USE OF MICROPHONE TECHNOLOGY TO IMPROVE SPEECH PERCEPTION IN BACKGROUND NOISE IN PEDIATRIC CI USERS

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Abstract #62
PROBLEM

Children with hearing loss are affected more than their normal hearing peers by the negative consequences of background noise and distance on speech understanding.
POSSIBLE SOLUTIONS: MICROPHONE TECHNOLOGIES

1. T-mic:
   • Situated at the entrance of the ear canal to exploit the acoustic properties of the pinna.
   • Can significantly improve speech understanding in noise (Gifford and Revitt, 2010; Kolberg et al., 2015).

Advanced Bionics Naída CI Q70
2. Directional microphones:

- Can significantly improve speech understanding in challenging acoustic environments for adult CI users (Buechner, et al., 2014; Mauger et al., 2014; Geißler et al., 2015).
- e.g., UltraZoom

Advanced Bionics Naída CI
Processor Mic
Rear Mic

UltraZoom

Automatically adapts null(s) towards dominant noise source(s).
3. Wireless Remote Microphones:
   • Transmit speakers voice to the CI sound processors via Bluetooth, FM or DM.
   • e.g., Phonak RemoteMic
     • Uses Bluetooth

POSSIBLE SOLUTIONS: MICROPHONE TECHNOLOGIES

RemoteMic

ComPilot

Naída CI Q70
STUDY QUESTIONS

1) Does the use of directional microphone and remote microphone technology improve speech recognition in background noise in children with CIs?

2) How do children with CIs using UltraZoom (UZ) or RemoteMic (RM) compare to peers with normal hearing (NH)?
METHODS - PARTICIPANTS

- 10 children with Advanced Bionics HiRes90K CIs
- Age: 6 to 19 years (median 16 years)
- 5 unilaterals and 5 bilaterals
- Currently use the Naida CI Q70 sound processor (all but one)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age</th>
<th>Age at CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAW</td>
<td>13</td>
<td>12 y</td>
</tr>
<tr>
<td>AAD</td>
<td>19</td>
<td>L: 7y; R: 12y</td>
</tr>
<tr>
<td>AAF</td>
<td>14</td>
<td>R: 3.5y; L: 11y</td>
</tr>
<tr>
<td>AAA</td>
<td>19</td>
<td>8y</td>
</tr>
<tr>
<td>AAB</td>
<td>17</td>
<td>7y</td>
</tr>
<tr>
<td>AAH</td>
<td>6</td>
<td>L: 5y; R: 5.5y</td>
</tr>
<tr>
<td>AAP</td>
<td>16</td>
<td>13y</td>
</tr>
<tr>
<td>AAQ</td>
<td>12</td>
<td>12y</td>
</tr>
<tr>
<td>AAS</td>
<td>19</td>
<td>L: 2y9m &amp; 16y; R: 15 y</td>
</tr>
<tr>
<td>AAV</td>
<td>13</td>
<td>R: 11y; L: 4y</td>
</tr>
</tbody>
</table>
METHODS - TEST SET UP

Test Conditions:
- 100% T-Mic
- UltraZoom
- RemoteMic: Mixing ratios of 50%, 75%, 100%

Research Naída processors were used with all participants.
The participants’ everyday preferred map was used for the study.
SRT (80%) measured via CRISP (Litovsky, 2003, 2005)
1). UZ and RM significantly improve SRT (80%) in background noise as compared to T-Mic alone.

2). There was no significant difference between UZ and RM.

3). UZ or RM allows some children with CI to function as well as NH peers when noise is present.
CONCLUSIONS

1). Children with CI should be given the option to use directional microphone and RM technology to improve performance in noisy situations.

2). UltraZoom can provide children with CI an advantage of ~6 dB as has been shown in adults. Teens may be more accepting of directional microphone technology as a strategy for use in complex listening environments.

3). Though children with CI remain at a disadvantage in quiet as compared to NH children, microphone technology can enhance performance for children with CI to more closely approximate that of normal hearing peers.