Immediate Effects of Sensory-Targeted Ankle Rehabilitation Strategies on Balance and Range of Motion in Those with Chronic Ankle Instability

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INTRODUCTION
Chronic ankle instability (CAI) is an extremely common consequence of a lateral ankle sprain. CAI is attributed to a combination of mechanical and functional insufficiencies that significantly constrains the sensorimotor system’s ability to cope with changing demands, resulting in repeated ankle sprains. Traditional rehabilitation strategies for this condition focus on motor pathway impairments (i.e. strength, coordination) with very little emphasis on the potential to intervene through sensory pathways. Similarly, most research on CAI has focused only on maximizing motor output, ignoring the full spectrum of sensorimotor dysfunction associated with CAI. However, it has been demonstrated that the sensorimotor system dynamically shifts reliance on various sensory inputs depending on the demands placed on the system. Potentially, sensory-targeted ankle rehabilitation strategies, including triceps surae stretching, plantar massage, or ankle joint mobilization, targeting 3 types of sensory pathways (musculotendinous, plantar cutaneous, and articular, respectively), has beneficial effects on objective measures of sensorimotor function including single limb balance measured through center of pressure (COP) excursion in those with CAI. However, we do not yet understand the unique contributions of these interventions.

PURPOSE
To evaluate the immediate effects of sensory-targeted rehabilitation strategies (STARS) on COP excursion velocity during a single limb balance task in those with CAI.

METHODS

Design: Multi-Center Randomized Controlled Trial
Setting: Research laboratory

Subjects: 61 individuals with self-reported CAI were randomly assigned to four different STARS groups.
- CAI was defined as a history of at least 1 ankle sprain with 2 episodes of giving way in the last 6 months, <90% on the Foot and Ankle Ability Measure (FAAM) and <80% on the FAAM-Sport (FAAM-S) Scale.
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Outcome Measures
All subjects performed 3 trials of single limb stance on a force plate with eyes closed for 10 seconds. AMTI Accusway force plate Sampling Frequency: 50 Hz

CoP velocity was calculated for the mediolateral (CoPV-ML) and the anteroposterior (CoPV-AP) directions. During the trial, if a subject touched down or failed to maintain the target position (see figure below), the trial was stopped and repeated.

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All subjects received a 5 minute treatment upon completion of the pre-STARS testing.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CoPV-ML Change</th>
<th>CoPV-AP Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle Joint Mobilization</td>
<td>0.4±1.8</td>
<td>0.4±2.0</td>
</tr>
<tr>
<td>Plantar Massage</td>
<td>-0.6±0.8</td>
<td>-0.6±1.0</td>
</tr>
<tr>
<td>Triceps Surae Stretching</td>
<td>-0.4±1.2</td>
<td>-0.3±1.9</td>
</tr>
<tr>
<td>Control</td>
<td>0.6±1.0</td>
<td>0.6±1.2</td>
</tr>
</tbody>
</table>

A negative value indicated a beneficial change (reduction in CoP velocity).

DISCUSSION
The STARS that appears to be most effective for enhancing single limb balance as measured by CoP velocity in both the ML and AP directions immediately after one treatment is plantar massage. While each STARS offers unique contributions to rehabilitation for those with CAI, stimulating the plantar afferents through plantar massage has the most apparent immediate beneficial effect on balance for those with CAI.

REFERENCES

FUNDING ACKNOWLEDGEMENTS
The project described was supported by Grant Number R03 AR061561 from the NIAMS/NIH. Project Title: Sensory-Targeted Ankle Rehabilitation Strategies (STARS)