Children, Hearing Loss, and Communication

ANCS 2009
Hearing Loss

30 million Adults
1 million Children
Adults use their residual hearing to *continue* to communicate,
Age
Degree of Hearing Loss

- **10%** Profound
- **21%** Severe
- **30%** Moderate
- **39%** Mild

- **Mild** (15-40 dB HL)
- **Moderate** (41-60 dB HL)
- **Severe** (61-80 dB HL)
- **Profound** (>80 dB HL)

Pittman & Stelmachowicz (2002)
Age & Hearing Loss

![Graph showing the relationship between age and hearing loss levels (Mild, Profound). The x-axis represents age in years (0 to 18), and the y-axis represents hearing loss in degrees.](image-url)
Speech Perception
(Stelmachowicz et al, 2001)

- Children
  - 23 HI Children
  - 60 NH Children

- Normal speech perception as a function of audibility
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>
</thead>
<tbody>
<tr>
<td>Quiet</td>
<td>99.7% (0.7)</td>
<td>96.3% (6.9)</td>
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<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)
<table>
<thead>
<tr>
<th>Language</th>
<th>Novel Word Construction</th>
<th>Limited</th>
<th>Extended</th>
</tr>
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<tbody>
<tr>
<td>sathnw</td>
<td>sothnud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>daztél</td>
<td>doztul</td>
<td></td>
<td></td>
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<tr>
<td>fasnw</td>
<td>fosnush</td>
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<td>stomun</td>
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<td>hamtél</td>
<td>homtul</td>
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</table>
Learning Game
Results
Results

![Graph showing performance over trials for different conditions](image-url)
Results

![Graph showing performance over trials for different conditions: NH, HI, EXTENDED, LIMITED.](image)

- PERFORMANCE (% CORRECT) on the y-axis.
- TRIAL on the x-axis.
- Different conditions are represented by distinct markers and line styles.

Legend:
- NH
- HI
- EXTENDED
- LIMITED
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.