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Original Research

Ankle Bracing and the Neuromuscular Factors Influencing Joint Stiffness

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Abstract

Context: Health care professionals commonly prescribe external stabilization to decrease the incidence and severity of ankle sprains. The mechanism for this decrease is not clearly understood. Examining the effects of ankle bracing on biomechanical stability and influencing factors may provide important information regarding the neuromuscular effects of bracing.

Objective: To study the effects of 2 different ankle braces on the neuromuscular factors influencing ankle stiffness.

Design: Mixed-model repeated-measures design.

Setting: Research laboratory.

Patients or Other Participants: Twenty-eight physically active participants composing 2 groups: 14 with unilateral functional ankle instability (age = 26.19 ± 6.46 years, height = 166.07 ± 12.90 cm, mass = 69.90 ± 13.46 kg) and 14 with bilaterally stable ankles (age = 23.76 ± 5.82 years, height = 174.00 ± 11.67 cm, mass = 68.60 ± 13.12 kg).

Intervention(s): Participants were fitted with surface electromyography electrodes over the peroneus longus, peroneus brevis, tibialis anterior, and soleus muscles. Each participant received transient motion oscillations to his or her ankle on a custom-built medial-lateral swaying cradle in each of 3 conditions: no ankle brace (NB), lace-up brace (LU), and semirigid brace (SR).

Main Outcome Measure(s): Ankle stiffness as measured by the cradle and preactivation levels (percentage of maximal voluntary isometric contraction) of the 4

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test muscles.

Results: Stiffness levels increased across brace conditions (NB = 24.79 ± 6.59 Nm/rad, LU = 28.29 ± 7.05 Nm/rad, SR = 33.22 ± 8.78 Nm/rad; $F_{2,52}$ = 66.185, P < .001). No differences were found between groups for rotational stiffness (stable = 27.36 ± 6.17 Nm/rad, unstable = 30.18 ± 8.21 Nm/rad; $F_{1,26}$ = 1.084, P = .307). Preactivation levels did not change for any of the tested muscles with the application of an ankle brace ($F_{2,52}$ = 1.326, P = .275).

Conclusions: The increase in ankle rotational stiffness with the addition of an ankle brace and the lack of any demonstrable neuromuscular changes suggested ankle braces passively contributed to the stability of the system.

Keywords: stability, preactivation, reflexes, orthoses

Steven M. Zinder, PhD, ATC, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article. Kevin P. Granata, PhD; Sandra J. Shultz, PhD, ATC, FNATA, FACSM; and Bruce M. Gansneder, PhD, contributed to conception and design; analysis and interpretation of the data; and critical revision and final approval of the article.

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