

**MetroHealth Medical Center**

**RESEARCH DAY 2023**

**Abstract Submission Form**

**Poster Title:** Iterative Learning Control to Improve Post-Stroke Walking

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**Location of Laboratory:** VA/OBC

**Category:** Physical Medicine and Rehabilitation

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Stroke is the leading cause of disability in the United States, with an estimated 9.4 million persons reporting having had a stroke. Hemiparesis is a common result following stroke and is characterized by weakness and the reduction of motor control on one side of the body. As a result, around 30% of stroke survivors experience significant walking impairment and require assistance to walk. Implanted multi-joint stimulation has been shown to improve post-stroke gait speed, endurance, and kinematics. Existing stimulation control methods however lack the ability to automatically adapt to changes over time, such as fatigue. Additionally, there is considerable time required to manually determine the optimal assistance parameters. In the present study, I investigate the use of Iterative Learning Control (ILC) to address both shortcomings. ILC is based on the notion that control of a repetitive task can be optimized by learning from previous iterations. Using both musculoskeletal simulation and real-time implementation with an individual with stroke, I present preliminary results from the application of ILC to neuromuscular stimulation during the swing-phase of gait. Simulation showed that the joint angle errors were reduced to less than 4 degrees within 50 steps. These results highlight the utility of ILC and motivate its continued development moving forward.