Can You Hear Me Now?
Speech Perception Testing With Children Who Have Hearing Aids and Cochlear Implants

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Disclosures

Financial:
- I am employed by the Moog Center for Deaf Education
- I am a (re)habilitation and special projects consultant for Advanced Bionics, LLC.

Non-financial:
- I received my AuD from the University of Memphis
Aided Speech Perception Testing

• Administration of evaluation measures to determine a child’s ability to detect, recognize, identify, and comprehend what is heard using his hearing aid(s) or cochlear implant(s)

Goal of Amplification

• To ensure audibility of soft and average level speech across the broadest frequency range possible, while maintaining comfort for loud sounds, in a variety of listening environments
How do we know if we met our goal?

Speech Perception Testing

Speech Perception Testing Utility
- Validation of device fitting/programming
- Comparison of programs/settings/devices
- Fitting FM/DM systems
- Determining CI candidacy
- Evaluating auditory skills development
- Guiding auditory skills therapy / (re)hab

Aided Audiogram
- Detection ≠ Recognition
- Detection ≠ Identification
- Detection ≠ Comprehension
Perception Influences Production

We speak the way that we hear

or

G.I.G.O

In = Out
Time

- Start with one test
- Collaborate with the child's therapist/teacher
- Have an assistant in the booth
- Use CPT codes 92626 & 92627

The Test Battery

- Needed to measure specific aspects of speech perception, as no single variable can assess or represent speech perception as a whole
  - Lucka Mendel, 2008

- Required to accommodate a variety of children:
  - Of different ages
  - Chronological, developmental, linguistic
  - Using different communication modes
     - Oral, cued speech, total, or manual
  - With different auditory skills
  - Eisenberg, et al., 2005

Testing Parameters

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<th>Easy</th>
<th>Hard</th>
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<td>Response Formats</td>
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<td>Presentation Delivery</td>
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<tr>
<td>Condition</td>
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<td>Level of Presentation</td>
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<tr>
<td>Presentation Environment</td>
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<td>noise</td>
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</table>
### Response Format

- **Closed-set**
  - Typically easier
  - Limits response choices
  - Good for young children & children with poor speech production
- **Open-set**
  - Typically harder
  - Unlimited response choices
  - Generally more typical of real life

### Presentation Delivery

- **Monitored Live Voice**
  - Typically easier
  - Generally poorer reliability
  - May be good for very young children &/or introduction of new test materials
- **Recorded**
  - Typically harder
  - Best reliability
  - Goal for all tests

### Condition

- **Auditory-visual**
  - Typically easier
  - Allows access to the speakers face during stimulus presentation
  - Good for introduction of test materials & determination of the impact of visual access
- **Auditory-only**
  - Typically harder
  - Provides information about performance without visual access
  - Most tests are completed in this condition
Level of Presentation

- **Average**
  - Typically easier
  - 60 dB SPL
  - Normal conversational level
- **Soft**
  - Typically harder
  - 50 dB SPL
  - Soft conversational level

Presentation Environment

- **Quiet**
  - Typically easier
  - Results indicate best possible performance
- **Noise**
  - Typically harder
  - Results indicate more realistic performance
  - Most tests can be given in background noise & some were developed specifically to evaluate performance in background noise
  - Multitalker babble is preferable

The Moog Center Battery

- Ling 6 Sound Check
- TISP Low Vocal & Standard
- TISPT
- Minimal Pairs
- GASP Words
- MLNT (easy & hard)
- LNT (easy & hard)
- PBK
- CNC
- Iowa Monosyllable Test
- California Consonant Test
- Plurals Test
- Common Phrases
- GASP Sentences
- BKB Sentences
- CID Everyday Sentences
- MLST-C Sentences
- Pediatric AzBio Sentences
- AzBio Sentences
- Phrases in Noise (PINT)
- HINT-C Sentences in Noise
- Pediatric AzBio Sentences in Noise
- GMST-Sentences in Noise
- AzBio Sentences in Noise
ESP Standard Monosyllables

WIPi

MLNT
Test Selection

- Child Factors:
  - Age
  - Developmental Level
  - Language Skills

Test Selection

- Test Factors
  - Stimuli
    - Phonemes, Patterns, Words, Sentences
  - Level of Difficulty
    - Easiest to hardest:
      1. Monitored Live Voice, Closed-set, Quiet
         - Rate, articulation, familiar speaker
         - Pictures/toys to choose from – known word
         - Easy listening situation
     2. Recorded, Open-set, Noise
        - Consistent presentation, rate and manner, unfamiliar speaker
        - No pictures or toys to choose from – unknown word
        - Difficult listening situation

Where To Start

<table>
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<tr>
<th>Test</th>
<th>Detection</th>
<th>Recognition</th>
<th>Identification</th>
<th>Comprehension</th>
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<tr>
<td>Ling 6 Sounds</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>ESP</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIPF</td>
<td>X (consonants)</td>
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<td></td>
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<td>Minimal Pairs</td>
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<td></td>
<td></td>
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<tr>
<td>GASP Words</td>
<td></td>
<td>X (familiar words)</td>
<td></td>
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</tr>
<tr>
<td>MLNT</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>LNT</td>
<td></td>
<td>X</td>
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### Where to Start: Auditory Language Age (ALA)

- If ALA < 2, administer ESP
- If ALA ≥ 2 to ≤ 5, administer WIPI
- If ALA is ≥ 4 to ≤ 6, administer PBK
- If ALA ≥ 6, administer CNC

Adapted from Madell & Flexer, 2008
What Next?

- If score is < 50%
  - Give an easier test
- If score is > 50%
  - Give same test at a soft presentation level
  - Give a test in background noise
- If score is ≥ 85%
  - Give a more difficult test

General Testing Protocol

- At least one single word test
  - 60dB SPL; Right, Left, Both
  - 50dB SPL; Both
- At least one sentence test
  - 60dB SPL; Right, Left, Both
  - 50dB SPL; Both
- At least one test in background noise
  - +5dB SNR
  - Per test protocol

General Testing Frequency

- For children with cochlear implants:
  - 1, 3, 6, 9, 12 months post initial activation
  - At least annually (prefer every 6 months)
  - Following programming and/or devices changes
  - If concerns arise
General Testing Frequency

- For children with hearing aids:
  - As soon as is developmentally appropriate
  - At least annually (every 6 months until age 3)
  - Following programming and/or device changes
  - If concerns arise

Utility Revisited

- Validation of device fitting/programming
- Comparison of programs/settings/devices
- Fitting FM/DM systems
- Determining CI candidacy
- Evaluating auditory skills development
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Conclusion

- Aided speech perception testing is of great value for children with hearing aids and cochlear implants
- It can and should be incorporated into standard clinical practice to ensure accurate assessment and optimum outcomes

AAA, 2013
Final Thought

Questions?

References