

# Effect of lower limb muscles activity on postural control in Parkinson's patients with orthostatic hypotension

Rabie Fadil<sup>1</sup>, Asenath X.A. Huether<sup>2</sup>, Andrew P. Blaber<sup>3</sup>, Jau-Shin Lou<sup>2</sup> and Kouhyar Tavakolian<sup>1</sup>

<sup>1</sup>University of North Dakota, Biomedical Engineering Research Complex, Grand Forks, ND, USA

<sup>2</sup>Parkinson Disease Research Laboratory, Department of Neurology, Sanford Health, Fargo, ND, USA

<sup>3</sup>Department of Biomedical Physiology and Kinesiology, Simon Fraser University, Burnaby, BC, Canada

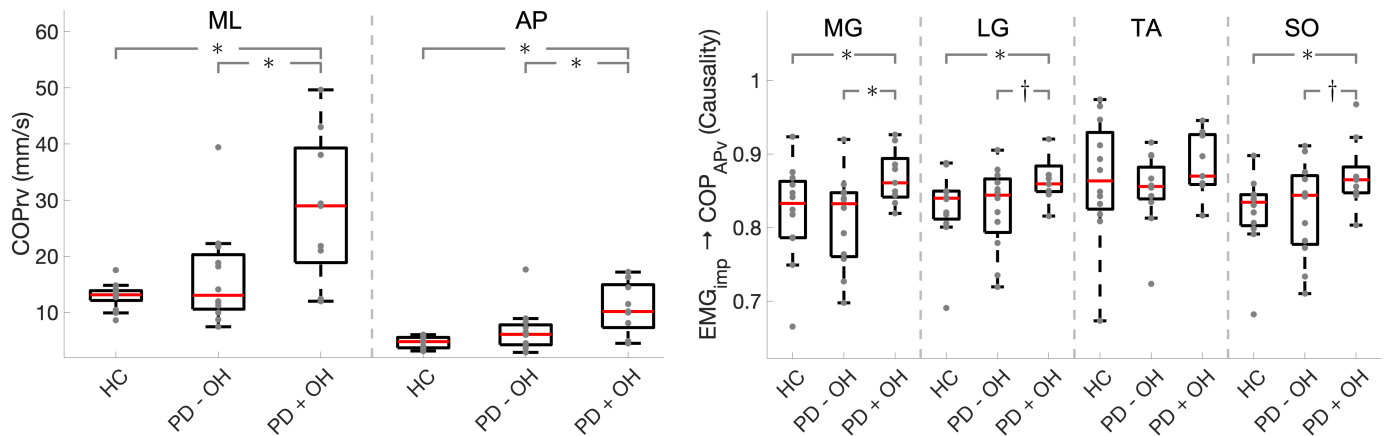
## Objective

The purpose of this study is to investigate the effect of leg muscles activation on postural control in Parkinson's disease (PD) patients with and without orthostatic hypotension (OH), and healthy controls.

## Methods

Simultaneous center of pressure (COP), and electromyogram (EMG) of the bilateral tibialis anterior (TA), lateral and medial gastrocnemius (LG, MG), and soleus (SO) were recorded from 9 PD patients with OH (PD + OH), 12 PD patients without OH (PD - OH) and 12 healthy controls (HC) in supine (5 minutes), head-up tilt test (15 minutes), and standing positions (5 minutes). Convergent Cross Mapping (CCM) was used to examine the causal relationship between the individual leg muscles activity and postural control in the medial-lateral (ML), and anterior-posterior (AP) directions during standing.

## Results



Preliminary results showed that PD + OH experienced higher postural sway in both ML and AP directions compared to HC and PD - OH, while no difference in postural sway was observed between PD - OH, and HC. Moreover, calf muscles (MG, LG, SO) showed a higher drive toward postural control in the AP direction in PD + OH compared to HC, while postural control through TA muscle was not different between PD + OH, PD - OH, and HC.

## Conclusions

Our data suggests that PD patients with OH displayed higher postural sway which was accompanied with a greater drive of calf muscles toward postural control in the AP direction. The obtained results also suggest that calf muscles are mainly used to maintain balance in the AP direction. The findings of this study can assist in the development of an effective system for monitoring orthostatic intolerance via causal relationship between lower limb muscles activation and postural control to prevent syncope and falls.