Sensorimotor Control UK

Authors: Aisha Islam, Cuili Chen, Lisa Alcock, Kianoush Nazarpour, Lynn Rochester, Annette Pantall

Title: 'Muscle synergies are related to gait parameters during walking to an auditory rhythmic cue in people with Parkinson's disease'

Gait impairment in Parkinson's disease (PD) leads to increased falls and disability. Research indicates auditory rhythmic cueing (ARC) normalises stepping through auditory feedback, which may be observed through muscle synergies (multi-muscle coordination patterns). This study aims to evaluate changes in gait and cognition related to ARC walking in PD.

Thirteen healthy older adults (78 ± 7 years, 47% female) and twenty-five with PD (70 ± 5 years, 37% female). Global cognitive function assessed with the Montreal Cognitive Assessment (MoCA). Surface electrodes (Cometa, Bareggio (MI) Italy) measured lower limb muscle activity bilaterally from tibialis anterior, medial/lateral gastrocnemius and soleus during overground walking. Muscle synergies were determined using non-negative matrix factorisation, and the number calculated accounting for 90% of overall variance (nVAF) [2]. Gait parameters (velocity, stance, time) were determined from trunk accelerometery recordings and correlated using Spearman rank with nVAF.

No significant differences *(p>0.05)* in nVAF between NW and ARC in both groups. During ARC in the PD group, positive correlations were found between nVAF and both velocity *(r=0.43, p=0.048)* and MoCA scores*(r=0.412, p=0.045)*. Negative correlations found between nVAF and both step time duration *(r=-0.53, p=0.011)* and stance duration *(r=-0.637, p=0.001)*.

In the PD group, greater nVAF was correlated with improved step time, stance duration, velocity and MoCA scores. Higher NVAF suggests greater motor control complexity, and is associated with improved gait performance and higher cognitive function during ARC walking. Individuals with PD with better cognitive function may benefit most from ARC applied during walking by changing motor control strategies.

Aisha Islam, 1st year PhD Candidate
Supervised by Dr Annette Pantall. Prof. Lynn Rochester and Dr Kianoush Nazarpour
IoN, CARU – Brain and Movement Research Group