions: The use of NSAIDs in athletics is less than that reported for team-sport events. However, nutritional supplements are used more than twice as often as they are in international football competition. Significant differences were found between the different disciplines regardless of geographic origin. Nevertheless, African and Asian athletes seem to receive lesser pharmaceutical support by their team physicians than other athletes. Whether some of the athletes are over-medicated or others under-supplied due to lower financial resources needs special regard in the future. Both over-medication and under-medication may have detrimental effects not only for the athletes' health status but also for their sports performance. It therefore is absolutely essential that an evidence-based approach to the prescribing of medication and nutritional supplements is adopted, to protect the athlete's health and prevent them from testing positive in doping controls.

1. Tscholl P, Alonso JM, Junge A, Dolle G, Dvorak J. The Use of Medication and Nutrional Supplements in Track and Field Athletes. Am J Sports Med 2009;submitted.

EFFECTS OF ENDURANCE TRAINING AND ONE SESSION OF EXHAUSTIVE EXERCISE ON ACTIVITY OF PLASMA GOT<AST>,GPT<ALT> ENZYMES AND TAC IN RATS

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The aim of this study was to determine the interaction effect of 8 weeks of endurance training and one session of exhaustive exercise on hepatic injury in rats. Methods :Three week-old male wistar rats (n= 24) were randomly divided into two groups 1)endurance training (n=12), and untrained group (n=12) .The first group participated in 8 weeks training program, 5 day/week ,consisted of treadmill running with the beginning speed of 8 m/min for 10 min/day which gradually increased to 32m/min for 1.5 h/day at the 8th weak. At the end of endurance exercise both groups were divided randomly into two subgroups. One of the two subgroups in every group performed exhaustive exercise while the others were given rest and their blood samples were taken after 14 hours resting time. The program of exhaustive exercise was to run on treadmill with the beginning speed of 20 m/min for 10 min while the speed was gradually increased to 35m/min and kept constant until the rats were exhausted. Blood samples of the exhaustive training groups were collected immediately after the end of exercise .The activity of (GOT/AST)(GlutamicOxaloaceticTransaminase), (GPT/ALT)(GlutamicPyrovicTransaminase) and TAC in plasma were measured .The one way ANOVA method with repeated measure at 0/05 significance level was utilized to analyze the data. Results: The results indicated that the level of plasma GOT and GPT enzymes activity in exhaustive group were significantly higher than control group (P<0/05) while no significant increase in the activity of these enzymes in endurance and (endurance+ exhaustive) groups was observed (P>0.05). There was a significant difference in TAC between endurance and control groups as well (P=0/001) while there was no significant difference between endurance and (endurance+ exhaustive) groups (P=0.916).Also there was a significant difference in TAC between (endurance + exhaustive) and exhaustive groups (P=0.024).Conclusion: Findings of current study indicated that increase in activity of GOT and GPT enzymes were observed in exhaustive group while no alteration was seen in trained group. Also body temperature elevation and consequent formation of Heat Shock protein after endurance training has a inhibitory effect on the increase of plasma GOT and GPT enzymes activity after one session of exhaustive exercise in endurance trained group. In this research total antioxidant capacity (TAC) were not altered in exhaustive group .This study showed that endurance training could have inhibitive effect on increase of main hepatic cells injury markers in rats.

14:15 - 15:15

Poster presentations

PP-SA03 Sport Statistics and Analyses 3

THE STATE OF THE ART OF SCIENTIFIC RESEARCH IN COMBAT SPORTS

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Introduction: The aim of the study is to analyse the current situation of the scientific research in combat sports. The study was conducted considering the number of publications and their topics for each discipline. We compared the publications submitted to the ECSS congresses over the last 9 years, to trace the state of the art of scientific research in combat sports and in every specific discipline.

Methods: The research was carried out considering all the abstracts books of ECSS congresses of the last 9 years (1999-2008). Each publication on combat sports was catalogued in specific grids in order to collect data divided into discipline, publication chronological order and lastly scientific type (physiology, refereeing, regulations, tests, training, technique and tactics, etc..).

We analysed statistically the grids by comparing the publications divided into discipline and topic. We calculated percentages and reliability

Results: The total number of articles about combat sports from 1999 to 2008 at ECSS congresses is 171. The majority of the articles deals with Judo (64; 37%;p> 0,01), follow TKD (22; 13%;p>0,01), karate (20; 12%; p>0,01), boxe (n.17; 10%; p>0,01) wrestling (13; 8%;p>0,01), kick boxing (10; 6%;p>0,01), muay thay (4; 2%; n.s.), thai chi chuan (4, 2%; n.s.), sanda - kung fu (2; 1%; n.s.), shoot boxe and MMA (2; 1%; n.s.), and lastly capoeira, kendo and thai boxe with a little percentage of published articles. (1; 1%; n.s.).

We pointed out a significant growth in the number of experimentations in combat sports, in spite of a fair variability in the studies carried out from 1999 to 2008 (1999: 7; 2000: 2; 2001: 23; 2002: 14; 2003 :11; 2004: 18; 2005: 27; 2006: 26; 2007: 17; 2008: 26). From 1999, in effect, ECSS congresses had been showing an ever growing interest in combat sports.

With regard to the topics, the physiological state was dealt with more often (34; 22%), follows the psychological state (16; 11%), injuries and traumas (15; 9%), technique and tactics (14; 9%) , dietary habits (12; 7%), strength tests (10; 6%), athletic training (9; 6%), balance test (8; 5%), athletes comparison (7; 4%), supplements (7; 4%), biomechanics tests (6; 4%), competitions and matches(5; 3%), trainer's methods (4; 2%), endurance tests (4; 2%), speed tests (10; 6%).

Conclusions: We can state that the number of publications in the field of combat sports is rather limited when compared with the publications about other sports. This trend, however, contrast with the high number of athletes who practise such disciplines. The low interest in combat sports showed by researchers can be put down on the lack of funds assigned to research in that field or to the low popularity of martial arts and combat sports in the academic area. Our research group "Combat Sport Study and Research Center" has been working for over 7 years trying to fill the lack of scientific studies in such disciplines.

References

Abstract books of the ECSS Congress (from 1999 to 2008)

THROWING VELOCITY DIFFERENCES IN TRAINING VS. EUROPEAN CHAMPIONSHIPS IN THE WATER POLO SPANISH FEMALE NATIONAL TEAM

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INTRODUCTION: The velocity component of accurate, overhead water polo throws, especially in the act of goal shooting, is an important ingredient of successful scoring ability. It seems that when a tactical situation (goalkeeper) is included the speed has been smaller. However, there are no studies that presents if differences are found in performance between training or real play situations. PURPOSE: To compare the throwing velocity differences in training vs. European championships in the Water Polo Spanish female national team. METHODS: Eleven healthy woman sub-champions of Europe (22.5 ± 2.9 years; 65.0 ± 8.0 kg; 171.7 ± 7.5 cm) were tested at training (pre-competitive period), or at the Europe Championships (competitive period), always in a indoor swimming pool. For the training test, a radar, placed ten meters behind the goal, and aligned with the penalty line, registered two throwing at maximum intensity from the penalty line. The shooting was carried out with a goalkeeper. The best shot was selected for the analysis. For the championships test, the same position of the radar was allowed. We analyzed all the shots carried out from the penalty line in the last five matches. T-test for dependent samples was used (P ≤ 0.05). RESULTS: There were no between-situations differences. The data confirm that the throwing velocity was similar in the training situation (15.46 ± 1.15 m•s-1), when they were compared to the championship condition (15.55 ± 2.24 m•s-1). CONCLUSION: The throwing velocity is similar when a water polo player performs a shot from the penalty line with goalkeeper, independently the situation: training vs. international championship. In this sense, the control of the throwing velocity over the training can be a very reliable method of the championships shots velocities. REFERENCES: 1. Bloomfield J, Blanksby BA, Ackland T, et al. The influence of strength training on overhead throwing velocity of elite water polo players. Aust J Sci Med Sport, 1990; 22: 63-7. 2. Triplett T, Fleck SJ, Smith SL, et al. Isokinetic torque and throwing velocity in water polo. Med Sci Sports Exerc, 1991; 23: S11. 3. Smith SL. Applied physiology of water polo. Sports Med, 1998; 26: 317-34. 4. Van Der Wenden K. The effects of game-specific task constraint on the outcome of the water polo shot. New Zeland: Auckland University of Technology, 2005. 5. Vila H, Ferragut C, Argudo FM, et al. Relationship between anthropometric parameters and throwing velocity in water polo players. J Hum Sport Exerc, 2009; 4: 57-68.

ANALYSIS OF REFEREES' DECISIONS DURING THE FIFA WORLD CUP 2006

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Introduction: During World FIFA Championships media, sponsors, and nationalism create a relevant pressure on teams and referees. Despite this environment, top-class referees need to officiate processing information accurately and reacting with appropriate decisions (MacMahon et al. 2007). Differently from team sports that make use of technology for offside decisions, during a football game the referee has individual decision-making responsibilities, which reflect both his personality to apply the football rules and different "national refereeing styles". The aim of this study was to describe the profile of the referees' decisions during the World Soccer Championship 2006.

Methods: The referees' decisions from the 64 matches of the 2006 FIFA World Championship were analyzed by means of the following indicators: 1) Direct Free Kick (D), i.e. kicks or attempts to kick an opponent, charges an opponent, handles the ball deliberately, etc.; 2) Indirect Free Kick (I), i.e. offside, plays in a dangerous manner, etc.; 3) Disciplinary Sanctions (S), i.e. delaying the restart of play, deliberately offence versus referee, etc. Data were analyzed in relation to the entire match, the two halves, the different time periods (0-15, 15-30, 30-45, and overtime) of each half, and the tournament's phase (qualifying, quarter-finals, semi-finals and finals).

Results: During the 1st half, the occurrence of D, I, and S was 81%, 14%, 5%, respectively. The relative picture during the 2nd half was 75%, 20%, 5%. Regarding D, decisions per match were 9±4 for kicking an opponent, 5±3 for charging an opponent, and 10±4 for pushing an opponent, respectively. The relative picture for I indicators was 5±3 for the offside and 1±1 plays in a dangerous manner. In relation to the game periods, yellow cards occurred most frequently during the last 15 min of the two halves (19%). While red cards showed the highest frequency during the first 15 minutes of the 2nd half (29.2%), 12.5% and 8.3% occurred during the 1st and 2nd overtime periods, respectively.

Discussion: In general, the low occurrence of D, I, and S during a match indicates that teams participating in FIFA World Cup 2006 mostly engaged in a fair playing. However, a more aggressive play occurs during the last fifteen minutes of each half and the first period of second half when the players are more likely to receive yellow cards. The surprisingly occurrence of red cards during the overtime periods could be attributed to the players' attempt to catch the last chances to score a goal.

References

MacMahon C. et al., (2007). Journal of Sports Sciences, 25(1): 65–78.

POSSIBLE EFFECTS OF NEW REGULATION IMPLEMENTATION ON POLE VAULT EVENT

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Introduction: According to the Athletics European Team Championships new regulations, which are to be introduced in June 2009, each pole vault event competitor shall be entitled to a maximum of 4 fouls only throughout the whole event. The purpose of the present study was to examine the possible effects that the implementation of the new regulations, would have had on the conduction of the event for males and females.

Methods: Male and female pole vault finals official results in Olympic Games, IAAF Outdoor World Athletics Championships and European Outdoor Athletics from 2000 onwards, were analysed.

Results: Male pole vaulters (N=102), start the competition at a mean height of 551.29cm (SD±7.96) and conclude at 568.31cm (SD±15.57), with a mean height difference of 17.02cm (SD±12.49). During the event they perform a mean of 6.85 attempts (SD±2.16), classified as either successful (M=2.41, SD±1.15) or failed (M=4.44, SD±1.38). Following the fourth foul 40.20% of them perform failed attempts (M =1.80, SD ±0.98 attempts) and 10.78% successful ones (M=1.36 SD ±0.67 attempts). If the new regulations were applied, athletes would achieve a mean height difference of 15.83cm (SD±4.82) between start and finish.

Female pole vaulters (N=93), start the competition at a mean height of 424.19cm (SD±16.46) and conclude at 450.56cm (SD±19.71), with a mean height difference of 26.37cm (SD±13.35). During the event they perform a meane of 8.01 attempts (SD±2.48), classified as either successful (M=3.47, SD±1.59) or failed (M=4.52, SD±1.48). Following the fourth foul 50.54% of them perform failed attempts (M=1.68, SD±1.23) and 12.90% successful ones (M=1.50, SD±0.67 attempts). If the new regulations were applied, female athletes would achieve a mean height difference of 24.91cm (SD±4.82) between start and finish.

Discussion: Data demonstrate that the new rules would have resulted in a decrease in the event final performance (6.99% and 5.53% for males and females respectively), due to a mean attempt restrain of 11.13±4.76 and 12.13±6.64, in each final, for males and females respectively. No data however was available for variables such as the time duration of the event and our statistical analyses were based exclusively on the results recorded with the current regulations. Therefore, further research is required before drawing permanent conclusions regarding possible effects on the pole vault event duration and athletes' tactics.

References

European Athletics, Regulations for European Team Championships, 2009. [online] available from: < http://www.european-athletics.org/files/app3_-_european_team_championships-regulations-october_2008.pdf > [accessed 9/12/2008]

IAAF (2009). IAAF competition rules 2009. Monaco: International Association of Athletic Federations.

POSSIBLE EFFECTS OF NEW REGULATION IMPLEMENTATION ON HIGH JUMP EVENT

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UNIVERSITY OF ATHENS

Introduction: According to the Athletics European Team Championships new regulations, which are to be introduced in June 2009, each high jump event competitor shall be entitled to a maximum of 4 fouls only throughout the whole event. The purpose of the present study was to examine the possible effects that the implementation of the new regulations, would have had on the conduction of the event for males and females.

Methods: Male and female high jump finals official results in Olympic Games, IAAF Outdoor World Athletics Championships and European Outdoor Athletics from 2000 onwards, were analysed.

Results: Male high jumpers (N=102), start the competition at a mean height of 218.63cm (SD±2.70) and conclude at 228.07cm (SD±4.93), with a mean height difference of 9.44cm (SD±4.83). During the event they perform a mean of 7.28 attempts (SD±1.91), classified as either successful (M=3.15, SD±1.40) or failed (M=4.10, SD±1.17). Following the fourth foul 37.25% of them perform failed attempts (M=1.39,

SD±0.59 attempts) and 1.96% successful ones (M=1.50, SD±0.70 attempts). If the new regulations were applied, athletes would achieve a mean height difference of 9.34cm (SD±4.82) between start and finish.

Female high jumpers (N=105), start the competition at a mean height of 184.11cm (SD±2.38) and conclude at 195.02cm (SD±5.19), with a mean height difference of 10.90cm (SD±5.00). During the event they perform a mean of 8.21 attempts (SD±2.34), classified as either successful (M=3.90, SD±1.76) or failed (M=4.30, SD±1.14). Following the fourth foul 37.14% of them perform failed attempts (M=1.54, SD±0.75 attempts) and 5.71% successful ones (M=1.17, SD±0.40 attempts). If the new regulations were applied, female athletes would achieve a mean height difference of 10.71cm (SD±4.82) between start and finish.

Discussion: Data demonstrate that the new rules would have resulted in a decrease in the event final performance (1.05% and 1.74% for males and females respectively), due to a mean attempt restrain of 7.00±4.00 and 8.50±3.85, in each final, for males and females respectively. No data however was available for variables such as the time duration of the event and our statistical analyses were based exclusively on the results recorded with the current regulations. Therefore, further research is required before drawing permanent conclusions regarding possible effects on the high jump event duration and athletes' tactics.

References

European Athletics, Regulations for European Team Championships, 2009. [online] available from: < http://www.european-athletics.org/files/app3_-_european_team_championships-regulations-october_2008.pdf > [accessed 9/12/2008]

IAAF (2009). IAAF competition rules 2009. Monaco: International Association of Athletic Federations.

THE ANALYSIS OF DIFFERENCES IN TEHNICAL AND TACTICAL ELEMENTS OF JUDO BASED ON THREE WOMEN BALKAN'S CHAMPIONSHIPS

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Introduction: The objective of this research was conducted in order to determine the differences in technical and tactical elements of women judo fights on Balkan's Championships and to compare levels of differences in using tactical and technical elements during competition activities. A sample of 137 judo matches on three Balkan's Championships was used (2001/2002 and 2006).

Methods

In the purpose of analysis, we must introduce technical and tactical variables. For this research canonical discriminated analysis was used to determine the differences in particular situations (Rc, Wilk's Lambda, Barttler's test, Test of functions, Structure, Matrix, Chi-square).

Results: The result of this analysis show that there are statistically significant differences between matches on Balkan's Championships 2001/2002 and 2006. Summary of canonical discriminate functions show one isolated discriminated function.

The x2 (Chi Square) test was used to determine the differences between indicators for situational efficiency. The results show statistically important differences between fights on tree Balkan's Championships for:

Place of attack on the tatami ($x2 = 25.5$; $df = 1$; $p = 0.000$)

Technical points and penalties ($x 2 = 27.0$; $df = 8$; $p = 0.001$)

Elapsed time ($x2 = 9.36$; $df = 1$; $p = 0.002$)

Grips configuration ($x2 = 7.75$; $df = 2$; $p = 0.021$)

Discussion: Main reason for those differences is changing of judo rules during 2002-2006 periods, made by IJF. According to them, there is no red square on tatami, penalties and match duration for women are changed and "gold point" is introduced. These parameters were gathered concerning real fight at the highest competitive level. Also, regarding all analyzed matches, the differences were noticed in frequency of used techniques between NAGE WAZA and KATAME WAZA groups. Given results might be used for programming and training process control improvement in judo for senior female fighters in Bosnia and Herzegovina and wider.

References

Adams, N (1995). Grips, Ippon Books, Ltd

Kajmovic, H, Radjo, I., Kapo, S (2006). Differences in performance of situational efficiency between senior male and female participants at the European championships in judo, 2003 & 2004. International Society of Performance Analysis of Sport, Hungary

Sterkowicz, S (1998). Differences in the tournament activity of women and man in judo. Research paper, Institute of Sport Warsaw, Poland.

RACING STRATEGY IN BMX COMPETITION

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Introduction: Theories based on time trial studies indicate an advantage of a fast start for short and middle distance cycling events. However, when competing at the same time against other competitors, tactics also plays a role in pacing and winning. The main purpose of this study was to determine which racing strategies elite riders use to distinguish themselves from sub-elite riders.

Methods: The measurements were done during a European Championship round of Bicycle Motocross (BMX). The course was 358m long and divided in 6 sections (S1-S6), with the aid of the start, 5 strategic points (T1: after 10m; T2-T5 after each straight) and the finish (TF). With use of multiple video cameras, time and rank on T1-T5 and TF were recorded during the semi-finals of this race in the category Elite Men. From this, split-time, section-speed, normalized split-time, and final-time were determined. Split-ranking and final ranking was also determined. A Student's t-test was used to determine differences between elite riders (top 5) and sub-elite riders (11-16).

Results: Elite riders have a higher normalized split-time ($p<0.01$) than sub-elite riders on T1 (5.14% vs 4.97%) and T2 (21.77% vs 20.94%). The speed-distance profile shows a declining speed from S2-S6 for sub-elite riders. Elite riders have the same profile, but accelerate on S4. Elite riders ride a significant faster speed (11.09 vs 9.89 m/s) on S4 ($p<0.01$) than sub-elite riders. Split-times for elite riders was significant faster on T4, T5 and TF. Most rank changes occur on S2-S4 (10, 12 and 9 rank changes respectively), while few rank changes occur on S5-S6 (6 and 4 changes respectively).

Discussion: Elite riders in this study distinguish themselves from sub-elite riders in that they use a different racing strategy. Elite riders have a relative faster start and are able to accelerate on S4 where sub-elite riders cannot. This gives elite riders a tactical advantage in the last part of the race, where few rank changes occur. Koning et al. (1999) indicate that an all-out strategy is the best strategy on distances shorter than 1000m, based on a energy-flow model. The speed-distance profile in this study though, resembles more the pattern of a 1500m simulated time trial, as found by Hettinga et al. (2007). One explanation is the influence of tactics on the race strategy (Jones &

Whipp, 2002), which is absent in a simulated time trial. Another explanation for the finding is the used gear ratio, which is quite small in BMX, resulting in a quicker acceleration and achieving peak power and peak speed earlier than on a race bike and therefore requiring a more evenly paced strategy as power is generated more quickly resulting in a faster fatique.

References

Hettinga FJ, De Koning JJ, Meijer E, Teunissen L, Foster C (2007). Med Sci Sports Exer, 39 (12), 2212-2218.

Jones AM, & Whipp BJ (2002). Br J Sports Med, 36, 102-104.

Koning JJ de, Bobbert MF, Foster C (1999). J Sci Med Sport, 2(3), 266-277.

ANALYSIS OF FREE-THROW QUOTAS OF LEFTHANDED AND RIGHT-HANDED ELITE BASKETBALL PLAYERS

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Introduction: Research in the domain of handedness in sports showed that a tactical advantage is attributed to left-handed athletes in many sports (Brooks et al., 2003; Wood and Aggleton, 1989). There are only a few studies which analysed performance of sport-specific motion sequences of right- (RH) and left-handed (LH) athletes (Grondin et al., 1999). The aim of this study was to examine whether LH elite basketball players have a better free throw quota than RH elite basketball players.

Methods: The free throw performance of 299 players who participated in the season 2006/2007 of the NBA was evaluated statistically. The data were taken from the NBA website. The players were classified depending on position and handedness (right-hander: n=280, left-hander: n=19). The handedness was identified using the official list of LH players of the Association for Professional Basketball Research. In addition an online search of photos of all players was made. In order to discover significant differences between the free throw quota of all LH and RH basketball players and those playing the same position the Mann-Whitney-U-test was used.

Results: The free throw quota of the LH players was significantly higher (p= 0.034*). The highest significant result (p= 0.011*) was shown on the guard position. For the forward and center position no significant difference respectively no representative finding was obtained. There were over two times more LH players (26.3%) than RH players (12.1%) reaching a free throw quota over 85%. On the other hand, almost two times more RH players (19.3%) than LH players (10.5%) were found reaching a free throw quota under 65%.

Discussion: In contrast to other studies the strategic advantages, which were considered to be the reason for the superior performance of left-handers, are excluded in the free throw situation. The better performance of left-handers has been attributed to neurological benefits (Anzola et al., 1977; Geschwind and Galaburda, 1985). These benefits are often associated with better visual and spatial abilities (Nass and Gazzaniga, 1987) and could explain the results of this study and the findings of other examinations (Dane and Erzurumluoglu, 2003; Stöckel et al., 2007). Further studies examining different motor skills, a greater number of subjects and the reasons for the phenomenon found should be conducted.

References:

Anzola G, Bertolini G, Buchtel G, Rizzolatti G (1977). Neuropsychological, 15(2), 295-302.

Brooks R, Bussiere LF, Jennions MD, Hunt J (2003). Proc R Soc. B, 271, 64-66.

Dane S, Erzurumluoglu A (2003). Int J Neurosci, 113(7), 923-929.

Geschwind N, Galaburda AM (1985). Arch Neurol, 42(5), 428-459.

Grondin S, Guiard Y, Ivry RB, Koren S (1999). J Exp Psychol, 25(3), 747-754.

Nass RD, Gazzaniga MS (1987). In: F Plum (Ed), HB Physiol-Nerv Syst V. Oxford University Press, New York.

Stöckel T, Hartmann C, Weigelt M (2007). Z Sportpsych, 14(3), 130-135.

Wood CJ, Aggleton JP (1989). Brit J Psychol, 80, 227-240.

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SPEED ADAPTATION IN CYCLE DURATION AND EMG DURING RUNNING ON DIFFERENT GROUND SURFACES AMONG ORIENTEERS

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Introduction: Orienteering is a sport that is extremely demanding, not only with respect to work load, but also with respect to running techniques that has to be performed on different surfaces at different speeds. The change in surface from hard to soft and from even to extremely uneven etcetera will impose a challenge to the neuromotor system to execute an optimal movement for the specific demands. From a motor control point of view it would be beneficial to use a similar basic movement pattern over the whole velocity range and on different surfaces. The purpose was to study how important stride parameters such as the cycle duration, electromoygraphical (EMG) burst duration and activation level change with speed and with change in running surface.

Methods: In total six male elite orienteers, mean (range) age, height and weight; 25 (19-32) years, 1.80 (1.74-1.88) m and 71(67-75) kg, participated in the study. EMG was recorded with surface electrodes on m. vastus lateralis (VL) on the right leg. Angular displacement of the hip joint of the right leg was recorded by means of an electrogoniometer and used to determine the cycle duration. The participants ran on four different horizontal ground surfaces; gravel stone road, forest terrain, timber felling and wet moss. The recordings were done during running in four different constant self determined speeds: slow, medium, fast and maximum speed. The actual mean speed in the recording intervals performed by the orienteers were determined by means of an ultra sound based timing system (Time it, Eleiko AB, Sweden).

Results: The cycle duration decreased in a similar manner with speed during running on all the tested surface conditions. The burst duration of the knee extensor m. vastus lateralis shows the same trend as the change in cycle duration with speed. The same increasing trend in mean EMG activation level with speed is seen on all running surfaces. Surface related differences in cycle duration, burst duration and EMG amplitude were present.
Discussion: The clear trends in cycle duration and EMG during running on different surfaces with speed indicate that the neuromotor system tend to adapt the control of locomotion with a similar basic pattern in the studied parameters. Despite the similar generic trends a running surface like the wet moss may limit the speed range, elongate the EMG burst duration and demand a higher EMG activation level for a given speed. This is important information in endurance and strength training design and for the acute route choices in an orienteering race.

ACCURACY OF SHOOTING RESULTS IMITATION WITH AN OPTOELECTRONIC TRAINING SYSTEM

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Controlling of postural and weapon stability is a distinctive feature in the sport of shooting [1]. Optoelectronic training systems provide a shooter with data and graphical information on the aiming line cross point coordinates on a target [2]. The SCATT system indicates a prognostic result of a real shot taking into account the period of time from triggering up to the instant when a pellet leaves a barrel and also a lateral motion of a muzzle because the pellet having left the barrel continues moving in the same direction as the muzzle [3].
The aim of the research is to compare pellet coordinates on a target with coordinates of the SCATT system imitation trace.
The method of study includes shooting with Steyr LP-10 air pistol and 4,49 mm Finale Match pellets using simultaneous recording on the SCATT system and shooting with the pistol held in a vice and pellets from the same box. A research hypothesis is that coordinates of the imitation and pellet's coordinates on a target are equal. Relative coordinates of the SCATT system point and the pellet mark on a target were calculated to avoid systematic errors caused with non-focus of its axis and a barrel axis on a target, and a gravitational displacement of a pellet. A statistical hypothesis is that a dispersion of the relative coordinates equals a dispersion of pellets hit coordinates shot with the viced pistol.
A highly qualified female shooter made 10 shots from a 10 m distance. An initial speed of pellets (M±SD=162.2±0.6 mps) was measured with a chronoscope Combro cb-625мk4. A shot moment (0.0031 s) was calculated as a time of pellet motion along a barrel (0.25 m) assuming a constant acceleration during the time. A distance between pairs of the pellet and imitated points in the relative coordinates was 2.52±0.72 mm. A radius from a centre of 10 shots executed with the viced pistol was 1.36±0.76 mm. Normal distribution of the two samples was accepted using Shapiro-Wilk test ($p>0.1$). With Fisher-Snedecor criterion, the statistical hypotheses about equal variances was accepted ($p>0.620$). T-test showed a large difference in the mean distances ($p<0.003$), i.e. the SCATT system imitation of the pellet mark on the target is not relevant enough. This could be caused by non-correct modelling of a muzzle trajectory as the trace imitation because angular motion of a barrel relative to the muzzle falsifies calculation of its lateral speed. The SCATT system measures one kinematical parameter in the sagittal and one in the transverse plane. They are vertical and horizontal coordinates on a target simulation. A relevant model of a barrel motion needs one more parameter in both of the planes, e.g. angles of the barrel axis relative to a normal line to the target plane.
REFERENCE

1. Nowak S. Controlling of upright position and its development in the process of physical education. Radom: Politechnika Radomska, 2005

2. Mononen K. et al. Scand. J. Med. Sci. Sports. 13(3): 200-207, 2003

3. www.scatt.com

ESTIMATION OF CARDIORESPIRATORY FITNESS AMONG YOUNG MEN WITHOUT EXERCISE TEST

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Cardiorespiratory fitness is accurately measured by exercise testing, which is time consuming and not suitable for large group of subjects. Previous studies suggest that self-reported exercise habits may be useful in developing non-exercise prediction models for maximal oxygen consumption (VO2max) among adult population (1). However, simple methods are needed to estimate VO2max of young male conscripts before they enter compulsory military service. It would be useful to divide conscripts into different fitness groups in order to optimize the volume and intensity of physical training.
PURPOSE: To develop and estimate the validity of non-exercise method to predict VO2max among conscripts.
METHODS: Before military service, 50 males (age 19.7±0.3 years) reported their physical activity by international physical activity questionnaire (IPAQ)(2). In addition, Jackson's non-exercise method (1) was used to estimate their VO2max. During the first week of military service, VO2max (ml/min/kg) was directly measured in a maximal treadmill test. Body weight and height were also measured, and body mass index (BMI) was calculated. Subjects were randomly divided into two groups for further analyses. The results of the first group (N=25) were used to develop a regression equation to estimate cardiorespiratory fitness of young men based on IPAQ questions and anthropometric measures (CF method). The results of the second group (N=25) were used to evaluate the validity of this new developed CF method and Jackson's non-exercise method. VO2max estimates by these two methods were compared to directly measured VO2max by Bland and Altman plot (3).
RESULTS: Jackson's method overestimated VO2max so that mean difference between directly measured and estimated VO2max was -5.2 ± 4.6 ml/kg/min ($p<0.001$). Furthermore, Jackson's method overestimated VO2max to a higher degree among males with good cardiorespiratory fitness. New CF-method (regression equation including IPAQ's question of vigorous exercise and BMI) explained 71% of conscripts' VO2max (SEE 4.0 ml/kg/min). Mean difference between directly measured and estimated VO2max was non significant (-1.8 ± 5.7 ml/kg/min). There was neither significant correlation ($r = 0.22$, $p<0.28$) between the mean values and the difference of the CF and VO2max.
CONCLUSION: These findings indicate that CF method estimates VO2max equally well among males with high or low cardiorespiratory fitness. The present results suggest that VO2max of conscripts can be estimated with reasonable accuracy by body weight, height and self-reported participation in vigorous intensity physical activity. In practice, these findings suggest that CF method can be used as a tool to divide conscripts into different fitness groups in the very beginning of their military service.

REFERENCES:
1. Jackson AS et al. MSSE, 22:863-70, 1990.
2. Craig CL et al. MSSE, 35:1381-95, 2003.
3. Bland & Altman DG. Lancet, 1:307-10, 1986.

THE EFFECTS OF RESISTANCE TRAINING INTENSITY ON PHYSICAL FITNESS GAIN IN THE OBESE ELDERLY WOMEN

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Introduction: This study was designed to investigate how resistance training intensity affects muscular strength and body composition change responses in the obese elderly adults over a 12-week training period.
METHODS: Thirty-nine volunteers (obese elderly women) were divided into the following three groups; high-resistance (60~70% of 1RM, age 69.75±2.83, percent body fat 35.15±4.95), mid-resistance (40~50% of 1RM, age 68.64±3.2, percent body fat 34.78±5.32), low-resistance (20~30% of 1RM, age 70.92±3.86, percent body fat 33.82±5.29) training group. Exercise regimens consisted of three sets of arm curl, shoulder press, chest press, lat pull-down, abdominal, leg extension, leg curl, leg press, and hip adductor, 12 repetitions/set, 3 sets, 3 days/week. Each exercise program contains five minutes of warm-up session using cycle ergometer, main exercise using nine kinds of adjustable resistance exercise machine, and five minutes of cool-down session with stretching and belt massage. Dynamic muscle strength evaluated by 1RM on the nine exercises, senior fitness test (30s chair stand, 6-minute walk, functional reach, arm curl, grip strength, chair sit-and-reach), and body composition (body fat and percent body fat) were measured at 0, 6, and 12 weeks.
RESULTS: 1RM strength for all nine exercises increased significantly ($p<.05$) between groups according to period of exercise, and especially in 12th week, higher increase of 1RM occurred in the high-resistance and mid-resistance groups than in the low-resistance training group between-period without shoulder press. In the body composition, even though there was no meaningful difference between groups in terms of strength of exercise, it was noted that body fat and percent body fat reduced, and muscle mass increased after 6th week. Senior fitness test had statistically meaningful differences ($p<.05$) between period analyses on the all test items.
CONCLUSIONS
Following 12 weeks of strength training all three groups improved in the 1RM strength, senior fitness test, and body composition (in between-period analysis), but there were no differences in between-group (exercise intensity analysis) at any measurement factor in the 1RM strength, senior fitness test, and body composition.

MONITORING TRAINING IN ELITE SPRINGBOARD DIVERS.

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Introduction: Monitoring training is critical to the process of quantifying and correctly planning training, especially in the periodization of elite athletes. Session RPE method has proven to be successful in monitoring training load during steady state, high-intensity and multiple types of exercises (Foster C.,'96, '98, 2001, Minganti C. 2008). Divers practice basic skills, basic dives and optional dives from different heights (both springboard and platform); dryland workouts are also scheduled to work on specific skills and to improve strength and flexibility. No previous studies were conducted to evaluate the session RPE method in this sport Therefore, the aim of the present study was to evaluate the ability of the session RPE method to quantify training during diving practice.
Methods: Six elite divers, three males (age=25,7±6,1yrs; height= 171±6,1 cm; weight=66,7±1,2 kg) and three females (age=25,3±1yrs; height= 163,3 ±4,7 cm; weight=58,3±4 kg) participated in the present study. Each subject was monitored during two different training sessions (1 and 3 meters springboard) with a Heart Rate (HR) monitor (Polar Team System), and the RPE rating was obtained using the 10 cm VAS (Visual Analogue Scale). The subjects were asked to provide a rating of the overall difficulty of the training session 30 minutes after the end of the session. An exercise score for each training session was computed by multiplying the duration of the training session by the RPE (Session RPE). As an objective reference method for quantifying each training session the summated HR zone method (Edwards S.,'93) was used. The HR monitors were downloaded using software that allowed evaluation of the accumulated time in each of 5 HR zones based on 50-60%, 60-70%, 70-80%, 80-90% and 90-100% of theoretical HR peak (220-age). Time in each zone was used to calculate the training score (TRIMP) by multiplying the accumulated duration in each HR zone by different factors (50-60%=1; 60-70%=2; 70-80%=3; 80-90%=4, 90-100%=5) and summating the Results: Results: Pearson's correlation coefficient was used to evaluate the relationship between TRIMP scores (TRIMP =96±18,18) generated using the summated HR zone method and the session RPE (Session RPE =2372±882,28) method of monitoring the training session. Results (r= 0,88; p<0,05) shows a high correlation coefficient between the two Methods: Discussion: Results of this study are consistent with previous observations of a strong correlation between session RPE and the summated HR zones methods of evaluating training sessions.
Our results suggest that the session RPE method may be used as an easy method of creating a TRIMP score for evaluating exercise training in diving as well.
References
Foster C. et al. (1996), Wiscon. Med. J., 95, 370-374.
Foster C. (1998), MSSE, 30(7), 1164-1168.
Foster C. et al. (2001), J.of Strenght & Cond.Res.; 15(1), 109-115.
Edwards S. (1993) Sacramento:Fleet Feet Press, 113-129.
Minganti C. (2008) ECSS; 450.

EFFECTS OF COMBINED RELAXATION AND SHOOTING TRAINING ON SHOOTING PERFORMANCE IN BIATHLON

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Applied Tension Release (ATR) training has been successfully used in different clinical contexts in order to enhance the ability to decrease unwanted and unnecessary tension and arousal in everyday life situations (Öst 2002; Lisspers&Almén 2008). To some degree correspondingly, in biathlon, which consists of cross-country skiing and shooting, sportsmen must recover fast after the high intensity skiing bout just before the shooting and moreover, needs to have a ability to focus on shooting under a high external (e.g. public, other com-

petitors) but also internal stress. In one earlier study, Groslambert et al (2003) have shown that 6 weeks of shooting training combined with imagery training improved the stability of rifle at standing position in biathletes. However, there are only few studies considering shooting performance or shooting training in biathlon. Therefore, totally 20 biathletes at high national level (age 20+-4 yr, VO2max 60+-7 ml/kg/min-1, 1-13 (range) years in biathlon) were recruited to the study. First, VO2max and shooting performance at rest and immediately after two sub-maximal exercise intensities (75% and 90% of VO2max) were measured. Thereafter, subjects were randomized into experimental (EXP) and control (CON) groups. During 11 weeks intervention, the EXP group performed specific ATR-training 6 times per week, first with help of specific CD-ROM program (weeks 1-2). Thereafter, ATR training was successively combined with holding and "dry firing" training, with a goal that during the last two weeks of the intervention, ATR was integrated into all shooting training. CON continued their usual shooting training. Shooting performance was measured by SCATT prof. shooting training system® based on laser light, and was determined as a group size (mm) and stability of aiming (mm) for 20 shots at rest, and for 10 shots per each exercise intensities, but also as a total shooting accuracy which was calculated as a total sum of group size and stability of aiming at rest and during both exercise intensities. The exercise mode in all measurements was roller skiing on the treadmill. Totally 12 subjects (EXP n=7, CON n=5) completed the study. No change in VO2max was observed in EXP or CON group. EXP group showed decrease in group size at 75% of VO2max ($p<0.05$). In addition, stability of aiming was enhanced at rest and at 75% of VO2max ($p<0.05$) in EXP but also at 90% of VO2max ($p<0.05$) in CON. The total shooting accuracy was significantly improved (11%) in EXP compared to CON ($p<0.05$). Therefore, ATR training combined with shooting training enhances the shooting performance, and therefore, if these results can be replicated in further studies, it can potentially be recommended for the biathletes.

Groslambert A, et al (2003) Res Q Exerc Sport 74(3): 337-341

Lisspers J, Almén A (2008). Folksam Hälsa AB (swedish only, in press).

Öst L-G (2002) Encyclopedia of Psychotherapy (Vol1). M. Hersen & W. Sledge (Eds.), USA: Elsevier Science

THE IMPACT OF PHYSICAL ACTIVITY ON THE BEHAVIOUR OF RODENTS BY USING A DEXAMETHASONE-INDUCED RAT MODEL OF DEPRESSION.

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The antidepressive effect of physical exercise is of important interest, because the prevalence of depression, the economic burden and the need for more effective treatment options are enormous. The time delay in therapeutic response of antidepressants led to the theory that neural adaptations are required to induce a relief of depressive symptoms. The upregulation of neurotrophic factors seems to play an important role in the therapeutic response [1]. Exercise also induces the upregulation of neurotrophic factors [2]. In this study we tested the effect of physical activity on the behaviour of rodents that were treated with dexamethasone to induce depressive-like behaviour. Materials and methods: The studies were carried out on 32 adult male Wistar rats that were randomly divided into four groups. The "control group" (C), "control and exercise group" (CE), "dexamethasone control group" (DC) and the "dexamethasone and exercise group" (DE). The exercise consisted of a swimming exercise (1 h / day, 5 days / week) for 4 weeks (20 exercise training days), with an overload of 5 % of the rats body weight [3]. Every day rats were injected with either dexamethasone (DC / DE) or a saline solution (C / CE). It is known that these constant high concentrations of dexamethasone are able to induce depression-like behavior in rats [4]. The depressive-like behavior has been tested by using the Sucrose preference test SPT [5] that was performed twice before, after 7, 14, 21 and after the 4-week-swimming-period. Results: The SPT did not show differences between the groups on both tests before, on day 7 and 14 days of exercise. On day 21 and after the training period the DC group differed significantly from all other groups showing depressive-like behavior. All other groups including the DE group showed on day 21 and after the training non-depressive-like behavior. Conclusion: The results demonstrate in an animal model of depression the antidepressant effect of exercise in the SPT matching with the time delay observed in other therapeutic responses. To affirm these results the levels of neurotrophic factors will be measured.

[1] Nibuya M et al. (1995): Regulation of BDNF and trkB mRNA in rat brain by chronic electroconvulsive seizure and antidepressant drug treatments. J. Neurosci. 15, 7539–7547.

[2] Hunsberger JG et al. (2007): Antidepressant actions of the exercise-regulated gene VGF. Nature Med. 13, 1476–1482.

[3] Gobatto CA et al. (2001): Maximal lactate steady state in rats submitted to swimming exercise. Comparative Biochem Physiol 130:21–27.

[4] Antonijevic IA, Steiger A (2003): Depression-like changes of the sleep-EEG during high dose corticosteroid treatment in patients with multiple sclerosis. Psychoneuroendocrinology 28:780-795.

[5] Casarotto PC, Andreatini R (2007): Repeated paroxetine treatment reverses anhedonia induced in rats by chronic mild stress or dexamethasone European Neuropsychopharmacology 17, 735–742.

31P MRS AND MOTOR PERFORMANCE TESTS DISPLAY DIFFERENCES IN SKELETAL MUSCLE PROPERTIES OF SPRINT-TRAINED AND ENDURANCE-TRAINED SUBJECTS

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Introduction: Until recently, assessment of muscle metabolism was only possible via biopsy sampling, which is an invasive procedure. 31P-Nuclear magnetic resonance spectroscopy (31P-NMRS) nowadays offers a feasible way to study aerobic and anaerobic muscle metabolism non-invasively. Therefore, the aim of the present study was to assess muscle fibre properties of sprint-trained and endurance-trained athletes by 31P MRS and appropriate motor performance tests.

Methods: Ten competitive athletes, stratified according to their discipline and activity into five sprint-trained (SG) and five endurance-trained (EG) athletes, participated in the present study. Each athlete completed a 31P MRS assessing high energy phosphates, intracellular pH and muscle volume, a Wingate test (WAnT) measuring peak power (PP), mean power (MP), fatigue index (FI) and a countermovement-jump measuring jump height. Additionally, lactate was taken 3 minutes after the end of the WAnT.

Results: Lateralis PCr content of the EG was significantly higher than in the SG during the second recovery phase of MRS. PCr concentration of the lateralis muscle in the second recovery phase and MP.kg-1 correlated negatively: r = -0.728 (p ≤ 0.05). Muscle volume of the m. quadriceps was significantly greater in SG than in EG (2406 ± 250 cm3 and 2866 ± 339 cm3, p ≤ 0.05). The SG exhibited significantly higher values for PP, MP, FI and lactate as well as for jump height (p ≤ 0.01). Lactate post WAnT correlated significantly (p ≤ 0.01) with jump height (r = 0.97). T-Tests for independent variables and a logistic regression analysis were carried out.

Conclusion: Skeletal muscle reveals considerable differences between endurance and sprint athletes. 31P MRS in combination with motor performance tests therefore seems to be a suitable tool to display differences in skeletal muscle properties of subjects with a supposed difference in their muscle fibre distribution.

References:

1. Bernus G, Gonzalez de Suso JM, Alonso J, Martin PA, Prat JA, Arus C. 31P-MRS of quadriceps reveals quantitative differences between sprinters and long-distance runners. Med Sci Sports Exerc 1993;25(4):479-84.

2. Tesch PA, Karlsson J. Muscle fiber types and size in trained and untrained muscles of elite athletes. J Appl Physiol 1985;59(6):1716-20.

3. Yoshida T, Watari H. Exercise-induced splitting of the inorganic phosphate peak: investigation by time-resolved 31P-nuclear magnetic resonance spectroscopy. Eur J Appl Physiol Occup Physiol 1994;69(6):465-73.

PHYSIOLOGICAL INDICES OF IRANIAN ELITE FEMALE KAYAKRRS IN TWO DIFFERENT TESTS ON TREADMILL & ARM ERGOMETER

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Introduction: Testing is the beginning of the implementation of a training program and it will provide direction and purpose to the planning of training. Aerobic and anaerobic power are the main factors of optimal performance in kayakers (Bishop D., 2000). One of the most important points in choosing tests for measurement of physiological characters in sport sciences's studies is the principle of specificity. Upper body muscles are often involved in kayaking. It seems that it is more valid the using of tests that upper body muscles are more involved in them (Bishop et al., 1998). This study was conducted to evaluate physiological indices of Iranian elite female kayakers in two different tests on tredmill & arm ergometer.

Methods: Twelve Iranian elite female kayakers (age: 16.5±2 yrs; height: 166.7±4.4cm; body mass: 57.89±7.3kg; %BF: 20.33±6 percent) participate in this study. VO2max, lactat threshold, lactat threshold VO2, VO2 pulse and ventilation measured by two incremental tests on treadmill and arm ergometr with gas analizing. Body percent and muscle mass evaluated by body composition analyzer. Antropometric characteres such as height; sitting height; arm span; arm, thigh and leg lengths; arm, thigh, sholder and pelvise breadths; and arm, thigh, chest, hip and leg girths are masured. Subject's performance evaluated by 12 kilometer kayaking test (K12t).

Results: VO2max values measured by the arm ergometer was lower than VO2max values measured by treadmill. There was significant correlation between VO2max values measured by two tests (r=0.68,p=0.015). Negetive correlation attained between both VO2max values with K12t time that was significant only with arm ergometer VO2max values.There were no significant correlation between body composition and anthropometric measurments with both K12t time and VO2max values in two tests. There was high correlation between VO2max, VO2 palse and VE values in two tests.

Discussion: An important determinant in the measurement of VO2max is the quantity of the muscle mass stressed when performing the task or mode of exercise used to elicit maximal oxygen uptake (Midgley et al., 2007). VO2max values measured by specific test in kayakers(arm ergometer), had lower than non-specific (treadmill) test that is explainable by low used muscle mass in this test. Significant negative correlation between K12t and arm ergometer can refer to specific test of upper body like kayaking.

References:

Bishop D., (2000). Eur J Appl Physiol., 82: 91-97.

Bishop D., Jenkins DG, Mackinnon LT., (1998). Med Sci Sports Exerc., 30: 1270-1275.

Midgley AW, McNaughton LR., Polman R., Marchant M.,(2007). Sports Med, 37(12), 1019-1028

EFFECTS OF THREE DIFFERENT WHOLE-BODY VIBRATION TRAININGS ON KNEE EXTENSOR MUSCLES STRENGTH AND JUMP PERFORMANCE.

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Introduction: Whole-body vibration (WBV) has been recently employed as a means of strength training in healthy humans (Luo et al., 2005). Most likely, the effectiveness of WBV training programs might be dependent of the wide possible combination of parameters (peak-to-peak displacement of the platform and vibration frequency) characterizing a WBV training session. To date, only one study has attempted to determine the optimal vibration frequency for increasing muscle strength after WBV training (Savelberg et al., 2007), but the effect of the displacement of the platform remain uninvestigated. Therefore, the purpose of this study was to compare the effects of 3 different combinations of WBV parameters on knee extensor muscles strength and jump performance.

Methods

33 physically active male students were randomly allocated to 3 groups: i) a low frequency and low displacement (30Hz, 2mm, n=10; G2F30), ii) a low frequency and high displacement (30Hz, 4mm, n=11; G4F30) and, iii) a high frequency and high displacement (50Hz, 4mm, n=12; G4F50). Three times a week, the WBV training consisted of maintaining unloaded static squatting positions over a 6-week period. Maximal voluntary isometric, concentric and eccentric torque, jump performance (squat jump; SJ and countermovement jump; CMJ), knee extensor muscles activation and contractile properties evoked by percutaneous neurostimulation were assessed before and after the training period.

Results: Whatever the variable analyzed before training, no significant differences were observed between groups. After training, a significant group x time interaction was found for SJ and CMJ. Jump performance was increased for both G4F30 and G4F50 groups ($P<0.05$). A significant increase (time effect) was observed for: i) the maximal voluntary torque produced during isometric, concentric and eccentric contractions and, ii) the single and paired twitches evoked at rest. Knee extensor muscles activation and post-contraction potentiation were not significantly modified after the training period.

Discussion: This study desmonstrate that training protocols performed with high displacement (4 mm) were more effective than the one realized with a low displacement to increase jump performance. Regarding the vibration frequency, no conlusions can be drawn after the present study. This result is consistant with the previous report of Savelberg et al., (2007), however these authors have only assessed frequencies under 35Hz. Although significant increased were found, further research is required to ascertain the exact influence of displacement and vibration frequency on isometric and dynamic strength. In conclusion, our 6-wk WBV training programs realized with a high displacement were effective to improve jump performance. These enhancements might be attributable to peripheral adaptations.

References

Luo J, McNamara B, Moran K. (2005). Sports Med, 35(1), 23-41.
Savelberg HH, Keizer HA, Meijer K. (2007). J Strength Cond Res, 21(2), 589-593.

14:15 - 15:15

Poster presentations

PP-TT11 Training and Testing 11

VALIDITY AND RELIABILITY OF THE SINGLE-TRIAL LINE DRILL TEST OF ANAEROBIC POWER IN BASKETBALL PLAYERS

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Introduction: Although numerous tests have been used for anaerobic power and endurance assessment in basketball, questions arise regarding their movement and metabolic specificity (Ben Abdelkrim et al., 2007). The aim of the present investigation was to evaluate the single-trial form of the Line Drill Tet (SLDT) by measuring its concurrent validity, reliability, and sensitivity not only on the basis of performance output but also on blood lactate concentration following testing.

Methods: Twenty-four volunteers were assigned to either a control (C, N=12) or an experimental (BP, N=12 basketball players) group. Following familiarization, participants performed the SLDT, WAnT, and VJT in a random order to determine concurrent validity of SLDT. Subjects had their mean (MP) and peak power (PP) in the Wingate test (WAnT), mean height and MP in the 30-sec vertical jump test (VJT), and time-to-complete the SLDT measured. Blood lactate concentration was measured at rest and immediately after each test. Test-retest reliability was determined by computing the intraclass correlation coefficients (ICC) on time and blood. SLDT's sensitivity was determined by one-way ANOVA between the two groups

Results: Kendall's tau correlation analysis revealed significant (P<0.05) correlations between SLDT time and WAnT's PP (τ=0.78) and MP (τ=0.56) and VJT's MP (τ=0.85) and height (τ=0.90). SLDT lactate concentration was moderately (P<0.05) correlated with the respective lactate values of WAnT (τ=0.40) and VJT (τ=0.66). However, SLDT time in BP correlated (P<0.05) with VJT's MP (τ=0.80) and height (τ=0.90) but not with performance variables in WAnT. In contrast, SLDT lactate responses in BP were moderately (P<0.05) correlated with WAnT's PP (τ=0.54) and VJT MP (τ=0.68), height (τ=0.65), and lactate concentration (τ=0.65). Test-retest reliability ICCs for time and lactate were 0.92 and 0.93, respectively (P<0.05). In all tests, BP demonstrated higher (P<0.05) performance levels compared to C indicating an adequate sensitivity for SLDT.

Discussion: Previous research suggests that the LDT may be an acceptable field test for assessing anaerobic power in basketball (Hoffman et al., 2000). Our results show that the single-trial LDT demonstrates moderate to high concurrent validity compared against two criterion tests such as the WAnT and the VJT. Furthermore, the SLDT exhibited satisfactory reliability and sensitivity. This notion empowers basketball coaches to use the SLDT for measuring anaerobic power in their day-to-day practice since it is time- and movement-specific, inexpensive, allows the simultaneous measurement of several athletes.

References

Ben Abdelkrim N, El Fazaa L, El Ati J. (2007). Br J Sports Med, 41, 69–75

Hoffman JR, Epstein S, Einbinder M, Weinstein Y. (2000). J Strength Cond Res, 14, 261–264.

UPPER BODY STRENGTH AND MUSCULAR ENDURANCE IN SPORT CLIMBERS

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Introduction: The upper body strength and muscular endurance are limiting factors of performance in sport climbing. Suitable tests to evaluate climber's performance are still to be introduced in training practice. The aim of this study was to evaluate muscular strength measured by grip dynamometer and muscular endurance measured by bent-arm hang and finger hang on 2.5cm ledge in sport climbers.

Methods: The testing was realised with 145 climbers on artificial climbing wall. We have analysed the relationship between tests results and climbing performance RP (red point) using Pearson correlation coefficient. Tests results represented dependent variables in multivariate analysis of variance (MANOVA) with the independent factors sex and climbing performance. Climbers performance was divided in four levels (3/5; 6a/6c; 6c+/7b; 7b+/8b of French scale).

Results: The correlation coefficients between climbing performance and finger hang was 0.750, bent-arm hang 0.720, grip strength relative to body weight 0.591. The results for finger hang:

men: 10.8±6.7s; 32.2±11.9s; 50.1±16.8s; 71.7±8.2s; women 4.8±5.6s; 28.9±30.2s; 40.2±16.7s; 38.4±2.2s, for bent-arm hang: men: 25.4 ±17.6s; 45.1±15.9s; 53.8±12.4s; 77.8±25.7s; women 13.2±9.9s; 31.0±18.2s; 52.4±16.8s; 55.9±5.3s, for relative grip strength: men: 0.59±0.13; 0.68±0.10; 0.73±0.09; 0.76±0.08, women: 0.45±0.08; 0.52±0.45; 0.56±0.03; 0.67±0.13.

Discussion: Muscular endurance of upper limb and fingers is the main strength predictor of climbing performance. The used tests seem to be suitable to evaluate upper body endurance in sport climbers. The maximum grip strength is a strong predictor only when related to body weight. The use of grip dynamometry is controversial because of using the thumb and different muscle groups in the test (Schweizer& Furrer, 2007; Grant et al., 2001; Grant, Hynes, Whittaker, & Aitchison, 1996). Despite these facts, our results suggest that the simple grip dynamometry is an appropriate test for maximal finger strength evaluation in sport climbers.

References

Grant, S., Hasler, T., Davies, C., Aitchison, T. C., Wilson, J., & Whittaker, A. (2001). A comparison of the anthropometric, strength, endurance and flexibility characteristics of female elite and recreational climbers and non-climbers. Journal of Sports Sciences, 19, 499-505.

Grant, S., Hynes, V., Whittaker, A., & Aitchison, T. C. (1996). Anthropometric, strength, endurance and flexibility characteristics of elite and recreational climbers. Journal of Sports Sciences, 14, 301-309.

Schweizer, A., & Furrer, M. (2007). Correlation of forearm strength and sport climbing performance. Isokinetics and Exercise Science 15, 211-216.

THE MODIFIED LOUGHBOROUGH INTERMITTENT SHUTTLE TEST <LIST>: A PERFORMANCE TOOL FOR USE WITH GAMES PLAYERS

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Background: The Loughborough Intermittent Shuttle Test (LIST)1 was developed as a tool to reliably and accurately simulate the physiological demands of multiple-sprint sports such as soccer. The LIST protocol primarily involves periods of variable-intensity activity but since the sub-maximal exercise intensities are pre-determined and controlled by an audible signal it is not possible to examine self-selected aspects of running performance. Thus, it is not possible to assess fatigue-related decrements in exercise performance or whether any interventions increase 'work output'. Therefore, the aim of this study was to investigate the reliability of a modified version of the LIST that included self-paced running for use as a performance tool. Methods: Fourteen male games players performed the protocol on two separate occasions with at least 7 days recovery between trials. The LIST comprises 6 x 15-min blocks of 'prescribed' variable-intensity exercise (walking, sprinting, brief recovery, running and jogging) where participants exercise in time to audible signals. The modified test comprised 4 x 15-min blocks of 'prescribed' activity followed by 2 x 15-min blocks of 'self-paced' running (i.e. no audible signals). Participants were instructed to replicate the relative intensities of the prescribed exercise during the self-paced period. Various performance indicators were recorded during the protocol. Body mass (BM) was measured pre and post exercise while heart rate (HR) and blood lactate ([La]) were examined routinely. Participants were given 3 ml•kg-1 BM water during the 3-min rest periods between exercise blocks. Results: A correlation of r = 0.82 (P<0.01) and coefficient of variation (CV) of 1.7% for distance covered indicate good relative and absolute reliability. However, participants covered 1.4 ± 1.7% greater distance in Trial 1 (12.85 ± 0.26 km) vs. Trial 2 (12.67 ± 0.37 km, P=0.01). Distance covered was significantly less during the self-paced running period relative to prescribed activity (P<0.05). Percentage time spent in each activity was not different between trials (P>0.05) but average running velocity was higher in Trial 2 (P=0.01). Sprint performance was similar between trials (P=0.38) with a CV of 5.6%. There was no difference in BM loss (P=0.84) or mean HR (P=0.98) between trials but mean [La] was higher in Trial 1 (P=0.01). Conclusions: Incorporating self-paced exercise within the existing LIST test appears to be a sensitive means of quantifying key performance variables, provided participants are adequately familiarised with the exercise protocol. The protocol successfully detects the decay in running performance that occurs during the latter stages of exercise.

1Nicholas CW, Nuttall FE & Williams C (2000). The Loughborough Intermittent Shuttle Test: A field test that stimulates the activity pattern of soccer. J Sports Sci, 18: 97-104

PREDICTORS FOR MEASURED VO2MAX DURING A 20-METER SHUTTLE RUN TEST IN YOUNG SCHOLARS

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Purpose: The purpose of this study was to verify witch are the best predictors for the VO2max directly measured during a 20-meter shuttle run test (20mSRT) in Portuguese young students aged 13-17 years considering sex, age, height, weight, body mass index and 20mSRT running parameters [number of total laps (LAPS), last half-stage completed (HSTAGE) and maximal running speed (MRS)].

Methods: Sixty-two subjects were randomly selected from 4 schools of Porto district and analyzed. All subjects performed a 20mSRT wearing a portable gas analyser to measure the VO2max directly. VO2max was considered when a detection of a plateau in the VO2 curve, defined as an increase of VO2 less than 2 ml/kg/min with a concomitant increase in speed stage. However, it is known that the classical VO2 plateau is absent in many young subjects. So, if that was the case, VO2peak was taken as the highest oxygen uptake achieved during the 20mSRT and defined as VO2max. In the present study 8.1% of the subjects didn't achieved the VO2 plateau. Exhaustion was confirmed when (1) subjects desire to stop or demonstrate inability to maintain the required running pace despite strong verbal encouragement, (2) maximal heart rate was greater than 85% of the age-predicted maximal heart-rate (220-age) and/or (3) respiratory exchange ratio was greater than 1.0. Linear regression analysis by stepwise method was calculated using a significance level of 5% in the SPSS version 15.0.

Results: Sex, age, height, body mass index, LAPS, HSTAGE and MRS were significant related with VO2max ($p<0.05$). Linear regression analysis presented statistical significant results for the prediction model of the observed VO2max ($R=0.757$; $R^2=0.573$; Adjusted $R^2=0.559$; Std. Error of the Estimate=5.807; $F=9.069$; $p<0.05$). The analysis of regression coefficients indicates that only sex and MRS appear as significant predictors for measured VO2max ($p<0.05$).

Conclusions: As possible predictors, linear regression analysis indicates sex, weight and last half-stage completed in the 20mSRT.

This study was supported by FCT (Project: PTDC-DES-7242-2006; PhD grant: SFRH/BD/45090/2008)

DEVELOPMENT AND CONTROL OF SPECIAL STRENGTH ABILITIES BY ALPINE SKIERS IN PRECOMPETITIVE PERIOD

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Introduction: The high level of physical abilities of alpine skiers is a basic of good performances. This is a reason of annual planning and control of that field. The concrete content of the programs and system usually is a question of discussion.

Goal

The goal of research is to establish and integrate training system of planning and control of special strength abilities by alpine skiers in pre competitive period

Methodic of research included

Modeling as a method of establishment of training program which combine macro- , mezzo- and micro cycles. Literature review and expert evaluations were methods composed of a group of control tests as: length jump, three different triple jumps, fivefold and tenfold triple jumps, complex tests from maximal high jumps and multiple jumps over strength measurements platform

Objects of research

Alpine ski competitors – Bulgarian National Team members

Results and Discussion: The percent distributions of volume of training for physical abilities establish directions and influences of the training program. For development of very one of the strength abilities forms - dynamic, explosive, speed, agility, endurance the system of special exercise was selected. The analyses of control tests results show significant absolute and relatively improvements by all of the competitors. The analyses of individual dynamics of data for each tested person gives opportunity special strength level to be characterized. For example, the high for 60 contiguous maximal high jumps of the skier S.G. stays constant after his second performance (33±1 cm). This is a good target for good rating. On the other hand of the length jump by men and junior skiers the differences were found. By men the improvement between two control test procedures was average 8 ± 3cm. (PT -0,96) and by junior was average 14±4 cm (PT = 0.99).

Conclusions

-The establishing and experimented methodic for development of special strength by alpine skiers seems to be effective

-There were found significant improvements of the special strength abilities, which are forming an objective basics for successful competitive realization

-The presented system of planning and control is a priority factor of rational management of training process by alpine skiers.

References

"Physical fitness training by alpine skiers" by Dimitrov. A, Dimitrov. D., publ. by PA KIWI, Sofia, Bulgaria

TEST-RETEST RELIABILITY OF FITNESS AND SKILL TESTS IN ELITE MALE YOUTH BASKETBALL PLAYERS

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Purpose: To assess reliability of fitness and skill tests in elite youth basketball. Players (n=368) from 8 teams in Lithuania (U17 n=25; U16 n=21; U15 n=39; U14 n=57; U13 n=57; U12 n=37; U11 n=70; U10 n=58) completed 2 trials of 4 fitness tests: 20 metre sprint (Sprint); countermovement standing vertical jump (CMJ); standing vertical jump from squat (SVJ); side-step (SST) and two skill tests: ball dribbling (BD); & jump shot (JST), according to Balciunas et al., (2006). Change in mean & 95% confidence intervals, intra-class correlation coefficient, and log-transformed coefficient of variation were calculated (Hopkins, 2000) and correlated with age group. Results: Sprint: Cohort decrease in performance (mean diff .03secs, p<.001, 95% CI .04 & .01, ICCr .92, CV% 2.1); decrease for U17 (mean diff .04secs, p<.05, 95% CI .01 & .08, ICCr .74, CV% 1.9) and U10 (mean diff .06secs, p<.05, 95% CI .11 & .01, ICCr .71, CV% 3.2); ICCr range .71 to .89, CV% range 1.9 to 3.2 across years. CMJ: No cohort difference (mean diff .18cm, 95% IC .61 & -.26, ICCr .87, CV% 11.9) or year groups (mean diff range -.79 to .74cm, ICCr range .46 to .79, CV% 4.2 to 16.5); correlation between increasing age group and CV% (rho -.79, p<.05). SVJ: No cohort difference (mean diff .33cm, 95% CI .71 & -.04, ICCr .86, CV% 11.7); decreased performance for U16 (mean diff -1.44cm, 95% CI -1.6 & -2.73, p<.05, ICCr .70, CV% 6.1) and increased performance for U13 (mean diff .63cm, 95% CI 1.25 & .0, p<.05, ICCr .85, CV% 6.1) and U11 (mean diff 1.13cm, 95% CI 2.08 & .19, p<.05, ICCr .71, CV% 14.1); ICCr range .50 to .85, CV% range 4.7 to 15. SST: Cohort improvement (mean diff -.27secs, 95% CI -.21 & -.33, p<.001, ICCr .87, CV% 4.9) and all year groups (mean diff range -.15 to -.45secs, p<.05 to p<.001, ICCr range .72 to .90, CV% range 3.2 to 5.3) except U11; correlation between increasing age group and CV% (rho -.83, p<.05). BD: Cohort improvement (mean diff -.23secs, 95% CI -.17 & -.29, p<.001, ICCr .83, CV% 5.6) and all year groups (mean diff range -.19 to -.34, p<.05 to p<.001, ICCr range .62 to .91, CV% range 2.2 to 5.2) except U13. JSP: Cohort improvement (mean diff .72pts, 95% CI 1.04 & .41, p<.001, ICCr .45, CV% 54.5), with unacceptable ICCr (-.04 to .65) and CV% (28.5 to 77.1) ranges also in each age group. Conclusions: Cohort test-retest differences were deemed 'practically' unimportant with acceptable ICCr (>.70) except for JSP (ICCr .45). Trends for reduced CV% with increased age group reached statistical significance for the CMJ and SST suggesting increased variability in younger players. Apart from JSP, all tests are reliable for use with elite male youth players.

Balciunas et al., (2006). Long term effects of different training modalities on power, speed, skill and anaerobic capacity in young male basketball players. JSSM, 5, 163-170.

Hopkins WG (2000). Reliability from consecutive pairs of trials. In: A new view of statistics. www.sportsci.org/resource/stats/xrely.xls

ESTIMATING THE VELOCITY ASSOCIATED WITH THE MAXIMAL OXYGEN UPTAKE FROM THE 20M SHUTTLE RUN TEST IN ADOLESCENTS

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Introduction: The 20m shuttle-run test (1) is widely used for the assessment of aerobic power and the prediction of maximal oxygen uptake. The limitation of the 20m shuttle run test is that it does not provide information for the velocity which is associated with the achievement of maximal oxygen consumption (vVO2max). However, vVO2max is a variable which is widely used in prescribing intensities for interval endurance training (2). Therefore the aim of this study was to develop an equation for the calculation of the vVO2max using the 20m shuttle-run test.

Methods: Sixty male adolescent athletes performed a maximal exercise test on a treadmill to assess the actual vVO2max and a 20m shuttle-run test. The incremental exercise protocol started at 8 km/h and the speed was increased by 1km/h every 2min until exhaustion. The vVO2max was defined as the velocity at which the VO2max occurred and was sustained for at least 1 minute. Then, the subjects were randomly divided into a derivation (n=30; age=14.9±1.5 yrs.) and a cross-validation (n=30; age=15.2±1.5 yrs.) groups. Multiple-regression analysis was used to develop the equation from the derivation group using as independent variables the total runs, the stage achievement and the velocity at the end of the field test. The derived equation was cross-validated using: correlation coefficient (Rcross-validation) between the actual and predicted vVO2max, constant error (CE=actual vVO2max – predicted vVO2max), standard error of estimate SEE, total error TE (3), and the Bland-Altman plot for the agreement between the actual and the predicted vVO2max.

Results: The following equation best attained the above criteria and most accurately estimated vVO2max: vVO2max (km/h) =9.625 + (0.058 x Runs), R=0.84, SEE=0.7 km/h.

The cross-validation statistics showed a correlation coefficient between actual and predicted vVO2max, Rcross-validation=0.86. The mean difference was CE=0.1 km/h. The SEE and TE were, 0.5 km/h (3.5%) and 0.7 km/h (4.5%) respectively. Bland-Altman, 95% limits of agreement ranged from (-1.38 to 1.23 km/h).

Conclusions

The velocity at the end of the shuttle run test was about 1.5-3.5 km/h lower than the actual vVO2max. The cross-validation statistics showed that the equation of this study accurately predicts vVO2max in 12-18 yrs. males demonstrating low values of CE, SEE, and TE. In

conclusion, the equation of this study can be used for the estimation of vVO2max, so as to use this variable for the prescription of interval endurance training.

References

1. Leger, LA et al. (1988), J Sports Sci, 93-101.
2. Billat, V. (2001), Sports Med, 31 (1):13-31.
3. Malek, M et al. (2004), Med. Sci. Sports. Exerc. 36(8): 1427- 1432.

RELATIONSHIP BETWEEN MAXIMAL ISOMETRIC STRENGTH AND MUSCLE ENDURANCE

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Introduction: Good levels of both aerobic and neuromuscular fitness are of great importance in order to ensure sufficient physical performance of soldiers. Thus, it is essential to further develop field fitness tests which are valid to measure the true aerobic and neuromuscular performance. The purpose of the present study was to examine how well the present muscle fitness tests can evaluate maximal strength of different muscle groups. More specifically, our interest was to examine the relationships between bilateral isometric maximal strength of the arm and leg extensors and muscle endurance of the respective muscles.

Methods: Bilateral isometric maximal strength of the arm and leg extensors, grip strength, muscle endurance (recording of the number of repetitions in one-minute push-up, sit-up and squat actions) and VO2max were measured from a total of 783 reservists. Their mean age was 24 ± 2.8 yrs., height 1.80 ± 0.06 m, body mass 80.3 ± 13.5 kg, and percentage of body fat 17.8 ± 7.2 %. Muscle fitness index (MFI) was calculated from the results of muscle endurance tests. Overall physical fitness index (PFI) was further calculated from MFI and VO2max.

Results: Mean (±SD) bilateral isometric strength was 2917 ± 868 N for the leg extensors and 898 ± 201 N for the arm extensors, and that of grip strength 53 ± 9 kg. The number of reps/min was 38 ± 10 in sit-ups, 28 ± 12 in push-ups and 43 ± 8 in squats. Mean VO2max was 41.6 ± 8.1 mlkg-1min-1. Significant correlations were found between maximal strength of the arm extensors and repeated push-ups ($r = 0.58$, $p < 0.001$) as well as between repeated squats and VO2max ($r = 0.55$, $p < 0.001$). Bilateral isometric maximal force of the arm extensors correlated significantly with MFI and PFI ($r = 0.51$, $p < 0.001$; and $r = 0.47$, $p = 0.001$, respectively). No significant relationships were observed between maximal isometric strength of the arm or leg extensors and that of VO2max as well as between grip strength and MFI or PFI.

Conclusion: The present study demonstrated that in a large group of subjects with great interindividual variation in physical fitness, the present muscle endurance tests seem to measure not only the level of muscle fitness, but also to some extent that of maximal strength. The relationship between maximal strength and muscle fitness was found in push-ups but not in repeated squats. However, the performance in repeated squats was related with VO2max, whereas that of push ups did not. Thus, it seems that muscle fitness measured by push-ups also relies on maximal strength, while the level of aerobic capacity contributes to performance in repeated squats. This may be explained by a higher relative load (body weight) of maximal strength in push-ups than in repeated squats. In conclusion, the present muscle fitness tests seem to measure rather well the overall fitness profile of soldiers, and the contributive role of maximal strength could be indentified for the arm but not for leg extensor muscles.

THE VALIDITY OF POLAR FITNESS TEST IS ASIAN POPULATION

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THE VALIDITY OF POLAR FITNESS TEST IN ASIAN POPULATION

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Introduction: Polar Fitness Test (PFT) is a simple method to predict cardiorespiratory fitness. PFT predicts maximal oxygen uptake (VO2max) based on age, gender, height, weight, resting heart rate and heart rate variability measurements and amount of physical activity. The test has been developed and validated in Caucasian population (Väinämö 1996, Kinnunen 2000). The purpose of this study was to examine the validity of PFT in predicting the VO2max in Asian (Korea) population.

Methods: Sixty volunteer 20~49 years old female (n=30) and male (n=30) subjects participated in this study. All subjects were healthy and they did not use any medication. The mean(SD) of weight and height for the groups were: male 72.8 (8.4) kg, female 58.6 (9.4) kg and male 174.7 (5.9) cm, female 162.6 (5.6) cm.

Prior to maximal stress test, PFT was tested using Polar FT60 training computer (Polar Electro Oy, Finland). Activity level was classified according frequency and intensity of weekly exercise during past 3 months. The subjects resting HR and R-R intervals were recorded during quiet lying on the bed for 5 minutes.

Maximal stress test was performed using Bruce protocol. At each stage during the stress test, expired gases were collected and analyzed continuously (Trueone2400, USA). Criteria for attaining VO2max were as follows: heart rate at least 85% of the age-specific maximum (220-age), respiratory quotient (RQ) over 1.1, and voluntarily maximum (RPE higher than 17).To exam the mean differences of PFT and VO2max from laboratory test in each group, paired t-test was used. Also, the data was analyzed using the principle presented by Bland & Altman, and the total error of the prediction (E) was calculated.

Results: The mean(SD) values and E of PFT and VO2max by the laboratory test in ml/kg/min are as follows. Male: PFT 43.3 (7.8), VO2maxlab 43.5 (7.0), (E 12.3), Female: PFT 34.3 (4.4), VO2maxlab 35.7 (6.7), (E 10.4). The mean differences by two methods in male (t=-.182, Sig=.857) and female (t=-1.258, Sig=.218) were not significantly different.

Discussion: Measurements during exercise are the most common methods used to predict cardiorespiratory fitness. However, the current results showed that measurement from resting can be used to predict cardiorespiratory fitness. Our results show that PFT is a valid test to predict cardiorespiratory fitness in Koreans. However, in some individuals PFT may under-or overestimate the laboratory VO2max. The results of this study should be confirmed in other Asian populations and in individuals with various ages and activity status.

References

Kinnunen et al (2000). Med Sci Sports Exerc 32(5), 1535.

Väinämö et al. (1996).Proceeding of ICNN, Washington DC, June 3-6, 1939-1949.

IMPROVED MEASURING PROTOCOL FOR DETERMINING THE HUMAN POWER SPECTRUM: REPLACEMENT OF THE WINGATE TEST BY THE SPRINT POWER AND THE TRANSITION POWER TESTS

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Introduction: A test series capable of determining the human power spectrum, i.e. the maximum out-put power in all time domains of relevance (parts of a second to hours), has been introduced recently (Müller and Schmölzer, 2006; Müller und Hofmann, 2008).

Jumping power (squat jump force plate measurement) is used for the sub-second time domain.

For the domain of seconds the Sprint Power Test was developed (Müller and Fürhapter-Rieger, 2006). Pmax determined this way is substantially higher than what is called 'peak power' in the Wingate Test.

For determination of Pmax over 30s (immediate, non-oxidative, and oxidative energy modes) a new test protocol, termed Transition Power, is introduced here. Alternatively, 20s can be used.

For endurance power a maximal cycle ergometer step test is used (Hofmann et al., 1994; Müller and Hofmann, 2008).

It was the aim of this study to search for a relation between the load at maximum sprint power and the load for highest value of the 30s-mean power.

Methods: The sprint power measurement (2s) at loads between 4% and 16% of body weight considered the rotational energy of the fly-wheel. Instead of the Wingate Test, the Transition Power Test protocol was used for determining all-out power over 30s. This protocol avoids problems associated with maximum pedal frequency at the start: peak power cannot be obtained at or close to maximum pedal frequency (Hill AV, 1938), and measurement procedure is easier.

15 male and 10 female sport students participated in the study.

Results: The mean of the maximal 2s Sprint Power values (n=25) was 12.7 ± 2.4 W/kg (mean rpm:112), the mean of the power values (n=25) over 30s was 9.6 W/kg (85rpm), and the mean of the maxima during the 30s tests was 11.3 W/kg (107rpm).

Maximum sprint power of different individuals was significantly correlated (Kendall's tau=0.65; p=3.1e-5) with higher weight on the ergometer.

Surprisingly, in the 30s Transition Power Test there was no significant correlation (tau=0.28; p=0.08); the highest power was obtained at 11.3 % load (of body weight) and standard deviation was only 1.2 %.

Max. 2s sprint power ranged in the group from 8.4 W/kg to 16.9 W/kg and 30s transition power from 6.9 W/kg to 12.2 W/kg.

Discussion: For the determination of maximum power in the time domain of a few seconds (Sprint Power Test) a series of measurements at various resistances is necessary, whereas in the 30s time domain a single test using a weight of 11 % of body weight appears to be sufficient, according to the study results.

References

Hill AV (1938). Proc Royal Soc, 126(B), 136-195.

Hofmann P, Bunc V, Leitner H, Pokan R, Gaisl G (1994). Eur J Appl Physiol, 69(2), 132-139.

Müller W, Fürhapter-Rieger A (2006). Isokinet Excers Sci, 14(2), 201-203.

Müller W, Schmölzer B (2006). Isokinet Exerc Sci, 14(2), 137-139.

Müller W, Hofmann P (2008). Sport Aerodynamics, 49-91. Springer, Wien, New York.

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I would like to thank Patrick Rosmann for the excellent technical support of this study.

14:15 - 15:15

Poster presentations

PP-TT12 Training and Testing 12

ENERGY EXPENDITURE AND SUBSTRATE UTILIZATION DURING AND 30 MINUTES POST HIGH INTENSITY INTERVAL VERSUS CONTINUOUS EXERCISE BOUTS

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Purpose: There is a focus in the fitness industry on exercising to achieve high energy expenditure (EE) and especially high fat oxidation (FO). The purpose of the study was to compare exercise EE, early recovery EE (REE), and total FO during "hard aerobic interval" vs. "talking intensity" continuous exercise bouts typical of fitness industry exercise sessions constrained to about 45 minutes effective exercise time.

Methods: After preliminary testing, 9 regularly active males (28 ± 6 yr, VO2max 55 ± 5 ml•min-1•kg-1) performed 10 min warm-up followed by a self-paced high intensity interval session (INT) consisting of six, 4 min work bouts interspersed by 2 min recovery periods (34 min total exercise time) with continuous gas exchange measurement during exercise and 30 min post exercise. During INT, subjects were instructed to maintain the highest average work intensity they could for the 6 bouts. Responses were compared with those measured during a steady state, time matched (TM), and a steady-state distance matched (DM) exercise bout. The intensity of the steady state sessions was prescribed as "talking intensity". INT and TM sessions were performed in randomized order, with the DM session performed last. EE, REE, and FO were estimated from continuous measurements of respiratory gas exchange corrected for RER over 1.0 time segments. Fat oxidation calculations are considered minimum estimates due to presumed contamination of CO2 production with CO2 release due to H+ buffering.

Results: The INT (during work periods) vs. TM and DM session elicited higher heart rate (171 ± 14 vs. 154 ± 15, and 160 ± 11 $p<0.05$), blood lactate concentration (6.5 ± 2.8 vs. 2.1 ± 1.1, and 2.3 ± 1,1 mmol•L-1, $p<0.05$), and RPE (17 ± 1 vs. 12 ± 1, and 12.4 ± 0.9 $p<0.05$). EE during INT was ~12 % higher (555 ± 75 vs. 495 ± 68 kcal, $p<0.01$) and REE was 23% higher (89 ± 15 vs. 72 ± 9 kcal, $p<0.01$) when compared to the TM steady state session. No differences in EE were found between INT and DM, but REE were higher in INT than in DM (89 ± 15 vs. 76

± 16 kcal, p<0.01). FO tended to be lower during INT vs. TM and DM (9.4 ± 3.1 vs. 13.0 ± 5.3 and 12.4 ± 5.6 g, n.s.). FO during the 30 min post exercise period was higher after INT (4.5 ± 1.4 g) vs. TM (2.6 ± 1.3g) or DM (2.5 ± 1.3g, p<0.05). Total FO (34 min exercise + 30 min recovery) was similar in INT, TM and DM exercise sessions (13.0 ± 3.7, 15.5 ± 6.4, 15.0 ± 6.4 g, n.s.).

Conclusions: In this study, we have attempted to simulate two exercise prescriptions typical of the time constraints and intensity goals of "1 hour fitness classes" and compared this to a distance matched exercise session. Our results suggest that for the same time investment, self-paced interval training results in significantly greater total energy expenditure and similar total fat oxidation than continuous exercise performed at "talking intensity."

PERFORMANCE CHANGES IN TOP-LEVEL ATHLETES DURING A BLOCK-PERIODIZED TRAINING CYCLE

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UNIVERSITY OF MURCIA

Introduction: The rigorous demands of modern sport led prominent coaches to propose alternatives to traditional periodization. One representative model among these new trends is block periodization (BP). The main theoretical benefits of BP are: a) better possibilities to design multi-peak preparations; b) reasonable reductions of total training volume; c) ways to avoid negative interactions between different fitness components; and d) increased control over residual training effects (Issurin, 2008). Unfortunately, there are very few studies that have explored the effects of contemporary periodization and even less that have done so using elite athletes. Therefore, it was the purpose of this study to examine changes in selected physiological and performance variables in a group of top-level athletes across a 10-wk training cycle using a BP approach.

Methods: Fourteen top-level kayakers underwent a battery of tests, being assessed three times across two 5-wk training blocks. On each occasion, subjects completed an incremental test to exhaustion on the kayak ergometer for the determination of maximal oxygen uptake (VO2max), second ventilatory threshold (VT2), peak lactate (Lapeak), paddling speed at VO2max (PSmax) and at VT2 (PSVT2), stroke rate at VO2max (SRmax) and at VT2(SRVT2). One-repetition maximum (1RM) and mean velocity with 45% 1RM load (V45%) were assessed in the bench press (BNP) and prone bench pull (PBP) exercises. The main training goals of each block were: B1, anaerobic threshold and muscle hypertrophy; and B2, aerobic power and maximal strength.

Results: The BP training approach resulted in significant increases in VO2max (12.7%), VO2 at VT2 (8.1%), PSmax (3.0%), PSVT2 (5.0%), 1RM in BNP (9.3%) and PBP (10.2%), with no significant changes for Lapeak, SRmax, SRVT2 and V45% in BP and PBP.

Discussion: Changes in VO2max in only 10-wk of training are of similar magnitude to those described in previous studies with high-level kayakers (Bunc and Heller, 1994; Tesch et al., 1976), although the latter were accomplished after considerably longer training. The high values for strength and endurance parameters found in this study are in agreement with those reported by other investigators that studied high-level kayakers (Tesch et al., 1983) and demonstrate the great requirements of muscle strength and aerobic power of Olympic canoeing. Prioritizing the development of fitness components (one endurance and one strength component per block), by selectively concentrating load on 5-wk training blocks, seems to be an effective strategy for improving physiological and performance markers of highly trained top-level athletes with great requirements of both, strength and endurance.

References

Bunc V, Heller J. (1994) Eur J Appl Physiol, 68(1),125-129.

Issurin V. (2008) J Sports Med Phys Fitness, 48(1),65-75.

Tesch P, Piehl K, Wilson G, Karlsson J. (1976) Med Sci Sports,8(4),214-218.

Tesch P, Piehl K, Wilson G, Karlsson, J (1983) Can J Appl Sport Sci,8(2),87-91.

EFFECTIVENESS OF THE MONITORING THE TRAINING FOR THE SUBJECTIVE PERCEPTION OF TIREDNESS AND PERFORMANCE IN BASKETBALL PLAYERS

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Introduction: The present study aimed at evaluating and comparing the effects of adult basketball players´ training in different moments of periodisation.

Methods: Eight men took part in this study, with ages from 19 to 30 years, all of them athletes participating in the São Paulo basketball championship in the special division. The macrocycle analyzed encompassed 19 weeks and was divided into the periods: preparatory, competitive I and II (with four, six and nine weeks, respectively). The athletes were daily evaluated as to subjective perception of tiredness (Borg, 1982) and the load of applied training, that was the multiplication product of the volume in minutes by the intensity, obtained by perception scale of adapted effort (Foster, 1998). At the beginning and end of each microcycle, was evaluated the vertical jump (nine first weeks) and medicine ball throw (19 weeks). For the different comparisons, it was used in the technique of the parametric or not parametric analysis of variance for the model with a factor in repeated measures, complemented with the bonferroni´s multiple comparisons test. All the discussions here were accomplished considering the 5% significance level.

Results: Principal results point out to a variation of the tiredness self perception measure after training (13.7 ± 1.3a; 14.7 ± 1.5b and 14.6 ± 1.2b, for $p < 0.005$, respective for PP, CI and CII). Variables quantified by Foster's (1998) method also presented a variation during the period, as monotony (2.5 ± 2.0a; 2.1 ± 1.6a and 1.18b ± 0.4, for $p < 0.001$, respective for PP, CI and CII), and strain (9887 ± 9097a; 7360 ± 6272a and 4144 ± 2768b, for $p < 0.001$, respective for PP, CI and CII). Weekly total load not altered in periods. For the performance tests, the vertical jump not altered into periods (PP and CI), but medicine ball throw decrease in initial and end week in CII (initial: 3.80 ± 0.4a; 3.86 ± 0.3a and 3.59 ± 0.3b, $p < 0.005$ and end: 3.85 ± 0.3a; 3.89 ± 0.3a and 3.58 ± 0.3b, $p < 0.001$, respective for PP, CI and CII).

Discussion: The results found for the group of players analyzed show to effectiveness of monitoring athlete's load and tiredness through the proposed method to help planning the whole training, once athlete's status and applied load are monitored. The athlete's performance control showed the need to monitor their training in a more effective way, that is, weekly, once it was possible to obtain the exact moment of the rapid force performance decrease using an available simple method.

BORG, G. Med Sci Sports Exerc. 1982;14(5):377-81.

FOSTER, C. Med Sci Sports Exerc. 1998 Jul;30(7):1164-8.

SUZUKI, S.; SATO, T.; MAEDA, A.; TAKAHASHI, Y. J Strength Cond Res. 2006 Feb;20(1):36-42.

THE EFFECT OF HYPOXIC TRAINING REGIMENS ON PULMONARY FUNCTION

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Introduction: Hypoxic training results in respiratory adaptations, namely increased resting hypoxic ventilatory response (Schoene et al., 1990), and altered exercise breathing pattern (Mekjavic et al., 1991). The present study investigated the effect of three different hypoxic training regimens on pulmonary function, and on normoxic and hypoxic exercise ventilation (VE).

Methods: Thirty-six healthy male subjects (mean+SD age = 22.1 ± 3.5 yrs; height = 180.6 ± 5.5 cm; body mass = 73.6 ± 7.8 kg; VO2max = 50.8 ± 9.4 mL•kg-1•min-1) were equally assigned to four different training groups: "live low-train high" (LL-TH; n=9), which lived at 300m above sea level and trained at a simulated altitude (FIO2=12%); "sleep high-train low" (SH-TL; n=9) sleeping at a simulated altitude ranging fro 2800 to 3200 metres above sea level (FIO2=12%) and training at sea level; daily intermittent hypoxic exposures at rest (IHE; n=9) (7 cycles of 5-min hypoxia: 3-min normoxia) and training at 900 metres above sea level; or Control (Control; n=9) living and training at 300 m above sea level. All subjects trained 5 d•wk-1 for 4-wks on a cycle ergometer. The intensity of exercise training was 50% of the peak power output of each condition. Before and after each training regimen subjects conducted an incremental load exercise to exhaustion on a cycle ergometer under normoxic and hypoxic (FIO2=12%) conditions to define the VE. In addition, the pulmonary function at rest, namely forced vital capacity (FVC), forced expiratory volume in 1 sec (FEV1), peak expiratory flow (PEF), slow vital capacity (SVC) and maximum voluntary ventilation (MVV) was assessed by a spirometer (Cardiovit AT-2plus, Schiller, Switzerland).

Results: There were no significant differences in the FVC, FEV1, PEF and SCV in all groups post training. However, MVV was significantly ($p<0.05$) increased in the SH-TL group (Control: Pre: 183.4±34.0, Post: 185.0±29.9; SH-TL: Pre: 195.8±29.4, Post: 224.2±37.3). Moreover, VE was increased in SH-TL by a mean of 16.6±5 and 15.6±2 l∙min-1 in normoxia and hypoxia respectively, while no improvements were observed in the other three groups.

Discussion: SH-TL regime results in significant improvements in VE during exercise under nomoxia and hypoxia. These improvements accompanied by a significant increased MVV compared to Control group. We conclude that SH-TL is the most appropriate regimen to improve selected pulmonary variables at rest and ventilation during normoxic and hypoxic exercise.

References

Mekjavic I.B., Moric C., Goldberg S.V., Morrison J.B., Walsh M.L., Banister E.W., Schoene R. B. (1991). Eur J Appl Physiol Occup Physiol, 62, 61-65.

Schoene R.B., Roach R.C., Hackett P.H., Sutton J.R. Cymerman A., Houston C.S. (1990). Med Sci Sports Exerc, 22, 804-810.

SINGLE VS MULTIPLE SETS RESISTANCE TRAINING: EFFECTS ON UPPER AND LOWER BODY MUSCLE STRENGTH GAINS

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Most studies reported that performing resistance training with multiple sets per training session is more effective for increasing strength as training with a single set. However, only few studies compared the effects of single vs. multiple sets on strength between small vs. large muscle groups, and upper-body vs. lower-body muscle groups (Paulsen et al., 2003; Ronnestad et al., 2007). PURPOSE: The purpose of this study was to determine the effect of single sets vs. multiple sets on different muscle group strength in untrained subjects. METHODS: Twenty seven apparently healthy, untrained male participated in the study protocol. The volunteers were randomly assigned into one of two groups: 1) elbow flexion single set and knee extension three sets (E1-K3; n=13; 22.5 yrs; 174,9 cm; 70,9 kg), or 2) elbow flexion three sets and knee extension single set (E3-K1; n=14; 23.4 yrs; 173,3 cm; 79 kg). Subjects trained 2 days per week for 12 weeks and each workout consisted of 1 closed chain knee extension exercise and 1 elbow flexion exercise. Training intensity varied between 8 repetitions maximum (RM) and 12RM. Unilateral knee extension and elbow flexion strength were tested for both groups at 60°/s on a Biodex System 3 isokinetic dynamometer. Strength was expressed as peak torque (PT). Statistical evaluation of the data was measured using a 2 x 2 x 2 analysis of variance [group (E1-K3 and E3-K1) x time (pre and post) x muscle group (elbow flexors and knee extensors)]. The probability level of statistical significance was set at $p < 0.05$ in all comparisons. RESULTS: ANOVA revealed the increase in PT of the knee extensors muscles from week 0 to 12 was significantly higher in the E1-K3 group (12.1%) than in the E3-K1 (5.5%) group, while no difference existed in PT gains between E1-K3 (14.3%) and E3-K1 (13.1%) of the elbow flexors muscles. CONCLUSIONS: It was concluded that performing three sets of strength training is superior to one set for increasing strength of the knee extensors muscles. It was also concluded that single-set training protocols for the elbow flexors muscles might be sufficient for untrained individuals in the first 12 weeks of a strength-training program.

(1) Paulsen et al. J Strength Cond Res. 17:115-120, 2003.

(2) Ronnestad et al. J Strength Cond Res. 21:157-163, 2007.

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THE EFFECTS OF A SHORT–TERM TRAINING PROGRAM IN THE RATE OF FORCE DEVELOPMENT AND CONTRACTILE PROPERTIES OF UNTRAINED ADULTS

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Introduction: Rate of Force Development (RFD) is a term that describes the muscle's ability to produce rapidly force. Conflicting results are reported regarding the relationship between RFD and training and little evidence exists concerning the effects of a short-term maximum isometric training program on RFD, which is a major performance contributor in many sports (Aagaard et al., 2002). Thus, the purpose of this study was to investigate the changes in the voluntary torque, as well as the electrically evoked twitch torque properties, after a two days long program.

Methods: Nine untrained male subjects (age: 19.2±1.6 years, height: 181.0±5.0 cm, body mass: 79.4±7.3 kg) participated in the study. Training included two sessions of 30 maximal isometric, ballistic type plantar flexions, with 48 h interval. Evaluation of the calf muscles was assessed 48 h before and after the training. Maximum voluntary contraction, RFD and electromyogram (EMG) parameters were measured as well as electrically evoked twitch torque and maximum M-wave responses.

Results: After training the RFD during MVC increased in the later phase of contraction (after 100 ms) with no increase in the maximal force. No change in soleus EMG amplitude was observed, nonetheless medial gastrocnemius showed an increase during the force development period both in amplitude and frequency component, as assessed by spike analysis. Concerning the electrical evoked contractile properties, only peak twitch RFD increased significantly ($p<0.05$). All other examined parameters did not show any significant difference.

Discussion: The increase in voluntary RFD without concomitant increase of MVC could be explained by the increase in amplitude and firing frequency of gastrocnemius, in the absence of soleus or antagonist tibialis anterior electromyogram changes. The observed changes in gastrocnemius EMG gives evidence that spinal and/or supraspinal centers may contribute to adaptations after such short-term, isometric ballistic training (Del Balso and Cafarelli, 2007). The absence of adaptations in the soleus muscle, suggests that only muscles with larger proportion in fast twitch fibres are prone to the observed adaptations and may contribute to the voluntary RFD improvement.

References

Aagaard P, Simonsen EB, Andersen JL, Magnusson SP, Dyhre-Poulsen P. (2002). J Appl Physiol, 93(4), 1318-1326.

Del Balso C, Cafarelli E. (2007). J Appl Physiol, 103(1), 402-411.

SOCCER VS FLATWATER AND SLALOM KAYAK, IN RELATION TO BONE DENSITY AND MUSCLE MASS IN MALE COMPETITORS

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We investigated the effects of different weight-bearing and non weight-bearing physical activities on bone mineral density (BMD) and appendicular muscle mass (AMM) in male competitors. One hundred-six male (aged 18-26 yrs) volunteered. The sample included flatwater kayakers (Kflat; Ν = 22), slalom kayakers (Κslalom; Ν = 19), and soccer players (S; Ν = 33) who competed at national and international level. Thirty two age-matched non athletic individuals served as controls (C). All competitors exercised regularly at least 8 yrs for an average of 10 mo per year, 6 d•wk-1 for a minimum of 3 h•d-1. Segmental, total BMD and AMM were assessed with a dual-energy x-ray absorptiometry (DEXA). DEXA analysis also includes bone mineral content (BMC) and fat and lean masses. Total BMD was significantly higher ($p < 0.01$) in flatwater kayakers (mean ± SD: 1.31 ± 0.16 g•cm-2), slalom kayakers (1.36 ± 0.14 g•cm-2) and soccer players (1.47 ± 0.17 g•cm-2) than the C group (1.18 ± 0.13 g•cm-2) while soccer players revealed the highest. Soccer players had significantly higher regional BMD of the legs (1.59 ± 0.18 g•cm-2) compared with the three groups ($p < 0.05$). AMM was significantly higher ($p < 0.01$) in all three athletic groups (Kflat: 32.9 ± 3.2 kg; Κslalom: 31.2 ± 3.9 kg; S: 35.3 ± 4.4 kg) compared with C (26.4 ± 3.9 kg). Body fat percentage (% weight) was significantly lower ($p < 0.05$) in all competitors (Κslalom: 13.2 ± 5.1; Kflat: 11.0 ± 3.5 and S: 8.4 ± 3.1 kg) than the C group (17.5 ± 7.1 kg). Individuals engaged in competitive weight-bearing activities (soccer players) and also non weight-bearing activities (flatwater and slalom kayakers), have significantly higher total BMD and AMM than controls. These results suggest that competing either in weight or non weight-bearing activities may be an important factor in achieving a high peak bone mass and reducing osteoporosis risk in elite male competitors.

References

Maimoun, L., D. Mariano-Goulart, I. Couret, et al. Effects of physical activities that induce moderate external loading on bone metabolism in male athletes. J. Sports Sci. 22:875-883, 2004a.

Matsumoto, T., S. Nakagawa, S. Nishida, et al. Bone density and bone metabolic markers in active collegiate athletes: findings in long-distance soccer players, flatwater kayakists, and swimmers. Int. J. Sports Med. 18:408-412, 1997.

Morel, J., B. Combe, J. Francisco, et al. Bone mineral density of 704 amateur sportsmen involved in different physical activities. Osteoporosis Int. 12:152-157, 2001.

MAXIMUM DYNAMIC STRENGTH AND ENDURANCE RELATIONSHIPS IN TWO LOWER-BODY RESISTANCE EXERCISES

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Introduction: The purpose of this study was to examine the influence of maximum strength and exercise mode on the number of repetitions performed at the same intensity (%). The two lower-body resistance exercises selected were 90º Squat (Sq) and knee concentric extension (KE).

Methods: Seven male subjects (mass = 77.2 kg; height = 177.7 cm) experienced in resistance training were evaluated in repetition maximum (1RM) for Sq (1RMSq) and KE (1RMKE). The following days, with a minimum of 48 h between evaluations, they performed in randomized order the maximum number of repetitions (MNR) at 70% of 1RM. Continuous set configuration was used with interrepetition rests of 2 s. During the execution of the test, participants were suggested to perform all repetitions with maximum volitional velocity.

Results: MNR was of 33 ± 7.17 and 12 ± 3.45 for Sq and KE, respectively. Wilcoxon test showed significant differences among exercises in MNR ($p<0.05$). We did not find any significant correlation between 1RM and MNR. Spearman´s rank order significant correlation was detected between MNR in Sq and MNR in KE ($r = -0.767$; $p=0.044$).

Discussion: From these results, it was suggested that MNR at 70% of 1RM could be influenced by exercise mode but not by 1RM. Likewise, the negative correlation between MNR performances could be interpreted as an existence of different limiting factors from exercise mode differences. These factors could be related to the muscular type contraction and the muscle mass involved.

References

Braith R.W, Graves J.E, Legget S.H, Pollock M.L. Med Sci Sports Exerc 25 (1):132-8. 1993.

Shimano T, Kraemer W.J, Spiering B.A, Voler J.S, Hatfield D, Silvestre R, et al. J Strength Cond Res; 20(4): 819-23. 2006.

SPECIFICS OF TRIATHLON COMPETITIONS

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The performance in Triathlon, sport that combines swimming, cycling and running has been much studied in recent years. Among them the studies of physiological responses of the triathlete and biomechanical analysis of methods that make up the Triathlon. However, there are few studies that address the specifics in these competitions. This study aimed is determine whether there are differences in the

contribution of swimming, cycling and running performance in the overall results of Triathlon with different distances. It examined the performance of elite male athletes, top ten in race, in competitions of Triathlon held in Brazil in the last three years. For the characterization of evidence with different distances, the performance in swimming, cycling and running was correlated with the overall time of the different races analyzed, considering the significant correlations with $p < 0.05$. In step of Ironman held in Brazil, the modalities cycling and running were determinants ($r = 0.88$ and 0.77, $p < 0.05$, respectively), with swimming having no significance for the outcome ($r = 0.35$, $p > 0.05$). Brazilian Championship of Long Distance (3 km of swimming, 80 km cycling and 20 km running) running and cycling were the decisive manner ($r = 0.93$ and 0.85, $p < 0.05$, respectively), with swimming having no significance for the outcome ($r = 0.50$, $p > 0.05$). In the Brazilian Championship Olympic Triathlon (vacuum permitted), running and swimming were determinants ($r = 0.99$ and 0.74, $p < 0.05$, respectively) and cycling had negative influence on the performance of the race ($r = - 0.79$, $p < 0.05$). In Short Triathlon (vacuum permitted and allowed distances of 0.75 km of swimming, 20km cycling and 5km running), all procedures were important to the overall performance, especially the running ($r = 0.90$, $p < 0.05$), cycling ($r = 0.85$, $p < 0.05$) and finally the swimming ($r = 0.66$, $p < 0.05$). After the analysis and interpretation of data, we can conclude that: i) the tactics used in race with the vacuum permitted seems different the race without vacuum, ii) there are differences between the tactics employed for the Triathlon held at different distances, so it is necessary to analyze the distance from race to the athlete direct his tactics for the competition; iii) the running is the main modality in determining results of Triathlon, in the most distances analyzed. There is still a need for further studies on the performance of triathletes at different distances, including female athletes.

THE IMPACT OF MUSIC ON PHYSIOLOGICAL, PSYCHOLOGICAL, COORDINATIVE EFFECTS IN RECREATIONAL AND ELITE RUNNERS

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The common consumption of electronic music by small and light mp3 players during running raises the question if there is a performance benefit on the one hand or a cardiovascular risk on the other hand, respectively, for recreational and elite runners.

In our study eight recreational runners (RR: age 24.8±3.3 yrs; size 182±4 cm; body mass 81.0±7.9 kg; BMI 22.5±2.2; anaerobic threshold [v4] 3.26±0.48 m/s) and eight elite runners (ER: age 28.6±3.5 yrs; size 182±3 cm; body mass 73.8±5.1 kg; BMI 20.5±1.5; v4 4.36±0.25 m/s) completed an incremental treadmill test (TT) and a continuous running session (RS) until exhaustion at a velocity of 90 % v4. Both experimental parts were repeated twice with at least three days of recovery in between. The runners listened to self selected and sorted music by an mp3 player with earphones (volume was not limited) during one of the two exercise repetitions in a matched cross-over design. In TT we determined sub maximum (4 mmol/l blood lactate, LA) and maximum values for running velocity (v), heart rate (HR), VO2 and rate of perceived exertion (RPE). In RS we measured total running time and total running distance as well as LA, HR, respiratory exchange ratio (RER), RPE, stride frequency (SF) and stride length (SL) for every 10 min interval of running time.

The following results (mean ± standard deviation) were calculated using a multi factor ANOVA (main factors were performance group, music intervention and measurement time). In TT the music intervention (M) had no main effect on sub maximum and maximum running velocity, HF and VO2. RPE at 2 mmol/l LA was significantly lower in M (10.8±3.5 vs. 12.5±1.2, $p<0.05$) but was not affected at higher intensities. In RS total running time and total running distances until exhaustion were significantly increased in M for both groups (RR: 14.0±2.5 km in 80±12 min vs. 12.6±1.8 km in 73±13 min; ER: 21.2±3.1 km in 90±13 min vs. 18.1±2.8 km in 79±14 min , $p<0.01$ for main factor music intervention). No main effect for music intervention was found for LA, HR and RER. Running time until reaching RPE 15 was significantly longer in M in both groups (67±18 min vs. 47±14 min, $p<0.01$). Running coordination (step frequency and length) were unaffected by the music.

We conclude that a music intervention has no considerable effect on physiological and coordinative aspects during running. On the other hand running performance can be increased especially during moderate running (2 mmol/l LA). Obviously, recreational and elite runners are tolerating moderate intensities for a longer time because of a decreased work load perception. We conclude that music intervention may be helpful to increase training volume. The cardiovascular risk of music intervention in healthy runners seems to be low, since the autonomous signalling of peak intensity seems to be not affected. In case of a cardiovascular disease, off course, even a prolonged moderate run (e.g. during a marathon) can be dangerous.

14:15 - 15:15

Poster presentations

PP-TT13 Training and Testing 13

INCREASE OF SPECIFIC RAPIDITY OF JUDO THROUGH STIMULATION METHOD

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Introduction: Today Judo high level athletic competitions, such us Olympics and Internationals ones, are characterized by always more quick and offensive matches. The trainers pay attention to training methods able to increase the explosive strength in techniques projection of Judo. In this work we analyzed, Verchoshanskij stimulation method: an overload training done before technique exercises, to increase rapidity. We applied this method on judo training.

Methods: The experimentation was conducted on 10 Judo agonistic athletes (age: 16/29; weight: 57/93 kg; height: 153/185cm; age of practice: 8/21). To measure the improvement of rapidity obtained by the method of stimulation, we calculated the time of technique execution, with the TEP test (Projection Execution Time – Villani et all, 2001), an integrated system of photocells and a footboard with piezoelectric cells, that permits to calculate the split time and projection time of Judo techniques. Athletes performed the TEP test during 4 repetitions of preferred techniques (Tokui Waza or special technique) at the highest speed, making a 45 seconds pause between the techniques. After this Judokas performed a sequence of squat warm up and subsequently 3 series of 4 squat repetitions at 85% of 1RM, with a pause of 3 minutes between the series. At the end of 4 minutes recovery, the athletes repeated again the test as the first time. The

difference of the results obtained before and after the squat has been analysed statistically. The reliability of the protocol has been verified by test-retest correlation.

Results: The correlation between the results of the test and retest highlighted some values of r higher than 0,90 in all the parameters considered ($p<0.001$) so the protocol can be defined very reliable.

The analysis of the split time pointed out a very high correlation with r values of 0,99. The comparison of the results before and after the squat trial, revealed, in every studied case, a higher rapidity in the execution of techniques after the stimulus with percentage differences in all the parameters, varying from 10% to 17% ($p<0,05$).

Conclusions: The Anova results obtained permit us to confirm that the performed techniques after specific squat is really better than pre-squat values. So, the method of stimulation can be considered an important system of training useful to increase the rapidity/explosive strength .

Anyway, is important to point out that the results have been inferior to the results obtained by Verchoshanskij in previous tests, conducted over other athletics discipline. (improvement over 20%)

To obtain more interesting results it will be probably necessary to use the method of stimulus on athletes with more experience in the training with overloads.

Verchoshanskij J.V. .(1996). SdS, 36: 23-33, Italy

Villani R.(2001), 6°Annual Congress of the ECSS, p.1162, Cologne

Villani R., Di Vincenzo V. (2002), 7°Annual Congress of the ECSS, p.577, Athens

EVALUATION OF SPECIFIC RAPIDITY IN SANDA

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Introduction: From the analysis of Sanda matches we can understand that rapidity execution of punches and kicks, the frequency rapidity of techniques and the rapidity of reaction of the athlete are important factors to win this discipline. We organised a research to control the rapidity of reaction of specific action of Sanda techniques. In this research we studied two specific tests: the FSPK (Frequency Speed of Punch and Kick – Villani et all. 2006, mod.) and TEP test (Execution Time throwing techniques – Villani, 2001 mod.) mode PCP (Posterior Fall Point), which allow to take the time of reaction to luminous stimulus and the effective time of technique, with an integration system of photocells, of footboard with piezoelectric cells and of a luminous starter.

Methods: The athletes of this research were 20 all of these male between 18-24 years old and experts of Sanda from many years. Ten athletes are agonists while the other 10 athletes are amateurs. We have before administered the FSPK test in which we have analysed 3 combinations of jab and circular low kick for left and right position, in reaction to visual stimulus; later we have made the TEP test mode PCP with 3 projection, always in reaction to visual stimulus given from the luminous starter. The difference between the amateur and the agonist group, able to show discrimination capacity of tests, has been statistically analyzed with difference percentage and Anova. The group has repeated the whole battery of tests in two consecutive trainings for studying the reliability with test-retest correlation.

Results: The correlation between test and retest data concerning all the technique combinations analysed has resulted particularly high with value of r between 0,80 and 0,93. In FSPK test the agonist group has always significativity been faster of amateur group, with a difference between means of 14% ($p<0,05$) for reaction time of techniques, and 6% ($p<0,03$) for the action time.

This difference has been stronger in TEP test PCP, in which the agonists have reported an higher action rapidity (13%; $p<0.001$) and reaction times better of 16% ($p<0,05$) then amateurs.

Conclusions: The correlation test-retest has showed the great reliability of tests studied.

About the study of discrimination capacity of tests, the results don't have showed an absolute supremacy of agonist athletes in relation of amateurs (it's sure caused by the similar athletic and technique preparation level of the two groups), but the difference of the two groups appears however important and significative in all the tests analysed.

Then we can said that the FSPK test and the TEP test mod. PCP can be considered valid and reliable instruments for valuing the rapidity of reaction and action of Sanda athletes and for monitoring their performances during different phases of training.

References

Villani R.(2001), 6°Annual Congress of the ECSS, p.1162, Cologne

Villani R. et all (2006), 11° Annual Congress of the ECSS, p.522, Lausanne

EFFECTIVE PRACTICE SCHEDULE FOR IMPROVEMENT OF BALANCE

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Variety of exercises and methods are incorporated into balance training. However, there are no scientific guidelines concerning effective practice schedule for improvement of balance. Therefore, using retention tests we investigated a) optimal practice-rest ratios, and b) efficient exercise mode for balance training. A group of 14 PE students (age 21.0±2.3, height 181.2±8.9 cm, weight 74.2±8.0 kg) underwent different combinations of practice and rest on two balance tasks, making the percentage of time actually spent in practice (20%, 40%, 60% and 80%, respectively) of the total 30-min period. Thus, the protocol was as follows: a) 6 min practicing (12 x 30 sec) / 24 min rest (12 x 2 min), b) 12 min practicing (12 x 1 min) / 18 min rest (12 x 1.5 min), c) 18 min practicing (12 x 1.5 min) / 12 min rest (12 x 1 min), d) 24 min practicing (12 x 2 min) / 6 min rest (12 x 30 sec). This schedule was examined under different conditions: a) balancing or performing squats on wobble board, b) performing squats with different velocities while standing on wobble board, c) performing squats with different additional loads (AL) on wobble board. The learning was tested by administering a transfer test, which was given on the second day. The COP velocity was registered at 100 Hz by means of posturography system FiTRO Sway check based on dynamometric platform. While exercising and standing on stabilographic platform, cardiorespiratory parameters were monitored using breath-by-breath system Spiro-ergometry CS 200. Velocity of movement during squats was measured using the FiTRO Dyne. Results showed that for balancing on wobble board, the optimal condition for learning occurred when 80% of the time was spent practicing. However, by adding squats, such a combination of 2 min practice and 30 sec rest induced a gradual increase in ventilation and heart rate (peak values about 13.4%). Subjects also reported fatigue in lower limbs, which influenced their ability to perform exercise properly. The transfer test showed that for squats performing on wobble board, the optimal condition for learning occurred when 40% of the time was spent practicing. In addition, retention tests of various exercise mode showed that for improvement of balance are more efficient a) squats performing on wobble

board than balancing on unstable surface, b) explosive squats (~180 cm/s) than those performing with slower velocity (~90 cm/s), c) squats on wobble board with lower AL (e.g., 25% of body weight) than those performing with higher AL (50% and 75% of body weight). These findings indicate that explosive squats performing on wobble board with AL of 25% body weight for 1 min with 1.5 min rest in-between (i.e., 12 min practicing / 18 min rest in 30 min session) is effective schedule for improvement of balance. Previous experience also showed that adaptive changes in balance performance of elite athletes may be induced if such a schedule is provided 4-5 days per week for >25 training days.

THE EFFECT OF 8-WEEK INSTABILITY AGILITY TRAINING ON SENSORIMOTOR PERFORMANCE IN UNTRAINED SUBJECTS

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The study evaluates the effect of 8-week instability agility training on balance, reaction time and sensorimotor parameters. Untrained subjects divided into experimental (n = 16, age 21.1±1.0 y, height 179.6±8.1 cm, weight 72.3±8.5 kg) and control group (n = 16, age 21.0±0.8 y, height 181.8±5.7 cm, weight 75.9±6.6 kg) underwent reaction tasks similar to game-like situations in floorball on wobble boards (one 30 min session a week for a period of 8 weeks). Prior to and after the training sensorimotor parameters, balance and reaction time were evaluated. Sensorimotor parameters including distance, time and velocity of sway trajectory were measured by means of FiTRO Proprio check consisting of an unstable spring-supported platform equipped with PC system for feedback monitoring of COP movement. The task of the subject was to hit, as fast as possible, the target appearing randomly in one of the corners of the screen by horizontal shifting of COM (60 stimuli). Postural stability was assessed under both static and dynamic conditions (wobble board) with eyes open and eyes closed, respectively. The COP velocity was registered at 100 Hz by means of posturography system FiTRO Sway check based on dynamometric platform. Visual multi-choice reaction time was measured using FiTRO Reaction check. Two sets of 20 stimuli were performed in random order, one under normal conditions and another one while balancing on wobble board. During the task execution both sway velocity and reaction time were measured. Results showed that COP velocity registered under unstable conditions as a parameter of dynamic balance improved significantly (p≤0.05) from 121.7±18.7 mm/s to 97.0±16.1 mm/s. Even more profound decrease (p≤0.01) in sway velocity was found while responding on visual stimuli concurrently with balancing on wobble board (from 141.0±24.7 mm/s to 106.9±18.0 mm/s). Also multi-choice reaction time measured under unstable conditions significantly (p≤0.05) decreased (from 986.8±120.3 ms to 852.5±125.2 ms). However, this effect was not observed while standing on stable surface (from 833.2±118.4 ms to 812.6±114.0 ms). Similarly, there were no changes in COP velocity registered in static conditions with eyes open (from 13.6±2.7 mm/s to 13.1±2.4 mm/s) as well as with eyes closed (from 15.6±3.8 mm/s to 16.1±2.4 mm/s). Unfortunately, no information on changes in dynamic balance without visual control could be obtained because during pre-testing most of the subjects were not able to stand on wobble board with eyes closed. Training program applied has also proved to be unsufficient to improve sensorimotor performance. After the same training control group failed to show any significant improvement in all examined abilities. It may be concluded that balance exercises performed simultaneously with reaction tasks represent an effective means for improvement of balance on unstable surface, namely when responding to visual stimuli, and for decrease in multi-choice reaction time.

ENERGY EXPENDITURE AND COMFORT DURING NORDIC WALKING WITH DIFFERENT POLE LENGTHS

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NORWEGIAN SCHOOL OF SPORT SCIENCES

Nordic Walking is a fitness activity that has been practiced for about 10 years and which has spread internationally to for example Germany, UK, and USA from the Nordic countries. For many practitioners of Nordic Walking, an attractive characteristic of the activity is that energy expenditure is greater than during ordinary walking. Notably, the excess energy expenditure is attained without negatively affecting the perceived exertion or comfort. The lengths of the Nordic Walking poles are self-selected by practitioners on the basis of experience rather than research.

The purpose of the study was to investigate whether the aerobic demand of Nordic Walking could be enhanced further by adjusting pole length and through that achieve still higher energy expenditure, without compromising the comfort of the activity.

Twelve experienced participants [2.8±0.5 (mean±SEM) years of Nordic Walking on a regular basis of around 2 times per week] performed 6-min bouts of uphill (12˚), downhill (12˚), and horizontal Nordic Walking on a treadmill with their preferred pole length of 67.6±0.6% of body height and with 7.5 cm shorter poles. Participants were not unusual in stature or aerobic fitness [171.5±1.5 cm, 67.0±2.7 kg, 50.6±2.4 years, maximal oxygen uptake (VO2max) of 43.4±2.8 ml kg-1 min-1]. Treadmill velocity was self-selected by each participant for each slope and was maintained for both pole lengths. Energy expenditure was calculated from measured oxygen uptake while comfort was self-rated on a 1- to 10-point scale where 1 and 10 corresponded to "very, very uncomfortable" and "very, very comfortable", respectively.

The self-selected velocities during uphill, horizontal, and downhill were 1.13±0.04, 1.65±0.06, and 1.50±0.04 m s-1, respectively. During uphill Nordic Walking, the oxygen uptake and energy expenditure were 3.0±1.1% and 3.2±1.0% higher (P<0.05) with the short poles compared to the poles of self-selected length. For comparison, no differences of oxygen uptake or energy expenditure were found between the pole lengths during horizontal and downhill Nordic Walking. None of the comfort scores were different between the pole lengths during Nordic Walking at any of the slopes (P>0.05). The relative exercise intensity during Nordic Walking with self-selected pole length ranged from 43.7±2.4% (during downhill) to 86.8±2.2% (during uphill) of VO2max across the slopes. Underlining the peculiarity of Nordic Walking, participants rated comfort to above 7 at the same time as they exercised at above 85% of their VO2max during uphill Nordic Walking.

In conclusion, aerobic demand increased by about 3% for experienced practitioners of Nordic Walking using 7.5 cm shorter poles compared with self-selected poles for uphill walking at the same velocity. Notably, the excess energy expenditure with shorter poles was obtained without changes in the self-rated comfort. For horizontal and downhill conditions, energy expenditure and comfort were similar between pole lengths.

POSTURE ANALYSIS: VARIATIONS AND RELIABILITY OF BIOMECHANICAL PARAMETERS IN BIPEDAL STANDING BY MEANS OF FORMETRIC SYSTEM

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UNIVERSITY OF HAMBURG

Introduction: Testing human motor behavior has to take care of motion variability (Hatze, 1986). It is the purpose of this investigation to verify test reliability in three repeated trials of bipedal standing for posture analysis by means of Formetric® system parameters with regard to natural inherent motion variations.

Methods: N=69 back pain patients (36 females, 33 males; age 43 y ±12 y) participated in this investigation, where they went through three repeated posture measurements separated by a two minute brake minimum and with comletely new positioning. Back shape was analyzed by means of Formetric® system (resolution 7.500 pts/cm²; reconstruction error <0.2 mm) (Drerup & Hierholzer, 1994) and expressed in several parameters describing spine and pelvis character in the frontal plane (trunc imbalance, pelvic tilt, vertebral side deviation), the sagittal plane (trunc inclination, pelvis inclination, lordosis and kyphosis angles) and the transversal plane (vertebral surface rotation, pelvis torsion). Reliability for the three trials was calculated using the Intra Class Correlation (ICC) coefficiant (SPSS 12.0). Variations of posture parameters were expressed using the standard error of the mean (SEM) based on the three repeated trials.

Results: SEM for pelvic inclination and torsion, all kyphosis and lordosis angles, as well as for all surface rotation parameters indicated a variability of ± 1-2°. For pelvic tilt it was ± 1-2 mm and for trunc inclination and imbalance it was ± 2-3 mm. ICC coefficiants of the posture parameters were higher than 0.9 for trunc and pelvic inclination, kyphosis and lordosis angles and were higher than 0.8 for trunc imbalance, pelvic tilt and all surface rotation parameters. ICC coefficiants were less than 0.8 for pelvic torsion and most of vertebral side deviation parameters.

Discussion: This study is embedded in a larger investigation, where spine shape deformities should be detected automatically and lead to a specific exercise therapie; following posture alterations should be observed in a pre-post design (Schröder & Färber, 2009). Technical accuracy of the Formetric® system is proved (Drerup & Hierholzer, 1994) and the system is known to be helpful in the diagnosis of back shape disorders (Asamoah et al., 2000). The results of this study make sure that test reproducability is given (ICC). The knowledge of the value of motion variability (SEM) in bipedal standing enables an investigator to judge both, an actual value of a spine shape parameter being normal or irregular, and modifications of posture parameters being accidental variations, or possibly being systematic, following the specific exercise therapy.

References

Asamoah V, Mellerowicz H, Venus J, Klöckner C (2000). Orthopade, 29 (6), 480-489.

Drerup B, Hierholzer E (1994). Clinical Biomechanics, 9, 28-36.

Hatze H (1986). Journal of Motorbehavior, 18, 5-16.

Schröder J, Färber I (2009). Zs. f. Physiotherapeuten, 61 (5), accepted.

DIFFERENCES BETWEEN BLOOD AND SALIVA LACTATE

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The determination of saliva lactate concentrations in saliva samples represents a non-invasive and an innovative method for determination of endurance capacity and endurance diagnostics. Therefore, the purpose of this study was to assess the concentration of saliva lactate (SL) in contrast to blood lactate concentration (BL).

18 healthy subjects (13 male, 5 female; age: 27.3±6.2 yrs; physical activity: 6.9±2.7 h*wk-1) performed four cycle ergometer tests (one lactate minimum test [LMT] and 3 constant load tests at 95%, 100% and 105% of the workload at the maximum lactate steady state [MLSS] determined from the LMT). Blood and saliva samples were collected simultaneously and analyzed for lactate.

All tests exhibit a clear delay in SL measurements when compared to BL. SL values were lower than BL values (range: 2-5 times). SL curve leveled off later than BL during the constant load tests. Workload of MLSS from the constant load test [BMLSSCL] (209.7±44.8 W) was significantly lower in comparison to workload measured for maximum lactate steady state during LMT generated from blood [BMLSS] (219.7±45.5 W; n=18; $p<0.05$) and saliva [SMLSS] (235.9±58.4 W; n=16; $p<0.05$).

The results demonstrated that more inertial appearance of SL may be explained by an additional diffusion of lactate in the salivary glands. An approximation of BMLSSCL by SMLSS is not possible when using the established protocol with an increment duration of 3 min. due to the delayed appearance of lactate in saliva.

MASTERING OF THE MAIN GYMNASTIC EXERCISES ON THE BASE OF THEIR BIOMECHANICAL ANALYSIS

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Introduction: The core of technique performance training at initial stages in artistic gymnastics is the basic skill training and mastering of specific main exercises of gymnastic all-around. The main exercise technique performance training becomes more and more important for gymnasts at the stage of initial specialization.

Methods: Biomechanical analysis of several main exercises was conducted for defining the kinematic parameters of their performing and for optimization of the main exercise mastering process. Those exercises were acrobatic forward handspring and back handspring, forward handspring vault, swing back to handstand on parallel bars and a giant circle on high bar. 6 experienced gymnasts performed these exercises and the performance was video recorded and processed in "Star Trace" computer programme. This way we've got the data of angular kinematics of the given exercises.

Results: 10 gymnasts of the initial specialization stage mastering the main exercise technique performance took part in our research. Their performing of the main exercises under research was also recorded and processed. The comparing of results showed the evident differences between the two groups, mostly in kinematics of joint angles.

The kinematic parameters of high qualification gymnasts' performance of the main exercises became the model for training of gymnasts at the stage of initial specialization. The achieved results were a target for the young gymnasts in their training process.

The technological approach of conditioning gymnasts is based on the following principles: algorithm of the methods aimed at effective achievement of the goal; minimization and optimization of the aids and means of training; selection and usage of training means adequate to individual gymnasts' conditions and those of sport facilities.

Discussion: The final comparison of the young gymnasts test group results with the high qualification gymnasts' data showed less significant differences between them. It certifies that the young gymnasts' main exercise technique performance changed to be closer to the model one. In addition, the test group results' dynamics was considerable and there were some significant differences between the initial and final results of the main exercise technique performance.

This research certifies that usage of the additional instrumental methods of gymnastic exercise performance evaluation allows to reveal performance errors more precisely. It will promote the efficiency of the training process.

A COMPARISON OF GROUND AND TREADMILL ENERGY COST OF RACE WALKING

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Purpose: A prerequisite in the development of a multistage field test is the knowledge of the energy cost of the specific mode of locomotion. There are only few data available about race walking, and most of them have been measured on a treadmill. Therefore, the aim of this study was to compare ground and treadmill energy cost of race walking with the purpose of determining the incrementation rate of a specific multistage field test.

Methods: Six highly trained race walkers of national to international calibre gave their written informed consent to participate in the study. They completed two randomly ordered sessions separated by at least 24 h, one on a 200 m indoor synthetic track, one a laboratory motorized treadmill. The protocol consisted in walking with proper technique at 8, 10, 12 and 14 km.h-1 for 4 minutes without rest in between. Thereafter, speed was incremented by 0.5 km.h-1 every minute until exhaustion to determine peak oxygen consumption. Oxygen uptake and related gas exchange measures were determined continuously on a 30 s basis using an automated cardiopulmonary exercise system (K4b2, Cosmed, Italy).

Results: Mean was 64.5 ± 10.3 ml.min-1.kg-1 and was reached at 14.7 ± 0.8 km.h-1. Combining data of all participants resulted in almost identical -speed relationships between track (y = 4.90x – 7.10, R2 = 0.53) and treadmill race walking (y = 4.85x – 6.74, R2 = 0.72). There was a high interindividual variability, as evidenced by a large standard error of estimate (SEE; 9.3 and 7.6 ml.min-1.kg-1 for track and treadmill race walking, respectively), and by the ~ 30 ml.min-1.kg-1 difference between less and more economical race walkers at 14 km.h-1. Interestingly, we observed a significant relationship between economy of walking at 14 km.h-1 and (r = 0.68, $p<0.05$). In this small sample of athletes, less economical race walkers compensated their lack of efficiency by higher . The visual inspection of individual curves confirmed the validity of using a linear model. The average energy cost of race walking estimated from such a model increased by 5 ml.min-1.kg-1 per km.h-1, either on the track or the treadmill. In comparison, the average energy cost of running is 3.5 ml.min-1.kg-1per km h-1. (X1 in ml kg-1 min-1) and walking economy (X2, at 14 km h-1 during the track test in ml kg-1 min-1) explained 92% of the variability of the maximal speed attained during the treadmill test (Y = 15.089 + 0.073 X1 - 0.07862 X2, R2 = 0.84 SEE = 0.39 km h-1).

Conclusion: Despite a high interindividual variability, our results underscore the usefulness of developing a specific multistage field test for race walking. Considering that optimal incrementation should allow an increase in of ~ 3.5 ml.min-1.kg-1 every two minutes, a speed incrementation of 0.5 to 0.75 km.h-1 every two minutes appears to be more specific to race walking than the 1 km.h-1 every two minutes incrementation that is usually used in running.

OPTIMAL ELECTRODES SETTING FOR TRANSCUTANEOUS ELECTRICAL STIMULATION OF THE QUADRICEPS

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Introduction: Treatment or training sessions with neuromuscular electrical stimulations (NMES) are generally performed in a transcutaneous manner with the aid of surface electrodes. Several investigators have highlighted the benefits of quadriceps stimulation during rehabilitation following traumatic injury or surgery of the knee and during physical preparation of athletes (Kramer and Mendryyk, 1982). However, the practical modalities of quadriceps stimulation (number, size and localization of electrodes) remain controversial (Vanderthommen and Duchateau, 2007). The present work aimed to determine the optimal electrodes setting for NMES applied to the quadriceps.

Methods: Twenty physically active men (23 ± 2 years, 180 ± 8 cm, 75 ± 12 Kg) underwent first an evaluation of left quadriceps maximal isometric voluntary torque (QMIVT). The exact localization of the motor points of vastus medialis (MPVM) and vastus lateralis (MPVL) was also determined. Then, we tested unilaterally, isometrically and consecutively five electrodes settings (ES) including rectangular (10 x 5 cm) (RE) or square (5 x 5 cm) (SE) electrodes, with identical stimulation parameters (biphasic symmetric rectangular pulses, 80 Hz, pulse duration 0.35 ms, constant current intensity (42 ± 11 mA)): ES1= 1 channel, 2 RE transversally on the thigh (with the distal electrode placed on MPVM and MPVL); ES2= 1 channel, 2 RE longitudinally on MPVM and MPVL; ES3= 1 channel, 2 SE on MPVM and MPVL; ES4= 2 channels, 4 SE (with 2 SE placed on MPVM and MPVL); ES5= 2 channels, channel 1= 1 SE on MPVM and 1 RE transversally on the proximal part of the thigh, channel 2= 1 SE on MPVL and 1 RE transversally on the proximal part of the thigh. For each ES we measured the electrostimulated torque.

Results: The mean QMIVT reached 200 ± 51 Nm. The MPVM and MPVL were situated 10 ± 2 cm and 14 ± 3 from the patellar base, respectively. The stimulated contractions reached 9.2 ± 7.4 Nm (4.6% of QMIVT) for ES1, 8 ± 4.8 Nm (4% of QMIVT) for ES2, 15 ± 8.3 Nm (7.5% of QMIVT) for ES3, 16.3 ± 7.7 Nm (8.2% of QMIVT) for ES4 and 40.4 ± 11.3 Nm (20.2% of QMIVT) for ES5 ($p<0.05$).

Discussion: During NMES programs it appears crucial to use a proper electrode setting ensuring efficient muscle recruitment and therefore optimized training effects. However, physiotherapists and trainers often place electrodes empirically especially for NMES applied to the quadriceps. This study demonstrated the relevance of using two channels for quadriceps NMES and of setting, for each channel, one small "excitative" electrode exactly on the motor point of vastus medialis or lateralis and one bigger "dispersive" electrode transversally on the proximal part of the thigh (in order to close the circuit).

References

Kramer JF, Mendryyk SW. (1982). Phys Ther, 4, 1657-1667.

Vanderthommen M, Duchateau J. (2007). Exerc Sport Sci Rev, 35, 180-185.

UTILITY AND VALIDITY OF THE STEP TEST IN WATER BASED ACTIVITIES

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Introduction: The Actiheart –AH- (Cambridge Neurotechnology, UK) is a relatively new waterproof device that combines heart rate (HR) and activity data for objectively measuring physical activity (PA) and inferring energy expenditure (EE). It has been already demonstrated (Brage, 2005) that the ramped step test, designed to establish the individual heart rate (HR) physical activity intensity (PAI) relationships and to derive a prediction equation for fitness, allows a greater accuracy in the estimation of physical activity energy expenditure (PAEE) activities on land.

The purpose of the present study was to examine the utility and validity of the step test in water based activities (WA).

Methods: 12 physically active women (age 26±2,9 yr; BMI 19,7±1,6 kg/m2; resting V'O2 3,4±0,6 ml/kg/min) volunteered to participate in the study and performed in two separate weeks the following tests: a laboratory test (incremental test to exhaustion on treadmill) in order to identify the actual maximal oxygen consumption (V'O2max, K4b2, Cosmed, Italy) and two ramped step tests (one on land and the other in water). Oxygen consumption was measured continuously throughout the step tests by indirect calorimetry (IC) and participants wore the AH on the chest for simultaneous estimation of HR-PAI relationships. V'O2max was predicted at the end of the step tests from AH data.

Results: HR-PAI relationships obtained with IC, even if significantly correlated (r=,905, p<,0001), significantly differ on land and in water (p<,0001). HR-PAI relationships estimated by the AH were highly correlated with IC both on land and in water (r=,906 and ,737, p<,0001 on land and in water respectively) even if they resulted significantly different in both conditions (p<,0001). The positively correlated errors with measured values in the plots of both land and water models indicate a proportional difference in these equations (mean difference between methods= land 15,4±9,7, water -18,2±18,5; 95% limits of agreement= land -4 to 34,7, water -18,8 to 55,3). The variances of the two methods significantly differ (p<,0001). In fact, the shared variance between predicted HR-PAI relationships from the IC was R2 = 0,71 (SEE = 5,22 ml/kg/min) on land and R2 = 0,54 (SEE = 12,62 ml/kg/min) in water. V'O2max predicted at the end of the step tests from AH data significantly differ from the actual values (p<,001), even if it is highly correlated (r=,791, p<,001).

Discussion: The significant differences detected between HR-PAI relationships on land and in water with IC underline the necessity to perform the step test both on land and in water to increase the accuracy for estimating EE if WA are concerned. The AH significantly underestimates HR-PAI relationships and V'O2max, so it can be suggested to use HR-PAI relationships derived from IC when possible.

References

Brage S. et al. Eur J Clin Nutr. 2005 Apr;59(4):561-70.

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Poster presentations

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EFFECTS OF TRAINING CESSATION ON MUSCLE STRENGTH, BODY COMPOSITION AND RESTING HORMONES IN ELITE KAYAKERS

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Introduction: In top-level athletes, there is a need to incorporate some regeneration period after the conclusion of the main event of the season in order to allow for physical and mental relief before the start of a new training cycle (Bompa, 1999). Usually, this layoff is associated with performance declines that are dependent on the chosen recovery strategy (reduced training or inactivity), initial fitness level, and total time under reduced or absence of training stimuli (Mujika and Padilla, 2000). However, the consequences of these post-season breaks on performance are not fully understood. The aim of this study was to analyze changes in muscle strength, body composition and resting hormones during 5-wk of training cessation (TC) in ten elite kayakers.

Methods: Maximal strength and power testing, body composition assessment and blood sampling were conducted 7-d before the start of the Flatwater Racing World Championships (T1), and after 5-wk of TC (T2). One-repetition maximum (1RM) and mean velocity with 45% 1RM load (V45%) were assessed in the bench press (BP) and prone bench pull (PBP) exercises. Body fat (BF) and muscle mass (MM) were estimated from anthropometric measurements. Blood samples were assayed for testosterone (T) and cortisol (C) by radioimmunoassay.

Results: From T1 to T2, significant declines in 1RM values were found for BP (-9%) and PBP (-8%). Similarly, V45% significantly decreased by 13% and 9% for BP and PBP, respectively. No significant changes were observed in body mass. However, BF significantly increased (21%) and MM decreased (6%) from T1 to T2. Cortisol decreased (-30%) and T increased (12%); consequently, T/C drastically increased (70%).

Discussion: The main findings of the present study were that 5-wk of TC resulted in significant reductions in maximal strength and muscle power, decreases in muscle mass and increments in body fat, elevation in T and T/C and reduction in C. Thus, short-term TC resulted in a true detraining effect, with large declines experienced in physiological markers of highly conditioned athletes. Positive changes were those related to an apparently increased androgenic-anabolic activity, possibly due to the body's reaction to combat the catabolic processes induced by the high levels of physical and mental stress experienced during the precedent season. Our findings support previous research (Häkkinen et al., 1981; Izquierdo et al., 2007), and demonstrate the need of a maintenance program of reduced training to avoid excessive declines in neuromuscular function in cases where a prolonged break from formal training is required.

References

Bompa TO. (1999) Periodization. 4th ed. Human Kinetics, Champaign (IL).

Häkkinen K, Komi PV, Tesch PA. (1981) Scand J Sports Sci, 2, 50-58.

Izquierdo M, Ibañez J, González-Badillo JJ, Ratamess NA, Kraemer WJ, Häkkinen K, Bonnabau H, Granados C, French D, Gorostiaga EM. (2007) J Strength Cond Res, 21(3), 768-775.

Mujika I, Padilla S. (2000) Sports Med, 30(2), 79-87.

RELIABILITY OF LUMBAR POSITION SENSE TEST USING ELECTROGONIOMETER IN SEATED POSITION ON A SWISS BALL.

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Introduction: Joint position sense has been used to measure proprioception with isokinetic dynamometer (Lephart & Fu, 2000) or 3space track (Newcomer et al, 2000; Shum et al, 2007). It hasn't been measured with electronic goniometer on lumbar spine.Therefore, the aim of this study was to determine the reliability of lumbar position sense test over a swiss ball using electrogoniometer (Transducer TSD130A from Biopac Systems, USA).

Methods: Twelve healthy volunteers, 8 men and 4 women (22.3+/-2.6 vs. 23+/-1.8 respectively) performed maximal flexion and extension lumbar movement 3 consecutive trials, sitting over a Swiss ball with hips and knees between 80º and 90º of flexion maintaining the back straight keeping the sight to the front and both hands over the knees on a relaxed position. This was repeated in two different days. The Electrogoniometer was attached on the skin, its cranial arm following lumbar line up to L3 level and lower arm following lumbar line under L3 level. Repositioning error data were collected. It was required to maintain during 3 seconds each perceived maximal flexion and extension position during each of the three trials. There was neither feedback nor order along the test. Intertest repeatability was obtained calculating the variability coefficient between trials in the same day of test. Intratest repeatability obtained using Wilcoxon non parametric statistic analysis between tests in two different days. Intertest repeatability was considered when variability coefficient was lower than 100% and Intratest repeatability was considered with Wilcoxon significance p≥ 0.05.

Results: Variability coefficient means were from 5.8% to 10% for both repositioning errors. Bilateral signification from Wilcoxon test was p=0.285 reaching maximal flexion and p=0.508 reaching maximal extension.

Conclusions: The results suggest that the electrogoniometer is a reliable instrument to measure the lumbar position sense over a Swiss ball. It could be an easy and less sophisticate way to improve lumbar proprioception researches.

References:

Lephart, S., Fu, F. (2000). Proprioception and Neuromuscular Control in Joint Stability. U.S.A: Human Kinetics.

Newcomer, K., Laskowski, M.D., Yu, B. i Larson, D. (2000). Repositioning error in low back pain. Comparing trunk repositioning error in subjects with chronic low back pain and control subjects. Spine, 25(2), 245-250.

Shum, G.L., Crosbie, J. i Lee, R.Y. (2007).Three-dimensional kinetics of the lumbar spine and hips in low back pain patients during sit-to-stand and stand-to-sit. Spine, 32(7), 211-219.

ANALYSIS OF HEART RATE IN THE ELITE KITEBOARDING: NATIONAL CUP 2008

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Introduction: The principal aim of this study is to identify the intensity that supposes competition to participant in 2008 Spain National Cup. Physiological demands and intensity of the effort have been analyzed in new Olympic windsurf board (Castagna et al, 2007) and Laser and mistral sail (Vogiatzis et al, 2002). This data was recorded in Elite International level although it was not under racing conditions. Kiteboarding is a new water sport. The athlete (Nickel et al, 2004) uses a small board and transfers the energy of the wind into speed by a large maneuverable kite.

Methods: Ten male professionals windsurfers (n=9, 27.6±22 years, 174.1±5.1 cm Height, 74.4±8.6 Kg weight, 9.91±3.4 kg body fat). Were chosen the ten first qualified of elite Kiteboarding: Spain National Cup 2008 (organised by Royal Spanish Sailing Federation,and the Spanish Association of Kiteboarding (AEK), Santa Pola (Spain) 2008) and were monitorizaded during the firts race, (racing form,R1) valid to the final classification in the championship. It was used a GPS recording unit (outdoor sports computer series W 600). The software was used in order to analyze data to FRWD outdoor sports computers series for the GPS data. After assessment, data was analysed statistically using the SPSS 13.0 software package to compare kiteboarding parameters. Wind´s speed varied from 10 to 14 $m \bullet s^{-1}$. Anemometer was (AVM-40, Kestrel 4000).

Results: Heart rate (HR) and average temperature (30.6±1.2ºC) was recorded, making a difference in the total time of the course (16.5±1.4 min). On one hand with up-wind leg (8±0.1 min, 19.02±7.2 $km \bullet h^{-1}$, 127.37±4.1 $beats \bullet min^{-1}$) and also on the other hand with down-wind leg (8.5±0.7 min, 14.43±8.1 $km \bullet h^{-1}$, 140±8.5 $beats \bullet min^{-1}$).

Discussion: Values of heart rate are significantly higher than those obtained in other studies windsurf (Castagna et al, 2007; Vogiatzis et al, 2002). This may be due to the way in which data were recorded (higher wind speed, the kite higher and the structure of competition). Actually there are significant differences (p <0001) between heart rate and speed record with a maximum wind and wind leg to leg. Find similar differences in other studies (Castagna et al, 2007; Vogiatzis et al, 2002). In summary, heart rate is a parameter warning intensive effort in kiteboarding, but is influenced by external parameters (the competition, the wind speed and size of the kite) and internal (age and educational level).

References

Nickel, C. Zernial, O. Musahl, V. Hansen, H. Zantop, T. Petersen, W. (2004), A Prospective Study of Kitesurfing Injuries. The American Journal of Sports Medicine. 32 (4): 921-927.

Castagna, O. Vaz Pardall, C. Brisswalter, J. (2007), The assessment of energy demand in the new olympic windsurf board: Neilpryde RS: X. European Journal of Applied Physiology. 100 (2): 247-252.

Vogiatzis, G. De Vito, A. Rodio, A. Madaffari, M. Marchetti, A. (2002), The physiological demands of sail pumping in Olympic level windsurfers. European Journal of Applied Physiology. 86 (5): 203-209.

RELIABILITY AND VALIDITY OF A KAYAK ERGOMETRY TESTING.

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Introduction: Flat-water kayaking is an olympic sport that combines different types of boats (canoe and kayak) and distances (500 m for female and 500 m and 1000 m for male competition). The contribution of aerobic metabolism at individual races has been established between 60 and 80% for 500 m and 1000 m, respectively. In this sense, an accurate assessment of optimal training intensities for to

develop aerobic and anaerobic metabolisms is needed. This assessment can be achieved through field tests (open water environment) or under simulated conditions in laboratory environment using specific kayak ergometers. Several investigations have attempted to test the validity of these ergometers, comparing open water kayaking and kayak ergometry (Larsson et al., 1988; Witkowski et al., 1989; Van Someren & Dunbar, 1996). The results of some of these studies showed a lack of correspondence of physiological responses to open water and ergometric tests. Probably, drag resistance generated by ergometer (laboratory test) and open water (field test) can to produce these differences modifying, indeed, the kayaking technique. However, there have been advancements in the development of air-braked kayak ergometers that can to offer new possibilities in the application of laboratory test for prescription and evaluation of kayak paddlers. So, the aims of this study are to determine the validity of a specific kayak ergometer and to evaluate its application in training prescription and evaluation of top-level kayak paddlers and to design an ergometric test protocol for the assessment of certain physiological and technical parameters that can to define kayaking performance.

Methods: Fourteen male top-level kayak paddlers (all members of Spanish Kayaking National Team) participated in this investigation. All subjects carried out two ergometric tests (Ergo1 and Ergo2) and one open water test (OWT) in random order.

Results: At anaerobic threshold (AnT) intensity, the results showed acceptable levels of reliability (comparison between data of Ergo1 and Ergo2 tests) in the assessment of velocity ($r=0.784$; $p=0.004$), stroke frequency ($r=0.976$; $p<0.001$), heart rate ($r=0.964$; $p<0.001$), and blood lactic acid concentration ($r=0.899$; $p<0.001$). Validity coefficients showed a strong relationships between Ergo2 and OWT tests in all physiological and technical parameters with the exception of velocity ($r=0.498$; $p=0.121$).

Conclusions: It can be concluded that specific ergometry can be used to evaluate and to prescribe training AnT intensities of top-level kayakers attending to parameters such us heart rate, whole blood lactic acid concentration, and stroke frequency. Nevertheless, the training prescription through specific ergometry must be taken cautiously when velocity is the parameter of reference.

References

Larsson B et al. Ergonomics 1988, 31: 1701-1707.

van Someren KA, Dunbar GMJ. J Sports Sci 1996, 14: 102.

Witkowski M et al. Biol Sport 1989, 6: 307-308.

THE EFFECT OF THREE DIFFERENT COMPRESSION GARMENTS ON TIME TO EXHAUSTION, OXYGEN UPTAKE AND LACTATE CONCENTRATION DURING HIGH INTENSITY EXERCISE

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Introduction: Compression stockings have become common among endurance athletes not only in long lasting events (e.g. marathon) but also in short and middle distance running. Although their use is widespread during these intense exercises, few scientific research were executed observing their influence during these kinds of exercise. Furthermore the majority of these studies focus on wearing stockings, whereas no study has investigated the effect on performance and related physiological variables when increasing the amount of compressive area onto the body. The aim of the study was therefore to investigate the influence of three different compression garments (stockings, stockings + tight, whole body compression) on maximal endurance performance and performance influencing parameters.

Methods: 14 male well-trained endurance athletes (age: 27,1 ± 4,8 yrs, height: 183,1 ± 7,6 cm, weight: 76,3 ± 7,6 kg, VO2peak: 63,7 ± 4,9 ml*kg*min-1) performed an incremental step test on a treadmill, to assess the velocity for the following four high intensity exercise bouts (HIB), which started four days after the initial testing. During HIB, all subjects randomly wore textile with different compressive surface: 1. regular non compressive running gear, 2. compression socks, 3. compression tights and 4. whole body compression (tight & top). During each of the high intensity exercise bouts time to exhaustion (TLim), lactate concentration (LAC) and oxygen uptake (VO2peak) was measured.

Results: TLim was 310 ± 130, 280 ± 76, 296 ± 90 and 281 ± 91 seconds for the non compressive, sock, tight and whole body condition, which constitutes no statistically significant difference ($p<0,05$). Either not significant was LA, where values of 7,6 ± 2,88, 7,31 ± 2,29, 7,64 ± 2,46 and 7,12 ± 2,11 mmol*l-1 were measured. This is supported by VO2peak, which was 59,8 ± 13,6, 62,9 ± 7,3, 60,3 ± 8,9 and 61,1 ± 8,6 ml*kg-1*min-1 and not significant as well.

Conclusion: For the first time the effects of increasing the amount of compressive surface vs non compression on maximal endurance capacity was evaluated. The results of this study revealed no beneficial effects neither on time to exhaustion (TLim) nor on performance affecting variables like VO2 or LAC when wearing compressive textile. Although, one has to consider that the data was detected during a high intense exercise bout. Scientific data concerning long distance events like Marathon or Ironman are yet to be undertaken, what disallows suggestions about the physiological and psychological effects of compression clothing during long lasting endurance events.

INCREASING PASSIVE RECOVERY DURATION LEADS TO GREATER PERFORMANCE DESPITE HIGHER BLOOD LACTATE ACCUMULATION AND PHYSIOLOGICAL STRAIN DURING REPEATED SHUTTLE 30-S SPRINTS

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Introduction: Increasing recovery duration during very short (i.e., <6 s) repeated sprints has been shown to improve performance and to decrease physiological strain (Balsom et al., 1992; Glaister et al., 2005), inferred from lower heart rate (HR), post-exercise blood lactate accumulation ([La]) and rating of percieved exertion (RPE)). Whether this effect is preserved when considering sprints (i.e., 30 s) and recovery (i.e., >60 s) of longer durations is not known. The aim of the present study was to examine the effect of increasing recovery duration on repeated 30 s sprint performance and HR, [La], and RPE.

Methods: Thirteen male team-sports players (21±1 y; 76.8±6.3 kg; 1.79±0.10 m) performed 6 maximal 30 s shuttle sprints, each interspersed with either 35 (RS35) or 80 s (RS80) of passive recovery. The two assessments were performed one week apart and in a random order. HR was measured continuously (Polar S810, Polar Electro, Kempele, Finland), and [La] (Lactate Pro, Arkray Inc, Japan) and RPE (0-10 Borg scale) were collected 3 minutes post trial. Maximal and mean distance covered, as well as speed decrement index (%Dec) (Glaister et al. 2005) were computed for each recovery condition.

Results: Maximal distance was similar for both trials (135±10 vs. 137±9 m, $P=0.30$), whereas mean distance was lower (117±7 vs. 127±9 m, $P<0.001$) and %Dec higher (13±7 vs. 8±3 %, $P=0.03$, ES=-0.91) for RS35 compared with RS80. Maximal HR was similar for both conditions (94±4 vs. 94±4% HRmax, $P=0.75$), whereas mean HR was higher for RS35 (88±4 vs. 84±1% HRmax, $P<0.001$ for RS35 vs. RS80,

respectively). [La] and RPE were greater for RS80 compared with RS35 (15.1±1.7 vs. 13.3±2.2 mmol.l-1, P=0.03, ES=0.84 and 8.7±0.9 vs. 7.9±1.0, P=0.07, ES=0.74).

Conclusion: Increasing passive recovery from 35 to 80 s during repeated 30 s maximal shuttle running sprints in team-sport players leads to greater total distance covered and lower speed decrement, despite an increase in physiological strain (RPE) and [La] accumulation. This beneficial effect on running performance is not surprising; the longer passive recovery duration may enabled greater PCr resynthesis between sprints. However, the increase in [La] accumulation contrasts previous studies (Balsom et al. 1992; Glaister et al. 2005). This could be related to a decrease in aerobic participation with increased recovery duration, possibly leading too an increased anaerobic deficit at the initiation of each sprint. Increasing passive recovery duration can be used by coaches to trigger anaerobic system participation during 30-s repeated sprints.

References

Balsom P. D., Seger J. Y., Sjodin B. and Ekblom B., (1992). Int J Sports Med, 13, 528-33.

Glaister M., Stone M. H., Stewart A. M., Hughes M. and Moir G. L., (2005). J Strength Cond Res, 19, 831-7.

POWER AND SPEED AMONG YOUTH ATHLETES FROM DIFFERENT TEAM SPORTS

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Introduction: Team-sport training is generally characterized and by a diverse range of training types. Power and speed are variables that influence the performance of the athletes and are frequently tested to provide a profile as well as training-induced adaptations. Considering that the performance is specific to training and to the type of sport, the aim of this study was to evaluate the jump capacity (countermovement-jumps (CMJ), squat jumps (SJ) and CMJ with arms swing (CMJW)) and speed 20 meters sprint (20S)) of young athletes from different team-sports Basketball, Futsal, Handball and Volleyball during the preparation phase for the 2008 Youth Games of Parana State-Brazil.

Methods: The sample was composed of 45 male (Age: 16.3±0.6 years; Height: 1.81±0.4 m; Weight: 73.6±9.9 kg) and 41 female (Age: 15.5±1.1 years; Height: 1.66±0.4 m; Weight: 60.4±6.7 kg). The study was approved by the university human ethics committee and all subjects signed an informed consent document. The vertical jumps were collected according to Bosco protocol. The subjects stood on a contact mat and the jump height was calculated by an Ergojump apparatus (Bosco system). Three attempts were allowed and the highest one was recorded for each test. The speed was measured with a wireless time system composed of 3 pairs of infrared emitters at the 0-m, 10-m and the 20-m marks. Each subject completed two attempts and the fastest trial was recorded. The One way ANOVA was utilized to test the differences among the group of means and the Scheffee Pos Hoc was used as the follow-up test. The significance level was set at p ≤ 0.05.

Results: For the male athletes the results were: VERTICAL JUMP: Basketball (N 12)-SJ: 33.6±4.5 cm; CMJ: 37.5±4.0; CMJW: 45.0±5.1.Futsal (N 10)-SJ: 33.6±4.5 cm; CMJ: 37.4±3.1; CMJW: 43.7±3.9.Handball (N 13)-SJ: 35.3±5.8 cm; CMJ: 38.5±6.5; CMJW: 43.7±3.9.Volleyball (N 10)-SJ: 36.4±5.9 cm; CMJ: 40.1±6.7; CMJW 46.3±6.7), SPEED: Basketball-3.11±0.11s; Futsal-2.98±0.03s; Handball-3.11±0.17s; Volleyball-3.00±0.18s.

For the female athletes the results were (VERTICAL JUMP: Basketball (N 12)-SJ: 26.6±3.1 cm; CMJ: 28.4±3.1; CMJW: 32.1±3.3. Futsal (N 10) -SJ 20.0±4.1 cm; CMJ: 23.9±4.5; CMJW: 28.2±3.1. Handball (N 12)-SJ 24.3±3.7 cm; CMJ: 26.6±4.1; CMJW: 31.0±5.1. Volleyball (N 7)-SJ 27.3±3.6 cm; CMJ: 30.9±3.7; CMJW 35.5±5.3. SPEED: Basketball-3.38±0.16s; Futsal-3.37±0.11s; Handball-3.43±0.13s; Volleyball-3.36±0.18s. The statistical analysis revealed that there were no significant differences among the group means of the four types of team-sports considering either male or female subjects.

Discussion: Based on these results the used tests did not show differences when evaluating athletes from different types of team-sports. Despite the specificity of training and the characteristics of each sport, it was not possible to verify the differences caused by these aspects on such a young group of athletes.

MINIMUM OF HRV DURING EXERCISE COMPARED WITH LACTATE MINIMUM AND CONCONI TEST

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BACKGROUND: Heart rate variability (HRV) decreases to a minimum with increasing exercise intensity (Tulppo et al., 1996).

PURPOSE: We compared HR and power output at HRVmin with HR and power output at lactate minimum (LM) as well as the point of HR deflection of a Conconi test (CT).

METHOD: 41 subjects (19 men and 22 women; age: 29 ± 5 years, weight 69 ± 12 kg and height 175 ± 9 cm) performed 3 tests on a treadmill and 57 subjects (30 men and 27 women; age: 31 ± 6 years, weight 69 ± 12 kg and height 175 ± 9 cm) performed 3 tests on a cycle ergometer to determine HR and speed (power output) at HRVmin, LM and CT. HRV during exercise was analysed plotting each RR-interval as a function of the previous RR-interval (Pointcaré plot). Standard deviations of instantaneous beat-to-beat variability were calculated in windows of 100 RR-intervals. HRVmin matches with the lowest standard deviation of the consecutive RR-window.

RESULTS: In running, speed at HRVmin was lower than at LM and CT (11.0 ± 2.2 km/h vs. 12.2 ± 1.6 km/h, $p < 0.05$, and 12.7 ± 1.7 km/h, $p < 0.001$). In cycling, power output at HRV min corresponded to power output at LM but was lower than at CT (190 ± 44 W and 194 ± 47 W vs. 228 ± 61 W, $p < 0.01$). HR at HRVmin was lower than at LM and CT in running (155 ± 12 min-1 vs. 167 ± 12 min-1 and 170 ± 9 min-1, $p < 0.001$) as well as in cycling (145 ± 16 min-1 vs. 160 ± 13 min-1 and 154 ± 11 min-1, $p < 0.001$). HR at HRVmin corresponded to 82 ± 6 % of HRmax during running and 79 ± 7 % during cycling.

CONCLUSION: Speed, power output and HR are lower at HRVmin than at LM and CT except for power output at LM. Therefore, HRVmin is not suited as a tool to determine anaerobic threshold but rather to determine a useful endurance training intensity for moderately trained subjects.

REFERENCE:

Tulppo et al.: Quantitative beat-to-beat analysis of heart rate dynamics during exercise. Am J Physiol 271: 244-252, 1996.

EFFECTS OF DIFFERENT WARM UP INTENSITIES ON POWER OUTPUT AND METABOLISM DURING AND AFTER SHORT TERM MAXIMAL SPRINT EXERCISE

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Introduction: Despite limited scientific evidence supporting their effectiveness, warm-up (WU) routines prior to exercise are a well-accepted practice. As a result, warm-up procedures are usually based on the trial and error experience of the athlete or coach, rather than on scientific study. Several previous studies have demonstrated that a number of physiological changes occur with active warm-up, some of which are potentially capable of improving performance. The majority of the effects of warm up have been attributed to temperature-related mechanisms. The purpose of the present study was to determine the effect of three different WU regimes on metabolism and performance during and after short term maximal exercise.

Methods: At three subsequent visits to the laboratory, subjects (n=11) performed 30 s lasting maximal sprint tests on a cycle ergometer (SRM) with different prior warm up (WU) intensities: 1. without prior warming up (W), 2. extensive warm up (E): 12 min cycling at 60% of VO2 peak, 3. intensive warm up (I): 12 min cycling at 60% of VO2 peak including three 10 s lasting peaks at 200% of VO2 peak. After the warming up, subjects stayed in a sedentary position for 5 min, followed by the sprint test. Blood samples were taken under resting conditions, after warming up, before sprint exercise (pre M), and in minute intervals during recovery (0 min-15 min) to determine lactate concentrations [La]. Spirometric data were collected during the whole session.

Results: The peak power (PP) output as well as the mean power (MP) output for the sprint test was significantly lower for W (PP: 951 ± 91 W & MP: 680 ± 181 W) compared to E & I (PP: 1007 ± 110 W & MP: 738 ± 192 W; E) (PP: 1022 ± 90 W & MP: 740 ± 191 W; I).

[La] after WU were all significantly different from each other. After the 5 min rest only (I) was still significantly elevated. During the recovery period neither differences in [La] nor in La kinetics were found (only the increment directly after sprint test (pre M-0') was significantly lower between (W) vs. (I)). Peak oxygen consumption after sprint tended to be higher after E & I conditions compared to W without reaching statistical significance.

Discussion: Several possible effects of WU (systemic/local) are discussed in literature which might have an effect on performance. Our results show that performance during 30 s sprint is enhanced by WU irrespective of WU intensity. Contrary to previous studies (Gray et al. 2002) we found no differences in blood La accumulation. Improved performance was not related to differences in measured aerobic or anaerobic metabolism, although VO2 tended to increase higher after exercise (although muscle metabolism might be different). Although pre exercise [La] were different between the 3 conditions, high [La] had no negative effects on performance in this test, supporting the new view for La as a metabolite and signaling molecule and not as a factor of fatigue.

DEVELOPING BODY COMPOSITION REGRESSION EQUATIONS FOR MALE ADOLESCENT ATHLETES.

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The objective of the study is to develop regression equations for the male adolescent athletes at the ages of 15-17 years old by using hydrostatic weighting as a criterion method. 155 male adolescent athletes (basketball, volleyball, football, handball, swimming, track and field athletes) participated voluntarily in this study. The athletes were training for at least 1 year, 2 hours/3 days/week. Body density (BD), body fat percentage (%BF), and lean body mass (LBM) were determined by using Hydrostatic Weighting (HW). Oxygen dilution method was used to determine residual volume. Anthropometric variables; body weight (BW) in kg, height (H) in cm, skinfold thicknesses (mm), circumferences (cm), width (cm) were measured. Resistance (R)(ohm) and reactance (ohm) measurements were taken by using Bioelectric Impedance (BIA). Resistance Index (RI) (cm2/ohm) was calculated by dividing H-squared to R. To develop regression equations, dependent and independent variables were treated to Multiple Stepwise Analysis after Pearson Product Moment correlation coefficient determined between variables. Highest R-squared (0.77) and lowest SEE (0.00519) BD regression equations for anthropometric measurement is BD= 1.064 - 0.0001162(H) + 0.002204(age in years) + 0.0001633(BW) - 0.0007809(abdomen skinfold thickness) - 0.0005526(thigh skinfold thickness); highest R-squared (0.77) and lowest SEE (2.0795) BF% regression equations for anthropometric measurement is BF% =21.317 - 0.906(age in years) -0.02027(BW) + 0.305(abdomen skinfold thickness) + 0.202(thigh skinfold thickness); highest R-squared (0.97) and lowest SEE (1.487) LBM regression equations is LBM= -6.918 + 0.886(BW)+ 0.01794(RI) +0.635(age in years) -0.226 (abdomen skinfold thickness) -0.159(thigh skinfold thickness). All equations were then tested by using cross validation (R-squared for 1st and 2nd group are 0.79, 0.73; 0.80, 0.70 ;0.97, 0.96 respectively), by dividing the data randomly into two groups. Therefore, these high R-squared and low SEE regression equations were recommended for use in estimating BD, BF% and FFM of adolescent athletes.

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CORRELATION BETWEEN ANXIETY AND CARDIAC LOAD IN TEAMGYM PERFORMANCE

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UNIVERSITY OF ROME

Introduction: Teamgym is a fairly new and popular form of Gymnastics including only trampoline, tumbling and floor exercises. Compared with other categories of gymnasts, teamgym athletes reported a significantly higher occurrence of injuries (Harringe et al., 2007). Therefore, anxiety is the psychological factor most commonly linked to motor performance during gymnastics, often related to heart rate frequencies (Cottyn et al., 2006; Gramer, Saria, 2007). The aim of the present study was to investigate the correlation between anxiety, heart rate frequency and teamgym performance during National and European Championships.

Methods: Ten Italian elite gymnasts, 5 males and 5 females, (mean age 21 ± 2) performed the same exercise program during National (NC) and European Teamgym Championships (EC). Gymnasts' cardiac load (HR) was measured recording heart rate (Polar team System)

and was classified based on the percentage of time spent in three zones (Low-intensity: <85% HRmax; High-intensity: 86-95% HRmax; Maximal effort >95% HRmax). The State-Trait Anxiety Inventory form Y (STAY-Y) (Spielberger, 1983) was administered to test the anxiety levels before competition. Friedman's test Anova was calculated to verify the heart rate, anxiety levels and penalty scores differences in the two different competitions. Furthermore, correlations between heart rate, anxiety and penalties points were calculated.

Results: Significant differences (p<.05) emerged between anxiety levels during NC (46pts ± 8pts) and EC (54pts ± 8pts). National tumbling competition showed significantly lower values (p<.05) both in heart rate frequencies (<85% HRmax= 91%;) and in assigned penalty points (0.30pts ± 0.10pts) compared to EC (<85% HRmax= 71%; 0.50pts ± 0.20pts)

Significant correlations emerged only during the tumbling performance between heart rate and penalty points (Spearman Rho= 0.80; p<0.01) during NC and between anxiety levels and penalties (Sperman Rho= 0.73; p<0.01) during EC.

Discussion/Conclusion: Despite the exercise program did not differ between National and European Championship, the higher HR, anxiety levels and penalty points observed during the latter competition might be attributed to a higher arousal determinated by the high level and importance of the event.

Furthermore, correlations between high heart rate frequencies, anxiety levels and penalty points assigned to the team during the tumbling performance, probably depends to the gymnasts' concern in performing the more difficult and risky acrobatic elements at this apparatus.

References

Harringe ML Renstrom P Werner S (2007). Scand J Med Sci Sport

Spielberger CD (1983). Consulting Psychologists Press, Palo Alto, CA.

Cottyn J De Clercq D Pannier JL Crombez G Lenoir M (2006). J Sports Sciences.

Gramer M Saria K (2007). Biological Psychology.

RECOVERY STRESS PERCEPTION AND SALIVARY CORTISOL BEHAVIOUR OF SWIMMERS IN DIFFERENT TRAINING PERIODS

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Introduction: Many investigations have studied the psychological, physiological and biochemical responses of athletes to different load training periods with the aim to monitor more precisely the load training effects. However, those studies have been showing different results (Coutts et al. 2007). Therefore, we investigated the effects of different training loads on stress and recovery perception (SRP) and salivary cortisol (SC) in different training periods.

Methods: Subjects were highly trained, male swimmers (17.7 + 1.3 y.o.). SRP and SC were evaluated after three distinct training phases (T1, T2 and T3). In T1, subjects swam approximately 50.000 meters in a week. After one month (T2), swimmers covered an average of 45.000 meters in a week with a higher intensity. In T3, after a month, swimmers covered an average of only 25.000 meters. SC were measured through enzymatic immunoassay. SRP was evaluated using the questionnaire RESTQ-Sport for the Portuguese language (Costa & Samulski, 2005). The Anova one-way with repeated measures and Pearson's product moment correlation were used for statistical analysis. P<0.05.

Results: From T1 to T3, it were observed a significant reduction in RESTQ-Sport scales, Fatigue (2,28 + 1,11; 1,12 + 0,71), Lack of Energy (2,33 + 0,93; 1,5 + 0,61), and an increase in SC (0,23 µg/dL + 0,15; 0,47 µg/dL + 0,19). Between T2 and T3, it were observed a reduction in Fatigue (2,29 + 1,08; 1,12 + 0,71), Lack of Energy (2,02 + 0,84; 1,5 + 0,61), Disturbed Breaks (2,0 + 0,7; 1,23 + 0,75), and an increase in SC (0,38 µg/dL + 0,15; 0,47 µg/dL + 0,19). From T1 to T2, there were significant augments in SC (0,23 µg/dL + 0,15; 0,38 µg/dL + 0,19). It were observed significant correlations between SC and SRP only in T1, in scales Social Recovery (p=0,002), General Well Being (p=0,031) and Disturbed Breaks (p=0,034). Conclusion: Different load training may cause changes on SRP and SC. However, psychological stress (SRP) may not necessarily be correlated with the physiological stress (SC). Moreover, the results highlight that it is necessary different variables to monitor the load training more precisely and that the SC can show the same behaviour direction when the load training is increased or decreased.

COUTTS, A. J.; WALLACE, L. K.; SLATTERY, K.M. Monitoring changes in performance, physiology, biochemistry, and psychology during overreaching and recovery in triathletes. International Journal of Sports Medicine, 28, p. 125-34, 2007.

COSTA, L. O. C.; SAMUSLKI, D. M. Processo de validação do questionário de estresse e recuperação para atletas (RESTQ-Sport) na língua portuguesa. Revista Brasileira de Ciência e Movimento, 13, p. 79-86, 2005.

THE EFFECTS OF 12 WEEKS PILATES ON BALANCE, FLEXIBILITY, MUSCLE STRENGTH IN ELDERLY WOMEN

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THE EFFECTS OF 12 WEEKS PILATES ON BALANCE, FLEXIBILITY, MUSCLE STRENGTH IN ELDERLY WOMEN

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Introduction: The popularity of Pilates has recently increased over the past decades in health care and sports medicine field as well as fitness field which has influenced research studies to examine the effects of Pilates. The purpose of this study was to determine if Pilates exercise could improve dynamic balance, flexibility, reaction time and muscle strength in older women.

Methods: Subjects were recruited from 60 female volunteers aged over 65 years old on a Nursing Home in Ankara. Participants were invited to join a 12-week series of one hour Pilates exercise meeting three times per week. Dynamic balance, flexibility, reaction time, number of falls and muscle strength were measured before exercise and after 3 months of exercise.

Results: There were significant differences between pre-and post-tests in exercise group. Flexibility (p<0.05);balance (p<0.01);get up go (p<0.05);hand grip strength,right (p<0.01),left (p<0.01);reaction time (p<0.05);muscle strength (p<0.01) and number of falls (p<0.05).There was no significant differences between pre and post tests in control group.

Discussion: Some researchers studied the effects of Pilates based training on balance in an elderly population and found positive effects. In our study, we found positive effects on balance and we searched also,muscle strength, flexibility, number of falls and reaction time.

References

June Ann Kloubec.Pilates exercises for improvement of muscle endurance, flexibility, balance and posture. University of Minnesota, PhD. Thesis

Eric G. Johnson, PT, DPTSc_, Andrea Larsen, DPT, Hiromi Ozawa, DPT,Christine A. Wilson, MPT, Karen L. Kennedy, MPT. The effects of Pilates-based exercise on dynamic balance in healthy adults. Journal of Bodywork and Movement Therapies (2007) 11, 238–242

MEASUREMENT OF LOWER LIMBS INVERSE DYNAMIC WITHIN GOLF SWING

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Introduction: Weight transfer within golf swing has a great effect on its success. Weight transfer patterns within golf swing are described in Richards et. al. (1985) and Ball & Best (2007). Lower limbs are differently effected by unevenly weight transfer in separate phases of the golf swing. Publications about golf practice engage in weight transfer especially in conjunction with equilibrium abilities (Wiren, 1990).

Methods: Three male golfers aged 19-24 years with handicap between 0-5 were measured. Pressure effects against ground-sheet were measured in three directions (vertical, antero-posterior, lateral) with unit KISTLER. To evaluate measured signals software BioWare was used. Kinematic analyzer unit CODA Motion System was synchronously connected with force plates. Data were evaluated in separate phases of the golf swing.

Results: Take-away, Mid Backswing, Late Backswing, Top of Backswing, Early Downswing, Mid Downswing, Ball Contact and Follow Through were used phases of the golf swing. The obtained data show different pressure forces of lower limbs with ground-sheet during separate phases of the golf swing. The maximum pressure action of left lower limb with force plates were measured in Ball Contact Phase in vertical direction (370N) and lateral direction (23N – in swing way). The maximum pressure force in antero-posterior direction was measured in Early Downswing Phase (27N – posterior).

There were not measured such high values of pressure force of right lower limb into pressure plate in any direction. The maximum pressure forces were measured as follows - in vertical direction in Mid Backswing phase (150N), in lateral direction in Ball Contact Phase (13N – in swing way), and in antero-posterior direction in Early Downswing Phase (26N – anterior).

Conclussion: Left lower limb pressure force is higher in any direction compared with right lower limb, especially in vertical direction. The measured pressure forces were in accordance with weight transfer within golf swing described in Wiren (1990). Repeated measures showed equalities between strokes of all five tested subjects. It proves high interindividual stability of the performance of the movement task of all probands.

References

Ball KA, Best RJ. (2007). Different centre of pressure patterns within the golf stroke I: Cluster analysis, Journal of Sports Science, 25, 757-770.

Ball KA, Best RJ. (2007). Different centre of pressure patterns within the golf stroke II: Group-based analysis, Journal of Sports Sciences, 25, 771-779.

Wiren G. (1990). PGA Teaching manual, Greenstone Roberts Advertising, Palm Beach Gardens.

Richards J, Farell M, Kent, J, Kraft, R. (1985). Weight transfer patterns during the golf swing, Research Quarterly for Exercise and Sport, 56, 361-365.

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THE INFLUENCE OF SWEAT AND ALCOHOL ON CAPILLARY BLOOD LACTATE MEASUREMENT

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Introduction: In order to receive proper blood lactate values during exercise it is important to know that human sweat also contains lactic acid. In daily routine, e.g. in exercise testing, it is possible that arterial blood samples might be contaminated by sweat leading to higher blood lactate values. From this point, to ensure high quality standards, the blood obtained from the earlobe needs to be free of sweat in order to measure capillary blood lactate concentration. Further, alcohol is often used to clean the earlobe which might also influence the accuracy of arterial blood lactate measurement.

To our knowledge it is generally unknown that sweat influences arterial blood lactate values. In this study we want to detect the influence of low and high concentration of sweat within a blood sample on the accuracy of arterial lactate measurement.

Methods: The subjects participating in the study exercised for 60 minutes at 160 watt on a cycle ergometer. Capillary blood samples were taken from earlobe every 10 minutes. At the same time sweat was collected from skin with capillary tubes. The system for lactate measurement (EBIOplus, Eppendorf, Germany,) requires 20 µl blood. After exercise the blood samples were diluted with sweat and alcohol at different rates.

Results: The lactate concentrations from undiluted blood samples during exercise ranged from 0.88 to 1.76 mmol/L. The diluted samples with sweat showed higher concentrations: The lowest dilution with sweat (1:1.05) revealed a concentration of 2.78 mmol/L compared to 0.88 mmol/L of the undiluted blood sample. Lactate values of the highest dilution (1:2) with sweat showed a concentration of 18.85 mmol/L. The dilutions with alcohol show, in contrast to sweat, lower value of lactate to undiluted blood.

Discussion: The results of this study show, as expected, higher levels of lactate concentration compared to undiluted samples. Alcohol, within the blood sample, on the other hand results in lower lactate values. Regarding the results it is a justified claim that all scientific personnel handle the collection of arterial blood with care, especially when the subjects produce a high amount of sweat.

ESTIMATING ANAEROBIC POWER BY NEW ZIGZAG TEST: TARBIAT MODARES ANAEROBIC TEST <TMAT>

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1,2,3. TARBIAT MODARES UNIVERSITY, 4. SHAHID BEHESHTI UNIVERSITY

Introduction: The ability to produce high rates of power output is essential for performance in many sports (Macintosh et al., 2003). The use of jump tests for anaerobic power assessment has more application as a sport-specific test than cycle or treadmill tests. The purpose of this study was to design new zigzag test titled of Tarbiat Modares Anaerobic Test (TMAT) that validated by the gold standard test, 30s Wingate test, (Benke et al., 2002).

Methods

Thirty female athletes (age: 22.46±1.8 yrs; body mass: 53.53±5.50 kg; height: 162.18±5.31 cm; body fat percent: 25.54±5.60) participated in this study. TMAT consists of 6 bouts of 8 peer zigzag jump with 10 second rest between them. The height of hurdle was 20 cm and the distance of jumping line to hurdle was 10 cm. The changes of blood lactate and heart rate was measured in the 30s Wingate test and TMAT. Peak, average and minimum power values and fatigue indices was determined in two tests. Also, subjects were tested on 2 separate occasions to assess reliability of TMAT,

Results: The equation for calculation of power in TMAT was P(w)=8mg×0.43906/t (t=time). The results showed that there is a significant correlation in peak, average and minimum values of anaerobic power indices between TMAT and the 30s Wingate test ($p<0.01$, $r=0.73$; $p<0.01$, $r=0.69$; $p<0.01$, $r=0.55$ respectively). But this correlation was no significant in fatigue index between two test ($p>0.01$, $r=0.31$).There was no a significant difference in changes of blood lactate amounts between two tests from rest to 5 min after test. Also there was no significant difference in heart rate changes between two tests from rest to immediately after tests but the moderate correlation was shown of fatigue index.

Discussion: The finding of the present study showed that the TMAT is a valid and reliable field test to assess anaerobic power of athletic performance because there was significant correlation between the peak, average and minimum power indices of the TMAT and the 30s Wingate anaerobic test (validity) and the significant correlation between TMAT test and retest its (reliability).

References

Macintosh B R, Risharg P, Svedahl K . (2003). EurJ Appl physiol.88:572-579.

Benke R, Pollman C, Bleif I, Leithauser M R, Hutler M. (2002). EurJ Appl physiol.87:388-392.

DYNAMICAL AND KINEMATIC VARIABLES OF DIFFERENT VERTICAL JUMPS: A PRELIMINARY STUDY

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Introduction: The main aims of this preliminary study were: (i) to assess a group of relevant dynamical and kinematical variables to study the vertical jump; (ii) to analyse the differences between vertical jumps with and without counter-movement, based on the abovementioned variables (Stretch Shortening Cycle - SSC versus no SSC) and between different SSCs (longSSC versus shortSSC); (iii) to establish the relations between neuromuscular factors gained during the vertical jumps analysed.

Methods: Nine students of the 4th year of the Physical Education and Sport Course, without relevant sports history, performed five times each type of jump [squat jump (SJ), counter-movement jump (CMJ) and drop jump (DP)]. The best jump of each subject in SJ, CMJ and DP was selected, according to the maximal height accomplished. Dynamical and kinematical data were acquired with a force plate AMTI BP2416 with a 1000 Hz of frequency and 2 video cameras JVC9800 with a 100 Hz, being the data analysed with the Software SimiMotion 6.1, using the adapted gravity centre model of Dempster.

Results: The results pointed out differences in the performance between different jumps. The maximal height was 48, 44 and 42 cm in the CMJ, DJ and SJ, respectively. Thus, the SSC jumps presented best results in relation to the no SSC jumps. Concerning the displacement, a difference between the longSSC and shortSSC was noticed. The DJ presented a lower decrease of the centre of mass and a difference of 22.8 cm to the CMJ was found. Significant differences between the no SSC jump (SJ) and the SSC jumps in the beginning of the propelling phase were observed. For example, at null velocity, SJ showed only 944 N (corresponding almost to the weight of the subject) and in CMJ and DJ the force was 2.5 and 3.5 times higher. The duration of the lift phase, as expected, was lower in the shortSSC. Concerning the force and muscular power, an increase in the SJ, CMJ and DJ was verified: peak force of 2188, 2131 and 3577 N and mean power of 1977, 2200 and 2884 W, respectively.

Discussion: With this study we attempted to associate dynamical and kinematic data to vertical jump performance, analysing the relations between the variables of cause-effect and the jump performance. The relations described in previous studies (Bobbert et al., 1996; Aragón-Vargas & Gross, 1997) were verified considering jumps with and without SSC and between longSSC and shortSSC.

References

Aragón-Vargas, L.F.; Gross, M.M. (1997). Kinesiological factors in vertical jump performance: differences within individuals. J Appl Biomech, 13, 45-65.

Bobbert, M.F.; Gerritsen, K.M.; Litjens, M.A.; Van Soest, A.J. (1996). Why is countermovement jump height greater than squat jump height? Med Sci Sports Exerc, 28(11), 1402-1412.

Dempster, W.T. (1955). Space requirements of the seated operator: geometrical, kinematic, and mechanical aspects of the body with special reference to the limbs (Wright Air Development Center Tech. Rep. No. 55-159). Dayton, OH: Wright-Patterson Air Force Base, WADC.

IMPORTANCE OF SOME DIMENSIONS OF MOTOR AND MORPHOLOGICAL SPACE IN POLICE OFFICERS

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Introduction: The research of the interrelations among the various subsystems of the psychosomatic status is often in the focus of interest of many researchers. Among them, motor abilities and morphological characteristics – on which performance as regards motor efficiency depends – certainly have a special place since successful job performance of police officers or criminal investigators in field work significantly depends on the dimensions of the motor and morphological space.

Methods: In the present research, we focused on establishing the correlations between certain dimensions of the motor and morphological space between police officers and criminal investigators. The morphological status was defined by 14 morphological dimensions and the motor status comprised 6 motor variables. The significance of the differences between the results of the morphological dimensions and motor variables was assessed by the application of the t-test for small dependent samples.

Results: When examining basic statistical parameters, we have found that criminal investigators are, on average, three years older than police officers and that they also have 15 % more fat tissue. The larger quantity in fat tissue could be explained by the theory on the increased accumulation of subcutaneous fat tissue on the upper body associated with age (McArdle at al., 1996). The reason also lies most probably in the motorics of the work performed. The work of a police officer requires a well developed energy component of movement which reflects in the motor abilities associated with endurance, be it speed or strength. In addition, the demands of professional work of

police officers in mastering complex motor programmes (self-defence, overcoming the hurdles, etc.), which are characterised by variability and involvement of several different factors, are much greater in comparison with criminal investigators. I assume that police officers are aware of the importance of strength in their operational work (use of force) and increase, by means of training, their muscle mass which replaces fat tissue as found in the research carried out on the sports population.

Discussion: In the research, negative correlations were established between the voluminosity and motor abilities associated with strength. In the morphological status, test subjects differ in the thickness of the subcutaneous fat. In the motor status, however, they differ in aerobic ability, repetitive and explosive power. The results of the research point to a large influence of morphological characteristics (subcutaneous fat) on motor abilities and require that they should be monitored in relation to the motor space.

References

McArdle, W., Katch, F., Katch, V. (1996). Exercise Physiology: Energy, Nutrition and Human Performance. 4th Edition. Donna B. (ed.) Maryland, Baltimore, USA, Wiliams & Wilkins publishing company.

THE EFFECT OF BACK EXERCISES ON DRAWING ARMS IN ARCHERS

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According to some studies elite archers develop a specific forearm and pull finger muscle activation strategy by active contraction of the forearm extansors with the fall of the clicker. On the other hand the back muscles play the major role drawing and releasing phases of the bow and good working back muscles help to maintain forearm muscle activation strategy. This strategy requires relatively long training period. PURPOSE ; The purpose of this study was to investigate the effect of eight weeks of back strength development training on EMG activities at release and performance in beginner archers. METHODS ; Six man and two women beginner archers (age: 16,38±038 ; years of training 1,94±1,04; FITA scores 1083±71,2) were involved in the study. Each subject participated in double test session. Eight weeks of back strength development training (Lateral Pull Down, Rowing, Dumbell Lateral Rise, Dumbell Front Rise, Dumbell Behind Rise, Dumbell Shrug, Upright Rowing, Back Extansion, Sit up) were applied in %40-60 of max. between two test session. Forearm extansors and flexors, deltoid posterior, deltoid middle, trapezius middle and trapezius lower muscles EMG activities that belongs to the drawing arm and bow arm were measured in each test session, and performance was recorded. Subjects totally twentyfour successive shots at the each experimental part of the study.

Analysis/Results; EMG recordings 2 s prior and 1 s after the fall of clicker has been rectified, integrated and normalized in Microsoft Excel programmes. Differences between two test session was analysed in Wilcoxon statistical tests. According to the results of the study, there were significant differences in forearm flexors and extansors, deltoid posterior, deltoid middle, trapez middle and lower in drawing arm, and forearm extansors, deltoid middle and lower in bow arm and the performance between two test session ($p<0,05$).

CONCLUSIONS; As a result, positive development was observed with the effect of back strength development training in beginner archers, so that the archery trainers can give a place to the strength trainings in their training programmes besides technical training to gain more performance and time.

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Poster presentations

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OPTIMAL LOAD FOR POWER PRODUCTION IN VERTICAL JUMPING

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Introduction: Muscle power is considered one of the main determinants of athletic performance that requires explosive force production such as jumping (Kawamori and Haff, 2004). There has been an increasing volume of research focused on the load that elicits maximum power output. The mechanical output in isolated and complex movements depends on applied external load. The most of the studies in this area have investigated maximal power output in vertical jumping (VJ). In this work, we reviewed the results of all published studies that examined the effects of loading on mechanical output in VJ, with particular reference to training level of the tested subjects.

Methods: A computerized search of articles that studied the effects of the loading on mechanical power output during VJ was performed using MEDLINE and SCOPUS databases.

Results: From a total of 19 studies that examined the load-power relationship in VJ, the vast majority of authors reported that either an exceptionally small or zero external load (13 out of 19 studies) represents the optimal load for power production in VJ. Conversely, only six studies reported the optimal loads that were considerably higher than subjects' body weight. It should be also noted that most of the reviewed studies revealed a loading associated decrease in power output (Jaric and Markovic, 2009).

Discussion: This review of literature showed that about 70% of all included studies reported either body weight or the smallest external load applied as optimal for power production in VJ. It should be noted that these studies mainly used untrained individuals as subjects. In contrast, in about 30% of studies that revealed considerably higher external loads as optimal for power production in VJ, the authors used strength/power athletes as subjects. Besides the training level of subjects (Cronin and Sleivert, 2005), several other factors could be responsible for the observed discrepancy in optimal loading for power production in VJ. These include: 1) differences in data collection and analyses protocols (Dugan et al., 2004), 2) inclusion or exclusion of body weight in calculations of power, 3) determination of the loading and data collecting equipment (Crewther et al., 2005), and 4) use of free weights vs. machines (Dugan et al., 2004). In conclusion, this review showed that optimal load for power production in VJ appears to be the subject's body weight. In contrast, strength/power trained athletes produce maximal power in VJ when using external loads ranging from 20% to 70% of their 1 RM in back squat.

References

Crewther B, Cronin J, Keogh J (2005). Sports Med, 35(11), 967-989.

Cronin J, Sleivert G (2005). Sports Med, 35(3), 213-234.

Dugan EL, Doyle TLA, Humphries B, Hasson CJ, Newton RU (2004). J Strength Cond Res 18(3), 668-674.
Jaric J, Markovic G (2009). Med Sci Sports Exerc, 41(4), 759-766.
Kawamori N, Haff GG (2004). J Strength Cond Res, 18(3), 674-684.

COMPLEX DIAGNOSTICS IN GREAT SAMPLES OF ELITE ATHLETES – BETWEEN DESCRIPTION AND PATTERN DETECTION

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Introduction: To improve knowledge of specific training-load in elite sport, performance and health diagnostics are indispensable. The number of published articles on diagnostics of this kind therefore has expanded very rapidly. The presented study examined the individual characteristics of 322 elite athletes (Olympic sports) of different competition-levels in the following areas: biomechanics, dentistry, nutrition, orthopaedics, psychology, sports medicine and training science. These standardized tests have been carried out by the German Research Centre of Elite Sport (momentum). Data comprised of more than 2100 parameters per person. For the scientific analysis of a matrix of 322x2100 cells, different kinds of statistical methods have been used.

Methods: 322 athletes (156 male: 18±3,4 years, 181±10,2 cm, 74±14,6 kg; 166 female: 17±3,6± 3,5 years, 167,39±10,5 cm, 57,38±11,7 kg) participated in this study. Three groups of statistical methods with the following goals were selected: (A) univariate traditional descriptive data analysis for comparing e.g. clinical standard values collected from non-athlete samples with athletes. (B) Hypothesis based inferential bi- and multivariate data analysis for detecting correlations and mean value differences for certain subgroups (e.g. sport disciplines, gender, age). (C) A posteriori, explorative data analysis with pattern detection methods for discovering unknown characteristics.

Results: A: In general clinical reference values often differ significantly from our data. This refers to blood parameters such as LDL (52% of athletes), hematocrit (58%) und CK-NAC (69%). Performance parameters such as VO2max, the anaerobic threshold (V2,V4), maximum strength, jumping height and others are currently used for the development of new reference values in certain sport disciplines. These results shall also serve for grouping criteria for competition squads. On the other hand the descriptive data highlighted in parts remarkable deficits in various categories of physical fitness and led to new concepts of training especially in youth sports.

B: New insights with respect to explained variance between hematological, performance and anthropometric data could be shown. The same is true e.g. for differences between the above mentioned subgroups (sport disciplines, gender, age). Especially the multiple data-interaction in disjunct scientific disciplines, such as nutrition components, blood parameters and performance were found to be interesting.

C: In the frame of pattern detection decision tree prediction showed – in contradiction to traditional group based statistics - remarkable new characteristics of subgroups, if intelligent classification algorithms are used. Other techniques such as single case studies and time series analysis showed the importance of individual characteristics. Finally data-mining tools promise to be useful also for prediction of performance indicators.

NEUROMUSCULAR, ENDOCRINE AND PERCEPTUAL RESPONSES DURING DIFFERENT LENGTH BETWEEN-MATCH MICROCYCLES IN PROFESSIONAL RUGBY LEAGUE PLAYERS

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INTRODUCTION: Appropriate recovery between matches is critically important in team sports which have regular competition. Reduced neuromuscular performance, alterations in hormone levels and increased perception of fatigue have been reported in rugby league players enduring a mismatch between training stress and recovery [1, 2]. However, the recovery patterns in these variables following professional rugby league matches is unknown. Therefore, the purpose of this study was to examine the time course of change in neuromuscular, perceptual and hormonal measures following a professional rugby league match during different length between-match microcycles.

METHODS: Following familiarisation, 12 professional rugby league players from the same team were assessed for changes in countermovement jump (CMJ) (force, power, flight time)[3], perceptual responses (fatigue, well being and muscle soreness) and salivary hormone (testosterone (T) and cortisol(C)) levels during 5, 7 and 9 day between-match training microcycles. Measures were taken 4 h prior to the first match, and then 1, 2, 4, 6*, 7*, 8* and 9* days following (*depending on group). All training was prescribed by the club coaches and was monitored using the session-RPE method.

RESULTS: Significantly lower mean daily training load was completed on the 5-day compared with the 7 and 9-day conditions. Some CMJ variables (flight time and contraction time), perception of fatigue, well-being and muscle soreness were significantly reduced in the 2 days following the match in each condition ($P<0.05$). All CMJ variables returned to near baseline values following 4 days in each condition. Both CMJ maximum and relative power was lower in the 7 day condition when compared with the 9 day condition ($P<0.05$). Fatigue levels were reduced at 48 h in the 7 and 9-day groups ($P<0.05$) but had returned to baseline in the 5-day group. All perceptual measures returned to baseline levels prior to the following match in each condition and followed changes in training load. Salivary T and C did not change in response to the match.

DISCUSSION: Neuromuscular performance and perception of fatigue are reduced for at least 48 h following a rugby league match but these can be fully recovered within 4 days. CMJ variables involving flight time appear to be best for assessing acute fatigue caused by a match, and variables involving power may be useful in assessing accumulated fatigue. The perceptual measures were sensitive to both acute fatigue and accumulated fatigue. The salivary hormone analyses have limited practical value for assessing recovery. These findings show that with correct training, it is possible to recover neuromuscular, perceptual and endocrine measures within 4 days after a professional rugby league match.

REFERENCES

1. Coutts, A.J., et al. (2007). Int J Sports Med, 28(2): 116-124.
2. Coutts, A.J. et al. (2008). Percept Motor Skills, 106(3): 904-916.
3. Cormack, S.J., et al. (2008). Int J Sports Physiol Perf, 3(2): 131-44.

RESPIRATORY MUSCLES TRAINING WITH ISOCAPNIC HYPERPNOEA <HY> METHOD IMPROVES VENTILATORY PARAMETERS AND EXERCISE CAPACITY

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Introduction: Recent evidences suggest that respiratory muscles training improves the exercise capacity.
Aim: To evaluate the efficacy of respiratory muscles training with HY (Spirotiger®) on respiratory parameters and exercise capacity.
Materials and Methods: 12 Females. Group A: 6 (age 24 ±0,8) with HY training (20 min/day x 5 weeks) for 1 month; Group B, control: 6 (age 23 ±2,6).
Respiratory function tests [vital capacity (VC, L), forced expiratory volume in 1st second (FEV1, L/sec), maximum voluntary ventilation (MVV, L/min), maximum inspiratory pressure (MIP, KPa)]; Incremental maximal cycle ergometer test: [Power output (PO, W), oxygen consumption (VO2, ml/min), tidal volume (VT), heart rate (HR, bpm), dyspnea scale (Borg)] before (T0) and after training (T1).
Ventilatory anaerobic threshold (VAT) was determined by V-Slope method. The daily physical activity was monitored by Armband at T0 and T1: unchanged. Statistical analysis by T-Test and Test ANOVA. The significance level was considered for values of P ≤ 0.05.
Results: Group A: a significant increase was observed for VC, MVV, MIP, PO at VO2max, PO at VAT: mean ± SD at T0 and T1 were respectively 3.87±0.32 and 4.15±0.35, 128±23 and 139±13, 7.16±1.03 and 8.74±1.75, 191±17.5 and 200±18,4, 111±8,9 and 116±10,8. Moreover, during the test, at T1 with respect to T0, HR and Borg scale were always significantly lower and VT was always significantly higher, whereas no significant difference was found for FEV1, VO2max and VO2 at VAT.
Group B: no significant change.
Conclusions: Respiratory muscles training with HY improved respiratory function parameters and power output expressed at VAT and at peak.

AEROBIC DANCE IS NOT CAPABLE OF USING THE WHOLE CARDIORESPIRATORY SYSTEM

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Introduction: Aerobic dance must be able to utilise the whole cardio respiratory system, similar to running in order to be considered an adequate training activity of aerobic endurance. This demand must further be valid for untrained as well as for those who already have a high aerobic capacity. The aim of the present study was to compare maximal oxygen uptake (VO2max) between aerobic dance and treadmill running in fit women.
Methods: Thirteen well trained female aerobic dance instructors, mean age 31 years (range 20 - 47), mean BMI 20,9 (range 17,9 – 23,3) exercised to exhaustion by running on a treadmill for measurement of VO2max and maximal heart rate (HRmax). Additionally, all subjects performed aerobic dancing until exhaustion after a choreographed videotaped routine for measurement of oxygen uptake (VO2) and heart rate (HR) response. Mean differences in VO2max and HRmax between aerobic dance and treadmill running were analysed by Student's paired T-test. Correlation between exercise forms was assessed by Pearson's correlation coefficient (r) with 95 % confidence intervals.
Results: VO2max in aerobic dance was significantly lower (52,2 ml•kg-1•min-1, 49,7 – 54,6) (mean, 95% CI) compared to treadmill running (55,9 ml•kg-1•min-1, 52,9 – 58,9) (p>0,0003). Further, HRmax in aerobic dance was 182 beats•min-1 (95 % CI: 176 - 187) and running 193 beats•min-1 (95 % CI: 187 - 199), giving no difference in oxygen pulse between the two exercise forms (p=0,09).
Discussion: Aerobic dance seems not able to use the whole cardiorespiratory system as achieved during running. This may result in a total lower work load during maximal interval training in endurance trained women in aerobic dance compared to running.

THE EFFECT OF ONE-NIGHT SLEEP DEPRIVATION ON PACING STRATEGIES AND INTERMITTENT-SPRINT PERFORMANCE

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CHARLES STURT UNIVERSITY

Introduction: Sleep deprivation prior to team sport exercise may result from a variety of reasons, including travel commitments and anxiety; however the ensuing effects on performance and recovery remain equivocal. Therefore, the aim of this study was to examine the effect of overnight sleep loss (~30hrs) on pacing strategies and performance for intermittent-sprint exercise.
Methods: Seven male, team sport athletes completed a familiarisation session, including a graded exercise test to determine VO2peak, and two conditions consisting of 2 consecutive days each including a 30min graded exercise run at 60-80% VO2peak followed by a 50min free-paced intermittent-sprint protocol (ISP). Each day was separated by either a normal night sleep (CONT) or an absence of sleep (SDEP). The ISP consisted of a 15-m sprint each minute followed by self-paced exercise in a shuttle run format at varying intensities (hard running, jogging, walking and bounds) for the remainder of each minute. Each day, pre and immediately post exercise, 15 maximal voluntary contractions (MVC) with a resting (Pf) and superimposed (SIF) twitch on the first and final 5 MVC of the right knee extensors were assessed. Pre and post exercise muscle biopsies were obtained from the vastus lateralis and assessed for muscle glycogen. Heart rate (HR), core temperature (Tcore), blood lactate (La) and glucose (Glu), and Rating of Perceived Exertion (RPE) were recorded throughout, while Profile of Mood States (POMS) was completed pre and post exercise.
Results: Sprint times were reduced on Day2 compared to Day1 within both conditions (P<0.05) however a greater reduction was evident within SDEP. Distance covered during self-paced exercise was negatively affected in SDEP Day2 compared to Day1, with a lower total distance during hard running bouts (P<0.05); however no significant differences were evident within the CONT condition. Mean distance covered during bounds was also lower in SDEP (P<0.05). Muscle glycogen was significantly lower pre exercise on Day2 following SDEP compared to CONT. Blood La and Glu were lower on Day2 in both conditions compared to Day1 (P<0.05). RPE and POMS were also adversely affected by sleep loss compared to Day1 (P<0.05). Finally, MVC, SIF & VA pre exercise on Day2 were significantly lower during SDEP compared to CONT (P<0.05).
Discussion: Results indicate that the ISP was negatively affected by ~30h sleep deprivation, through the reduction in self-selected exercise intensities (pacing strategies). Further, sleep loss retards the repletion of muscle glycogen and may be responsible for the greater decline in performance on the second day. Accordingly, the reduction in muscle glycogen and increased psychological strain prior to exercise may result in the reduction of voluntary muscle recruitment noted in MVC and thus be responsible for the slower pacing strategies and reduced performance noted following sleep loss.

ENERGY EXPENDITURE AND CARDIO-RESPIRATORY COSTS PLAYING INTERACTIVE COMPUTER GAMES: COMPARISON WITH SUB-MAXIMAL EXERCISE PARTICIPATION.

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TRINITY COLLEGE DUBLIN

In the developed world people typically spend less time engaged in physical activity and more time in front of the TV, computer and games console. Interactive computer consoles have recently entered the marketplace (Nintendo Wii) with the aim of increasing energy expenditure during computer gaming. A key question is whether these new systems increase activity sufficiently to result in increased energy expenditure (EE) and cardio-respiratory (CR) costs while permitting common screen-based activities. This study assessed EE and CR associated with playing the Nintendo Wii by comparison with other sub-maximal exercise modalities; and investigated if EE could be further increased by imposing additional lower limb movements in a 2m diameter circular grid while playing the Nintendo Wii.

Twenty male volunteers (mean age 23 yr, mass 85 kg, resting HR 82 beats.min-1 and resting VO2 4.9 mL.kg-1.min-1) completed 6 by 12-min randomized test elements; walking at 5.6km.hr-1, jogging at 9.6km.hr-1, cycling at 120W, seated PC game, playing Nintendo Wii and Nintendo Wii+ with imposed lower limb actions (Wii+). During exercise elements, VO2 and HR were continuously recorded on-line. Data were analysed using repeated measures ANOVA, post-hoc Tukey tests quantified significant differences, for all tests $P<0.05$ inferred statistical significance.

Mean±SD HR and VO2 during Wii were similar to walking (114±27 vs. 110±15 beats.min-1 and 11.4±5.5 vs.14.5±1.0 mL.kg-1.min-1, respectively). Mean HR during Wii+ (131±26 beats.min-1) was significantly greater ($P<0.001$) than walking or standard Wii play but not significantly different ($P>0.05$) from cycling (139±19 beats.min-1). Mean VO2 during Wii+ was significantly ($P<0.001$) greater than walking (19.8±5.2 vs. 14.5±1.0 mL.kg-1.min-1) and standard Wii play (11.4±5.5 mL.kg-1.min-1). Mean VO2 and HR data for all sub-maximal exercises and Wii game-play were significantly greater ($P<0.001$) than rest or playing a seated PC game. However, cardio-respiratory costs were significantly higher during running compared with all other assessed modalities. Mean EE was greater ($P>0.05$) during walking than standard Wii (17.5±1.3 vs. 13.8±6.7 kJ.hr-1.kg-1), however Wii+ (24.1±6.5 kJ.hr-1.kg-1) increased EE to a rate significantly higher ($P<0.001$) than standard Wii play or walking, and equivalent to cycling (28.4±4.7 kJ.hr-1.kg-1).

In conclusion playing the Nintendo Wii resulted in increased cardio-respiratory costs equivalent to walking at 5.6km.hr-1. When additional lower limb activities were incorporated into playing the Wii (Wii+), the cardio-respiratory costs and EE rates were significantly increased and were equivalent to cycling at 120W. As such, there is potential to further increase energy expenditure and cardio-respiratory costs associated with these new generation video games by incorporating supplementary lower limb activity.

ACUTE EFFECT OF VIBRATION AND PNF STRETCHING TECHNIQUE ON FLEXIBILITY

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UNIVERSITY OF ATHENS

INTRODUCTION: Flexibility has been defined as the range of motion about a joint or a related series of joints (4). Local vibration and the hold-relax Proprioceptive Neuromascular Facilitation (PNF) maneuver have been used as methods for increasing joint range of motion (3, 2). The purpose of the present study was to examine the acute effect of local vibration and PNF on flexibility and to compare the two Methods: METHODS: Ten male recreational athletes participated in this study (age: 23.8 ± 1.0 yrs). After a standardized warm-up participants performed the sit-and-reach test, which was used as an indicator of flexibility (1). The best of four trials was used as the test value. Then the subjects executed either the vibration (V) or the PNF maneuver (P) in a randomized and counterbalanced order. In condition V participants performed hamstrings stretching, one leg at a time, on a vibration platform. The vibration frequency was 30 Hz, with amplitude of 2 mm and 30 sec duration. In condition P participants lay supine and an experienced physiotherapist passively stretched the hamstrings until the subjects reported mild pain. Next, they were asked to execute isometric contraction of the hamstrings against the instructor ˋs manual resistance for 10 seconds. A 10 second relaxation period followed the contraction and the whole procedure was repeated three times for each leg. Sit-and-reach test was performed immediately after condition V or P. Differences between the two conditions and before - after the intervention were examined using t-test. Results are presented as mean ± SE.

RESULTS: The sit-and-reach scores before the intervention did not differ between the two conditions (V = 23.1 ± 1.9 vs P = 24.0 ± 2.1 cm). After either vibration or PNF the sit-and-reach scores were significantly higher compared to the pre measures (V = 27.3 ± 1.9 and P = 28.0 ± 2.1 cm, $p<0.001$).

DISCUSSION: According to the results either local vibration or PNF can be used as methods for increasing flexibility. The above mentioned increase could be attributed to: a) increase in pain threshold, b) increase in blood flow and temperature and c) induced relaxation of the stretched muscle (3).

REFERENCES

1. American College of Sports Medicine. ACSMˋs Guidelines For Exercise Testing and Prescription (7th ed.). Philadelphia: Lippincott, Williams & Williams, 2005.

2. Cornelius WL & Hands MR. The effects of a warm-up on acute hip joint flexibility using a modified PNF stretching technique. J. Athl. Train. 27(2): 112-114, 1992.

3. Issurin VB, Liebermann DG & Tenenbaum G. Effect of vibratory stimulation on maximal force and flexibility. J. Sports Sci. 12: 561-566, 1994.

4. Sands WA, McNeal JR, Stone MH, Russel EM, Jemni M. Flexibility enhancement with vibration: acute and long-term. Med. Sci. Sports Exerc. 38: 720-725, 2006.

THE SOME ANTROPOMETRIC EVALUATIONS AND GRIP AND LEG STRENGTH OF TURKISH SPORTIVE CLIMBERS

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PURPOSE ; The purpose of this study was to investigate the some skinfold evaluations and Grip and Leg Strength of Turkish Sportive Climbers

METHODS ; Eight man (age: 25,00±4,28; years of training 5,68±4,80) and five women (age: 28,00±1,87; years of training 4,30±3,10) Sportive Climbers were involved in the study. Right left hand grip strength ang leg strenght has been measured with dynamometer. The

skinfold measurements has been recorded from ten skinfold areas which are triceps, biceps, subscapula, chest, suprailiac 1, suprailiac 2, midaxillar, abdomen, thigh and calf by skinfold caliper (Holtain, 0,2 mm)

ANALYSIS/RESULTS; The right hand strength has been found 48,46±6,35, left hand grip strenght 46,51±4,58 ang leg strenght151,63 ±22,70 in men sports climbers. The right hand strength has been found 30,30±4,74, left hand grip strenght 28,86±2,82 ang leg strenght 69,93 ±39,95 in women sports climbers The skinfold measurements has been found triceps 8,84±4,57, biceps 3,78±1,18, subscapula 11,09±3,14, chest 6,8±,2,5 suprailiac 15,16±9,57, suprailiac 2 7,23±3,35, midaxillar 9,93±4,78, abdomen 14,75±5,73, thigh 11,59±5,72 and calf 8,06±4,59 in men sport climbers. The skinfold measurements has been found triceps 15,42±7,10, biceps 5,4±1,90, subscapula 10,54±3,04, chest 11,9±8,35 suprailiac 15,93±9,53, suprailiac 2 10,31±4,58, midaxillar 9,26±2,19, abdomen 18,54±8,27, thigh 25,93±9,65 and calf 17,26±9,66 in women sport climbers.

CONCLUSIONS; With these results, sportive climbers can be define with the aspect of the skinfolds and grip strength. Sportive climber trainers can give a place to the strength trainings in their training programmes besides technical training to gain more performance and time.

14:15 - 15:15

Poster presentations

PP-PS04 Psychology 4

A COMPARATIVE STUDY OF AGGRESSION IN MARTIAL ARTS

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Introduction: Aggression in sport is define as any behavior , not recognized as legal within the official rules of conducts , directed toward an opponent , official , team-mate or spectator who is motivated to avoid such behavior. A number of sport psychologists have noted that aggression and violence are serious problems in sport, particularly contact sport. The purpose of present study was to investigate the aggression in martial arts and comparison with non-athletes.

Methods: 209 elite martial arts athelets (53 tackwondo, 52 judo, 54 Kong fu and 50 karate) with 48 non-athlete (aged 20.3+ 0.7) participated in this study. They completed Buss and Perrys (1992) aggression questionnaire. It consists of 29 items, distributed unequally among physical aggression, verbal aggression, anger and hostility.

Results: our results showed significant difference in aggression items between groups (P<0.001).Tukey test also showed that, the most difference was in kong fu group in relation with non-athletes and judo group. Other athletes groups do not any difference with non-athletes.

Conclusions: Findings showed that the type of martial arts have own effects on aggressive characterized of athletes.

References:

Agnieska W,Milena S,Edward W.(2007) Self-aggression in athletes practicing combat sports.Physical education and sport,51,67-71

John H.(2008) A critique of the development of competitive aggresivenss and anger scale.Psychology of Sport and Exercise,10,1-8

REINTERPRETING COMPETITIVE STRESSORS WITH A REVERSAL THEORY FRAMED EXPRESSIVE WRITING INTERVENTION

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Introduction: Expressive writing can improve physical (e.g. reported physical symptoms) and psychological (e.g. depression) health indices (Chung and Pennebaker, 2008; Goldman et al., 2007). However, no studies have examined its use in helping athletes to cope with competitive stressors. This preliminary qualitative study explored the use of expressive writing combined with a Reversal Theory (RT; Apter, 2001) framed imagery intervention. This involves participants interpreting an experience from different perspectives defined by the motivational states in RT: serious-playful; rebellious-conforming; self-other; mastery-sympathy.

Method: Sixteen athletes completed the Motivational Style Profile (MSP: Apter et al., 1998; motivational dominance measure) and 20 min of expressive writing about a recent competitive stressor. They were taught the key principles of RT and how to use imagery to engender RT states which they then used to recreate different motivational states. They wrote about their experience from these different state perspectives in four 20 min sessions in counterbalanced order. They completed a final 20 min writing session without the intervention. Sessions ran on consecutive days and participants completed affect measures pre and post writing. Participants discussed their experiences of the intervention in a follow-up interview and completed the MSP again.

Results: Key results suggest individual differences in affect changes following writing with increases in positive affect, negative affect, or both. Participant and researcher noted changes in writing content and the participant's interpretation of the stressful event from the first to the final session included increased: emotional awareness; focus on others; self-confidence, and, self-awareness and analysis. Participants identified changes in their approaches to training or competition including: adopting a more playful approach to competition, optimising the social aspects of competition to increase enjoyment, and, valuing co-operation with others to make training more meaningful.

Discussion: A RT framed writing intervention may help athletes to reinterpret competitive stressors, resulting in positively perceived changes in training and competition approaches and increased self-awareness. Individual differences in affective responses to RT writing need consideration when applying this intervention in practice and in future research. Further developments to this preliminary study could include drawing comparisons between the use of RT framed writing and 'standard' expressive writing to help athletes to cope with competitive stressors.

References

Apter MJ. (2001). Motivational styles in everyday life: A guide to reversal theory. American Psychological Association, Washington DC.

Apter MJ, Mallows R, Williams S. (1998). Pers Ind Diffs, 24, 7-18.

Chung CK, Pennebaker JW. (2008). Brit Jo Health Psych, 13, 15-21.
Goldman N, Dugas MJ, Sexton KA, Gervais NJ. (2007). Behav Mod, 31, 512-538.

IT'S NATURAL! HOW BRAZILIAN OLYMPIC WOMEN PERCEIVE PAIN

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The effort performed by high-level athletes in training and competition situations lead them to experiencing a new uncomfortable daily event characterized as pain. This feeling may reach extreme levels, depending on the moment lived in the training periodization, whose effects are a lowering in the motivation and the loss of competitive objectives. Aiming at improving their technical gesture, these athletes develop mechanisms to face up with limit situations that lead them to support different types of pain, which in many cases causes serious lesions. Although pain perception, besides being subjective, is a cultural construction related to the individual's history of life, the actual extent of its limiting force on performance has been little studied, perhaps due to the ethical difficulty caused by the need of experimenting with human beings; therefore, its importance should not be underestimated. Methods: The study included 62 Brazilian Olympics women that participated in Olympic Games from 1952 until 2008. The athletes were interviewed in a life-history format so that elements could be gathered.

Discussion/Conclusion The pain was comparable to obstacles that could have interrupted or hampered the women athlete's career. The team participation, which includes the trainer, the physician and the athlete's family, represents a fundamental part of the process of injury overcome. Of note, by tapping into and mobilizing the athlete's psychological reserves, the professional team and the social environment contribute greatly to a rapid and steady recovery. The ability an athlete has to resist to, and the capability to recover from, pain when it does occur is as decisive in the course and duration of a competitive sports career as it is for the achievement of the athlete's full potential. The effort accomplished in a training and competition situation is understood as natural and necessary in order to achieve high performance levels. In face of this, training days when physical exhaustion is not achieved are seen as "lost days" or inefficient ones. On the other hand, the search for the resistance threshold leads to a vulgarization of pain which may conduce athletes to bone and/or muscle lesions. This vulgarization of pain leads to extreme situations, such as the acknowledgment of non-pain as the end of the career when a new routine is lived and experienced and the absence of painful feeling makes the athlete to recognize new emotional states never lived before.

THE REPRESENTATION OF PAIN IN HIGH LEVEL SPORTS

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One of the events widely pointed as limiting the performance (and, therefore, acting as a barrier to the achieve of success) is pain. Pain is defined as a 'sensitive and emotional displeasing experience, associated with real or potential tissue damage, or described within terms of such lesion'. This way we perceive that the dialectic established by the common sense between injury - painful sensation is not always valid. Pain is always subjective. Each being learn how to utilize this term by means of his/her own previous experiences (IASP). The indications of literature about the subjective component of pain, added to the cultural implications and diverse representations constructed throughout the individual's history of life, demonstrate the necessity to redouble attention on the painful complaint since its manifestation can disguise latent contents as dissatisfaction, doubt and fear linked to present situations or future perspectives related to the individual´s personal and professional life.

This experimental research try to evaluate the representation of pain among athletes. The subjects evaluated will be brazilian athletes competing in different modalities and in all spheres of sports (municipal, national or international). The instrument used to collect objective data will be the Sports Inventory for Pain (SIP- Meyers, Bourgeous, Stewart & LeUnes, 1992) and to collect the qualitative data the athletes will be interviewed and asked to narrate theirs "stories of pain". We intend to investigate in which ways the athletes cope, face and control pain episodes, the athlete´s capacity to discriminate different types of pain (training x injury) as well as their sensibility to respond to sign and limits, essencial conditions in the pursuit of the best result for the team and for the athlete as human being and as social hero.

COOK, D.B.; HOLTYN, K.F. Pain and exercise. International Journal of Sport Psychology. 2000; 31: 256-277
FRY, J. P. Pain, suffering and the paradox in sport and religion. Pain and Injury in Sports: social and ethical analysis. New York: Routledge, pp 246-260, 2006.
GATCHEL, R.J.; TURK, D.C.; Psychosocial Factors in Pain – Critical Perspectives. New York, The Guilford Press, 1999
KUGELMANN, R. Pain as a symptom, pain as a sign. Health – an interdisciplinary journal for the social study of health, illness and medicine. 2003; Vol 7 (1): 29-50
MCNAMEE, M. Suffering in and for sport – some phylosophical remarks on a painful emotion. Pain and Injury in Sports: social and ethical analysis. New York: Routledge, pp 229-245, 2006.
MELZACK, R.; WALL, P. D. The challenge of pain. London: Penguin Books, 1991.
MEYERS, M.C.; BOURGEOIS, A.E.; LEUNES, A. Pain Coping response of collegiate athletes involved in high contact, high injury potencial sport. International Journal of Sport Psychology. 2001; 32: 29-42
TURK, D. C.; MELZACK, R. Handbook of pain assessment. New York: The Guilford Press, 1992.

HIGH EMOTIONAL INTELLIGENCE SCORE IS RELATED TO THE USE OF TASK-ORIENTED COPING IN ECUADORIAN SPORT SCIENCE STUDENTS

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Objective: To establish a relationship between Emotional Intelligence (EI) score and coping strategies used during stressful sport events.

Method: Ecuadorian Sport Science students (N=155) answered to both, the TEIQue (Trait Emotional Intelligence Questionnaire; Petrides & Furnham, 2003) and the CICS (Coping Inventory for Competitive Sport; Gaudreau et Blondin, 2002) with respect to a personal stressful sport event.

Results:

Higher trait EI score is positively correlated with the use of task-oriented coping (r=.43; p<.0001) and negatively correlated with the use of disengagement-oriented coping (r=-.22; p<.05).

Conclusion: Ecuadorian Sport Science students with higher EI score present more efficient coping strategies when they face up to a stressful event. Future research should confirm the consistence of these results across different cultures.

References:

Gaudreau, P., & Blondin, J. P. (2002). Development of a questionnaire for the assessment of coping strategies employed by athletes in competitive sport settings. Psychology of Sport and Exercise, 3(1), 1-34.

Petrides, K. V., & Furnham, A. (2003). Trait emotional intelligence: Behavioral validations in two studies of emotion, recognition and reactivity to mood induction, European Journal of Personality (Vol. 17, pp. 39-57).

SELF, COPING STRATEGIES AND PHYSICAL ACTIVITIES IN PREADOLESCENTS: AN ACTION RESEARCH WITH PREADOLESCENTS

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1. UNIVERSITY KORE OF ENNA, 2. UNIVERSITY S.ORSOLA BENINCASA OF NAPLES

Introduction: Few studies explored a connection between self (physical and social), variables connected with building an identity and physical activities (Lidor R., 2004; Theodosius & Papaioannou, 2006; Annesi, J. J., 2007). Nonetheless, the research conducted to date has not considered these variables as aspects related to educational orienteering, even though they are part of a global process related to growth and identity construction. The main objective of educational orienteering is to put the adolescent in a position where he can make pondered and realistic decisions, helping him to discover himself. Working in orienteering in junior high school means early intervention on the psychological components implicated in the process of choice and decision making, involved in learning. Research-intervention achievement wants to estimate the incidence of physical activity in Self and in the prerequisites of educational orienteering (self-esteem, self-efficacy, interpersonal adaptation, coping and meta-cognition). The general purpose is to build an 'expanded' educational orienteering itinerary that also includes physical and sport activities.

Methods: Research-intervention is composed of three phases. In the I phase (actually in progress and will conclude on May 2009) pretests will be administered for the assessment of the variables analysed. In the II phase, (that will be realize in the 2010) participants (200 pre-adolescents from 12 to 14 years of age) involves physical activities, educational itineraries including obstacles courses aimed at empowering coping and meta-cognitive abilities. In the III phase the participant's final levels will be tested. The instruments that will be used are Semantic Differential for analyzing the physical and social self; the Physical Self-Description Questionnaire (PSDQ) in short form; the self-esteem Multidimensional Test; the interpersonal adaptation questionnaire and the AMOS 8-15 test for research on the meta-cognition aspects of the learning process.

Expected results: Results of the first phase will be presented. In accordance with the previous research, specific physical activities cause significant changes of the variables measured, essential elements of the Self building and educational orienteering prerequisites.

References:

Annesi J. J. (2007) Relations of age with changes in self-efficacy and physical self-concept in preadolescents participating in a physical activity intervention during afterschool care. Perceptual and Motor Skills, Vol 105, No.1, pp. 221-226.

Lidor R. (2004) Developing metacognitive behaviour in physical education classes: The use of task-pertinent learning strategies. Physical Education & Sport Pedagogy, Vol 9, No. 1, pp. 55-71.

Theodosius A. & Papaioannou A. (2006) Motivational climate, achievement goals and metacognitive activity in physical education and exercise involvement in out-of-school settings. Psychology of Sport and Exercise, Vol 7, No 4, pp. 361-379.

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Poster presentations

PP-PP05 Physical Education and Pedagogics 5

DOES IT MATTER WHERE CHILDREN LEARN? ORIENTEERING AS AN ENSAMPLE

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Introduction: Teaching within the topic map understanding has long been characterized by the rationalistic tradition (Johansen, 1999). An alternative to the traditional method is situated learning (Griffin, 1995). The starting point of this investigation is that indoor and outdoor space creates different sense impressions. Moreover map reading can be considered as a cognitive exercise. The requirement for this type of tasks is linked to three different knowledge areas; declarativ, prosedural and strategic knowledge (Thomas& Thomas, 1994). In this study we wanted to test these three forms of knowledge, through various orienteering tasks.

Methods: Action Research has been selected as the research design in this study. The results are based on an intervention study of 54 kids in 4. grade in primary school (9- and 10-year-olds). The two groups of pupils where going through a five-week-long intervention where they worked with the same learning activities, but in different spaces (indoor and outdoor). 12 pupils (6 boys and 6 girls) were pretested, post-tested and retested (one year after) in the three mentioned areas of knowledge.

Results: Declarative knowledge - the pupils had an average of 1.4 correct links between mapsymbols and its referrer rendered in color photo in the pre-test. In the post-test the average increased to 11.8, and in the retest it had decreased to 5.8.

Procedural knowledge - 6 of the pupils managed to orient the map in the pre-test, 7 pupils in the post-test, and 8 pupils in the retest.

Strategic knowledge - the wayfinding exercise shows that 5 pupils mastered the task satisfactorily in the pre-test. This increases to 10 pupils in the post-test, and 7 pupils in the retest.

In all three tests, we see relatively small differences between those who were outside and those who were inside during the intervention period. The most consistent findings are related to gender.

Discussion: Use of situated learning in different contexts (indoor vs.outdoor) has shown that both approaches lead to the development of knowledge and skills, but these have largely been temporary. The result of the study indicate that the development of declarative knowledge is not space dependent and that pupils from the outdoor group, in the long run, build up procedural knowledge with more resistance. The investigation also concludes that there are differences between boys and girls. The boys score higher on all tests. This is consistent with other studies examining the spatial task solutions (Malinowski & Gillespie, 2001).

References

Griffin M M (1995). Situated learning, transfer, and map skills.

Johansen B T (1999). Orientering.

Malinowski J C, Gillespie W T (2001). Individual differences in performance on a large-scale, real-world wayfinding task. Thomas KT, Thomas JR (1994). Developing Expertise in Sport: The Relation of Knowledge and Performance.

GENDER DIFFERENCES IN SWIMMING COMPETENCE AND PERCEIVED COMPETENCE

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Introduction: An increased risk for drowning is seen in males, particularly since they may overestimate their abilities, compared to women. Moran (2008) has found gender differences in New Zealand, particularly that men overestimate their ability and women underestimate their ability. The purpose of this study was to investigate the gender differences of practical swimming skills and self reported perception of swimming competence.

Methods: Eighty one (81) university students were asked to fill out a questionnaire and also to perform practical tests of their swimming competence. The questions addressed their perceived competence (in a pool), their perception of whether they could perform as well outdoors in open water, and their perception of risk in five risk scenarios. The practical tests covered seven essential skills. The Mann – Whitney U test was employed to examine statistical differences. A 0.05 level of confidence was accepted as significant.

Results and Discussion: Of the seven practical tests, four showed a significant gender difference: floating ability, entry dive from pool deck, surface dive to 2m depth, and rescue towing. In every case, the women performed better than the men. Self reported perception of competence showed significant gender differences for only three of 21 items. The women reported greater competence than the men for "the ability to stay afloat in deep water without support", while the men reported greater competence for "surface dive to the bottom of the deep end of the pool (4m). Eighty percent of the men reported that surface diving would be easy/very easy, while only 62% of the women reported the same. Interestingly, the women both reported greater competence and actually demonstrated greater competence than the men on the floating test. On the other hand, while the women actually performed better on surface diving, the men reported the perception that they were more competent in this skill. Lastly, there were no significant gender differences in perceived risk for the five risk scenarios.

Conclusions

It can be concluded that there are few gender differences both in practical and perceived ability in Norway. It does not support the hypothesis that a possible gender difference makes males more susceptible for drowning.

References

Moran, K. (2008). Will they sink or swim? New Zealand youth water safety knowledge and skills. Int. Journal of Aquatic Research and Education, 2(2), 114-127

THE BODY AS AN INSTRUMENT OF EXPRESSION OF EMOTIONS IN SPORT

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UNIVERSITY OF JAEN

Introduction: We can communicate without words and we can convey emotions and attitudes towards situations, physical status and identity, with the body movement performed. Motos (1983) described the gesture as an intentional movement and y it is fraught with meaning that reflects the personality of the person. It is an expression of emotion. May be it is voluntary or involuntary.

The aim is to observe the communication and expression of emotions and feelings in sport, through the use of the body of athletes, depending on the time of the party and the marker.

Methods: 12 volleyball players have participated They had a mean age of 20.9 ± 3.3 years. They were playing in a mid-level team. At the time of measurement they were in first position with aspirations to upgrade. To gather the data has been compiled a schedule of observation.

Results: There are certain behaviors that are characteristic of the times that a game is won and therefore the players are happy and full of satisfaction. On the other hand, there are other behaviors that are characteristic of those moments where they lose the point and sentiments of the players are radically opposed.

Discussion: The players express their feelings and emotions through the body and movement without being aware. Score a point implies a feeling of joy that is manifested by the body open; symmetrical form; quick, enthusiastic and intense movements, longer duration and with a sense of lightness. Conversely, losing a point implies a feeling of anger and rage. It is manifested in a feeling of heaviness and sinking, in which the subject prefers the solitude and isolation and it shows through the body closed, asymmetrical shapes, and slow, short and heavy movements. At the time of addressing a new point, when players score a point, they are much more active, happy, dynamic... Conversely, when they have missed the point it seems that they try to forget this game quickly and focus on the following. By the way to express and interact themselves each player with their peers, it seems that the level of cohesion of this team is high.

References:

Bergeles, N. and Hatziharistos, D. (2003): Interpersonal attraction as a measure of estimation of cohesiveness in elitge vollyball teams. Percept Not Skill, 96(1): 81-91.

Motos, T. (1983): Iniciación a la expresión corporal. Teoría, técnica y práctica. Barcelona: Humanitas.

Santiago, P. (1985): De la expresión corporal a la comunicación interpersonal. Teoría y práctica de un programa. Madrid: Narcea.

Schinca, M. (1988): Expresión corporal. Madrid: Escuela española.

Spink, K.S. (1992): Group cohesion and starting status in successful and less successful elite vollyball teams. J Spots Sci, 10(4): 379-388.

CHANGES IN MOTOR EFFICIENCY OF SLOVENIAN YOUTH AFTER THE ELIMINATION OF THE EFFECTS OF MORPHOLOGICAL CHARACTERISTICS

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Motor efficiency depends on morphological characteristics (Momirovič, Hošek, Džamonija, & Gredelj, 1989). In Slovenian children, negative trends in the manifestation of motor efficiency and morphological characteristics have been noticed (Strel, Kovač, & Jurak, 2007), therefore the purpose of the study was to find out what effects did the morphological characteristics have on the motor efficiency of both genders over the ten-year period (1994-2004).

The sample of measured subjects included 1396 pupils in 2004 and 1352 pupils in 1994, aged between 15 and 19 years. Fourteen anthropometrical measurements were used to evaluate morphological dimension and thirteen measuring procedures were used to evaluate motor efficiency of measured subjects. The effects of morphological characteristics were eliminated with the use of multiple analysis of covariance by considering anthropometrical measurements as covariates.

Partialization revealed that in pupils morphological characteristics accelerate motor efficiency of boys and decelerate motor efficiency of girls. Different effects of morphological characteristics on motor efficiency can be explained with biological differences between the genders and different physical maturation of boys and girls in this age period. These differences can be most clearly explained when observing the changes in morphological characteristics at the age of 15 and 16.

Namely, at this age an increase of body height and decrease of skin fold can be noticed in boys, whereas in girls an increase is seen in both weight and skin fold.

In general, accelerating effects of morphological characteristics on motor efficiency of boys was higher in 1994, whereas the largest decelerating effects in girls have been noticed in 2004. The tendency of the direction of the effects leads to conclusion that the changes in morphological characteristics of boys and girls at this age and for the studied period (1994 - 2004) had negative effects on partial motor efficiency. However, as a result of earlier biological maturation (and consequently larger muscle strength) and various compensatory mechanisms (e.g. improvement in technique) these negative effects have not been revealed on the manifest level of motor efficiency.

References:

Momirovič, K., Hošek, A., Džamonja, Z., Gredelj, M. (1989). The effects of
morphological characteristics on the results of tests of physical abilities.
Kineziologija 22(2), 141-146.

Strel, J., Kovač, M. in Jurak, G. (2007). Physical and motor development, sport activities and lifestyles of Slovenian children and youth - changes in the last few decades. Chapter 13. In W.D. Brettschneider & R. Naul (ed.), Obesity in Europe: young people's physical activity and sedentary lifestyles (pp. 243-264). Frankfurt am Main: Peter Lang.

THE ORIENTATION OF ADOLESCENTS' PHYSICAL ACTIVITY WHEN APPLYING BRIEF COUNSELLING

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Introduction: There is hardly any doubt that the physical and psychical welfare of humans is strongly related with physical activeness. Overview of explorations concerning the education of physical culture at school demonstrates that from the historical perspective, school physical culture programs did not use to be adequately related with the habits of healthy lifestyle, physical activeness and health (Kardelienė, Kardelis, 2006).

In the process of alteration of educational paradigms influencing physical culture at school when the achievement of individual health and good fitness throughout the life is desired, forms and methods promoting physical activity of adolescents have been sought for.

Methods

From three to six solution-focused interventional sessions with adolescents were conducted using the Educational Consulting Method, which is created on the basis of works of the creators of Solution focused brief therapy method, Steve de Shazer and Insoo Kim Berg (de Shazer, 1985).

115 students aged 13 to 19 took part in the analyses. 65 students (the experimental group) aged 13 to 19 were consulted by using the Educational Consulting method. The changes were evaluated by using a ten-point progress evaluation scale. The experimental group's results were compared to the comparative group. The comparative group was important to assess spontaneous alterations of issues related with physical activity because no educational intervention was used with these students.

Results: 79.3 per cent of consulted adolescents and 25.6 per cent of the comparison group adolescents showed improvement on the progress evaluation scale ($p<0.05$). No significant changes happened in students within the group of comparison. An inductive presupposition is developed stating that the physical activity of adolescents may be promoted by applying educational consulting.

Discussion: The data confirmed that adolescent counselling in the school setting based on the Educational Consulting method is an efficient method improving the adolescent capacity for solutions and orienting adolescents' physical activity. The method of Educational consulting possesses clearly and precisely specified educational technologies and is based on ideas of positive psychology as well as on the cognitive attitude to learning: active processes, cooperation, application of knowledge in a novel environment (transference of whatever has been learnt), emphasis on the social context, underlining the individuality of the trainee as an expert of his/ her individual situation.

References

deShazer S (1985). Keys to solution in brief therapy. NY: W.W. Norton and Company.

Kardelienė L, Kardelis K (2006). Pedagoginė komunikacija kūno kultūros veikloje: monografija. Kaunas: LKKA.

THE RELATION BETWEEN THE SPECIFIC AND GENERAL COMPETENCES IN PHYSICAL EDUCATION TEACHERS' TRAINING

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UNIVERSITY OF PITESTI

Introduction. In this context the university education graduates will have to accomplish the four direction of education with the help of these competences and specific capacities that were obtained in concordance with the content of the "formation" term, as an activity of

integration of activity socio-professional training at the level of some specific education models in the course of one's life, Mihailescu L. (2004).

Hipotesis.We consider that the training of formatters is the most responsable instructive activity of the education system because the modern society is changing permanently and this requires the pedagogues some competences for a process of education for changing in the course of one's life. From this perspective we will analyse the context of formatores' training in „physical education and sport" area.

Content. The research objectives are: to analyze the structure of the education system; to analyze the way in which the curriculum was changed starting with the projection level to the purpose level; to evaluate the competences of the university education graduated in the fundamental domain of "physical culture and sport" in order to accomplish efficiently the four main trends of education:"learning to know".

Focusing the didactic process on competences supposes the identification of the general and specific competences (cognitive abilities) realized by the syllabus of the Physical Education and Sport domain and psyhopedagogy module. We identified the main competences on the three cycles of the syllabus Bologna and the relation between them: general competence, specific cognitive abilities, competences in psychology domain, competences in general pedagogy domain, competences in specialitiy methodology domain, psychological competences.

Conclusions: 1.On the capacities and competences' accomplishment route, in concordance with the final performance standards of the education in our domain, are teh followings: the priority of the educational process; objectives–contents concordance; a functional relation between objectives and contents; the evaluation integration in the curricular documents' structure as a strategy of adjustment and self adjustment ;the adoptability of the evaluation system to different alternatives;the individualization of the education

2.In the new syllabus the contents on disciplines and activities become, depending on the necessary and possible knowledge, formation means of the theoretical and practical - methodical competences, of the necessary behavior and attitudes, and also relational, of high level.

Selective bibliography

1.Colibaba Evulet, D., Major Changing in the University Education, R.C.H.P., Pitesti, 2003; 2.Erikson, L.N., Concept – Based Curriculum and Instruction, Teaching Beyond the Facts, Corwin Press; Inc; Thousand Oaks, California, 2002; 3.Mihailescu, L., Curriculum's Paradigm in Superior Speciality Education, in "Sport Science" Magazine, No. 43, p.29 – 39, Pitesti, 2004;

ANALYSIS OF A POSSIBLE RELATIONSHIP BETWEEN MOTOR AND SPORT ACTIVITIES AND TYPE OF PLANTAR PRESSURE DISTRIBUTION IN THE PRIMARY SCHOOL STUDENTS IN ITALY

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1. UNIVERSITY OF SALERNO, 2. UNIVERSITY OF CASSINO, 3. UNIVERSITY OF NAPLES

Introduction: The enhancement of motor activity in the school is a way to improve the educational process as stated by the National Guidelines of the Ministry of Education.

Indeed, the engagement in motor activities gives students the chance to live experiences that leads to correct and healthy lifestyles including the prevention of diseases related to hypokinesia as some forms of flat foot resulting from postural defeats or overweight.

Objectives

This research was aimed to study the possible relationship between plantar structure and motor and sport practice, lifestyle and eating habits in children aged 6 to 11 years.

Material and Methods

The research was carried out using a sample of 500 children aged between 6 and 11 years, attending 3 primary schools in Naples, Salerno and Caserta.

The experimental protocol was previously established through the joint action between the school teachers, parents and researchers, who shared the aims of the survey. Data about age, dietary habits, motor and sports practice played by students were previously and indirectly collected through the support of the families. Information on weight and height were directly collected. The research team analyzed the plantar pressure distribution through a practical and immediate system of analysis: the PDM - multifunctional strength platform. This tool allows to perform static and dynamic analysis of forces and pressures while the subject is in standing position or in motion , with or without shoes. It also evaluates the distribution of loads, allowing detailed analysis about the characteristics of the different moments of the pressure distribution of the foot (provided by the software that processes data in real-time).

Results: The results of the survey showed not only a relationship between height, weight, dietary habits, lifestyles and the type of plantar pressure distribution, but also revealed a possible relationship between motor-sport practice and the characteristics of the pressure distribution of the foot. The research opens up to further studies on the 'modelling' functions of motor-sport practice related to the type and the characteristics of foot pressure distribution.

References

- Stimec, B. & Polancec, J. (2008). Relations between some anthropological characteristics and school success in particular school subjects of the 5° elementary school grade pupils. Proceeding Book of the 5th International Conference on Kinesiology. Zagreb (Croatia).

- Babin, J., Vlahovic, L., Bavcevic, T., (2008). Influence of specially programmed PE lessons of morphological characteristics changes of 7 year-old pupils. Proceeding Book of the 5th International Conference on Kinesiology. Zagreb (Croatia).

ENERGY EXPENDITURE AND PSYCHOMOTOR AND TRADITIONAL TEACHING METHODOLOGIES: A POSSIBLE RELATIONSHIP?

GOMEZ PALOMA, F., BALDASSARRE, G., GALDIERI, M., PIGNATO, R., LO PICCOLO, A., SIBILIO, M.

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Introduction: Studies on the relationships between body and learning processes are embedded in a broad area of research that studies the relationship between education and neuroscience (Gallese, 2006), investigating the neurophysiological (Iacoboni, 2005) and neuropsychological (LeDoux, 2002) mechanisms that regulate the bodily dimension of the person (Sibilio, 2002). The aim of the work is to analyze a possible relationship between the energy / calories expenditure (EE) of students of primary school and low secondary school and learning through the traditional teaching actions and the psychomotor-methodological ones.

Methods: The study, carried out in 14 schools of the Province of Salerno, was conducted on a sample of 95 pupils (45F-50M) of an age ranging between 7 and 10 years and between 12 and 15 years.

The instrument used for the detection of the EE is the SenseWare Armband, put on the right arm of the students. It records data on the EE calculated thanks to an exclusive and patented algorithm in different conditions and environments.
Data have been collected firstly during teaching interventions based on the traditional methodology (frontal lesson) and, subsequently, during psychomotor activities inside the historical and spatial subject-areas.
Results: The data emerged during the teaching activities were assessed in relationship with many variables as the method used, the sex of the student and the class he/she belonged to.
Discussion: The expected results will allow to evaluate the possible relationship between the caloric expenditure and the teaching methods used. The meaning and aim of this research is to find a scientific justification to foster the active use of a psychomotor approach from which a learning process related to a healthy energy expenditure can take advantage. This can be the base on which to build up the wellness of the students of the Italian primary and low secondary school who currently spend most of his/her school life in a sedentary way.
References
- Babin, J., Vlahovic, L., Bavcevic, T., (2008). Influence of specially programmed PE lessons of morphological characteristics changes of 7 year-old pupils. Proceeding Book of the 5th International Conference on Kinesiology. Zagreb: Croatia.
- Breslauer, N., Zivcic, K. & Nicolic, I. (2008). Influence of different physical education curricula on the fifth-grade pupils motor abilities. Proceeding Book of the 5th International Conference on Kinesiology. Zagreb: Croatia.
- Dollman, J., Norton, K. & Norton, L. (2005). Evidence for secular trends in children's physical activity behaviour. British Journal of Sports Medicine 2005;39:892-897.
- Gallese, V. (2006a) Intentional attunement: A neurophysiological perspective on social cognition. Brain Res. Cog. Brain Res., 1079: 15-24.
- Iacoboni, M., Molnar-Szakacs, I., Gallese, V., Buccino, G., Mazziotta, J., and Rizzolatti, G. (2005) Grasping the intentions of others with one's owns mirror neuron system. PLOS Biology, 3: 529-535.

EVALUATION OF GROSS MOTOR SKILLS IN CHILDREN IN THE CZECH REPUBLIC

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Introduction: Gross motor skills are important for social interaction on the playground, for performance in physical education and they contribute meaningfully to a physically active childhood. Many physical educators consider these skills to be the most important motor skills in motor development because they are the cornerstones of many games (Butterfield, & Loovis, 1993; Williams, 1992). The aim of this study is to evaluate the developmental disorders in gross motor skills in Czech children through the Test of Gross Motor Development-2 (Ulrich, 2000).
Methods: Three hundred and fifteen children with a mean age of 7.9 years (SD = 1.09) participated; one hundred and fifty two were boys (M age = 7.85 years, SD = 1.05), and one hundred and sixty three were girls (M age = 7.96 years, SD = 1.13). Towards to compare results with US norm population, children have been divided into ten groups by age and gender; such as six years boys (from 5.5 to 6.49 years), seven years boys (from 6.5 to 7.49 years), other groups have been defined equally.Results: Czech children scored much lower in all categories. To evaluate a significance of differences between CZ and US norm population the effect size has been used. This shows that performance of Czech children is strongly behind American ones.
Discussion: Upwards denies conclusion of preliminary study which supposed that performance of Czech girls is similar to the performance of American girls. Now it appeared that when compared to American all Czech children scored lower. There would be different kind of explanation. These results are similar to the study on Dutch children by Houwen, Visscher, Hartman, and Lemmink (2007). These authors conclude that some skills are more typical of the American sport culture than for the Dutch children. This may have caused different performance of both Dutch and Czech children.
Acknowledgement: This study has been supported by a grant from the Grant Agency of the Czech Republic no. 406/07/0168.
References
Butterfield S, Loovis E. (1993). Influence of age, sex, balance, and sport participation on development of throwing by children in grades K-8. Perceptual and Motor Skills, 76, 459-464.
Houven S, Visscher Ch, Hartman E, Lemmink KAPM. (2007). Gross motor skills and sports participation of children with visual impairments. Research Quarterly for Exercise and Sport, 78, 16-23.
Ulrich DA. (2000). The Test of Gross Motor Development. (2nd Edition). Austin, TX: PRO-ED Publishers.
Williams N. (1992). Throwing and catching: a steady diet. Journal of Physical Education Recreation and Dance, 64, 14.

HISTORY OF SPECIAL EDUCATION AND DISABILITY. RELATIONSHIP PHYSICAL EDUCATION AND SPORT.

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Introduction: Today you can design special education as a science that is included in the educational sciences and is part of the historical process of social integration of these people. Therefore it is necessary to undertake a journey through different historical stages in the concept of disability, their relationship with the sport and the development of education in special education. The main objective of this review will examine the historical evolution that has taken disability in relation to physical education and sport and its influence on the normalization of the individual.
Methods: It has a historical and legislative, to check both the legal reality of the disabled as the social and the involvement of sport for their normal development, through a discussion group, consisting of specialists in physical education.
Results: It has shown that the concept of disability and its relationship to sport has been narrowing due to the social reality they demanded, with a full phasing in society as the legal framework has been adapted to this need . At present it appears that the measures being taken are necessary to bring about a normalization of the individual and thus to encourage social inclusion. Also in education, physical education curriculum has undergone a transformation that has produced an adaptation of both the media and the teaching process - learning.
Discussions: The sport has been a key part to the success of disabled people through formal education (school) as well as informal education (through partnerships, programs, etc.).. Similarly through the current rules are guaranteed full rights to their normal develop-

ment. It is noted that through the same social, are adjusting resources and processes of learning and educational needs with these reforms, enhances the character of equality that prevails in education.

References:

- Sánchez Palomino, A. y Torres González, J.A. (1997). Special Education I: a curricular, organizational and professional. Ediciones Pirámide. Madrid
- Ríos Hernández, M. (2007). Manual Adapted Physical Education to students with disabilities. Editorial Paidotribo. Barcelona
- Parrilla, M.A. (1992). The teacher at the school integration: "research and training". Editorial Cincel. Madrid.
- Rigo, E. y Talens, D. (1987). Interdisciplinary and Special Education, on ICE: Theory and practice of special education.UIB. Palma

RELATIONSHIPE BETWEEN SALIVARY CHROMOGRANIN A AND FATIGUE COMPLAINT DURING JUDO AND LECTURE IN STUDENTS

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Relationship between salivary Chromogranin A and fatigue complaint during Judo and lecture in students

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We have studied the relation between fatigue complaints and judo and lecture using questionnaire method of fatigue in student. Complaint items of fatigue were apparent sleepiness and yawning for the lessons. Salivary chromogranin A (CgA) was considered as an index of stress condition. But the change rate of CgA was close relation parasympathetic condition of the item of sleepiness and yawning in fatigue survey. In this study, the change rate of CgA was analyzed by the transition pattern of fatigue complaints of sleepiness and yawning after judo and lecture. The transition patterns of fatigue in which were the incidence case of complaint, the disappearance case of complaint, the continuous case of complaint and the no complaint case, expressed by using dummy number. Multiple regression analyses of the change rate of CgA to the transition pattern of complaint of sleepiness and yawning were down, The subjects were healthy six male students. They have Judo training one and half hour a week. Saliva was collected twice before and after judo or lecture lesson. The correlation coefficient(r) between the change rate of CgA and the transition pattern of complaint of yawning and sleepiness were examined. In judo, r=0.75 for the continuous complaint of sleepiness, and r=0.92 for the continuous complaint of yawning. In lecture, r=0.54 for both the continuous complaint of sleepiness and yawning. Thus the change rate of GgA seemed to be related positively to the complaints of sleepiness and yawning during the load. In multiple regression analyses, the standard partial regression coefficients of the change rate of CgA to transition pattern of complaint items were analyzed. In judo, the standard partial regression was positively 0.488 ($p<0.03$) for the continuous complaint of yawning, and was positively 0.75($p<0.01$) for the continuous complaint of sleepiness. In lecture, the standard partial regression was positively 0.84 for the continuous complaint of sleepiness and 0.52 for the continuous complaint of yawning. In order to confirm the results, all data that joined together the judo and lecture data were analyzed. The standard partial regression coefficient of the change rate of CgA to the transition pattern of fatigue was 2.413($p<0.039$) for the continuous complaint of yawning and 2.751($p<0.05$) for the continuous complaint of sleepiness. Thus, those results showed that the change rate of CgA level was positive correlation to the sleepiness and yawning as the parasympathetic sign. It seemed that it was important to check the correction of parasympathetic condition to the evaluation of salivary CgA level.

'YOU DON'T NEED ME TODAY...DO YOU?' AN ASSESSMENT OF THE SUPPORT PROVIDED BY LSAS IN MAINSTREAM PE LESSONS

SCATTERGOOD, A.

UNIVERSITY OF CHESTER

Introduction: In many countries over the last decade or so, physical education has been used increasingly by governments as vehicles of social policy targeted at promoting the inclusion of young disabled people and those with special educational needs (SEN) in mainstream schools. A feature of this increasing political commitment has been the growing expectation that teachers will work in collaboration with a range of other professionals, especially Learning (or Teaching) Support Assistants (LSAs), to help include these pupils in mainstream classes. Despite the emphasis that has come to be placed on the important contribution that LSAs are thought to provide to pupils experiences of PE, there is currently little research that has examined these issues.

Methods: The central objective of this paper is enhance our understanding of the ways in which LSAs are managing the constraints on them to help deliver teachers to deliver PE to pupils in PE lessons. In doing so, the paper reports on data generated by semi-structured interviews conducted with 22 LSAs currently working in secondary schools in North-East England.

Results: The findings of the study suggest that the kind, range and quality of support provided by LSAs within PE lessons varied – often quite substantially – from one school to another. This variation was related to the kinds of training that LSAs had received, their personal background and experiences, the value they attached to PE. The values and attitudes that LSAs expressed about their experiences of PE, and working with teachers, were significantly related to the ways in which they are able, in the course of their day-to-day lives, to manage the relational constraints they experience in schools.

Discussion: The findings of the study suggest that it is only possible to understand adequately the experiences and actions of LSAs, and how this impacts on the inclusion of disabled pupils and those with SEN in PE, by analyzing the particular networks of relationship of which LSAs are a part. An appreciation of these relational constraints, together with other broader changes in educational policy, are vital pre-requisites for developing a more realistic assessment of how LSAs help provide pupils what are regarded as worthwhile educational experiences. It is concluded that the use of PE and school sport as a means to pursue the government's non-sporting goals has had the effect of undermining the extent to which government are able to achieve its inclusion policy goals. It is also clear that whilst government has a greater capacity to make crucial decisions over the policy priorities to be pursued, the nature and complexity of the relationships in which they are involved means that the extent to which they are able to achieve their objectives is very dependent on the actions of other groups such as LSAs as they, too, attempt to protect, maintain and advance their own individual and/or collective interests.

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