JCEWM 2024 ;2 (1):88-98

Original Research

Neuromuscular Electrical Stimulation Strengthening and Blood Flow Restriction.

Wayne Scott MPT, PhD[1], Leah Desjardins, PT, DPT[1], Katherine McMillan, PT, DPT[1], Michael Popolizio, PT, DPT[1], Stephen Shein, PT, DPT[1]

1 School of Physical Therapy, Husson University, Bangor, ME

Purpose: Few studies have examined the effects of combining Neuromuscular Electrical Stimulation (NMES) with Blood Flow Restriction (BFR), and none have attempted to use BFR with a typical NMES strengthening protocol. The purpose of our study was to examine the effects of using BFR with a NMES strengthening protocol.

Methods: Electrically elicited knee extensor muscle torques were compared in two conditions, NMES vs. NMES + BFR. A NMES strengthening protocol was utilized consisting of 10 repetitions of 10-second contractions with 50 seconds of rest. The maximum tolerated stimulation amplitude, electrically elicited muscle torque, muscle fatigue, pain, and post-testing soreness were analyzed.

Results: The addition of BFR to NMES did not affect the maximum tolerated stimulation amplitude or electrically elicited muscle torques. However, the addition of BFR to the NMES strengthening protocol did induce greater fatigue (46.0 +/- 19.7 vs 73.1 +/- 11.1 % of the initial muscle torque was produced at the end of the strengthening protocol) ($p < .001$), increased pain ratings at the 5th (5.3 +/- 2.1 vs. 4.0 +/- 2.5) ($p = .009$) and final (6.7 +/- 2.2 vs. 4.3 +/- 1.6) ($p = .003$) contractions of the strengthening protocol but decreased muscle soreness at 48 hours post testing (1.6 +/- 1.7 vs. 2.7 +/- 1.8) ($p = .017$). Three of the 13 participants, who had the lowest pretesting systolic blood pressures, didn't complete the testing due to hemodynamic issues.

Conclusions: BFR combined with a NMES strengthening protocol did not affect the maximum tolerated stimulation amplitude or muscle torques, but did increase muscle fatigue and pain, while reducing muscle soreness.

Keywords: Neuromuscular Electrical Stimulation, Blood Flow Restriction

Corresponding Author:

Wayne Scott, MPT, PhD

Husson University

1 College Circle

Bangor, ME 04401

scottw@husson.edu