The Effects of Vibrations on the Light Touch Perception Threshold of Transtibial Amputees

Aaron Robinson¹, Jenny Kent¹, Shane R. Wurdeman², Adam L. Jacobsen³, Nicolas Stergiou¹,⁴, Kota Z. Takahashi¹

¹Department of Biomechanics, University of Nebraska at Omaha, Omaha, NE 68182
²Department of Clinical and Scientific Affairs, Hanger Clinic, Houston, TX USA
³Veterans Affairs Medical Center, Omaha, NE USA
⁴College of Public Health, University of Nebraska Medical Center, Omaha, NE USA

Introduction
Sensations deriving from the residual limb and the prosthetic socket interface may be important for mobility/balance following an amputation. One potential way to improve sensation in the residual limb-socket interface is the use of sub-threshold vibrations.

Purpose: To determine whether the use of sub-threshold vibrations can improve light touch sensation in transtibial amputees.

Hypothesis: The application of a sub-threshold pink noise vibration will improve an amputee's ability to perceive a light touch stimulus in the residual limb surrounding the area of amputation.

Methods

<table>
<thead>
<tr>
<th>Groups</th>
<th>Total</th>
<th>Gender</th>
<th>Age (yrs)</th>
<th>Height (m)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral Transtibial Amputee</td>
<td>20</td>
<td>F=4 M=16</td>
<td>59.7±15</td>
<td>1.79±0.6</td>
<td>100.2±15.9</td>
</tr>
<tr>
<td>Healthy Control</td>
<td>17</td>
<td>F=4 M=13</td>
<td>54.1±16</td>
<td>1.72±0.09</td>
<td>85.5±18.8</td>
</tr>
</tbody>
</table>

Conditions
1) No vibration
2) White noise vibration
3) Pink noise vibration

Fig. 1: The application of vibrations (White and Pink Noise) had no significant effect on the perception of light touch in the residual limb (tibial crest) of individual with transtibial amputation (p=0.44).

Discussion
Our hypothesis was not supported, even though some interesting trends were present especially for the below protective sensation threshold amputees. We are currently testing whether sub-threshold vibrations can improve other functions, such as walking and standing using biomechanical analyses.

Acknowledgements
This work was supported by NIH P20GM109090 and NIH R15HD08682.

References