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