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Original research

Muscle Activation During Side-Step Cutting Maneuvers in Male and Female Soccer Athletes

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Abstract

Context: Female soccer athletes are at greater risk of anterior cruciate ligament (ACL) injury than males. Sex differences in muscle activation may contribute to the increased incidence of ACL injuries in female soccer athletes.

Objective: To examine sex differences in lower extremity muscle activation between male and female soccer athletes at the National Collegiate Athletic Association Division I level during 2 side-step cutting maneuvers.

Design: Cross-sectional with 1 between-subjects factor (sex) and 2 within-subjects factors (cutting task and phase of contact).

Setting: Sports medicine research laboratory.

Patients or Other Participants: Twenty males (age = 19.4 ± 1.4 years, height = 176.5 ± 5.5 cm, mass = 74.6 ± 6.0 kg) and 20 females (age = 19.8 ± 1.1 years, height = 165.7 ± 4.3 cm, mass = 62.2 ± 7.2 kg).

Intervention(s): In a single testing session, participants performed the running-approach side-step cut and the box-jump side-step cut tasks.

Main Outcome Measure(s): Surface electromyographic activity of the rectus femoris, vastus lateralis, medial hamstrings, lateral hamstrings, gluteus medius, and gluteus maximus was recorded for each subject. Separate mixed-model, repeated-measures analysis of variance tests were used to compare the dependent variables across sex during the preparatory and loading contact phases of each cutting task.

Results: Females displayed greater vastus lateralis activity and quadriceps to hamstrings coactivation ratios during the preparatory and loading phases, as well as greater gluteus medius activation during the preparatory phase only. No significant differences were noted between the sexes for muscle activation in the other muscles analyzed during each task.

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Conclusions: The quadriceps-dominant muscle activation pattern observed in recreationally active females is also present in female soccer athletes at the Division I level when compared with similarly trained male soccer athletes. The relationship between increased quadriceps activation and greater incidence of noncontact ACL injury in female soccer athletes versus males requires further study.

Keywords: [electromyography](#), [anterior cruciate ligament](#), [preparatory phase](#), [loading phase](#), [sex differences](#)

Ashley M. Hanson, MA, ATC, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article. Darin A. Padua, PhD, ATC; J. Troy Blackburn, PhD, ATC; William E. Prentice, PhD, PT, ATC; and Christopher J. Hirth, PT, ATC, contributed to conception and design; analysis and interpretation of the data; and drafting, critical revision, and final approval of the article.

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