ABSTRACT

MOTOR PERFORMANCE AND MOTOR UNIT BEHAVIOR IN RESPONSE TO ISCHEMIC CONDITIONING POST STROKE

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The purpose of this dissertation was to quantify changes in motor performance and motor unit behavior in response to ischemic conditioning (IC) post stroke. People with stroke often have long term functional deficits following therapeutic interventions characterized by underlying muscle weakness and fatigability. IC is an emerging therapy which involves transient bouts of ischemia to a limb with some evidence that IC may help improve motor function post stroke. Although the mechanisms of IC are likely multifactorial, the premise for this dissertation is that IC increases sympathetic drive and the excitability of the nervous system resulting in enhanced activation of motor units and motor performance during different types of muscle contractions in people post stroke.

In Aim 1, using multichannel electromyography, we quantified changes in motor unit firing and recruitment behavior in the paretic knee extensors during sub-maximal contractions. Altered motor unit firing and recruitment behavior was used as an indirect measure of intrinsic excitability of the motor neuron before and after IC of the paretic leg. IC increased excitability of the motor neuron pool in the paretic leg relative to a control condition regardless of contraction intensity. In Aim 2, we evaluated the motor performance during a fatiguing sub-maximal contraction following IC. We found that post IC, task duration was greater and accompanied by maintained motor unit firing rates compared with the control condition. In Aim 3, we explored the blood pressure response in people with stroke during IC as a proxy for alterations of sympathetic drive. We found an increase in blood pressure during IC at rest compared to the control condition. Taken together, the increased excitability of motor unit firing behavior and blood pressure response in people post stroke are consistent with increased sympathetic drive following IC. Clinically, these data support IC as an adjunct therapy to enhance the neural response to exercise, muscle activation, and motor performance in people post stroke.