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Original Research

Knee Joint Kinematics and Kinetics During a Lateral False-Step Maneuver

Grace M. Golden, PhD ATC CSCS[1], Michael J. Pavol, PhD[2], and Mark A. Hoffman, PhD ATC[2]

[1]University of California, Los Angeles, CA
[2]Oregon State University, Corvallis, OR

Abstract

Context: Cutting maneuvers have been implicated as a mechanism of noncontact anterior cruciate ligament (ACL) injuries in collegiate female basketball players.

Objective: To investigate knee kinematics and kinetics during running when the width of a single step, relative to the path of travel, was manipulated, a lateral false-step maneuver.

Design: Crossover design.

Setting: University biomechanics laboratory.

Patients or Other Participants: Thirteen female collegiate basketball athletes (age = 19.7 ± 1.1 years, height = 172.3 ± 8.3 cm, mass = 71.8 ± 8.7 kg).

Intervention(s): Three conditions: normal straight-ahead running, lateral false step of width 20% of body height, and lateral false step of width 35% of body height.

Main Outcome Measure(s): Peak angles and internal moments for knee flexion, extension, abduction, adduction, internal rotation, and external rotation.

Results: Differences were noted among conditions in peak knee angles (flexion [$P < .01$], extension [$P = .02$], abduction [$P < .01$], and internal rotation [$P < .01$]) and peak internal knee moments (abduction [$P < .01$], adduction [$P < .01$], and internal rotation [$P = .03$]). The lateral false step of width 35% of body height was associated with larger peak flexion, abduction, and internal rotation angles and larger peak abduction, adduction, and internal rotation moments than normal running. Peak flexion and internal rotation angles were also larger for the lateral false step of width 20% of body height than for normal running, whereas peak extension angle was smaller. Peak internal rotation angle increased progressively with increasing step width.

Volume 44, Issue 5 (September/October 2009)

< Previous Next >

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Conclusions: Performing a lateral false-step maneuver resulted in changes in knee kinematics and kinetics compared with normal running. The differences observed for lateral false steps were consistent with proposed mechanisms of ACL loading, suggesting that lateral false steps represent a hitherto neglected mechanism of noncontact ACL injury.

Keywords: noncontact injury mechanisms, anterior cruciate ligament, sidestep cutting

Grace M. Golden, PhD, ATC, CSCS, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article. Michael J. Pavol, PhD, contributed to acquisition and analysis and interpretation of the data and drafting, critical revision, and final approval of the article. Mark A. Hoffman, PhD, ATC, contributed to conception and design; analysis and interpretation of the data; and drafting, critical revision, and final approval of the article.

Dr Golden is now at the University of Oregon, Eugene, OR.

Address correspondence to Grace M Golden, PhD, ATC, CSCS, Department of Human Physiology, 1240 University of Oregon, Eugene, OR 97403-1240, e-mail: graceg@uoregon.edu.

top