Pediatric Hearing Instrument Fitting in 2010:
The Sound Foundations Cuper Project

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Stefan Launer, Ph.D.
Misconceptions
Tools to uncover the “myth” about horses

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Are there misconceptions about Pediatric HI fittings?

- How many hours do infants and toddlers wear instruments/day? School aged? Teens?

- How often are children provided access to noise solutions?

- How often is DSL applied in pediatric instrument fittings?

- What is the average programming time for pediatric hearing instruments
Sound Foundations Cuper Project: Purpose

To understand pediatric hearing instrument fittings and usage by collecting data from a large number of pediatric hearing instrument fitting files

- Pediatric hearing instrument usage
- Technology selection and activation
- Class and model selection
- Prescriptive method
- Demographics of pediatric hearing instrument users
- Audiologists’ workflow
- Pediatric instrument fitting and follow up practices
- Use of fitting tools
Project Scope

- Invited clinical and school pediatric audiologists to participate
- All participating workstations were activated in Jan 2010
- Data logging was uploaded to central server in May and September
- Data analyzed and presented at Sound Foundations
  - 100 workstations
  - 72 clinics
  - 28 schools
  - 8 months of logging
  - 4918 subjects
  - 8669 ears
Cuper Data Collection

A Sound Foundation Through Early Amplification
Objective Insights into Several Aspects of Fitting and Use

Wearers  Usage  Features  Process  Impact

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Outline

Wearers  Usage  Features  Process  Impact
Average AC hearing loss
56 dB with no gender effect
Instrument users by audiogram type and age
6% conductive or mixed

* 9% mixed or CHL by teens

<table>
<thead>
<tr>
<th>age groups</th>
<th>0-4</th>
<th>5-8</th>
<th>9-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audiogram UCL</td>
<td>0</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Audiogram BC</td>
<td>169</td>
<td>224</td>
<td>538</td>
</tr>
<tr>
<td>Audiogram AC</td>
<td>2127</td>
<td>2006</td>
<td>3634</td>
</tr>
</tbody>
</table>
Hearing loss by degree and age

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Distribution of Fittings by Age
are we loosing the interest of teens?

- 46%
- 29%
- 25%

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Outline

Wearers

Usage

Features

Process

Impact
HI use/day increases with age
children wear their HI on avg. 5.5hr/day
HI Usage Categories: percentiles / usage time

40%
Listening Environment

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Outline

Wearers  Usage  Features  Process  Impact
Technology Class Selected in Pediatric Fittings
children fitted with economy 63% of time

No age related differences were seen in class selection
Style Selected
97% of children wear BTEs

Rx’s BTE based on potential for growth
Style Selected

little difference with teens, preference for CRT over ITE

Custom products may be an option for older children
**Accessible Programs**

**FM+M, automatic and calm**

<table>
<thead>
<tr>
<th>program name</th>
<th>#install.</th>
<th>in % (HI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM + Mic</td>
<td>3235</td>
<td>51.12%</td>
</tr>
<tr>
<td>SoundManager</td>
<td>2889</td>
<td>45.65%</td>
</tr>
<tr>
<td>Calm Situations</td>
<td>1375</td>
<td>21.73%</td>
</tr>
<tr>
<td>TriPilot</td>
<td>1144</td>
<td>18.08%</td>
</tr>
<tr>
<td>Speech in Noise</td>
<td>734</td>
<td>11.60%</td>
</tr>
<tr>
<td>T-Coil + Mic</td>
<td>299</td>
<td>4.73%</td>
</tr>
<tr>
<td>SoundFlow</td>
<td>214</td>
<td>3.38%</td>
</tr>
<tr>
<td>T-Coil</td>
<td>190</td>
<td>3.00%</td>
</tr>
<tr>
<td>Custom</td>
<td>184</td>
<td>2.91%</td>
</tr>
<tr>
<td>Music</td>
<td>151</td>
<td>2.39%</td>
</tr>
<tr>
<td>FM</td>
<td>140</td>
<td>2.21%</td>
</tr>
<tr>
<td>Comfort in Noise</td>
<td>109</td>
<td>1.72%</td>
</tr>
<tr>
<td>Acoustic Telephone</td>
<td>53</td>
<td>0.84%</td>
</tr>
<tr>
<td>ZoomControl</td>
<td>3</td>
<td>0.05%</td>
</tr>
</tbody>
</table>

"...benefits and limitations of this technology are unknown"

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Accessible Programs
FM ready calm, automatic and calm are most common

“it is essential that the audiologist provide phone access even for the youngest HI wearers.”

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Feature guidance by AAA

- Multiple channels 100%
- Expansion 100%
- Compression 100%
- Frequency compression/transposition (5030/7813 @90%) 60%

“should be considered viable unless data becomes available to exclude”
Start-up program

<table>
<thead>
<tr>
<th>Program Name</th>
<th># Install</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM + Mic</td>
<td>2584</td>
<td>40.83%</td>
</tr>
<tr>
<td>SoundManager</td>
<td>2054</td>
<td>32.46%</td>
</tr>
<tr>
<td>TriPilot</td>
<td>856</td>
<td>13.53%</td>
</tr>
<tr>
<td>Calm Situations</td>
<td>608</td>
<td>9.61%</td>
</tr>
<tr>
<td>SoundFlow</td>
<td>161</td>
<td>2.54%</td>
</tr>
<tr>
<td>Custom</td>
<td>27</td>
<td>0.43%</td>
</tr>
<tr>
<td>Speech in Noise</td>
<td>21</td>
<td>0.33%</td>
</tr>
<tr>
<td>FM</td>
<td>6</td>
<td>0.09%</td>
</tr>
</tbody>
</table>
Activation of Program Button

children <9 typically not given multiple program access
Activation of Volume Control

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Sound Recover
active in 90% of available time
Outline

Wearers
Usage
Features
Process
Impact
1980s: DSL Algorithm Development – in the Seewald basement
– Almost half of the respondents reported using a “personal fitting strategy” 75-100% of the time

– Greater than 90% of responding audiologists reported that they used the DSL approach 0-24% of the time

Hedley-Williams, Tharpe, Bess 1996
2010- Professor Seewald, I think we got the message!

Fitting formula chosen by percentage in pediatric fittings

- **DSL**: 85%
- **NAL**: 0%
- **Phonak**: 15%
Binaural fit rates

Avg. of all US fittings

0 - 4
5 - 8
9 - 18
Tracking “hot domain transitions (%)"
Revealed that there is no typical workflow
- search/try and error
- first fitting/follow up fitting
- what was the task

- Some typical paths
  - Start ⇒ Tuning ⇒ End (34%)
  - Start ⇒ Initial ⇒ Tuning ⇒ End (19%)
  - Start ⇒ Initial ⇒ End (17%)
  - Start ⇒ End (9%)
Hearing Instrument Programming Time
10-15 mins, follow-up about 2 mins shorter

avg duration

<table>
<thead>
<tr>
<th></th>
<th>0 - 4 first fit</th>
<th>5 - 8 first fit</th>
<th>9 - 18 first fit</th>
<th>19 - 65 first fit</th>
<th>0 - 4 follow-up</th>
<th>5 - 8 follow-up</th>
<th>9 - 18 follow-up</th>
<th>19 - 65 follow-up</th>
</tr>
</thead>
</table>

N=13,466
Objective findings

– Almost 40-50% of kids use the devices less than 4 h/day
  On average, children wear hearing instruments for 5.5 hours/day
– School-aged children are in background noise for about 30% of their listening hours. Infants are in noise for about 20% of their listening hours
– The DSL formula is applied to 85% of pediatric fittings of specialty centers and schools
– Kids: typically economy class products
– AAA Guidelines fulfilled in general
  – Automatic switching used rather often
– Workflow, usage of fitting tools, fitting process
– Pediatric programming sessions take 10-15 minutes

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Value of Cuper

– We don’t have an APGARs for predicting performance of pediatric hearing instrument users. We continue to study performance outcomes with the intention of isolating those circumstances and actions which are most likely to produce the desired results.

– As we develop a more robust evidence basis for clinical decision making, we first need to understand objectively what the variables in play are.

– Getting Better through a dogged analysis of the details (Gewande, 2007)

– Cuper presents an objective, large scale analysis of the application of technology and usage which can be tied to product improvement, performance outcomes
Acknowledgments

– All participating clinics and schools

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– Phonak Headquarters Cuper project managers – Daniel Meier, Ulrike Lemke
Thank You