Preliminary Findings on Spectral and Temporal Resolution in Cochlear Implanted Infants

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DISCLOSURES

• Jay Rubinstein has been a consultant for Advanced Bionics, Cochlear Co., Nurotron, Shanghai Lishengte and received prior research funding from Advanced Bionics and Cochlear Co.
Applications For Psychoacoustic Tests in CI Patients...

- Evaluation of Map
  - Won (2012)
- Predicting Speech Perception
  - Won (2007, 2010)
- Determining Candidacy
  - Shim (2014)

- Can psychoacoustic tests be used to measure spectral and temporal resolution in CI infants?
Central Hypothesis

- Spectral and Temporal resolution are mature in CI and NH infants
Listeners Were Taught to Respond to Spectral and Temporal Acoustic Changes

Spectral Resolution Measure (Spectral Ripple Discrimination, SRD)

Temporal Resolution Measure (Amplitude Modulation Detection, AMD)

AMD + SRD predict 56% variance in adult CI users (Won et al., 2011)
Observer-based Psychoacoustic Procedure

Werner, (1995)
# Participants

<table>
<thead>
<tr>
<th>CI Infants, n=6</th>
<th>CI Adults, n=3</th>
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<tbody>
<tr>
<td>Congenitally Deaf</td>
<td>Postlingually Deaf</td>
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<tr>
<td>Age at CI = 8-16 months</td>
<td>Long Term Users</td>
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<tr>
<td>Length of use = 3-13 months</td>
<td>1 AB, 2 Nucleus</td>
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<tr>
<td>3 AB, 3 Nucleus</td>
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Unilateral testing in soundfield via clinical processor and preferred settings

Additional NH Infants and Adults were tested
Infants Are Inefficient Listeners!
If Infant Auditory Resolution is Mature

NH Data

Cl Data

Task Performance

NH Infants

NH Adults

Cl Infants

Cl Adults

Stimulus Difficulty
If CI Infant Auditory Resolution is Immature...

**NH Data**
- **NH Infants**
- **NH Adults**

**Cl Data**
- **Cl Infants**
- **Cl Adults**
AMD Slopes are similar in Infants and Adults

NH Listeners

CI Listeners

Group X Stimulus Difficulty: not significant

Immature Efficiency, Mature Temporal Resolution
SRD Slope is steeper in NH infants than NH adults

**NH Listeners**

- NH Infants (N=9-12 each depth)
- NH Adults (N=10 each depth)

**CI Listeners**

- CI Infants (N=6)
- CI Adults (N=3)

Group X Stimulus difficulty:
Significant interaction (p = 0.01)

Multiple Potential Explanations
Are **Spectral** and **Temporal** resolution mature in CI and NH infants?

Preliminary results: **Yes for CI infants**

But...

**Obvious Limitations:** Small n, confounding variables, high variability

**Why does Spectral Resolution Seem Immature in NH Infants?**

- Nonspectral cues (Intensity? Pitch? Temporal?)
- Not seeing this interaction when controlling for intensity cues
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