Effect of Deep Heating and Foam Rolling vs. Static Stretching of the Gastrocnemius and Soleus Complex in Improving Active Ankle Dorsiflexion Range of Motion

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ABSTRACT

PURPOSE

There are many means of intervention when it comes to improving range of motion (ROM) of a joint. There is no consensus as to which treatment is the most beneficial for increasing dorsiflexion of the ankle. The purpose of this study was to determine which treatment protocol involving static stretching, deep heating, and/or foam rolling would provide greater improvements in ankle dorsiflexion range of motion. METHODS: The deep squat component of the Functional Movement Screening (FMS) was used as a screening tool to determine the eligibility of volunteers. Those who scored “2” or “proper squat with a board placed underneath heels” on the FMS were included in the study. Eighteen Division III Track and Field athletes (ages 1.47 ± 1.43 years) were eligible to participate and were randomly assigned to three treatment groups [static stretching (SS), static stretching and foam rolling (SS+FR) or ultrasound, foam rolling and static stretching (US+FR+SS)]. The study measured left and right active ankle dorsiflexion (degrees) with the knee in the extended and flexed to approximately 90 degrees position. Measurements were taken at baseline, prior to and immediately after each treatment session, and at a final assessment after 3 weeks of a treatment period. RESULTS: The two-way repeated measures analysis of variance (ANOVA), with an alpha of .05, revealed there was no group effect, but a significant time effect on all dependent variables. Paired samples t-tests revealed left ankle dorsiflexion with the knee extended at final ($M = 19.12$; $SD = 5.10$) was significantly greater than baseline ($M = 12.50$; $SD = 7.60$), $t(16) = -5.97$, $p < .001$. Right ankle dorsiflexion with the knee extended at final ($M = 18.88$; $SD = 5.70$) was significantly greater than baseline ($M = 15.12$; $SD = 4.26$), $t(16) = -3.15$, $p = .006$. Right ankle dorsiflexion with the knee flexed at final ($M = 22.92$; $SD = 7.82$) was significantly greater than baseline ($M = 24.47$; $SD = 6.47$), $t(16) = -2.70$, $p = .014$. All participants improved bilateral active dorsiflexion ROM from baseline to final, which demonstrated that all three treatment types were similar in their effectiveness. Future research should consider involving individuals who have suffered from lower leg injuries in the past year and of various activity levels to generalize our findings in collegiate Division III Track and Field athletes.

METHODS

Participants

18 total University of Wisconsin - Eau Claire Track and Field athletes completed the study.

Age ranged between 18-22 years old (average 19.94 years).

Participants were randomly assigned to one of the three treatment groups: static stretching (SS), foam rolling and static stretching (FR+SS), and ultrasound, foam rolling, and static stretching (US+FR+SS).

Eligibility Screening

Pre-assessment questionnaire about health history and signed an informed consent form, stating that their participation was voluntary and all personal information will remain confidential.

Procedure

Over a 3 week period, 5 treatments were completed with a minimum of 72 hours in between treatment sessions.

Right and left dorsiflexion ROM with knee flexed and extended was measured prior to and following each individual treatment.

Treatment Groups

SS: 3x30s calf stretch with knee extended on slant board with 30s rest in between sets. Stretching was held at a discomfort level of 5/10, which represents a nagging, uncomfortable, troublesome sensation. Repeat with knee slightly flexed. Repeat bilaterally.

FR+SS: Foam roll for 90s on from popliteal fossa to the calcaneus. Used longer strokes until a trigger point was felt. Completed SS protocol. Repeat bilaterally.

US+FR+SS: Ultrasound on the musculotendinous junction of the gastrocnemius-soleus complex for 7 minutes at 1MHz, 100%, 1.5W/cm². Completed FR+SS protocol. Repeat bilaterally.

A final assessment was conducted 72 hours after treatment session 5. It included a reassessment of FMS deep squat and bilateral ankle dorsiflexion ROM.

RESULTS

Table 1. Descriptive Data of Participants

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age (Years)</th>
<th>Height (Inches)</th>
<th>Weight (Pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>females</td>
<td>19.94 ± 1.43</td>
<td>68.9 ± 4.37</td>
<td>176.12 ± 51.08</td>
</tr>
</tbody>
</table>

Table 2. FMS Scoring Criteria: Deep Squat

1. Upper torso parallel with tibia in a vertical
2. Knee flexed over foot
3. Femur flexed
4. Tibia and hamstrings parallel
5. Knees not over feet

Table 3. Results of Two-Way Repeated Measures Analysis of Variance

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SUMMARY AND CONCLUSIONS

FMS subscale reassessment to see changes in errors while performing a FMS deep squat: 3/16 (18.75%) improved, 14/18 (77.8%) no change, and 1/18 (5.5%) declined.

14/18 (77.8%) improved squat depth and 4/18 (22.2%) had no change (Figure 2).

All participants improved bilateral active dorsiflexion ROM from baseline to final, which demonstrated that all three-treatment types were similar in their effectiveness.

REFERENCES


