



Mid Atlantic Regional Chapter of the American College of Sports Medicine

Annual Scientific Meeting, November 4th- 5th, 2017
Conference Proceedings

International Journal of Exercise Science, Issue 9, Volume 6



Segmented Motor Output in Parkinson's Disease Improved with Speed-Based Exercise

Rebecca J. Daniels, Christopher A. Knight. University of Delaware, Newark, DE

In people with healthy neuromotor control, rapid isometric contractions (force pulses) are produced with a linear relationship between rate of force development (RFD) and peak force that results in relative invariance in time to peak force (tPF). Parkinson's disease (PD) disrupts motor output, sometimes resulting in discontinuous bursts in the electromyogram and abnormal rapid force pulses. Transient reductions in RFD result in step-like increases in force to the peak force level. Little is known about this segmentation and if it can be affected by speed-based exercise. **PURPOSE:** Aim 1 was to quantify the duration of the first segment in rapid force pulses and determine its consistency across segment-dominant (SegD) individuals. Aim 2 was to determine if speed-based exercise can improve the smoothness of force output in PD. **METHODS:** 19 adults with PD (69.6±7.9 yrs, Hoehn Yahr stage ≤3, 1 female) completed the study. Subjects performed 75-100 rapid isometric handgrip force pulses to varying percentages of their maximal voluntary contraction force. 7 subjects completed a 6-week program (2 sessions/ week) with low-resistance high-speed bicycling intervals. Dependent variables were time to first peak (t1Pk), tPF, half-relaxation time (HRT), peak RFD, and number of segments from threshold to peak force (SEG). Subjects with ≥14% of pulses with SEG were classified as SegD. Pearson's correlations described relationships between measures. Simulation modeling analysis was used to determine differences in SEG within individual subjects before and after training. **RESULTS:** 7 of 19 subjects tested were SegD with low variance in t1Pk (0.11±0.04 s) compared to tPF in smooth pulses from non-SegD (0.12±0.05 s) and all pulses in SegD (0.25±0.16 s). The average SEG frequency on the rising phase of the force recording was 6.5±2.7 Hz. SEG were positively correlated to HRT (r=0.82, p=0.01) and negatively correlated with mean RFD (r= -0.72, p=0.048) in SegD. Of the 7 SegD subjects, 5 had decreased SEG after the exercise program (p<0.05). **CONCLUSION:** Segmentation of motor output alters the isometric force profile in some PD and occurs within the frequency range of tremor. Peak forces not reached in approximately 0.11 s may be more likely to exhibit segments. Speed-based exercise may improve the smoothness of isometric force production in PD.