

## **Perceived Discomfort during 4 weeks of Neuromuscular Electrical Stimulation Training in Older Adults**

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### **ABSTRACT**

Neuromuscular electrical stimulation (NMES) generates involuntary muscle contraction and may be a safe and effective treatment alternative when voluntary resistance training is not possible. However, little research has been done to determine patient tolerance to NMES in older adults. **PURPOSE:** The aim of this study is to determine how NMES is tolerated across 12, 40-min NMES training sessions in older adults. **METHODS:** Participants ( $n = 6$ ) consisted of healthy, older adults (mean age:  $71.2 \pm 3.2$  years). Participants performed maximal voluntary contractions (MVC) using the quadriceps muscles on an isokinetic dynamometer prior to the stimulation. The stimulation intensity delivered was set to achieve 15% MVC as measured on the isokinetic dynamometer. Participants were seated in the isokinetic dynamometer with the knee fixed at  $60^\circ$  and received a 40-min NMES treatment three times per week for 4 weeks (12 total sessions). Four electrodes were placed over the quadriceps. NMES was set at a frequency of 60 Hz with a pulse width of  $200\mu\text{s}$ . The duty cycle consisted of 10 seconds of stimulation and 15 seconds of rest that repeated for a total of 40 minutes on each leg. Every 5 minutes the force was calculated and if it dropped below 15% of MVC, the stimulation intensity was increased until 15% of MVC was met. Using a standard pain scale, participants were asked to rate perceived pain (0 = no pain at all, 10 = worst pain possible) during the NMES at 1, 20, and 40 minutes of stimulation on each leg during treatment day 1, 7, and 12. Stimulation intensity was also recorded and compared. The averages of right and left leg pain scores and intensity were used for comparison. Pain score and stimulation intensity data were analyzed using SPSS software with repeated measures analysis of variance (DAY  $\times$  MIN), with significance set at  $p \leq 0.05$ . **RESULTS:** For pain, there was a significant main effect for MIN ( $p = 0.022$ ) and DAY ( $p = 0.020$ ). For MIN, perceived pain significantly increased (MIN 1:  $3.0 \pm 1.0$  vs MIN 20:  $4.8 \pm 0.7$ ;  $p = 0.013$ ) and then remained stable (MIN 40:  $5.5 \pm 0.6$ ;  $p = 0.086$ ) compared to MIN 20. For DAY, pain decreased 54.2% (DAY 1:  $6.3 \pm 0.4$  vs DAY 7:  $3.6 \pm 0.7$ ;  $p = 0.002$ ) and then remained stable (DAY 12:  $3.4 \pm 1.2$ ;  $p = 0.858$ ) compared to DAY 7. For intensity, there was a significant main effect for DAY ( $p = 0.027$ ). Stimulation for DAY intensity increased (DAY 1:  $13.6 \pm 1.1$  vs DAY 7:  $16.5 \pm 2.0$  mA;  $p = 0.032$ ) and then decreased (Day 12:  $14.8 \pm 1.5$  mA;  $p = 0.031$ ). **CONCLUSION:** The data indicate that participants experienced a moderate amount of discomfort during the first NMES treatment. However, the perceived pain decreased significantly by day 7, demonstrating that NMES may be a feasible muscle strengthening option for older adults.