Children, Hearing Loss, and Communication

ANCS 2009
Hearing Loss

1 million

30 million

- Adults
- Children
Adults use their residual hearing to continue to communicate,
Age
Degree of Hearing Loss

- **21%** Severe (61-80 dB HL)
- **30%** Moderate (41-60 dB HL)
- **10%** Profound (>80 dB HL)
- **39%** Mild (15-40 dB HL)

Pittman & Stelmachowicz (2002)
Age & Hearing Loss

<table>
<thead>
<tr>
<th>AGE (years)</th>
<th>HEARING LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Profound</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Mild</td>
</tr>
<tr>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>
Children – 23 HI Children – 60 NH Children

Normal speech perception as a function of audibility

Speech Perception
(Stelmachowicz et al, 2001)
Speech Perception in Noise
Crandell (1993)

• Children
  – 20 HI Children
  – 20 NH Children

• Poor speech perception in noise

<table>
<thead>
<tr>
<th></th>
<th>NHC</th>
<th>HIC</th>
</tr>
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<tbody>
<tr>
<td>Quiet</td>
<td>99.7% (0.7)</td>
<td>96.3% (6.9)</td>
</tr>
<tr>
<td>-6dB SNR</td>
<td>70.7% (15.4)</td>
<td>38.1% (25.4)</td>
</tr>
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Language
(Pittman, 1998-2008)

• Children
  – 76 HI Children
  – 137 NH Children

• Delayed lexical development as a function of age
Language
(Blamey et al., 2001)

- Children
  - 40 HI Children
  - 47 CI Children

- Impaired lexical development as a function of age
Word Learning
(Pittman, 2008)

• Purposes: To determine the rate of word learning in children with hearing loss compared to children with normal hearing.

• Rate: Defined as the number of exposures necessary to achieve 70% performance.

• Conditions: Compared rate for limited and extended bandwidth conditions.
Method

- Children
  - 36 with NH
  - 14 with HL

- Stimulus Bandwidths
  - Limited (4 kHz)
  - Extended (9 kHz)
Novel-Word Construction

<table>
<thead>
<tr>
<th>Limited</th>
<th>Extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>saθnəd</td>
<td>sothnud</td>
</tr>
<tr>
<td>daztəl</td>
<td>doztul</td>
</tr>
<tr>
<td>fasnəʃ</td>
<td>fosnush</td>
</tr>
<tr>
<td>stamən</td>
<td>stomun</td>
</tr>
<tr>
<td>hamtəl</td>
<td>homtul</td>
</tr>
</tbody>
</table>
Learning Game
Results

![Graph showing performance over trials for different conditions: NH, HI, EXTENDED, LIMITED. The graph illustrates the increase in performance (%) correct with increasing trials.]
Results

![Graph showing performance over trials for different conditions.]
Results

![Graph showing performance over trials](image-url)
Summary

• HI children’s speech perception and language development are impaired under degraded listening conditions.
• HI Children are able to perceive speech and learn new words as well as NH children under optimal listening conditions.
• The development of amplification specifically for children may play an important role in their communication development as well as their academic success.