Subthreshold Vibration Does Not Affect Walking Performance of Transtibial Amputees

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INTRODUCTION

- Amputation below the knee causes a person to lose important pathways of sensation to the central nervous system [1].
- The goal of this work is to find if a stochastic resonance pattern will help to improve walking performance of residual limb in transtibial amputees when applied as subthreshold vibration to the affected side.
- The choice to work with pink signal is based on its prevalence in natural processes. [2]

STOCHASTIC RESONANCE

<table>
<thead>
<tr>
<th>Signal below perception threshold</th>
<th>Above perception threshold – underlying signal is detected</th>
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Purpose: We specifically anticipated that stochastic resonance would enable an amputee to have better control of their prosthesis.

METHODS

- All subjects attended the Biomechanics Research Building for this biomechanical analysis.
- Three different vibration conditions were applied: no vibration, pink noise, and white noise.
- All vibrations were applied to the mid-thigh of the affected limb.
- Participants walked across the gait laboratory floor at self-selected pace.
- At least 10 traverses were completed.
- Motion data were captured at 100Hz using Cortex; kinematic data processed in Visual 3D.
- A 1-way Repeated Measures ANOVA was used to compare variables across all three conditions; \( \alpha = 0.05 \).

RESULTS AND DISCUSSION

- No significant differences found across conditions. (Figure 2)
- Vibration of thigh doesn’t improve walking performance.
- From the variables that were choose, there is high variability among participants, reflecting heterogeneity of group.

CONCLUSION

- Vibration of residual limb did not improve overall control of prosthesis from the measures that were analyzed.
- Will look into more possibilities: longer duration of vibration or testing outside laboratory setting in form of an intervention/training.

TABLE 1: Demographics of participants

<table>
<thead>
<tr>
<th>Amputation etiology</th>
<th>Gender</th>
<th>Age (yrs)</th>
<th>Height (m)</th>
<th>Mass (kg)</th>
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<tbody>
<tr>
<td>Amputation (n=15)</td>
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<tr>
<td>Trauma (n=5)</td>
<td>11M, 4F</td>
<td>59.67(14.8)</td>
<td>1.79(0.067)</td>
<td>101.19(16.3)</td>
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<tr>
<td>Vascular (n=4)</td>
<td></td>
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<tr>
<td>Other (n=6)</td>
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REFERENCES


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