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Dorsolateral prefrontal cortex activity towards fatigue of type 2 Diabetes Mellitus patients with macro-angiopathy and peripheral neuropathy (pilot study)

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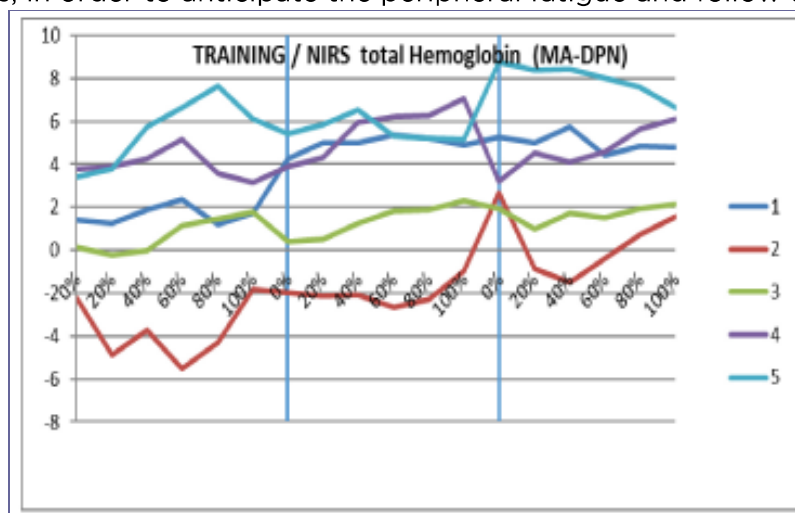
Abstract:

Background and aims: Patients with chronic type 2 Diabetes Mellitus (T2DM) show a decreased neuromuscular activation and increased fatigue depicted by a raised postural central of pressure (COP) kinetics during standing tasks. The dorsolateral prefrontal cortex (DLPFC) is responsible for many cognitive and motor functions and is believed to be involved in the overriding mechanism of fatigue. It is unclear, however, if there are differences in COP and DLPFC activity between T2DM patients who present macro-angiopathy (MA) without diabetic peripheral neuropathy (DPN) and those with both MA and DPN. The aim of the present study is to determine whether differences in COP kinetics between patients with MA alone and both MA-DPN exist and if these differences correlate with DLPFC activity.

Materials and methods: 15 participants, both males and females, (mean age 66±5,7), divided in 3 groups of 5 [5 healthy controls (HC group), 5 T2DM patients with MA alone (MA group) and 5 T2DM patients with both MA and DPN (MA-DPN group)] were included in the study. They performed 3x2 minutes trials of COP Antero/Posterior (A/P) displacements, with a visual feedback, controlled by a metronome in 20bits/min, moving their weight between 2 points, on the top and the bottom of a screen. Pre-Post Data collection: Near Infrared spectroscopy for DLPFC, Tibialis Anterior isometric strength, COP sway velocity, COP area (mm²) and COP A/P amplitude (mm) were also measured.

Results: Repeated measures and matched pair T-test analysis was performed. During every 2' trial, the COP Sway area and the avgCOP A/P displacements amplitude decreased, in both MA group and MA-DPN group, but not in HC group. Moreover, after each 2' trial the average COP sway velocity increased only in MA-DPN group and not in the other 2 groups. The Maximal Voluntary Isometric Contraction of the Tibialis Anterior decreased in MA group and MA-DPN group, but not in HC group, between baseline and immediately after the last bout. Finally, there was an increase trend in total Hemoglobin (tHB, blood volume) at the DLPFC, in MA-DPN group, but not in the other 2 groups, during and at the end of the trials.

Conclusion: T2DM patients with MA alone and both MA and DPN demonstrated decreased mobility during the exercise, but only the MA and DPN patients demonstrated increased DLPFC activity. This can be probably explained by the greater cognitive dependence showed by the MA-DPN group, in comparison with the other two groups, in order to anticipate the peripheral fatigue and follow the task.



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