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Clinical Studies

Comparison of Lower Extremity Kinematics and Hip Muscle Activation During Rehabilitation Tasks Between Sexes

Maureen K. Dwyer, PhD ATC, Samantha N. Boudreau, MS ATC, Carl G. Mattacola, PhD ATC FNATA, Timothy L. Uhl, PhD PT ATC FNATA, and Christian Lattermann, MD

University of Kentucky, Lexington, KY

Abstract

Context: Closed kinetic chain exercises are an integral part of rehabilitation programs after lower extremity injury. Sex differences in lower extremity kinematics have been reported during landing and cutting; however, less is known about sex differences in movement patterns and activation of the hip musculature during common lower extremity rehabilitation exercises.

Objective: To determine whether lower extremity kinematics and muscle activation levels differ between sexes during closed kinetic chain rehabilitation exercises.

Design: Cross-sectional with 1 between-subjects factor (sex) and 1 within-subjects factor (exercise).

Setting: Research laboratory.

Patients or Other Participants: Participants included 21 women (age = 23 ± 5.8 years, height = 167.6 ± 5.1 cm, mass = 63.7 ± 5.9 kg) and 21 men (age = 23 ± 4.0 years, height = 181.4 ± 7.4 cm, mass = 85.6 ± 16.5 kg).

Intervention(s): In 1 testing session, participants performed 3 trials each of single-leg squat, lunge, and step-up-and-over exercises.

Main Outcome Measure(s): We recorded the peak joint angles (degrees) of knee flexion and valgus and hip flexion, extension, adduction, and external rotation for each exercise. We also recorded the electromyographic activity of the gluteus maximus, rectus femoris, adductor longus, and bilateral gluteus medius muscles for the concentric and eccentric phases of each exercise.

Results: Peak knee flexion angles were smaller and peak hip extension angles were larger for women than for men across all tasks. Peak hip flexion angles during the single-leg squat were smaller for women than for men. Mean root-mean-square amplitudes for the gluteus maximus and rectus femoris muscles in

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both the concentric and eccentric phases of the 3 exercises were greater for women than for men.

Conclusions: Sex differences were observed in sagittal-plane movement patterns during the rehabilitation exercises. Because of the sex differences observed in our study, future researchers need to compare the findings for injured participants by sex to garner a better representation of altered kinematic angles and muscle activation levels due to injury.

Keywords: [electromyography](#), [rehabilitation exercises](#)

Maureen K Dwyer, PhD, ATC, University of Kentucky, CTW Building Room 210E, 900 South Limestone, Lexington, KY 40536, e-mail: Maureen.Dwyer@uky.edu

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