ABSTRACT

Background: An increased risk of ACL injury has been shown in female athletes who land from jumping maneuvers with knee angles close to extension and in those who demonstrate a hamstring-to-quadriceps muscle recruitment imbalance.

Hypothesis/Purpose: The purpose of this study was to determine if added heel lift height would alter electromyography (EMG) magnitude and timing of the quadriceps (vastus medialis, vastus lateralis), hamstrings (semitendinosus, biceps femoris) and gastroc (medial gastroc, lateral gastroc) musculature during forward jump and drop-rebound jump landing tasks in females. The authors hypothesized increased heel lift height would promote recruitment of the hamstring and gastrocnemius muscles and increase the time to peak muscle activity in the quadriceps muscles.

Study Design: Prospective randomized trial

Methods: 60 recreationally active females participated. Participants performed five repetitions of forward jump and drop-rebound jump landing tasks while wearing different heel lifts heights (0, 12, 18, 24 mm) placed on the under-side of an athletic shoe. Task order and heel lift height were randomized. Dependent measures were average magnitude of muscle recruitment (AMR), peak magnitude of muscle recruitment (PMR), and time to reach PMR for six lower extremity muscle groups as measured by surface EMG.

Results: Repeated measures ANOVAs were used to determine the influence of heel lift height on the dependent measures. There were no significant differences in the AMR, PMR, or time to reach PMR with the four different heel heights during the landing maneuvers, with one exception. A significant difference was found in the time to achieve PMR in the semitendinosis muscle during a forward jump landing (p = .024). Post hoc analysis found significant differences with both the 18mm and 24mm heel lift height compared to 0mm.

Conclusions: Utilization of larger heel lifts (18mm and 24mm) to influence landing biomechanics may be of potential benefit; however, only when performing forward jump landing tasks. Further investigation into the protective effects of a quicker onset of semitendinosis peak magnitude is warranted.

Level of Evidence: 2

Key Words: ACL, electromyography, heel lift, kinematics, landing

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Conflict of Interest Statement: The authors affirm that they have no conflicts of interest to disclose.

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