

# MEDIAL AND LATERAL HAMSTRINGS RESPONSE AND FORCE PRODUCTION AT VARYING DEGREES OF KNEE FLEXION AND TIBIAL ROTATION IN HEALTHY INDIVIDUALS

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## ABSTRACT

**Background:** Hamstring weakness is a contributor to lower extremity pathology. Influence of knee flexion and tibial rotation on hamstrings muscle activation and knee flexion force has not been documented in the literature.

**Hypothesis/Purpose:** The purpose of the study was to determine the angle of knee flexion and tibial rotation that elicits the greatest knee flexion force and hamstrings activation in healthy, physically active adults.

**Study Design:** Descriptive, observational cohort study

**Methods:** Eighteen young healthy adults were recruited for study participation. Each individual performed maximal voluntary isometric hamstrings contractions at six different knee flexion angles (15°, 30°, 45°, 60°, 75° & 90°), each positioned at three different tibial rotation positions (internal rotation, neutral rotation and external rotation). Electromyographic activity of the medial and lateral hamstrings and knee flexion force production were recorded.

**Results:** On average, greatest force production was recorded at 30° knee flexion with tibia either in neutral rotation (124.1% of max) or in external rotation (123.5% of max). This same lower limb orientation also produced the highest amount of lateral hamstring activation (156.4% of max). Results also showed that force production and lateral hamstring activation decreased as knee flexion angle increased. Muscle activation for the medial hamstrings was not affected by knee flexion angle but did show higher activation in neutral or tibial internal rotation.

**Conclusion:** The results of the current research describe the relationship between knee flexion and tibial rotation and their effect on overall knee flexion force production and hamstrings activation. This research provides key insights about the specific knee joint angles and tibial orientation that may be preferred in exercise prescription for maximizing hamstring activation.

**Level of Evidence:** Level III

**Key Words:** Hamstrings, EMG, force production, muscle activation

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The protocol for this study was approved by the Institutional Review Board of the University of Minnesota.

The authors have no conflict of interest to disclose.

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