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Differences in Neuromuscular Excitation Rates in Young Adult, Older Adult, and People with Parkinson's Disease

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Older adults and people with Parkinson's disease (PD) experience a decrease in power and movement velocity, which are strongly related to function and mobility. High rates of neuromuscular excitation (NE) are required for rapid movement to occur. During rapid movement, the amplitude of NE in healthy young adults is greater than that observed during maximal voluntary contractions (MVC). While speed is known to be a predictor of hospitalization and survival, walking is often assessed at a preferred rather than a fast velocity and therefore peak rates of NE and function cannot be assessed. **PURPOSE:** To determine if older adults and people with PD show similar rates of NE as young adults across varying velocities in commonly tested movements. **METHODS:** Two young adults, one person with PD, and one older adult participated in this study. Participants performed weighted arm curl, transverse plane elbow extension, bicycling, and a 4-meter walk at increasing movement velocities. Surface electromyography (EMG) from relevant muscles was rectified and smoothed with a zero-lag 4th order Butterworth filter (20Hz low pass filter). Dependent measures were peak acceleration, peak rate of EMG rise (RER), and Q30b (integrated EMG of the 30ms prior to peak acceleration). **RESULTS:** A two way MANOVA was run for each movement with the independent factors of group and movement speed. The dependent factors were peak RER and Q30b for each muscle recorded. Preliminary results show that NE rates varied across groups and speeds for all four movements (arm curl: $F(12)=9.589$, $p<.001$; elbow extension: $F(16)=3.182$, $p<.001$; cycling: $F(70)=19.934$, $p<.001$; walk: $F(40)=11.501$, $p<.001$). For example, during arm curl, while the young adults NE was 676%mvc during the fastest condition (1.2Hz), older adults required 3125%mvc and people with PD 1576%mvc. During cycling, older adults showed a 238% increase in NE in the soleus between 40 rpms and 100rpms and people with PD's NE increased 403% whereas young adult NE increased by 172%. **CONCLUSIONS:** Differences in NE rates may account for some of the differences in function and mobility between aging and people with PD whereas inherent muscle quality differences may play a role when compared to healthy young adult.

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