Are we on target with our pediatric hearing aid fittings?

Ryan W. McCreery, Ph.D.
Boys Town National Research Hospital
ryan.mccreery@boystown.org
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Elizabeth Walker, Ph.D.
University of Iowa

Meredith Spratford, Au.D.
BTNRH

Jacob Oleson, Ph.D.
University of Iowa
Audibility is crucial
Audibility is variable

- **Child factors**
  - Degree of hearing loss
  - Ear canal growth
  - Hearing aid fitting

- **External factors**
  - Distance
  - Noise
  - Reverberation
  - Context
How can we maximize audibility?
Two components of auditory experience

Audibility + Hearing aid use = Auditory exposure
For each band – Audibility x FIW = weighted audibility

SII = Sum of weighted audibility of all frequency bands
Audibility and speech recognition by age

Stelmachowicz et al. 2000
Speech Intelligibility Index

- Estimate of aided or unaided audibility
- Can be applied to transfer functions to predict speech recognition *

* Some restrictions may apply
  - Transfer functions may have been developed on adults with normal hearing.
Audibility in previous studies

- Audibility is related to degree of hearing loss
- Hearing aid use is assumed to be full time

Sinninger et al. 2010
Age at First HA Fit

Number of Patients by Age at First HA Fit (in Months):
- <6: 100
- 6 to 12: 32
- 12 to 18: 13
- 18 to 24: 8
- 24 to 30: 11
- 30 to 36: 7
- 36 to 42: 10
- 42 to 48: 4
- >48: 15

.scatter plot showing the distribution of age at first HA fit (in months) with a line of best fit.
How well are HAs fit?

Normative range from Bagatto et al. 2011

Open squares = > 5 dB deviation from DSL

Filled circles = < 5 dB deviation from DSL

26% of ears < 0.65 SII

n = 195

McCreery, Bentler & Roush, 2013
Hearing aid use

Parent report = 10.84 hours
Data logging = 8.3 hours
Difference = 2.6 hours
Range = 2-10 hours
Predicted by age
- Younger age = larger prediction error

Walker et al, *LSHSS*, 2012
Hearing aid Use: Age and Setting

Walker, et al., LSHSS 2012

Percent Reporting "Always"

Car      | Public | Daycare
---      | ---    | ---
6 months | 12 months | 18 months | 24 months
0        | 20      | 40      | 60
10       | 30      | 50      | 80
20       | 40      | 60      | 100
30       | 50      | 70      | 100
40       | 60      | 80      | 100
50       | 70      | 90      | 100
60       | 80      | 100     | 100

Walker, et al., LSHSS 2012
Hearing aid use

- Parent report and data logging are similar
  - Agreement improves as child gets older

- Significant variability in data logging for parents reporting “full-time use”

- Ask specific questions about use
  - How many hours?
  - What situations are easiest/most challenging?
Effects on speech recognition in noise
Effects of audibility and use

Controlling for Unaided SII

\[ R^2 = 0.129, p < 0.05 \]

\[ R^2 = 0.102 \text{ (na)} \]
Effects of degree of hearing loss

**Graph 1:**
- **Mild**
- **Moderate-Severe**
- \( R^2 = 0.05 \) (ns)
- \( R^2 = 0.132 \) \( p < 0.05 \)

**Graph 2:**
- **Mild**
- **Moderate-Severe**
- \( R^2 = 0.102 \) (ns)
- \( R^2 = 0.143 \) \( p < 0.05 \)
Key Points

- Increasing audibility with hearing aids helps speech understanding in background noise
- Hearing aid use is confounded by degree of hearing loss
- The relationship between word recognition in noise and language depends on degree of hearing loss
What about changes over time?

- Audibility
  - Ear canal growth
    - Thresholds
    - Hearing aid output
- Hearing aid use
  - Increasing use with age
Audibility
Audibility Clusters

First Visit

Last Visit
Hearing aid use
Hearing aid use over time

- Entire group (n = 279)

Graph showing the percentage of hearing aid use over time for different categories:
- Low Increasing: 77%
- High Non-Increasing: 13%
- High Increasing: 13%
- High Decreasing: 13%

X-axis: First Visit to Last Visit
Y-axis: Percentage
Future questions

- How do audibility and hearing aid use affect outcomes?

- How does early auditory experience influence listening and learning at school age?
Thank you!