

# PEAK HIP MUSCLE TORQUE MEASUREMENTS ARE INFLUENCED BY SAGITTAL PLANE HIP POSITION

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## ABSTRACT

**Background:** An optimal position for strength testing of the hip musculature has not been identified. However, sagittal plane hip position during testing has been shown to influence hip external rotation strength.

**Hypothesis/Purpose:** The purpose of this study was to compare hip extension, external rotation, and abduction isometric torque at positions with differing degrees of hip flexion using a handheld dynamometer.

**Study Design:** A cross-sectional laboratory study.

**Methods:** Twenty-nine healthy and physically active females participated in this study. Peak isometric contractions were measured with a handheld dynamometer secured with a non-elastic strap and then converted to torque using segment lengths. Hip external rotation and extension were tested at 0°, 30°, and 90° of hip flexion. Hip abduction was tested at 0° and 30° of hip flexion and 5° of extension. Testing was randomized and counterbalanced. Repeated measures ANOVAs with Sidak's test for multiple comparisons were used for statistical analysis. Significance was set at  $p < 0.05$ .

**Results:** Significant main effects were found for hip extension ( $p < 0.001$ ) and external rotation ( $p < 0.027$ ), but not for abduction ( $p = 0.085$ ). Pairwise comparisons showed significant differences between all three testing positions for hip extension torque (0°v30°:  $p < 0.001$ , 0°v90°:  $p < 0.001$ , 30°v90°:  $p = 0.002$ ). Extension torque was highest in 90° of flexion ( $1.43 \pm 0.50$  Nm/kg\*m) and lowest in 0° of flexion ( $0.83 \pm 0.30$  Nm/kg\*m). Comparisons of hip external rotation torque tested at 0°v90° ( $p = 0.096$ ) and 30°v90° ( $p = 0.080$ ) were not significantly different but did have medium effect sizes. External rotation torque was highest in 90° of flexion ( $0.29 \pm 0.13$  Nm/kg\*m).

**Conclusions:** Direct comparisons of torque values of hip extension and external rotation tested at different sagittal plane positions should be cautioned due to differences. Hip extension and external rotation should be measured in consistent sagittal plane positions across examiners and testing sessions. Test position will be dependent upon the goals of strength testing.

**Level of Evidence:** 2b

**Key words:** Dynamometer, isometric force, hip joint, muscle strength

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