

## ORIGINAL RESEARCH

## THE ASSOCIATIONS BETWEEN HIP STRENGTH AND HIP KINEMATICS DURING A SINGLE LEG HOP IN RECREATIONAL ATHLETES POST ACL RECONSTRUCTION COMPARED TO HEALTHY CONTROLS

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## ABSTRACT

**Background:** Only a small amount of evidence exists linking hip abductor weakness to dynamic knee valgus during static and dynamic activities. The associations of hip extensor strength and hip kinematics during the landing of a single leg hop are not known.

**Purpose:** To determine if relationships exist between hip extensor and abductor strength and hip kinematics in both involved and uninvolved limb during the landing phase of a single leg hop in recreational athletes post anterior cruciate ligament (ACL) reconstruction. The presence of similar associations was also evaluated in healthy recreational athletes.

**Study Design:** Controlled Laboratory Study; Cross-sectional

**Methods:** Twenty-four recreational college-aged athletes participated in the study (12 post ACL reconstruction; 12 healthy controls). Sagittal and frontal plane hip kinematic data were collected for five trials during the landing of a single leg hop. Hip extensor and abductor isometric force production was measured using a hand-held dynamometer and normalized to participants' height and weight. Dependent and independent t-tests were used to analyze for any potential differences in hip strength or kinematics within and between groups, respectively. Pearson's  $r$  was used to demonstrate potential associations between hip strength and hip kinematics for both limbs in the ACL group and the right limb in the healthy control group.

**Results:** Independent t-tests revealed that participants post ACL reconstruction exhibited less hip extensor strength (0.18 N/Ht\*BW vs. 0.25 N/Ht\*BW,  $p < .01$ ) and landed with greater hip adduction (9.0° vs. 0.8°,  $p < .01$ ) compared with their healthy counterparts. In the ACL group, Pearson's  $r$  demonstrated a moderate and indirect relationship ( $r = -.62$ ,  $p = .03$ ) between hip extensor strength and maximum hip abduction/adduction angle in the involved limb. A moderate and direct relationship between hip abductor strength and maximum hip flexion angle was demonstrated in the both the involved ( $r = .62$ ) and uninvolved limb ( $r = .65$ ,  $p = .02$ ). No significant associations were demonstrated between hip extensor or abductor strength and hip flexion and/or abduction/adduction angles in the healthy group.

**Conclusion:** The results suggest that hip extensors may play a role in minimizing hip adduction in the involved limb while the hip abductors seem to play a role in facilitating hip flexion during the landing phase of a single leg hop for both limbs following ACL reconstruction. Researchers and clinicians alike should consider the importance of the hip extensors in playing a more prominent role in contributing to frontal plane motion.

**Levels of Evidence:** Level 2a

**Keywords:** ACL reconstruction, hip strength, kinematics, single leg hop

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