A Comparison of the Immediate Effects of Gastrocnemius Stretching with and without Self-Myofascial Release on Ankle Kinematics and Range of Motion

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Background
Altered mechanics resulting from a decrease in ankle dorsiflexion due to shortening of the gastrocnemius muscle may cause lower extremity injuries over time. Compensation for a lack of dorsiflexion leads to excessive subtalar joint pronation forces. Injuries that result from this include patellofemoral syndrome, medial tibial stress syndrome, plantar fasciitis and Achilles tendinopathy. These injuries are common in athletes, especially runners. Various stretching techniques are performed to prevent these injuries however their effectiveness has not been established.

Methods
Inclusion criteria: subjects must have less than 10 degrees of dorsiflexion range of motion with the knee extended but greater than 10 degrees of ankle dorsiflexion range of motion with the knee flexed.

Exclusion criteria: acute ankle injuries (within the past 6 months), prior lower extremity surgery (within the past 6 months), greater than 5 degrees knee flexion contractures, less than 0 degrees of subtalar eversion range of motion or history of neurological dysfunction.

Procedure: This is a randomized comparison study. Thirty participants with gastrocnemius shortening will be randomly assigned to groups: (1) stretching alone, or (2) stretching and SMR. Ankle dorsiflexion will be measured in non-weight bearing and weight bearing in both groups. Three dimensional motion analysis will be used to evaluate kinematics (Figure 6) and reflective markers will be placed on various bony landmarks (Figures 3-5). A baseline pre-intervention motion analysis will be performed while the participant walks and runs on a treadmill. Both groups will complete a standing gastrocnemius stretch (Figure 1). Group (2) will also perform SMR with a roller stick (Figure 2). Subjects will then have ankle dorsiflexion re-measured and post-intervention walking and running motion analysis.

Data Analysis: Group differences will be measured with an independent t-test and a two-way mixed factorial ANOVA will determine the effect of interventions. Currently, we have tested 6 subjects and data collection is ongoing.

Aims of the Study
The purpose of the study was to investigate:
(1) The relationship between gastrocnemius stretching and ankle kinematics
(2) The difference in ankle dorsiflexion range of motion (ROM) and ankle kinematics comparing stretching alone to a combination of stretching and self-myofascial release (SMR)

Discussion
We believe the combination of gastrocnemius stretching and SMR will have a greater impact on ankle ROM and kinematics during gait.

- Previous studies examined effects of gastrocnemius stretching on gait, but have not examined effects of SMR on (1) gastrocnemius length and (2) ankle kinematics during gait.
- Knowledge of the best methods of stretching can aid clinicians in treatment and prevention of related injuries throughout the kinetic chain.

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