Long term effects of high intensity training protocols on symptoms of central sensitization in persons with chronic nonspecific low back pain

A secondary RCT analysis

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BACKGROUND AND AIMS

Chronic nonspecific low back pain (CNSLBP) is a very common musculoskeletal disorder with a highly disabling character affecting man and women worldwide. Moreover, its prevalence is still rising and it increasingly burdens our health systems[1].

Exercise therapy (ET) is an important component in the management of CNSLBP. Recently, High Intensity Training (HIT), has been proven to be more effective than equal moderate intensity training to improve physical fitness and decrease functional disability in CNSLBP[2].

However, increasing evidence also shows the importance of changes in central pain-modulating mechanisms and perceived stress in the development of CNSLBP[3,4]. It is not clear to which extent HIT can impact on these factors.

The aim of this secondary analysis is:

1) to evaluate the effects of HIT protocols on symptoms of central sensitization in persons with nonspecific chronic low back pain.
2) to compare the effects of HIT on symptoms of central sensitization in subgroups with either high or low cut off values through a median split method.

MATERIALS AND METHODS

In this secondary analysis, PRE (at baseline) and FOLLOW-UP (6 months after finalization of the program) data was evaluated of three combined RCT cohort groups of persons with CNSLBP that participated in a HIT exercise therapy program (n=57, 24 sessions/12 weeks) at REVAL (Hasselt University, Belgium). The HIT program consisted of cardiorespiratory interval training and muscle strength exercises (general resistance and trunk strength training).

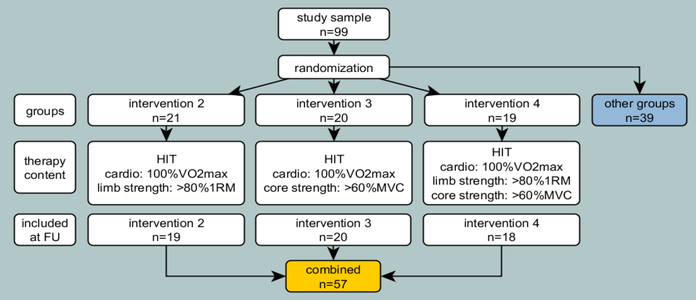

Figure 1: Display of study flow and the three therapy groups that were included in the combined follow-up analysis.

The outcome measures evaluated in this secondary analysis were symptoms of central sensitization (Central Sensitization Inventory (CSI)) and general perceived stress (Perceived Stress Scale (PSS)). A dependent sample t-test was performed to determine within group PRE to FOLLOW-UP differences. Following, a median split method (at the cut off value for clinical relevant symptoms of central sensitization (i.e. CSI>40/100)) was used to create and determine the same PRE to FOLLOW-UP within group differences in two subgroups (high/low). Lastly, between subgroup differences were determined through an independent sample t-test of the PRE to FOLLOW-UP delta values. A Bonferroni correction (significance=p>0.025) was performed in each analysis.

RESULTS

In total, fifty-seven persons (22 males, age=44.6y (SD 10.1); symptom duration=12.0y (SD 8.4), pain intensity (Numeric Pain Rating Scale)=5.5 (SD 1.6)) participated. Data from six persons (11%, 2 males) was lost to follow-up. Baseline characteristics from the drop-outs did not differ from the analyzed dataset.

Within group analysis showed a significant decrease in the CSI (31.5 (SD 11.6) to 27.6 (SD 10.3), p<0.001), but not in the PSS (13.2 (SD 5.3) to 11.7 (SD 5.8), p=0.048). The median split method (high: n=13 (25%), low: n=38 (75%)) as shown in Figure 2 showed a significant decrease of CSI in the high group (47.4 (SD 6.0) to 37.9 (SD 8.2), p=0.007) but not in the low group (26.2 (SD 7.7) to 24.2 (SD 8.7), p=0.142), and no differences of PSS in both the high (14.8 (SD 4.6) to 13.8 (SD 5.3), p=0.529) and low group (12.9 (SD 5.4) to 10.9 (SD 5.8), p=0,534). Finally, between subgroup analysis of CSI delta values showed a significant difference (Δ difference=7.94, p<0.001, not shown in Figure 2).

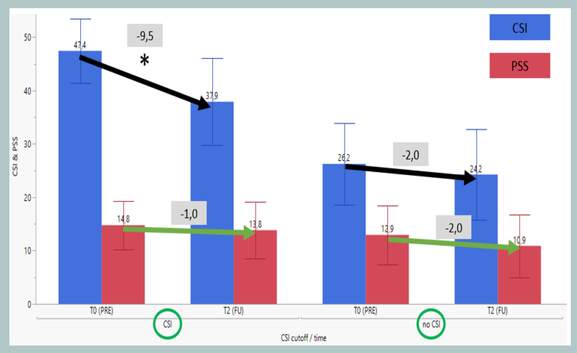

Figure 2: PRE and FU outcomes on the Central Sensitization Index (blue) and Perceived Stress Scale (PSS) for both the subgroup with clinically relevant symptoms of central sensitization ('CSI') and the subgroup without clinically relevant symptoms of central censitization ('no CSI') through the median split method. * represents significant within-group differences (p>0.025).

DISCUSSION

Results of this study suggest that

- HIT might be used as a therapeutic intervention to improve symptoms of central sensitization in CNSLBP on the longer term.
- positive effects of HIT on symptoms of central sensitization are more pronounced in persons with clinically relevant values.
- HIT does not seem to affect general perceived stress in CNSLBP on the longer term.

Limitations of this study include

- the possible impact of differences in program modes within this cohort group on the outcomes displayed in the current analysis.
- a low amount of persons in the median split high value CSI group which causes issues with regard to generalization of the results.
- lack of effect on perceived stress might be due to the low mean baseline stress score depicted in the current sample (a score of <14 relates to a low perceived stress level).

Future research of our research group will aim to

- provide more thorough insights on pain processing through semi-objective testing such as quantitative sensory testing and correlations of pain processing with biomarkers during the performance of acute and longitudinal protocols of HIT.

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