MUSIC PERCEPTION AND NON-LINGUISTIC ASSESSMENT OF CANDIDACY AND PERFORMANCE IN CHILDREN

JAY T RUBINSTEIN, KYU HWAN JUNG, IL JOON MOON, HYUN-JOON SHIM, MIN-HYUN PARK, JONG HO WON, NANCY MCINTOSH, WARD DRENNAN, DAVID HORN

FUNDDED BY NIDCD

PARK ET AL, JARO, IN PRESS
SHIM ET AL, OTOLOGY & NEUROTOLOGY, SEPT, 2014
JUNG ET AL, AUDIOLOGY & NEUROTOLOGY, 2012
CANDIDACY AND OUTCOME ASSESSMENT

Current CI candidacy is time and resource intensive

Requires hearing aid fitting, hearing aid audiologist, and hearing aids to determine “best-aided condition” in adults and “progress with hearing aids” in children

Speech testing is restricted to primary language of the patient

Speech testing is time-consuming, word lists are limited, variability of testing is problematic
ADVANTAGES OF PSYCHOPHYSICAL TESTING

Psychophysical (non-linguistic) measures have been thoroughly validated in adults and highly stable over time

They correlate well with vowel and consonant perception in SHL (Henry & Turner, 2005)

They correlate well postoperatively with CI performance on multiple clinical metrics (speech, speech in noise, music)

Rapid clinical versions have been developed and validated (Drennan et al, Ear and Hearing, 2014)

Can be used in babies with observer-based methods (Horn et al, this meeting)
CANDIDACY PREDICTION
POST-LINGUAL ADULTS
CORRELATIONS (32 EARS) BETWEEN RIPPLE THRESHOLD AND SPEECH PERFORMANCE
## CANDIDACY PREDICTION
**BASED ON DATA OBTAINED FROM 20 EARS**

Cutoff value: **0.845**

<table>
<thead>
<tr>
<th></th>
<th>SRD</th>
<th>Predicted aided AzBio*</th>
<th>Candidacy Prediction</th>
<th>Clinical aided Az Bio</th>
<th>Clinical Candidacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>S123 L)</td>
<td>1.2</td>
<td>58%</td>
<td>No</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>S123 R)</td>
<td>1.58</td>
<td>79%</td>
<td></td>
<td>92%</td>
<td></td>
</tr>
<tr>
<td>S124 L)</td>
<td>0.76</td>
<td>35%</td>
<td>Yes</td>
<td>1%</td>
<td>Yes</td>
</tr>
<tr>
<td>S124 R)</td>
<td>0.43</td>
<td>17%</td>
<td></td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>S125 L)</td>
<td>0.62</td>
<td>27%</td>
<td>Yes</td>
<td>36%</td>
<td>Yes</td>
</tr>
<tr>
<td>S125 R)</td>
<td>0.28</td>
<td>9%</td>
<td></td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>S126 L)</td>
<td>0.29</td>
<td>10%</td>
<td>Yes</td>
<td>11%</td>
<td>Yes</td>
</tr>
<tr>
<td>S126 R)</td>
<td>0.33</td>
<td>12%</td>
<td></td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>S128 L)</td>
<td>1.31</td>
<td>64%</td>
<td>No</td>
<td>80%</td>
<td>No</td>
</tr>
<tr>
<td>S128 R)</td>
<td>1.04</td>
<td>50%</td>
<td></td>
<td>78%</td>
<td></td>
</tr>
<tr>
<td>S134 L)</td>
<td>1.13</td>
<td>55%</td>
<td>No</td>
<td>77%</td>
<td>No</td>
</tr>
<tr>
<td>S134 R)</td>
<td>0.75</td>
<td>34%</td>
<td></td>
<td>67%</td>
<td></td>
</tr>
</tbody>
</table>

* Based on SRD only
More subjects needed but it appears that unaided spectral ripple detection may be a more efficient and equally effective candidacy measure than speech testing in the best-aided condition

Early results promising that mapping may also be simplified using spectral ripple detection post-CI (Drennan and McIntosh, 2015 AAS)
MUSIC PERCEPTION AND PSYCHOPHYSICAL ABILITIES

COMPARISON BETWEEN PRELINGUAL CHILDREN AND POSTLINGUAL ADULTS
Pitch direction discrimination appears similar to adults (UW-CAMP)
Melody and timbre perception is significantly worse than in adults.
Spectral abilities appear to similar to adults
Temporal modulation detection is worse than in adults at low modulation frequency.

- **Normal adults** (N=7)
- **Normal children** (N=7)
- **CI adults** (N=24)
- **CI children** (N=10)
Melody and timbre perception appears poorer in teenage children implanted before age 3 than in postlingually deafened adult CI users despite similar speech scores in quiet and in noise.

These differences do not appear to be spectrally based.

These differences do appear to be temporally based.

Development differences in temporal processing abilities between normal and CI hearing are a plausible cause.