

## Abstract

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**THESIS:** Biomechanical Differences Between Sexes and Limb Dominance during a Cutting Maneuver

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**Purpose:** Given the elevated risk of sustaining an ACL injury during sidestep cutting, and the potential differential risk to the two lower extremity limbs between males and females, the purpose of this study was to investigate the biomechanical differences in males and females between their dominant and non-dominant limbs during unanticipated sidestep cutting. **Methods:** Twenty-two healthy young adults (11 males and 11 females) performed multiple sidestep cutting maneuvers planting off both the dominant and non-dominant limb. Joint kinematics and kinetics of the hip, knee, and ankle joints as well as neuromuscular activation of the gluteus medius, hamstrings, and quadriceps were recorded during each trial.

**Results:** Findings revealed that females were subjected to larger hip adduction loads ( $p=.04$ ) while males underwent greater internal rotation ( $p=.003$ ) and abduction ( $p=.004$ ) loading at the knee during sidestep cutting. Males also had greater pre-activation of the lateral and medial hamstring musculature when compared to females, ( $p=.016$  and  $p=.025$  respectively). A secondary analysis found that males within the study had larger

adduction moments ( $p=.002$ ) and larger external rotation moments ( $p=.002$ ) at the knee joint as well as larger vertical GRF ( $p=.002$ ) than did their female counterparts. In addition a significant difference was found between limb dominance and loading rate, with the non-dominant limb undergoing larger loading rates ( $p=.031$ ). Lastly, correlations between pre- and post- medial hamstring activation revealed a negative relationship with injury risk ( $p=.003$  and  $p=.007$  respectively).

**Conclusions:** These findings suggest there may be differential risk of ACL injury between males and females at each joint, females having greater risk at the hip and males and the knee joint. More research should be done to better understand how each joint effects injury risk within and between sexes. As for limb dominance no definitive statement regarding risk discrepancy due to limb dominance can be made. However, future studies should focus on a more specific population of one sport and level of participation to better understand its influence.