

## ORIGINAL RESEARCH

## VARIATION IN MEDIAL AND LATERAL GASTROCNEMIUS MUSCLE ACTIVITY WITH FOOT POSITION

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**ABSTRACT**

**Background:** The gastrocnemius has two heads, medial gastrocnemius (MG) and lateral gastrocnemius (LG); little is known how they contract with different foot positions. The MG is more frequently strained than the LG; and gastrocnemius activation pattern altered by foot position may play a role in injury. Leg exercises often use a toe-in versus toe-out foot position to isolate one gastrocnemius head over another.

**Purpose:** The purpose of this study was to determine the electromyographic gastrocnemius muscle activity in the toe-out and toe-in foot positions during weight bearing and non-weight bearing activities. The hypothesis was that a toe-out foot position would elicit greater MG than LG activity; while the toe-in position would elicit greater activity in LG than MG in both weight bearing and non-weight bearing (NWB) positions.

**Study Design:** A cross-sectional study of young adults.

**Methods:** Thirty-three participants were recruited. Surface electrodes were placed on the bellies of the MG and LG. The gastrocnemius muscle was tested in toe-in and toe-out foot positions using two different tests: a standing heel-rise and resisted knee flexion while prone. Electromyographic activity was normalized against a MVIC during a heel raise with a neutral foot position. A 2x2x2 (Foot Position x Test Position x Muscle) ANOVA was used to determine if differences exist in activity between the MG and LG for toe-in versus toe-out standing and prone test positions.

**Results:** Significant test position main effect ( $F [1,32] = 86.9; p < .01$ ), significant muscle main effect ( $F [1,32]=5.5; p < .01$ ), and significant foot position x muscle interaction ( $F [1,32] = 14.58; p < .01$ ) were found. Post hoc tests showed differences between MG and LG in toe-out position ( $t = 3.10; p < .01$ ) but not in the toe-in for both test positions ( $t = 1.27; p = 0.21$ ).

**Conclusions:** With toe-out, the MG was more active than LG in standing and prone; no difference was noted between MG and LG in toe-in for either position.

**Level of Evidence:** Level 2

**Key words:** Electromyography, gastrocnemius, toe-in, toe-out

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