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Original Research

Lower Extremity Kinematics and Ground Reaction Forces After Prophylactic Lace-Up Ankle Bracing

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Abstract

Context: Long-term effects of ankle bracing on lower extremity kinematics and kinetics are unknown. Ankle motion restriction may negatively affect the body's ability to attenuate ground reaction forces (GRFs).

Objective: To evaluate the immediate and long-term effects of ankle bracing on lower extremity kinematics and GRFs during a jump landing.

Design: Experimental mixed model (2 [group] × 2 [brace] × 2 [time]) with repeated measures.

Setting: Sports medicine research laboratory.

Patients or Other Participants: A total of 37 healthy subjects were assigned randomly to either the intervention (n = 11 men, 8 women; age = 19.63 ± 0.72 years, height = 176.05 ± 10.58 cm, mass = 71.50 ± 13.15 kg) or control group (n = 11 men, 7 women; age = 19.94 ± 1.44 years, height = 179.15 ± 8.81 cm, mass = 74.10 ± 10.33 kg).

Intervention(s): The intervention group wore braces on both ankles and the control group did not wear braces during all recreational activities for an 8-week period.

Main Outcome Measure(s): Initial ground contact angles, maximum joint angles, time to reach maximum joint angles, and joint range of motion for sagittal-plane knee and ankle motion were measured during a jump-landing task. Peak vertical GRF and the time to reach peak vertical GRF were assessed also.

Results: While participants were wearing the brace, ankle plantar flexion at initial ground contact (brace = 35° ± 13°, no brace = 38° ± 15°, *P* = .024), maximum dorsiflexion (brace = 21° ± 7°, no brace = 22° ± 6°, *P* = .04), dorsiflexion range of motion (brace = 56° ± 14°, no brace = 59° ± 16°, *P* = .001), and knee flexion range

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of motion (brace = 79° ± 16°, no brace = 82° ± 16°, $P = .036$) decreased, whereas knee flexion at initial ground contact increased (brace = 12° ± 9°, no brace = 9° ± 9°, $P = .0001$). Wearing the brace for 8 weeks did not affect any of the outcome measures, and the brace caused no changes in vertical GRFs ($P > .05$).

Conclusions: Although ankle sagittal-plane motion was restricted with the brace, knee flexion upon landing increased and peak vertical GRF did not change. The type of lace-up brace used in this study appeared to restrict ankle motion without increasing knee extension or vertical GRFs and without changing kinematics or kinetics over time.

Keywords: prophylactic, braces, external ankle supports, landings, injury prevention

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