

Four Weeks of Neuromuscular Electrical Stimulation Treatment Increases Physical Activity among Older Adults

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Background

Physical activity (PA) and quality of life (QoL) often decrease with aging, as a result of reduced muscle mass and physical function related to sarcopenia. It is critical to explore viable and effective alternative therapies to increase physical activity, especially for those with limited ability to safely perform voluntary exercise. Neuromuscular electrical stimulation (NMES) is a muscle strengthening modality used in physical rehabilitation. Our **purpose** was to test whether a 4-week NMES intervention augmented physical activity and 2 aspects of QoL: perceived strength and self-esteem.

Methods

Participants: In this clinical trial, healthy older adults (68.8 ± 7.4 yrs) were randomized into NMES treatment group ($n = 12$) or sham group ($n = 5$).

Treatment Intervention: For NMES, a 40-min NMES treatment was applied to the quadriceps of each leg 3X per week for 4 weeks. SHAM underwent the same procedures, but no electrical current was administered.

Pre and Post Testing:

- Physical Activity: Participants wore an accelerometer at the waist during waking hours, for 1 week before and 1 week after the intervention. Average daily minutes of moderate-to-vigorous intensity PA (MVPA) and light intensity PA were calculated.
- QoL: A pre and post survey assessed perceived strength and global self-esteem on a 1-6 scale. (Physical Self-Description Questionnaire, Marsh et al., 2010)

Data Analysis: RM ANOVAs determined intervention effects.

Results and Conclusions

Table 1. Descriptive statistics for study variables

Outcome Variable:	Mean \pm SE				p-value
	NMES pre	NMES post	Sham pre	Sham post	
MVPA	54.2 \pm 6.5	65.5 \pm 7.4	54.7 \pm 8.3	51.0 \pm 9.4	0.047
Light PA	61.6 \pm 9.4	56.8 \pm 4.2	60.9 \pm 11.8	59.3 \pm 5.3	0.824
Perceived Strength	4.17 \pm 0.3	4.28 \pm 0.2	4.60 \pm 0.4	4.53 \pm 0.4	0.573
Self-Esteem	5.07 \pm 0.2	5.10 \pm 0.2	5.20 \pm 0.3	5.48 \pm 0.3	0.244

Note. *p*-value is for the group-by-time interaction from the RM ANOVA. Perceived strength was significantly correlated with MVPA, so it was included as a covariate for MVPA.

Conclusions:

- The NMES group increased their amount of MVPA ($d = 0.55$, medium effect) and trended toward decreased light PA ($d = 0.23$, small effect). It is possible they substituted light PA with MVPA.
- A longer NMES intervention may be needed to change QoL outcomes.
- Greater physical activity behavior subsequent to NMES treatment may counter the effects of sarcopenia and ultimately enhance QoL for older adults.
- This research informs health care practitioners that therapeutic modalities intended to increase strength may also promote healthy physical activity behaviors in older adults.**

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For older adults, the therapeutic effects of neuromuscular electrical stimulation (NMES) training led to 11 more minutes per day (77 more minutes per week) of moderate-to-vigorous intensity physical activity (MVPA).

Daily MVPA

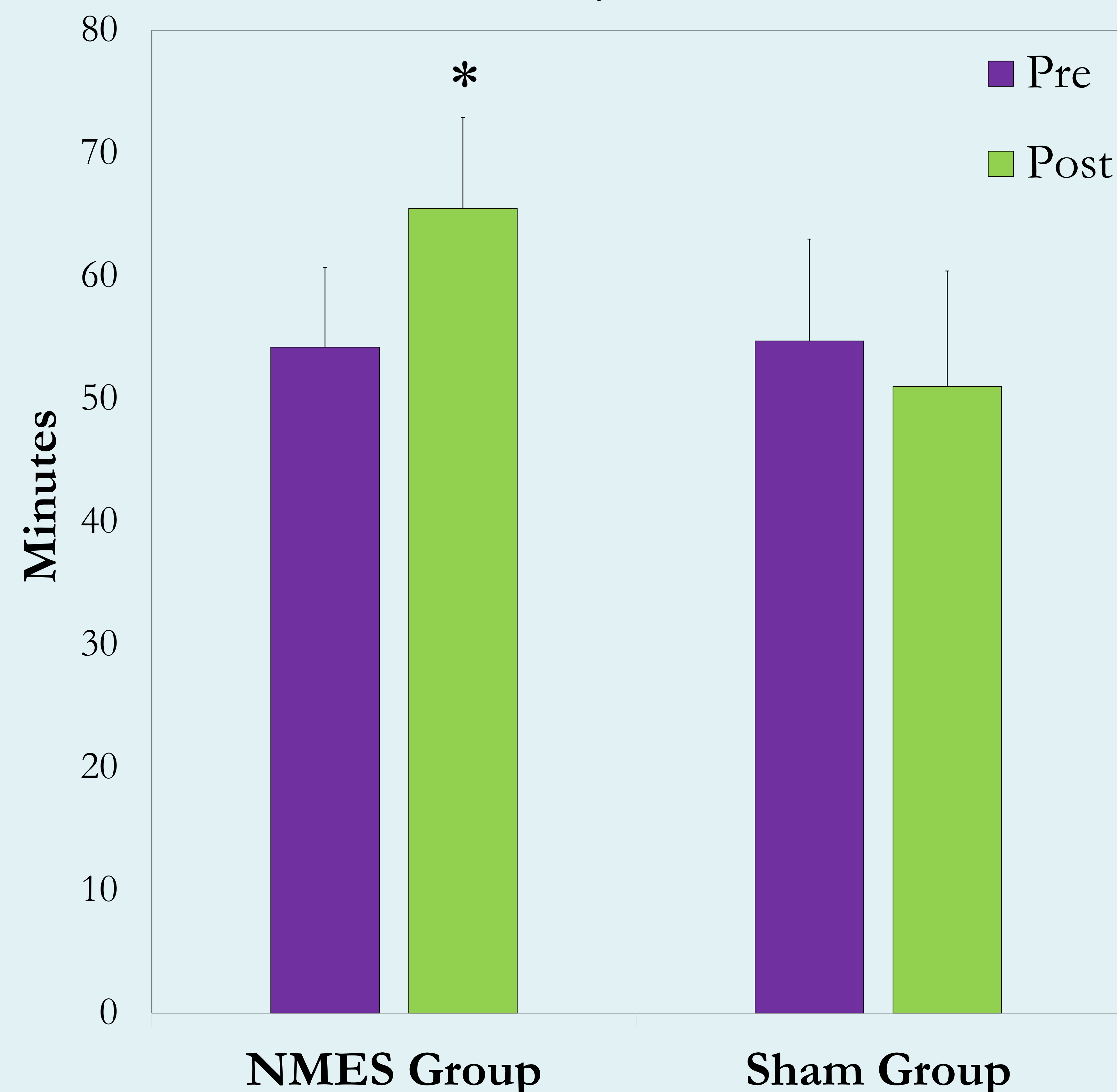


Figure 1. The NMES group significantly increased their daily MVPA (Cohen's $d = 0.55$). The sham group remained stable. * denotes $p < 0.05$

Figure 2. Experimental setup for NMES treatment.

(Permission was obtained for use of this photo.)

