

Project Title: *Gait Restoration in Hemiparetic Stroke Patients using Goal-Directed, Robotic-Assisted Treadmill Training*

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The overall goal of this study is to determine whether goal-directed, robotic-assisted gait training is more effective than conventional gait training for facilitating the recovery of stable walking patterns in hemiparetic stroke patients. The subject sample will consist of 100 patients in the sub-acute stage following stroke (less than 6 months post stroke), randomly assigned to one of 2 experimental groups. The first (control) group will receive one hour of conventional gait training, with appropriate physical assistance and feedback as necessary. The second group will receive body-weight supported treadmill training (BWSTT) with robotic-assistance using the Lokomat® System (Fig. 1, Hocoma, Inc., Zurich, Switzerland). The Lokomat® is an exo-skeletal robotic orthosis that attaches to a person's legs and assists the subject in achieving normal gait patterns while walking on a treadmill. During training sessions with the Lokomat®, patients will receive bio-feedback of their performance, allowing for goal-directed therapy. Both groups will be trained for 24 sessions over a 10 week period, 3 times per week, with 1 hr allocated for all training paradigms.

The re-acquisition of natural gait patterns and lower limb motor function will be evaluated at weeks 0, 4, and 8 of the intervention, as well as during a follow-up exam 3 months after study completion. Outcome measures include the speed and variability of unassisted walking, step lengths and cadence, postural balance, assessment of spasticity, and strength measures. Using these criteria, we will determine whether there are differences between conventional gait training and Lokomat® therapy for promoting the restoration of walking capabilities and reducing functional impairments in patients with hemiparesis following stroke.

During the first 8 months of Year 2, a total of 10 patients have been trained at NRH and 5 at RIC. Our original target was to complete 25 subjects by the end of year 2 since we hope to train 100 patients during years 2-5. Unfortunately we will fall short of our goal as RIC has had difficulty recruiting subjects to the study. For the subjects who have completed the program, all have demonstrated improvements in walking speed, endurance, strength, and other key gait metrics. Furthermore, all subjects have stated through questionnaires at the completion of the study that they enjoyed participating in the research and that their training has improved their quality of life. Our goal for the upcoming year is to continue training subjects with the hope of reaching 50 subjects by the end of year 3.



Fig. 1 -- Photograph of the Lokomat motor driven exoskeleton orthosis with body weight support system that will be used in the clinical trial grant