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Abstract Submission Form

Poster Title: **Transcutaneous Spinal Cord Stimulation as a Diagnostic Tool for Abnormal Muscle Coordination in Post-Stroke Gait**

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Location of Laboratory: **Old Brooklyn Campus**

Category: **Physical Medicine and Rehabilitation**

In the United States, stroke is the leading cause of long-term disability, with approximately 1/3 of stroke survivors suffering from residual gait impairments. A common abnormality in post-stroke locomotion is the lack of adequate knee flexion during the swing phase of the gait cycle. This is often termed Stiff-Knee gait (SKG). Traditionally, hip circumduction and pelvic obliquity are assumed to compensate for the lack of knee flexion. Our group's earlier research suggests that abnormal coordination of reflexes in the lower limbs may actually be causing hip circumduction, not voluntary compensations. Specifically, we found a reflex coupling between quadriceps and hip abductors that may falsely appear to be hip circumduction. Here, we propose the use of non-invasive transcutaneous spinal stimulation to probe reflex circuitry throughout the lower limbs to assist in the diagnosis of SKG. The spatiotemporal and neurophysiological characteristics of these spinally evoked motor potentials (SEMP) contain information that may shine light on the specific causes of SKG. We expect to find coupled activation of quadriceps and hip abductors following spinal stimulation. To test this hypothesis, we aim to collect data from ten able-bodied volunteers and ten individuals with post-stroke SKG while relaxed in a supine position and while walking. During walking, stimulation will be delivered during the pre-swing phase of the gait cycle. The SEMPs will be evoked through surface stimulation of the L2-L3 spinal cord using 2.5" round electrodes at the T12-L1 vertebral level as cathodes and 2"x 3.5" rectangular electrodes as anodes placed on the anterior superior iliac spine. SEMP data will be collected through electromyographic electrodes placed bilaterally on the gluteus medius, vastus lateralis, semitendinosus, soleus, and tibialis anterior muscles. Stroke participant responses of the paretic limb will be normalized to the non-paretic limb. The SEMPs will be analyzed for onset time, amplitude, complexity, and coherence and correlation. We expect stroke participants to show one or a combination of the following: delayed onset times, increased amplitudes of the knee extensors, increased signal complexity, coherence, and correlation. We expect for these results to provide a multi-faceted picture of the spinal circuitry. This would, in turn, be useful to diagnose gait abnormalities for the purpose of delivering optimal therapy programs.