

ORIGINAL RESEARCH

EFFECT OF RESTRICTED HIP FLEXOR MUSCLE LENGTH ON HIP EXTENSOR MUSCLE ACTIVITY AND LOWER EXTREMITY BIOMECHANICS IN COLLEGE-AGED FEMALE SOCCER PLAYERS

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ABSTRACT

Background: Hip flexor tightness is theorized to alter antagonist muscle function through reciprocal inhibition and synergistic dominance mechanisms. Synergistic dominance may result in altered movement patterns and increased risk of lower extremity injury.

Hypothesis/Purpose: To compare hip extensor muscle activation, internal hip and knee extension moments during double-leg squatting, and gluteus maximus strength in those with and without clinically restricted hip flexor muscle length.

Design: Causal-comparative cross-sectional laboratory study.

Method: Using a modified Thomas Test, female soccer athletes were assigned to a restricted ($>0^\circ$ of sagittal plane hip motion above the horizontal; $n=20$, age = 19.9 ± 1 years, ht = 167.1 ± 6.4 cm, mass = 64.7 ± 8.2 kg) or normal ($>15^\circ$ of sagittal plane hip motion below horizontal; $n=20$, age = 19.4 ± 1 years, ht = 167.2 ± 5.5 cm, mass = 61.2 ± 8.6 kg) hip flexor muscle length group. Surface electromyographic (sEMG) activity of the gluteus maximus and biceps femoris, and net internal hip and knee extension moments were measured between groups during a double-leg squat. Isometric gluteus maximus strength was assessed using handheld dynamometry.

Results: Individuals with restricted hip flexor muscle length demonstrated less gluteus maximus activation ($p=0.008$) and a lower gluteus maximus : biceps femoris co-activation ratio ($p=0.004$). There were no significant differences ($p>0.05$) in hip or knee extension moments, isometric gluteus maximus strength, or biceps femoris activation between groups.

Conclusions: Female soccer athletes with hip flexor muscle tightness exhibit less gluteus maximus activation and lower gluteus maximus : biceps femoris co-activation while producing similar net hip and knee extension moments. Thus, individuals with hip flexor muscle tightness appear to utilize different neuromuscular strategies to control lower extremity motion.

Level of Evidence: 3

Keywords: ACL Injury, Electromyography, Hamstring Injury, Musculoskeletal Injury, Neuromuscular Control,

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