**Introduction:** Individuals with amputations experience an invasive surgery compromising the residual limb resulting in detriments such as a decrease in muscle strength, muscle atrophy, gait impairments and pain. To alleviate these problems there are current solutions to provide temporary relief but none are cost effective or readily available to all individuals; nor do they help all individuals with amputation. Neuromuscular Electrical Stimulation (NMES) has been shown to improve the strength and volume of the quadriceps muscles in individuals who have experienced a total knee arthroplasty, osteoarthritis of the knee, anterior cruciate ligament repair and in individuals who suffer from a chronic illness. NMES has also been shown to decrease pain in conditions such as knee osteoarthritis, chronic back pain, and total knee arthroplasty. We are proposing a novel idea to apply NMES to individuals with amputation to see if we can achieve the same results.

**Objective:** The purpose of this study is to demonstrate the efficacy of NMES for individuals with a transtibial amputation. We aim to demonstrate that when compared to a control group individuals who receive three months of NMES intervention will show greater knee extension strength, increased volume of the residual limb, decreased chronic and phantom pain and improved gait relative to the baseline measures. We will also evaluate the feasibility of this intervention and determine effect sizes to power a larger study.

**Methods:** Up to twenty-five unilateral transtibial participants who are greater than one year post amputation will be recruited and randomized into two groups. One group will receive the NMES intervention and the other group will continue with their activities of daily living. The study consists of a baseline visit and four follow up visits. Outcome measures will be assessed by isometric and isokinetic knee extension strength tests, residual limb volume measurements, a pain questionnaire, the Prosthetic Evaluation Questionnaire (PEQ) and gait analysis with the GAITRite® System. A mixed model repeated measures ANOVA will be used to compare the outcome measures between groups and over time. If successful, this study may lead to a new low cost treatment for maintaining residual limb strength, volume and managing pain after an amputation.