The Effect of Vibration-Based Feedback on Gait Biomechanics in Those with Chronic Ankle Instability

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BACKGROUND

- Lateral ankle sprains are a common and financially burdensome injury that can result in chronic ankle instability (CAI).
- Individuals with CAI express increased inversion throughout the gait cycle and large lateral deviations in center of pressure during the stance phase of gait.
- It is hypothesized that these gait impairments further the progression of CAI as vulnerable positioning at the ankle leads to subsequent injuries and abnormal cartilage loading.
- Abnormal loading leads to post-traumatic osteoarthritis.

OBJECTIVES

To determine if a single vibration-based feedback gait training session in 1.) a laboratory environment and 2.) a real-world environment can decrease excessive inversion in individuals with chronic ankle instability.

PARTICIPANTS

7 participants were recruited and met the inclusion criteria

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th># of Ankle Sprains</th>
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<tbody>
<tr>
<td>23.28 ± 3.49</td>
<td>170.49 ± 10.02</td>
<td>73.26 ± 11.59</td>
<td>4.43 ± 2.32</td>
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METHODS

Procedures:

1.) Laboratory Session

- Baseline: 2 min walk on treadmill without device
- Intervention: 10 min walk on treadmill with device
- Post: 2 min walk on treadmill without device
- 5 Min Retention: 2 min walk on treadmill without device

2.) Real-World Session

- Baseline: 2 min walk on treadmill without device
- Intervention: 1 mile walk outside with device
- Post: 2 min walk on treadmill without device
- 5 Min Retention: 2 min walk on treadmill without device

Statistical Analysis:

- Non-parametric Friedman’s repeated measures ANOVAs
- Hedge’s G to measure effect size
- Estimated effect size is 0.3, alpha set at 0.05, and 1-β at 0.8, indicates a need for 20 subjects

RESULTS & DISCUSSION

- Despite non-significant group differences, visualization of the data showed that some, but not all, participants responded to the gait retraining session. Above are 2 participants who responded and 2 participants who did not respond to the treatment.

- Stance phase was divided into 10 separate sections
- Across the 10 sections, there were no significant changes in the inversion ankle angle positioning between baseline, post, and retention measures during the laboratory session (p>0.05) and during the real-world session (p>0.05).
- Because some participants responded to the intervention, it is possible we would see significant results when a larger sample size is collected and processed.
- Future research should focus on understanding why some participants, but not all, responded to the intervention.
- The impact of treatment volume, duration, and feedback parameters should also be investigated.

REFERENCES