

Conclusions: The present findings stress the vital role of addressing sleep quality, an invisible symptom, in the rehabilitation of PwMS, as it was significantly associated with HRQoL. Improving sleep quality may substantially improve HRQoL in PwMS.

Submission ID: 87; Submission Group: New Research Methodologies; Submitter: Elisa Gervasoni

The impact of experimentally induced fatigability on motor and cognitive functions: preliminary results from a multicenter cross-sectional study

R. Bertoni¹, R. Cardini¹, I. Carpinella¹, A. Tacchino², E. Grange², G. Bricchetto^{2,3}, C. Solaro⁴, M. Rovaris¹, D. Cattaneo^{1,5}, E. Gervasoni^{1*}

¹IRCCS Fondazione Don Carlo Gnocchi, Via Capocelatro 66, 20148 Milan, Italy, ²Italian Multiple Sclerosis Foundation (FISM), Via Operai 40, 16149, Genoa, Italy, ³Neurology Unit Galliera Hospital Genova, Italy, ⁴AISM Rehabilitation Service of Genoa, Via Operai 40, 16149, Genoa, Italy, ⁵Department of Pathophysiology and Transplantation, Università Degli Studi di Milano, 20100 Milan, Italy., *presenting author

Background: Fatigability is one of the most disabling symptoms in People with Multiple Sclerosis (PwMS) possibly contributing to reduced walking, balance, and cognitive capacity. These changes in performance seem to affect quality of life. However, the impact of motor fatigability on balance and cognitive functions has not yet been studied.

Objective: This cross-sectional study assesses the acute effect of experimentally induced motor fatigability on balance and cognitive functions.

Methods: So far, we assessed 20 PwMS aged (mean±standard deviation) 51.7±8.1 years with an EDSS score of 3.6±1.0 points and 9 Healthy Subjects (HS) 44.8±12.7 years in three Italian MS centers. Participants were asked to walk for 30 minutes or until they experienced complete exhaustion (Walking Fatiguing Test), which was monitored by Rate of Perceived Exertion (RPE)>18 points (Borg scale). In addition, participants performed balance tests (maintaining upright posture on a firm and foam surface with eyes open and closed), wearing 3 Inertial Measurements Units (IMUs), and cognitive assessment (Brief International Cognitive Assessment for Multiple Sclerosis, BICAMS) before (T0), immediately after (T1), and 30-minute after (T2) the Walking Fatiguing Test.

Results: PwMS walked for (mean±SD) 23.8±7.3 minutes with a RPE score of 17.4±3.0 points compared to HS (mean RPE 11.8±2.0). Additionally, PwMS worsened their balance performances (in terms of increased sway amplitude and decreased entropy) compared to HS at T1 (p<0.05), while no between-group differences were observed at T0 and T2 (p>0.05). No changes were also reported in BICAMS between PwMS and HS at three timepoints (p>0.05).

Conclusions: Our preliminary data show an acute effect of experimentally induced motor fatigability on balance, while no effect

was observed on cognitive functions. A larger sample should confirm these preliminary results.

Submission ID: 88; Submission Group: Outcome Measures; Submitter: Zuhail Abasiyanik
Perceived and performed dual-task ability in persons with multiple sclerosis: an international multi-centered study

Zuhail Abasiyanik^{1,2,3}, Ludovico Pedullà⁴, Bernardita Soler⁵, Carme Santoyo-Medina^{6,7}, Turhan Kahraman^{3,8}, Mieke D'Hooze^{1,2,9}, Andrea Tacchino⁴, Edwin-Roger Meza-Murillo⁶, Renee Veldkamp^{1,2}, Ilse Lamers^{1,2,10}, Areen Omar¹⁴, Griet Gysemberg¹⁰, Ingrid Galán⁶, Ethel Ciampi⁵, Claudia Carcamo⁵, Özge Ertekin¹¹, Serkan Özakbaş¹², Daphne Kos^{9,13}, Alon Kalron^{14,15}, Peter Feys^{1,2}

¹REVAL Rehabilitation Research Center, Faculty of Rehabilitation Sciences, Hasselt University, Hasselt, Belgium, ²UMSC, Hasselt-Pelt, Belgium, ³Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Izmir Katip Celebi University, Izmir, Turkey, ⁴Scientific Research Area, Italian Multiple Sclerosis Foundation (FISM), Genoa, Italy, ⁵Hospital Doctor Sótero del Río, Pontificia Universidad Católica de Chile, Santiago, Chile, ⁶Department of Neurology-Neuroimmunology & Neurorehabilitation Unit, Multiple Sclerosis Centre of Catalonia (Cemcat), Vall d'Hebron University Hospital, Barcelona, Spain, ⁷Department of Physiotherapy, Faculty of Medicine and Health Sciences, Universitat Internacional de Catalunya, Barcelona, Spain, ⁸Department of Health Professions, Faculty of Health and Education, Manchester Metropolitan University, Manchester, UK, ⁹National MS Center, Melsbroek, Belgium, ¹⁰Noorderhart Rehabilitation & Multiple Sclerosis Centre, Pelt, Belgium, ¹¹Faculty of Physical Therapy and Rehabilitation, Dokuz Eylül University, Izmir, Turkey, ¹²Department of Neurology, Medical Point Hospital, Izmir University of Economics, Izmir, Turkey, ¹³KU Leuven, Department of Rehabilitation Sciences, Leuven, Belgium, ¹⁴Department of Physical Therapy, School of Health Professions, Faculty of Medicine and Health Sciences, Tel-Aviv University, Tel-Aviv, Israel, ¹⁵Multiple Sclerosis Center, Sheba Medical Center, Tel-Hashomer, Israel.

Background: Cognitive-motor interference is documented using performance-based and self-reported measures in people with multiple sclerosis (pwMS). However, the association and discriminative properties of perceived and performed dual-task (DT) abilities across different disability levels in pwMS remain unclear.

Objective: To investigate association between observed and perceived DT ability and their discriminative properties in pwMS across six countries within the RIMS network (Belgium, Chile, Italy, Israel, Spain, and Turkey).

Methods: We enrolled 175 pwMS with mild disability (EDSS:0-3.5), 181 pwMS with moderate-to-severe disability (EDSS:4.0-6.5), and 184 age- and sex-matched healthy controls (HC).

Perceived DT difficulties were evaluated using Dual-Tasking Questionnaire (DTQ), Dual-Task Screening-List (DTS), and Dual-Task-Impact on Daily-life Activities Questionnaire (DIDA-Q). DT walking performance was measured by 30-second walking with and without a simultaneous word-list generation task. Motor DT cost (DTC), the percentage change of DT performance compared to single-task performance, was calculated. Discriminative properties were analyzed using area under receiver operating characteristic curve (AUC) and effect size (ES) for group differences.

Results: In the moderate-to-severe disability group, there was a significant but weak correlation between DTC and DIDA-Q ($r=0.179$) and DTQ ($r=0.232$). No significant correlation was observed in the mild disability group. Perceived measures exhibited good-to-excellent AUC (0.743 to 0.827) between pwMS with mild disability and HC, and excellent AUC (0.858 to 0.979) between pwMS with moderate-to-severe disability and HC. However, DTC showed poor AUC (0.544 and 0.559, respectively). When comparing perceived measures across the three groups, large ESs were evident, while DTC did not show a significant difference.

Conclusion: The study reveals no-to-weak correlation between self-reported and observed DT abilities in pwMS, potentially attributable to real-life DT involving both motor-motor activities and cognitive-motor components across various tasks. Self-reported outcomes seem well suited to identify pwMS with DT difficulties, indicating the need for interventions.

Submission ID: 89; Submission Group: Outcome Measures; Submitter: Anders Skjærbæk
One-year walking capacity changes in Danish patients with multiple sclerosis

Anders Guldhammer Skjærbæk^{1,2}, Lars G Hvid^{1,2}, Egon Stenager³, Finn Boesen¹, Ulrik Dalgas²

¹The Danish MS hospitals, Ry and Haslev, Denmark, ²Exercise Biology, Department of Public Health, Aarhus University,

³Department of Regional Health Research, University of Southern Denmark, Odense, Denmark

Background: Change in walking capacity in persons with multiple sclerosis (pwMS) is an important efficacy marker in medical treatment, rehabilitation and research. However, many different walking outcomes are used in MS research, but little is known about measurement differences between the most frequently used outcomes. Thus, the present study aimed to compare one-year changes in walking capacity across three commonly used walking outcomes in Danish MS patients following inpatient rehabilitation.

Methods: In a longitudinal two-hospital study, walking capacity was assessed within the first week of inpatient rehabilitation (baseline (T1)) and after one year (T2) using the timed 25-foot-walk-test (T25FWT; "walking speed"), the six-minute-walk-test (6MWT; "walking endurance"), and the six-spot-step-test (SSST; "walking balance and coordination"). Using mixed linear models one-year relative within-group changes and effect sizes were compared across outcomes.

Results: At T1 walking capacity was assessed in N=194 pwMS (69% females); age 54.3 ± 11.4 yrs, patient determined disease steps (PDDS) 2.9 ± 1.9 , time since diagnosis 14.7 ± 10.3 yrs and MS-phenotype (RRMS/SPMS/PPMS) 62%/18%/20%. At T2, results from 171 (88%) pwMS were available with mean improvements observed across all walking capacity outcomes; T25FWT $+0.11$ [0.07;0.15] (m/s), 6MWT $+8$ [-1;17] (m), and SSST 0.009 [0.004;0.013] (rounds/sec.). Relative within-group changes were improved for T25FWT (8.1 [1.3;15.0] %, Z-score=0.21) and SSST (7.7 [-1.1;16.6] %, Z-score=0.16), whereas 6MWT remained stable (2 [-5;8] %, Z-score=0.05). No differences ($p>0.10$) were observed between within-group changes across the three outcomes and no improvements reached clinical meaningful thresholds.

Conclusion: Minor one-year improvements in walking capacity were observed across three commonly used walking capacity outcomes in Danish MS patients following two-three weeks of inpatient rehabilitation. Relative changes were similar across walking capacity outcomes but did not reach clinically meaningful thresholds. MS patients sustained their walking capacity, which is considered important in a progressive disease like MS.

Submission ID: 90; Submission Group: Other; Submitter: Davide Cattaneo
Unraveling functional disorders and cortical activation during gait in non-disabled People with Multiple Sclerosis: preliminary results from a multicenter study

Davide Cattaneo^{1,2*}, Alessandro Torchio², Rita Berton², Francesca Baglio², Raffaella Chieffo³, Massimiliano Pau⁴, Eleonora Cocco⁵, Maria Assunta Rocca³, Tetzuo Morozumi³, Massimo Filippi³, Elisa Gervasoni², Marco Rovaris²

¹Department of Pathophysiology and Transplantation, Università Degli Studi di Milano, 20100 Milan, Italy, ²IRCCS Fondazione Don Gnocchi Via Capecelatro 66, 20148 Milan, Italy, ³Department of Neurology, Institute of Experimental

Neurology, Division of Neuroscience, San Raffaele Scientific Institute, Vita-Salute San Raffaele University, Milan, Italy, ⁴Dipartimento di Ingegneria Meccanica Chimica e dei Materiali,

Università di Cagliari, Italy, ⁵Multiple Sclerosis Regional Center, ASSL Cagliari, ATS Sardinia, Department of Medical Sciences and Public Health, University of Cagliari, 09126 Cagliari, Italy, *presenting author

Background: There has been limited research on balance and gait in non-disabled People with Multiple Sclerosis (PwMS). Moreover, less is still known about cortical activation during an ecological task such as walking, which may be assessed by functional near-infrared spectroscopy (fNIRS).

Objective: To investigate the patterns of functional disorders and cortical activation during walking in non-disabled PwMS.

Methods: We recruited 50 PwMS aged 43.7 ± 11.2 years (mean \pm standard deviation - SD) with a relapsing-remitting course and EDSS <2.5 (in 3 Italian centers). The EDSS score was 1.1 ± 0.7 and the disease duration was 13.2 ± 7.4 years.