Beyond Matching Targets: An Approach to Outcome Evaluation in Pediatric Hearing Aid Fitting

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AUDIOMETRIC ASSESSMENT



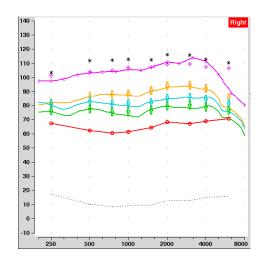


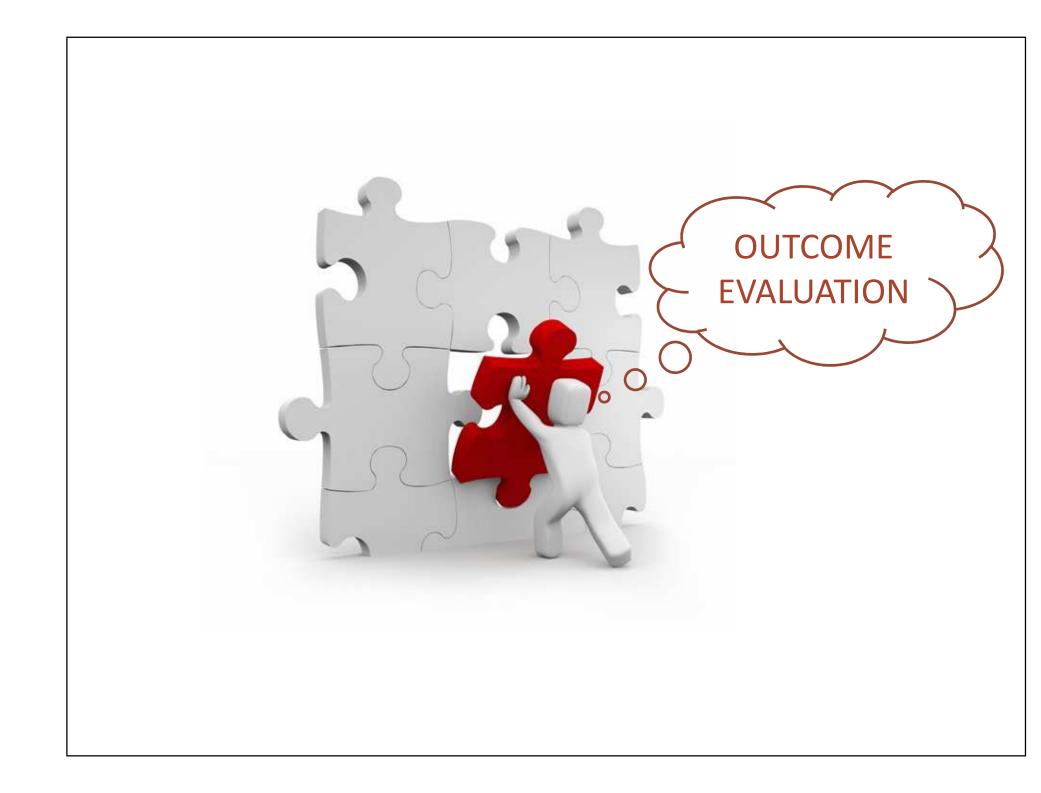
ELECTROACOUSTIC PRESCRIPTION

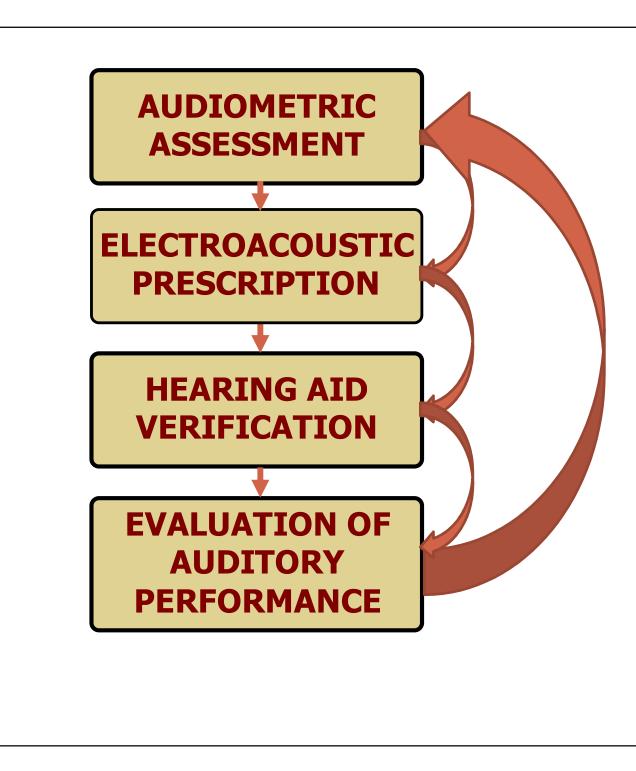
HEARING AID VERIFICATION

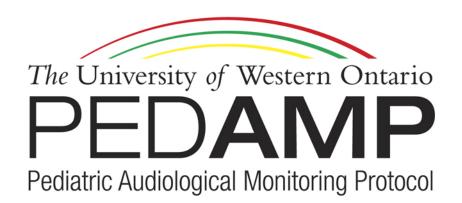
EVALUATION OF AUDITORY PERFORMANCE











Version 1.0

Marlene Bagatto, Sheila Moodie, Susan Scollie 2010

Considerations for Outcome Evaluation

Target Population:
Infants & young
children who
wear hearing aids

Good Statistical Properties

Purpose: Measure the impact of the hearing aid fitting



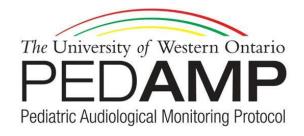
Clinically Feasible

Administration & Interpretation: By Audiologist

Clinically Meaningful

UWO PedAMP Development

- Avoid tools that:
 - are too lengthy or complicated
 - rely on information or scoring by other professionals (e.g., standard language measures)
 - May be implemented in other parts of the Early Hearing Detection and Intervention (EHDI) program
- Include tools that:
 - have good statistical properties
 - have good clinical feasibility and utility
 - support family-centered practice
 - help you collaborate better with others



- Maximize efficiency and interpretation through:
 - Visual tools to permit rapid scoring
 - Data to support interpretation

Community of Practice (Sheila Moodie)

- Soliciting opinions and experiences from end-users is recommended when developing outcome evaluation tools and clinical practice guidelines
 - (Graham et al, 2000; Andresen, 2000)
- Network of Pediatric Audiologists of Canada
 - Opinions were gathered regarding clinical relevance, quality, feasibility, utility, executability, acceptability, and comparative value of each tool
 - Modifications made where possible
 - Provided information about barriers and facilitators to implementation

Creating a Balance (modified from Bhattacharyya, O. 2010) Clear Complex Specific Rigid **ACTIONABLE EVIDENCE-BASED CLINICAL UPTAKE**

Purpose of the UWO PedAMP

- Intended to be used with children with permanent childhood hearing impairment (PCHI) from birth to 6 years who may or may not wear hearing aids
- Consists of several outcome evaluation tools that aim to measure *auditory-related outcomes* in infants and young children including the following dimensions:
 - Subjective assessment of early auditory development
 - Subjective ratings of auditory performance in daily life

Contents of the UWO PedAMP

- Ontario Infant Hearing Program (OIHP) Amplification Benefit Questionnaire
- Hearing Aid Fitting Summary
- Aided Speech Intelligibility Index (SII) Normative Values
- LittlEARS Auditory Questionnaire (Tsiakpini et al, 2004)
- Parent's Evaluation of Aural/Oral Performance of Children (PEACH) (Ching & Hill, 2005)

OIHP Amplification Benefit Questionnaire

- 11-item questionnaire jointly developed by the OIHP and Child Amplification Laboratory at UWO
- 5-point rating scale for parents addressing:
 - Acceptance and use of hearing aids
 - Auditory performance for different levels of sound
 - Effectiveness of service delivery
 - Overall satisfaction
 - Final question is open-ended asking about how hearing aid services could be improved

Where to find: UWO PedAMP v1.0 Training Manual

Hearing Aid Fitting Details

Reasons for Tracking Hearing Aid Fitting Details

- Good auditory-related outcomes infer good audibility from hearing aids
 - Important part of outcome evaluation guideline
- Clinician can determine whether individual child's fitting is providing a typical degree of audibility
- Provides overall reporting information for the Early Hearing Detection and Intervention (EHDI) program as a whole
 - Programs need measurable outcomes

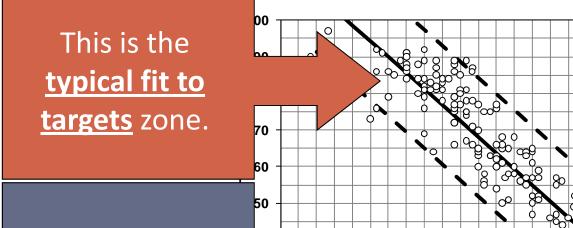
Hearing Aid Fitting Details

- Real-Ear-to-Coupler Difference (RECD)
- Maximum Power Output (MPO)
- Speech Intelligibility Index (SII)
 - Soft = 55 dB SPL
 - Average = 65 dB SPL

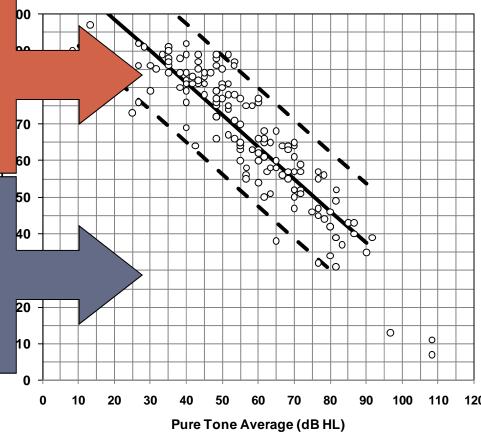
- •Proportion of speech above threshold
- Percentage value
- •Not a speech recognition score

Aided SII Normative Data

Average Speech Input (65 dB SPL)



This is the under targets zone.



Data courtesy of S.T. Moodie and Clinician Network

Appointment Type (Aided)

		Initial Assessment	Prefitting	Initial Fitting	30 Day Recheck	3 month Recheck	6 month Recheck	Yearly Rechecks	Event Driven
luation Tool	Hearing Aid Fitting Details	×	×	\checkmark	×	J	V	✓	✓
		×	×	×	×	<	✓	>	✓
tcome Eva		√ Establish Unaided Baseline: Administer at one of these appointments			√ If score ≥27, stop LittlEARS, use PEACH.	√ If score ≥27, stop LittlEARS, use PEACH.	√ If score ≥27, stop LittlEARS, use PEACH.	√ If score ≥27, stop LittlEARS, use PEACH.	✓
Out	PEACH	×	×	×					√

Hearing Aid Fitting Details



- RECD
- MPO
- SII

Functional Outcomes

- LittlEARS
- PEACH

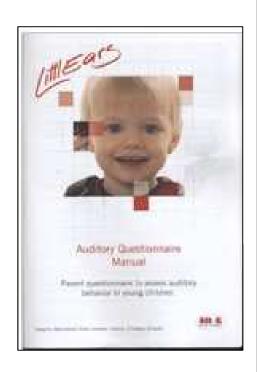
The LittlEARS Auditory Questionnaire

http://www.earfoundation.org.uk/shop/items/98 Other languages direct from MED-EL. Tel: +44 (0) 1226 242 874

LittlEARS (Tsiakpini et al, 2004)

- Goal: to assess auditory development during first 2 years of hearing
 - Receptive auditory behaviour
 - Semantic auditory behaviour
 - Expressive vocal behaviour

 Format: 35 yes/no questions listed in developmental order



LittlEARS

- Scoring: All 'yes' answers are added and compared to average and minimum values
- Normative data collected with 218 German-speaking families (Weichbold et al, 2005)
 - Reliable
 - Good internal consistency
 - Good discriminative ability
 - Good correlation of overall score and age of child
 - Validated in 15 languages (Coninx, et al, 2009)

Canadian Validation Study

- Data collected at H.A. Leeper Speech and Hearing Clinic, Humber River Regional Hospital, Rouge Valley Health System
- As a result, minor modifications to administration and score sheet
 - No changes to questionnaire items
- Network of Pediatric Audiologists of Canada examined questionnaire, administration guidelines and modified score sheet and provided feedback
 - 92% felt it was a suitable clinical tool

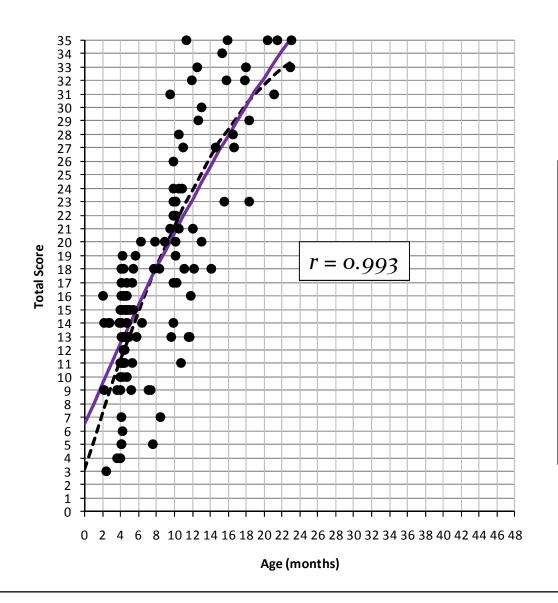
Canadian Validation Study

Subpopulation	Number of Participants	Mean Age (months)	Age Range (months)	
Normal Hearing	207	10.3	1.3-44.6	
ANSD	21	14.1	3.9-45.1	
Middle Ear Dysfunction	12	5.5	1.83 - 10.0	
Unaided PCHI	55	15.3	1.9-66.4	
Aided PCHI*	32	27.9	6.9-72.7	
Total	327	14.6	1.3 - 72.7	

^{*} Clinicians followed OIHP hearing aid fitting protocol (Bagatto et al, 2010)

Analysis

1) Validation: Normal Hearing Children



--- German Norms
--- Canadian Norms

Canadian Raw Data:

Typically Developing,≤ 24 months of age

Quadratic Regression Curves

German Norm Curve: N = 218

Canadian Norm Curve: N = 130

Mean age = 8.11 months

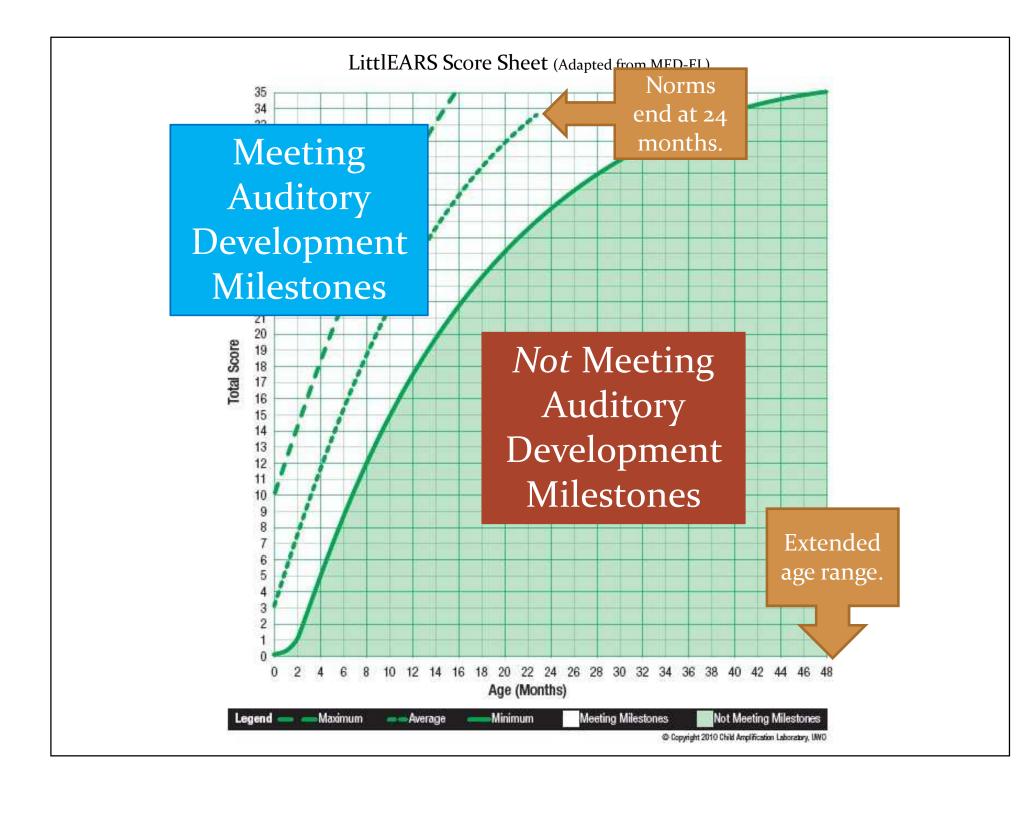
Age range = 2 to 23 months

Standard Deviation = 4.93

Mean score = 18

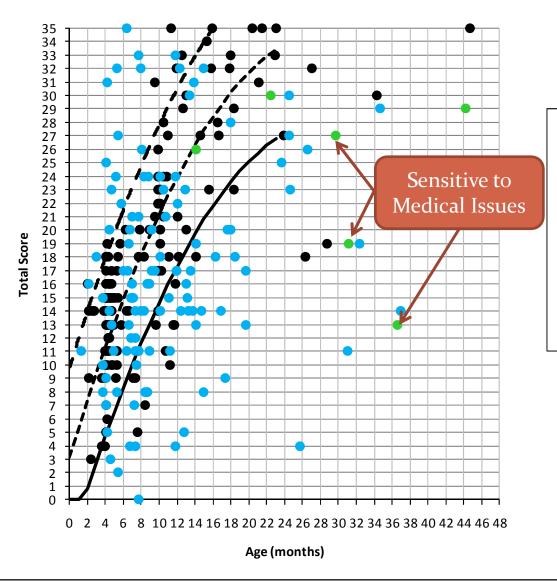
Score range = 3 to 35

Standard Deviation = 7.83



Results

1) Validation: Normal Hearing Children



German Norms:

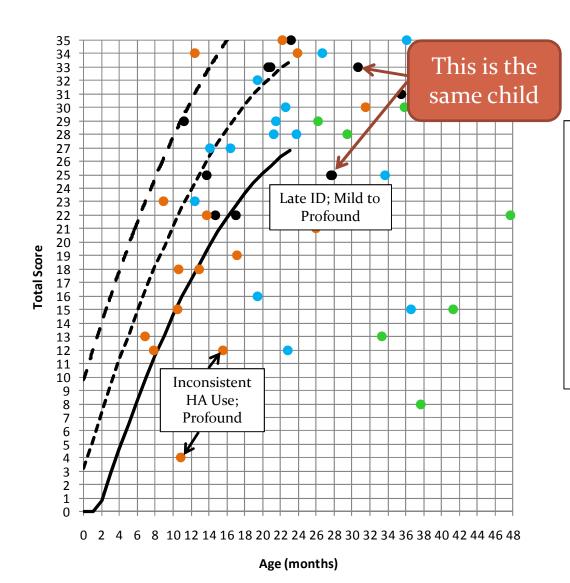
- ---- Average
- **-** · Upper 95 % confidence interval
- Lower 95 % confidence interval

Canadian Raw Data:

- Typically Developing
- Premature (chronological age)
- Medical Issues

Results

2) Children with Hearing Aids



German Norms:

- ---- Average
- **-** · Upper 95 % confidence interval
- Lower 95 % confidence interval

Canadian Raw Data:

- Typically Developing
- Premature (chronological age)
- Medical Issues
- Complex Factors

Summary: LittlEARS

- Short questionnaire that parents and clinicians find feasible to complete
- Norms developed from normal hearing children work well
- Sensitive to medical issues
 - Require more data to characterize different patient profiles
- Useful for monitoring the progression of auditory behaviours in infants and young children
 - Normal hearing
 - PCHI but unaided
 - PCHI and aided



The Parent's Evaluation of Aural/Oral Performance in Children (PEACH)

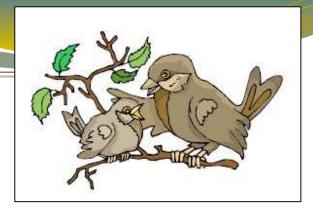
Diary:

http://www.nal.gov.au/outcome-measures_tab_peach.shtml

Rating Scale:

http://www.outcomes.nal.gov.au/LOCHI%20assessments.html

PEACH (Ching & Hill, 2005)



- Goal: to evaluate effectiveness of device for infants and children with hearing impairment
- Format: 13 item questionnaire assesses
 - hearing aid use
 - loudness discomfort
 - communication in quiet and noise
 - phone use
 - responsiveness to environmental sounds

PEACH Diary

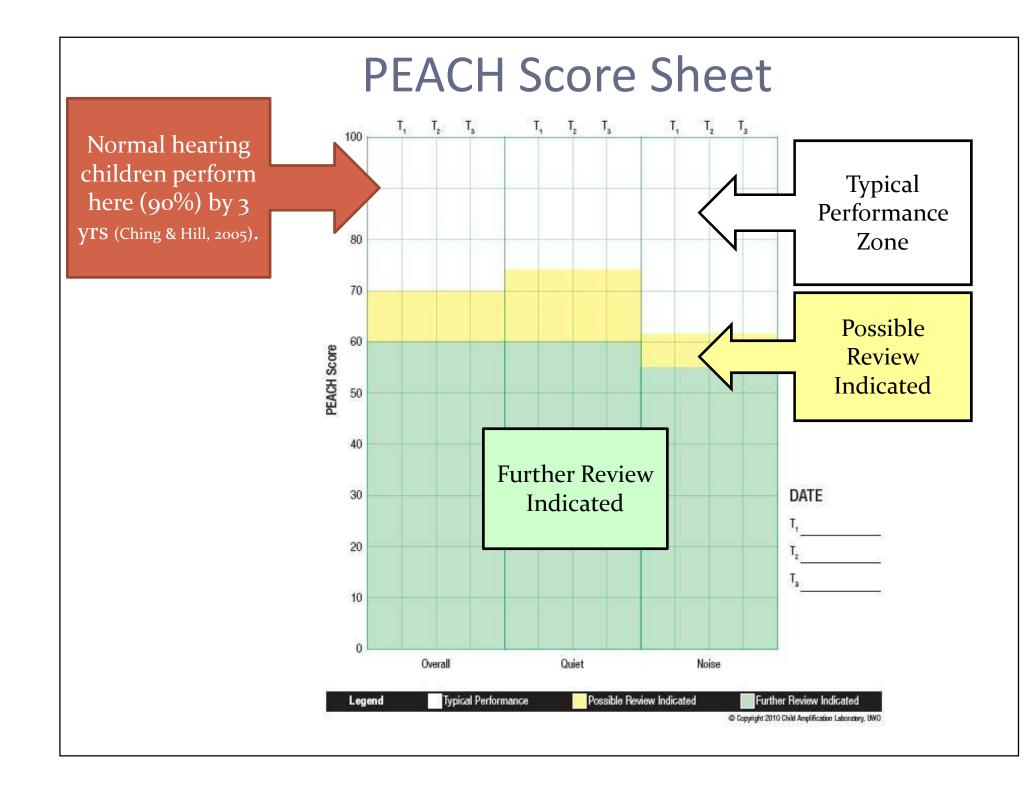
- Administration: systematic parental observation for 1 week followed by a structured interview with audiologist
- Good internal consistency and test-retest reliability
- Normative data collected with 90 parents of normal hearing children and 90 parents of hearing impaired children (Ching et al, 2007)
- Ching et al, 2008 demonstrated the tool is responsive to evaluating the impact of changes in hearing aid frequency response in severe to profound fittings

PEACH Rating Scale

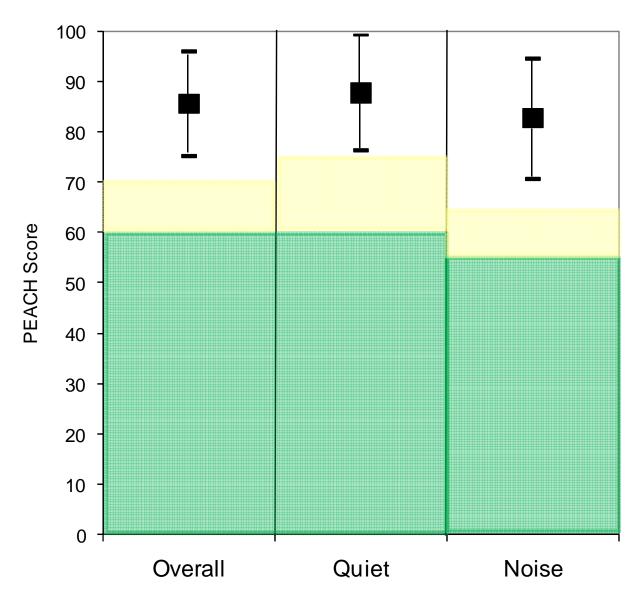
- 5-point rating scale
- Includes most of the scenarios from the Diary
- Parents think about their child's behaviour over the past week in relation to each question
 - Can be done in one appointment
 - No follow-up interview by clinician necessary
- Percentage scoring

PEACH Scoring

- No score sheet provided with PEACH, therefore, needed to develop one from existing literature and preliminary data
- Ching et al, 2005, 2008, NAL/DSL Study
 - Normal hearing children achieve 90% around age 3 years
 - Hearing impaired children achieve a range
 - Ching et al, 2005 = 62%
 - Ching et al, 2008 = 66%
 - NAL/DSL Study = 80%
 - Ching, Scollie, Dillon, Seewald, et al., 2010

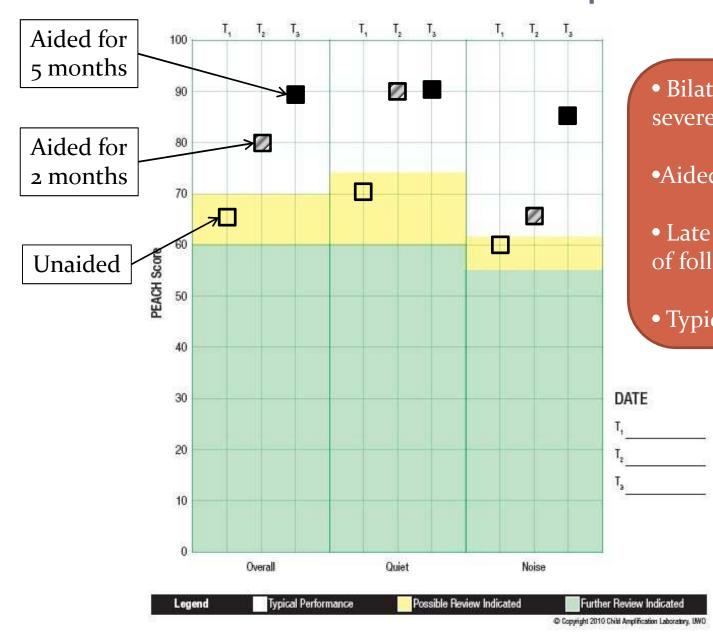


Preliminary Data: Aided PCHI



- 23 Subjects
- Typically developing
- Mean Age = 46.91 months
- Age Range = 20.63 78.40

Case Example



- Bilateral moderatelysevere hearing loss
- •Aided at 4.5 yrs of age
- Late fitting due to lack of follow-up
- Typically developing

Summary: PEACH

- Assesses functional auditory performance in quiet and noisy situations
 - Can compare to hearing impaired children who wear hearing aids using score sheet
- Can identify whether child is or is not performing typical auditory behaviours
- For example:
 - If noise score is poor, can discuss noise options

UWO PedAMP within an EHDI Program

 Implemented with children who may or may not wear hearing aids

- Consists of:
 - OIHP Amplification Benefit Questionnaire (aided only)
 - Hearing Aid Fitting Summary (aided only)
 - LittlEARS Auditory Questionnaire
 OR
 - PEACH Rating Scale

Importance of Outcome Evaluation

- Patients
 - Track and monitor
 - Involve parents result: good observers
 - Shared language
- Audiologists
 - Way to measure impact of hearing aid fitting
 - Improve efficiency and effectiveness of service delivery
 - Improve communication with families and professionals
- EHDI
 - Measure how program is doing
 - Helps describe patterns that affect children within the program

UWO PedAMP



- A guideline consisting of several outcome evaluation tools that aim to measure auditoryrelated outcomes in infants and young children
 - Visual tools to permit rapid scoring
 - Preliminary data to support interpretation
 - The UWO PedAMP will evolve through clinical implementation
 - Community of practice is important for success





Thank you...

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