

## **ISCOMS Abstract**

### **Title**

Auditory rhythmic cueing changes muscle activity patterns during walking in people with Parkinson's disease

### **Introduction**

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterised by motor dysfunction, increasing the risk of falls. This results from dopaminergic loss in the basal ganglia (BG), associated with habitual behavioural control [1] and motor learning [2]. Auditory rhythmic cueing (ARC), a rehabilitation technique, may normalise stepping through auditory feedback [3] and promote motor learning. However, motor control strategies associated with ARC are unknown. Analysis of lower-limb muscle activity during walking with ARC may reveal motor control strategies employed by people with PD related to improved motor function.

### **Methods**

Data analysis was performed on a subsample of 16 participants (8 healthy older adults (HOA) ( $74 \pm 7$  years, 47% female) and 8 with PD ( $70 \pm 4$  years, 37% female) drawn from a larger study. Surface electrodes (Cometa, Bareggio (MI) Italy) measured lower limb muscle electromyography bilaterally from dorsiflexors (tibialis anterior) and plantarflexors (medial gastrocnemius, lateral gastrocnemius and soleus). Participants walked overground for 300 seconds in alternating 30 second bouts of usual walking (UW) and ARC walking. Muscle synergies were extracted using non-negative matrix factorisation and the number (Nvaf) determined that accounted for 90% of overall variance [4].

### **Results**

During UW, there was little difference between groups in Nvaf (PD 3-6 Nvaf, HOA 3-5 Nvaf). However, during ARC walking, Nvaf increased in 3 participants with PD, whilst HOA showed no increase. Additionally a change in muscle weighting on the first 2 synergies was observed in the PD group, with right plantarflexors dominating during UW changing to left plantarflexors during ARC walking. People with PD with increased Nvaf during ARC also had a greater Falls efficacy scale (FES-I) score. Non-parametric tests show no significant differences between groups.

### **Conclusion**

Increased Nvaf following ARC suggests ARC promotes more complex motor strategies to normalise stepping in people with PD. Results suggest that individuals with higher FES-I scores, with greater fear of falling, benefit most from ARC. Analysis of the remaining experimental cohort will provide higher power for robust statistical tests.

### **Keywords**

Electromyography, Parkinson's disease, walking, cueing, rehabilitation

### **References**

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