Feasibility of Psychoacoustic Testing on Hearing-Impaired Individuals with a Portable Device

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Feasibility of Psychoacoustic Testing on Hearing-Impaired Individuals with a Portable Device

Presenter: S. Adelaide Bock | Advisor: Dr. Anna Diedesch

Introduction

- Portable Automated Rapid Testing (PART) was developed at the University of California, Riverside Brain Game Center
- PART expands on a traditional hearing test by measuring individuals' auditory processing abilities.
- PART also features an unconventional method of testing by conducting the testing on a portable device.
- Lelo de Larrea-Mancera and colleagues (2020) established PART normative data from 150 undergraduate students at the University of California Riverside (Data was collected before 2020).
- This study aims to evaluate PART's feasibility in the mild-to-moderate hearing-impaired population.

Methodology

- **Participants**
  - Normal hearing (NH) subjects (n = 9, mean age = 21, SD = 2.5)
  - Hearing impaired (HI) subjects (n = 8, mean age = 65, SD = 12.5)
- **Equipment**
  - MoCA score 26 or higher (out of 30)
  - Confirm the health of the outer & middle ear status
  - Pure-tone audiometry testing configuration and thresholds
  - HI subjects: mild-to-moderate symmetrical Sensorineural Hearing Loss
- **Procedure**
  - Psychoacoustic tests measured:
    - 2 kHz Notch Noise, Dichotic Frequency Modulation, Temporal Gap Detection, Temporal, and Spectrotemporal Modulation
  - Speech audiometry: Grason-Stadler (GSI) tympanometer
  - Tympanometry testing: Brüel & Kjær Head and Torso Simulator
  - Sound resistant booth using a GSI 61 audiometer and ER-3 insert headphones
  - Portable Automated Rapid Testing (PART) was developed for confirmation of participants' data at the research lab.

Results

<table>
<thead>
<tr>
<th>Subject</th>
<th>2 kHz Notch Noise</th>
<th>Dichotic FM</th>
<th>Gap</th>
<th>Dichotic FM</th>
<th>Spatial Release</th>
<th>Spectral Temporal Modulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH Left Ear Audiometric Thresholds</td>
<td>250 Hz</td>
<td>500 Hz</td>
<td>1 kHz</td>
<td>2 kHz</td>
<td>4 kHz</td>
<td>Mask 400</td>
</tr>
<tr>
<td>Mask 400</td>
<td>75.56</td>
<td>56.63</td>
<td>0.87</td>
<td>2.51</td>
<td>8.09</td>
<td>69.34</td>
</tr>
<tr>
<td>Mask 0</td>
<td>78.88</td>
<td>2.57</td>
<td>1.25</td>
<td>2.9</td>
<td>7.96</td>
<td>3.49</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>NH Right Ear Audiometric Thresholds</td>
<td>250 Hz</td>
<td>500 Hz</td>
<td>1 kHz</td>
<td>2 kHz</td>
<td>4 kHz</td>
<td>Mask 400</td>
</tr>
<tr>
<td>Mask 400</td>
<td>80.00</td>
<td>60.00</td>
<td>1.34</td>
<td>2.81</td>
<td>11.86</td>
<td>71.31</td>
</tr>
<tr>
<td>Mask 0</td>
<td>94.91</td>
<td>3.94</td>
<td>1.93</td>
<td>2.33</td>
<td>10.43</td>
<td>3.25</td>
</tr>
</tbody>
</table>

Discussion/Future Directions

- PART has great potential for contributing to the field of clinical audiology practice by providing a fast, easy, and affordable addition to the current test battery.
- Significant differences found across groups can be valuable for further research.
- Significant differences found in 2kHz Notch Noise (Mask400) testing t(6)=2.73, (p=0.034 < 0.05), Dichotic FM testing t(8)=3.70, (p=0.006 < 0.05), and Co-located SRM testing t(15)=2.87, (p=0.012 < 0.05).
- Significant differences were found in 2 kHz Notch Noise, Dichotic FM testing, and Co-located SRM testing.

Acknowledgements

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References

- Pictures were retrieved from: https://braingamecenter.ucr.edu/games/p-a-c-l