Historical Perspective on Unilateral Hearing Loss in Children

American Cochlear Implant Alliance Symposium – Emerging Issues in Cochlear Implantation

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Preview

I. Background
II. Psychoeducational Outcomes
   I. The Early Years
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III. Final Words
I. Background
Reports from Adults with UHL...

• 97% reported sound localization difficulties
• 100% reported difficulty hearing speech in a crowded room or listening to someone on their impaired side
• Feelings of frustration, embarrassment, and decreased quality of life

(Giolas & Wark, 1967; Subramaniam et al., 2005)
“...audiologists and otolaryngologists are not usually concerned over such deafness, other than to identify its etiology and assure the parents that there will be no handicap.”

Northern & Downs, 1978
1964-65 Rubella Epidemic

- 12.5 million cases
- 12,000 babies born deaf
II. Psychoeducational Outcomes

The early years...
Pilot Study: Bess & Tharpe, 1986

- 60 children with UHL in middle Tennessee
- Age range of 6 – 18 years (M = 13 yrs)
- Medical and educational case history data obtained
Age of Identification:
Grade Failure Rate

- Bess et al
- Oyler and Matkin

Percentage

UHLs  District Norms
62% of those with academic difficulty had hearing loss of the right ear.
# Studies Of Unilateral Hearing Loss

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Failed (1 or more grades)</th>
<th>Resource Help (1 or more years)</th>
<th>Combined (failed and/or resource help)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bess (1986)</td>
<td>35%</td>
<td>13.3</td>
<td>48.3%</td>
</tr>
<tr>
<td>Oyler (1987)</td>
<td>27.3%</td>
<td>40.7</td>
<td>68.0%</td>
</tr>
<tr>
<td>Jensen (1988)</td>
<td>18.0%</td>
<td>36.0%</td>
<td>54.0%</td>
</tr>
<tr>
<td>Bovo et al (1988)</td>
<td>22.0%</td>
<td>12%</td>
<td>34%</td>
</tr>
<tr>
<td>Martini (1988)</td>
<td>25.0%</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Wautier-Launey et al (1988)</td>
<td>40.4%</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>English &amp; Church (1990)</td>
<td>?</td>
<td>54%</td>
<td>?</td>
</tr>
</tbody>
</table>
Localization Task

![Graph showing error index for UHL and Normal hearing at 500 Hz and 3000 Hz frequencies.](image)
Behavior problems include social withdrawal, inattention, distractibility, & aggression.
Speech/Language Battery:

- Those who failed in school exhibited verbal I.Q.s significantly lower than those who succeeded in school
- Few differences found between groups on other standardized tests

Bess et al, 1986
What, if any, are the functional health effects of minimal hearing loss?
Dartmouth Primary Care Cooperative (COOP) CHARTS

- Screening tool for functional health
- Ten different domains
- Overall well being and quality of life
DOMAINS USED IN COOP CHARTS

- Emotional feelings
- School work
- Social support
- Stress
- Family
- Self esteem
- Behavior
- Energy
- Getting along with others
- Overall Health
### STRESS

During the past month, how much stress or pressure did you feel from other people? (Family, friends, teachers, other grown-ups or other kids)

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A little</td>
<td>![Articulated Character]</td>
</tr>
<tr>
<td>2</td>
<td>Some</td>
<td>![Articulated Character]</td>
</tr>
<tr>
<td>3</td>
<td>Quite a bit</td>
<td>![Articulated Character]</td>
</tr>
<tr>
<td>4</td>
<td>A lot</td>
<td>![Articulated Character]</td>
</tr>
</tbody>
</table>
## SCHOOL WORK

During the last month you were in school, how did you do?

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I did very well</td>
<td>[Image of a satisfied face]</td>
</tr>
<tr>
<td>I did as well as I could</td>
<td>[Image of a content face]</td>
</tr>
<tr>
<td>I could have done a little better</td>
<td>[Image of a satisfied face]</td>
</tr>
<tr>
<td>I could have done much better</td>
<td>[Image of a satisfied face]</td>
</tr>
<tr>
<td>I did poorly</td>
<td>[Image of a sad face]</td>
</tr>
</tbody>
</table>
COOP Results:

- For 6th graders -
  - scores were higher (more dysfunction) for MSHL group in 9 of 10 domains
  - Significant difference found on energy domain

- For 9th graders –
  - Scores were higher for MSHL group in 9 of 10 domains
  - Significant differences found on stress and behavior domains

Bess, Dodd-Murphy, Parker, 1998)
Listening Effort

Attentional requirements necessary to understand speech
Hypothesis:

Assuming a limited effort capacity, performance on a secondary task will decrease when the primary listening task is made more difficult, regardless of whether primary-task performance is affected.
Dual-Task Paradigm

- Subjects
  - 14 children with mild HL matched with NH children for grade level
  - Ages between 6 – 11 years

(Bourland-Hicks & Tharpe, 2002)
Dual-Task Paradigm

- Primary task: speech recognition in noise (PBK)
- Secondary task: button push to random presentations of probe light
- Bifurcated reinforcement scheme
Dual Task Paradigm

No difference in baseline RTs between groups
NOT SURE IF I SHOULD TAKE A NAP

OR CRY ABOUT BEING TIRED
II. Psychoeducational Outcomes

Today…
UHL and Speech-Language Scores
(Lieu, Tye-Murray, & Piccirillo, 2010)

• Sibling-controlled study of 6-12 y.o. with UHL
• n = 148
• Oral & Written Language Scales (OWLS)

Results:
• Children with UHL had poorer language comprehension, oral expression, and oral composite scores
• No right- or left-ear differences
Impact of Unilateral Conductive HL on Academic Performance
(Kesser, Krook, Gray, 2013)

• Case control survey
• School children with aural atresia
• None repeated a grade but 65% required resource help
• 47% had IEPs
• 45% received speech therapy
III. Final Words
Summary

• A significant portion of children with permanent UHL have been found to demonstrate difficulties observed
  – In academic settings
  – Under laboratory conditions
  – By parents and teachers
  – By the children themselves
Why do some children with unilateral hearing losses have significant academic difficulties while others do not?
What are the contributing stressors?

- Listening conditions?
- Listening effort?
- Lack of early or aggressive intervention?
- Lack of effective amplification?
- Concomitant otitis media?
- Etiology?
Most Common Etiologies of UHL:

- Head trauma (acquired)
- Temporal bone anomalies
  - enlarged vestibular aqueduct
  - cochlear dysplasia
  - cochlear nerve aplasia
- But, remain largely unknown from the last 3 decades
“... hard-of-hearing children are not easily recognizable and often are mistaken for children with vague, sometimes exotic, always bewildering ‘problems.’ Thus, ...they are invisible children.”

(Julia Davis, 1977)