A Clinical Approach to Validating Hearing Aid Fittings in Infants an Young Children

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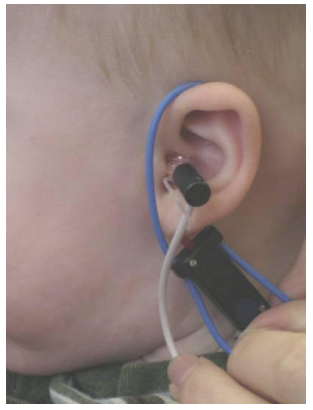
Collaborators:

- Ontario Ministry of Children and Youth Services Infant Hearing Program
- Richard Seewald, Doreen Bartlett, Linda Miller, Anita Kothari
- Martyn Hyde
- April Malandrino, Christine Brown, Frances Richert, Debbie Clench
- Network of Pediatric Audiologists of Canada

Audiometric Assessment



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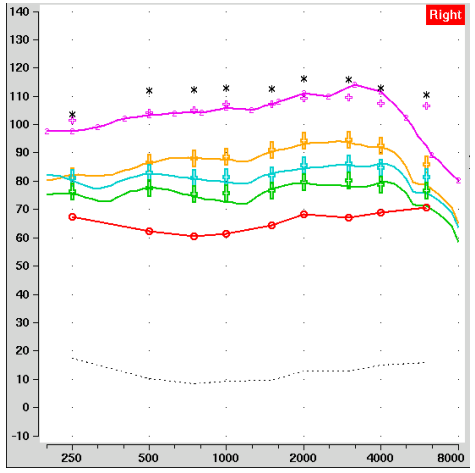
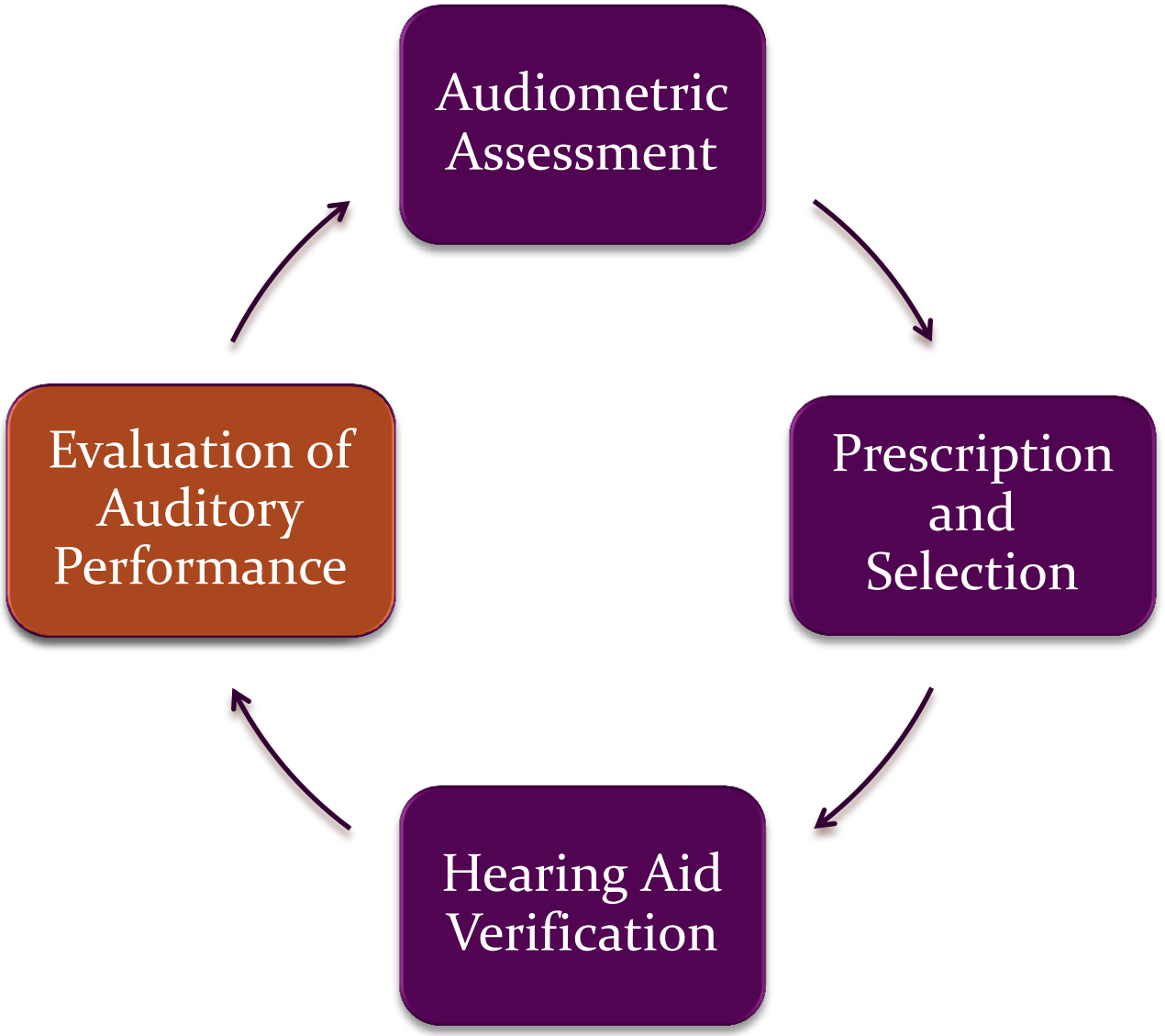
Prescription and Selection



Hearing Aid Verification

Evaluation of Auditory Performance

Process of Pediatric Hearing Aid Fitting



Provision of Hearing Aids

- Suitable technology and evidence-based hearing aid fitting protocols support accurate and safe hearing aid fittings for the pediatric population
  - American Academy of Audiology, 2013
  - Australian Protocol; King, 2010
  - British Columbia Early Hearing Program, 2006
  - Modernizing Children's Hearing Aid Services, 2005
  - Ontario Protocol; Bagatto, Scollie, Hyde & Seewald, 2010

Use of these protocols is important when evaluating candidacy for cochlear implantation.

Clinical Need:

Pediatric audiologists who fit young infants with hearing aids need tools to measure the impact of the hearing aid on the child's auditory development

Program Need:

Early Hearing Detection and Intervention (EHDI) programs need tools to assess the overall quality of the program

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

The University of Western Ontario

PEDAMP

Pediatric Audiological Monitoring Protocol

Version 1.0

Marlene Bagatto, Sheila Moodie, Susan Scollie

2010

www.dslio.com

Trends in Amplification, 2011, Volume 15

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

The University of Western Ontario
PEDAMP
Pediatric Audiological Monitoring Protocol

- Maximize efficiency and interpretation through:
  - visual tools to permit rapid scoring
  - data to support interpretation

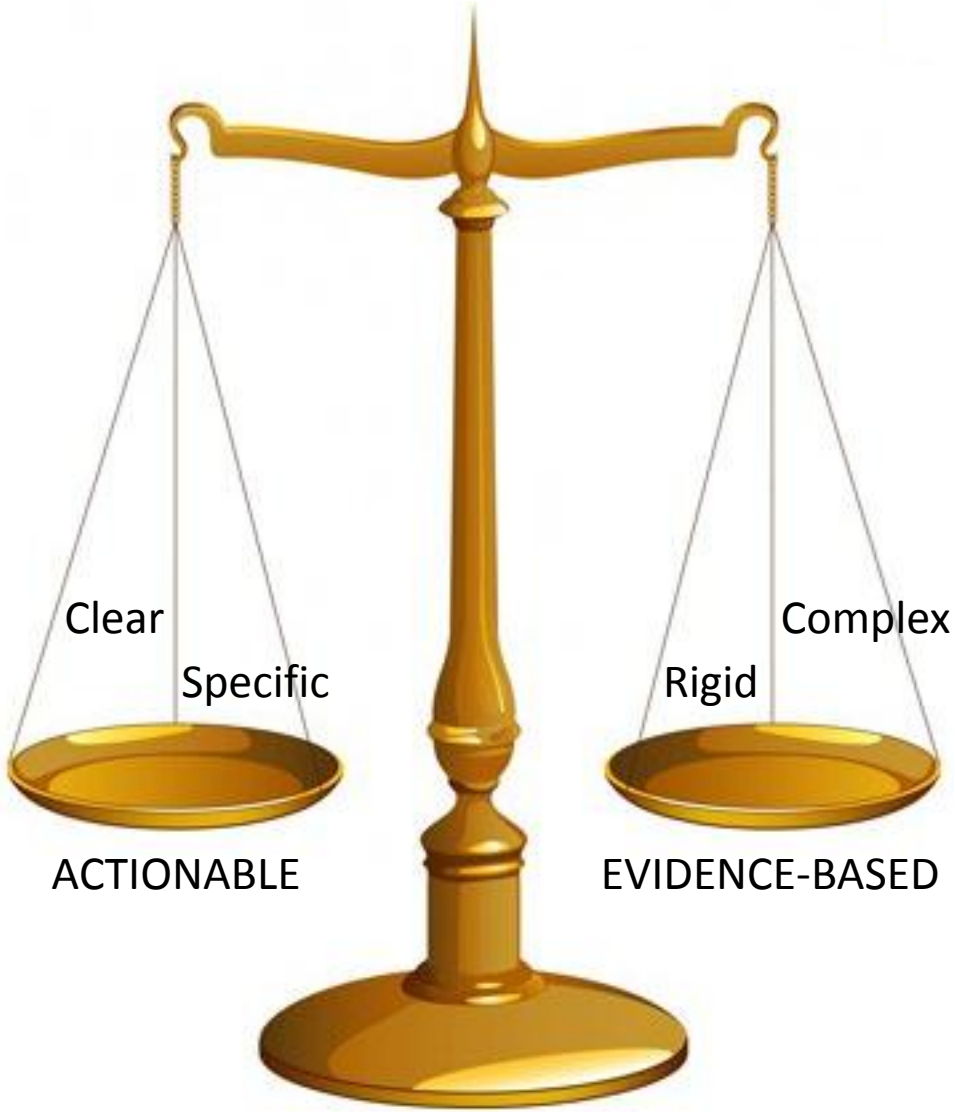
Community of Practice (Sheila Moodie)

- 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)



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)

Administration Guideline

Appointment Type (Aided)

Outcome Evaluation Tool	Initial Assessment	Prefitting	Initial Fitting	30 Day Recheck	3 month Recheck	6 month Recheck	Yearly Rechecks	Event Driven
Hearing Aid Fitting Details	×	×	✓	×	✓	✓	✓	✓
IHP Hearing Aid Benefit	×	×	×	×	✓	✓	✓	✓
LittlEARS	✓ Establish Unaided Baseline: Administer at one of these appointments			✓ If score ≥27 & >24 mos, stop LittlEARS, use PEACH.	✓ If score ≥27 & >24 mos, stop LittlEARS, use PEACH.	✓ If score ≥27 & >24 mos, stop LittlEARS, use PEACH.	✓ If score ≥27 & >24mos, stop LittlEARS, use PEACH.	✓
PEACH	×	×	×	↓	↓	↓	↓	✓

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: www.dslio.com

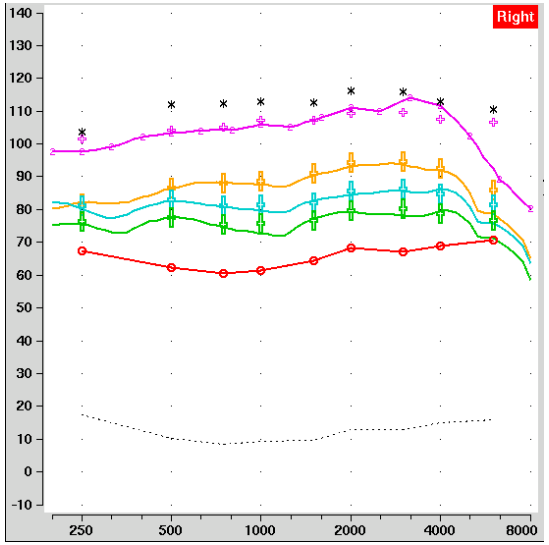
Hearing Aid Fitting Details

Reasons for Tracking Hearing Aid Fitting Details

- Good auditory-related outcomes infer good audibility from hearing aids
- 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*

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



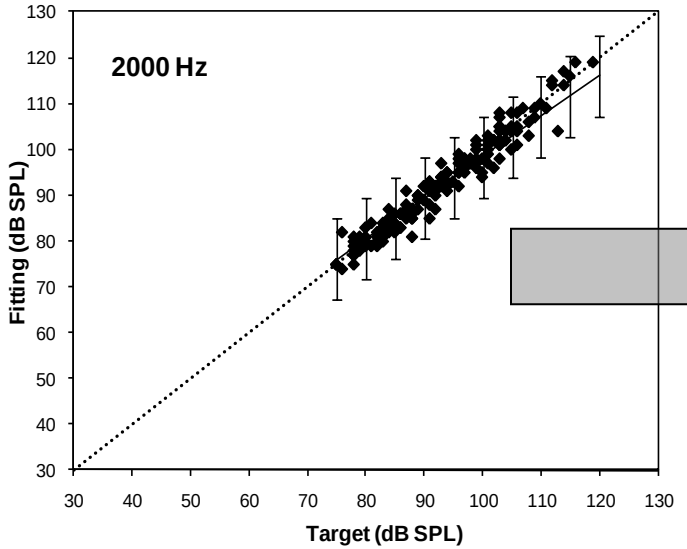
•Proportion of speech above threshold

•Percentage value

•Not a speech recognition score

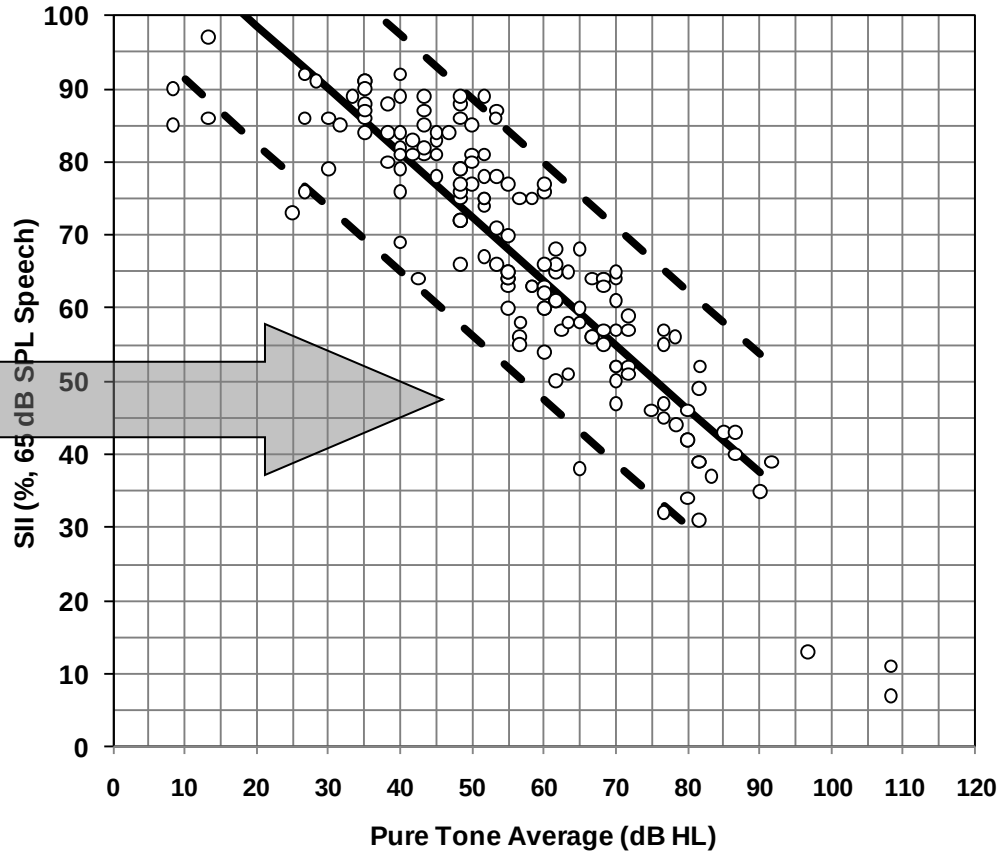
Aided SII Normative Data

Fit to Targets – within 5 dB



Data courtesy of S. Moodie and Clinician Network

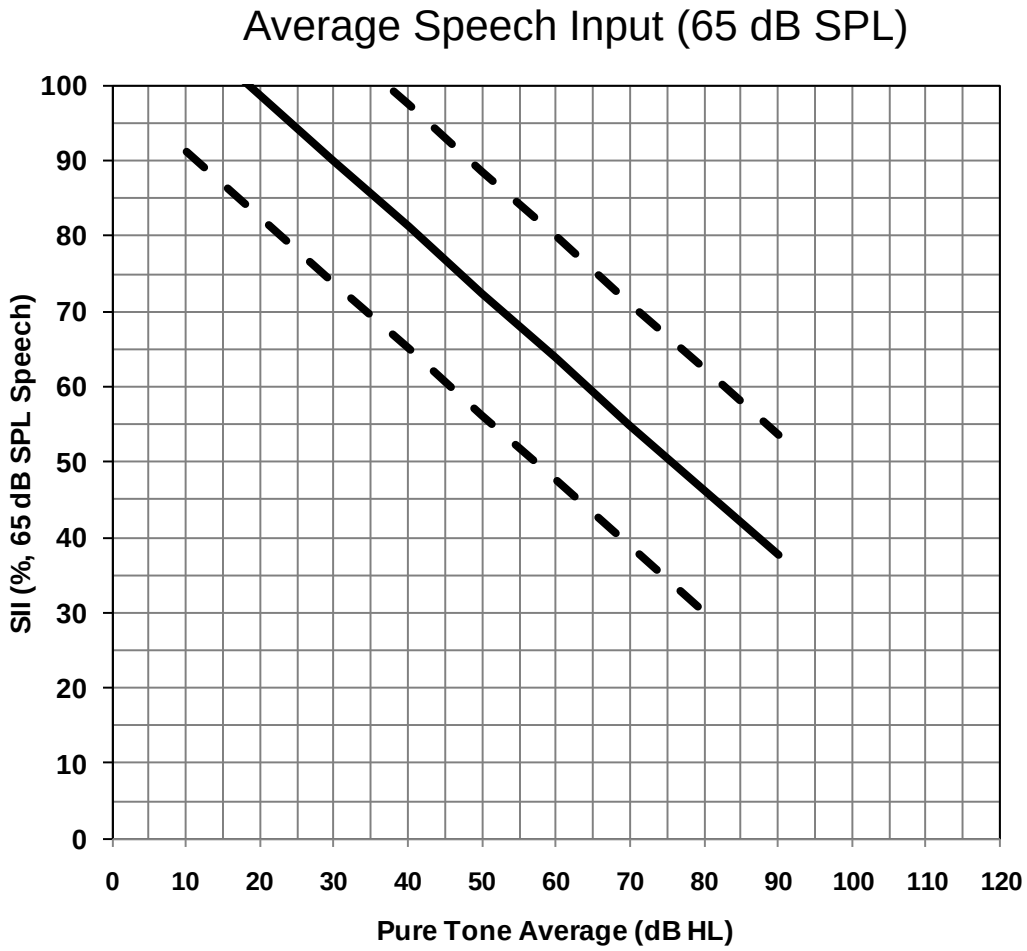
Average Speech Input (65 dB SPL)



Using the SII Normative Data

This is the **typical fit to targets** zone.

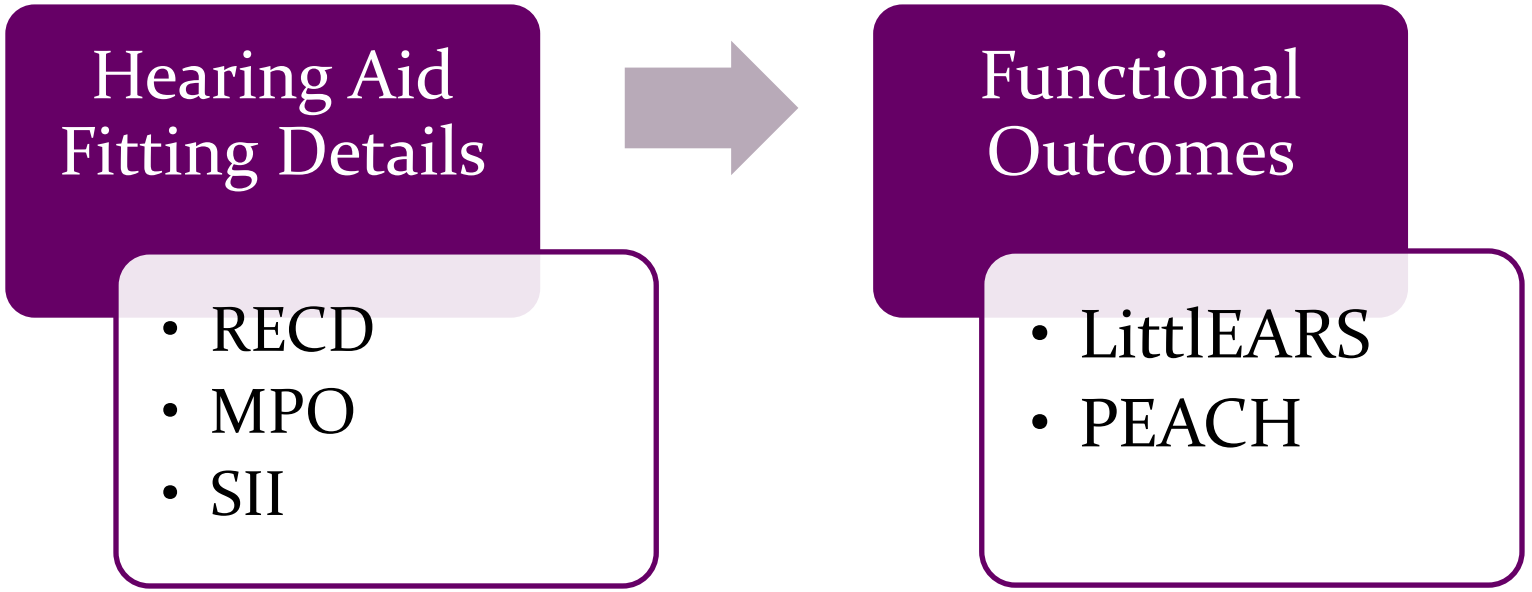
This is the **under targets** zone.



Recommended Fit-to-target Criteria

For losses ≤ 70 dB PTA:
- 5 dB from 250 – 2000 Hz
- 5 to 7 dB at 4000 Hz

For losses >70 dB PTA:
- insufficient data
- recognize inherent limitations of this fitting


Hearing Aid Fitting Details
• RECD
• MPO
• SII
Functional Outcomes
• LittlEARS
• PEACH

The LittlEARS Auditory Questionnaire

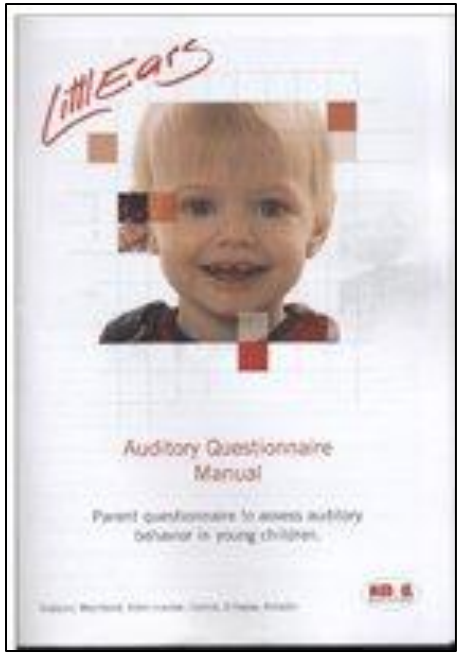
http://www.earfoundation.org.uk/shop/items/98

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

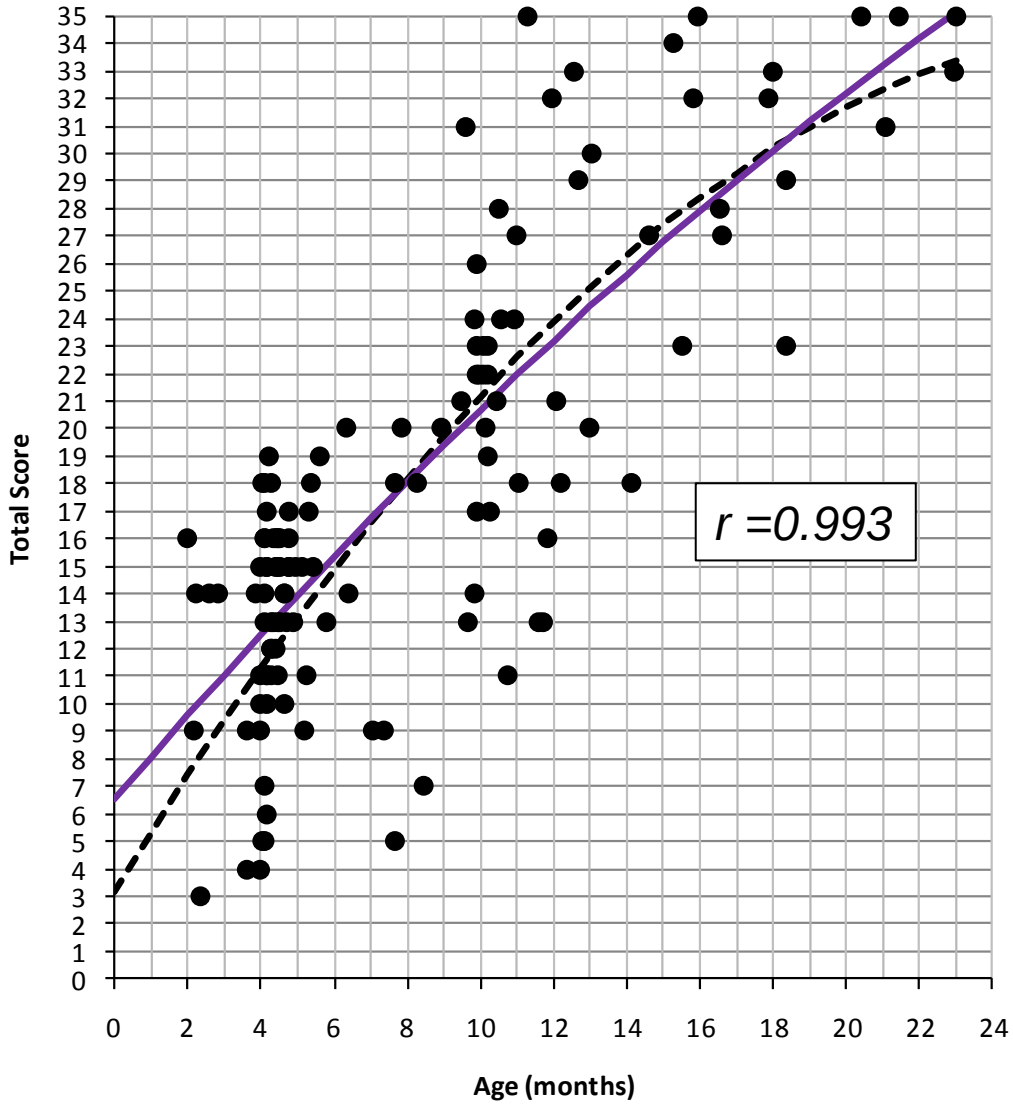
- Normative data collected with 218 German-speaking families (Weichbold et al, 2005)
  - Reliable
  - Good internal consistency
  - Good discriminative ability
  - Good correlation of overall score and age of child
  - Validated in 15 languages (Coninx, et al, 2009)
  - Available in 31 languages, including Mandarin

External Validation of the LittlEARS® Auditory Questionnaire with English-Speaking Families of Canadian Children with Normal Hearing

Bagatto, Brown, Moodie & Scollie, 2011

International Journal of Pediatric Otorhinolaryngology
Volume 75(6): 815-7

Validation: Normal Hearing Children



German Norms
Canadian Norms

Canadian Raw Data:
Typically Developing, ≤ 24 months of age

Quadratic Regression Curves

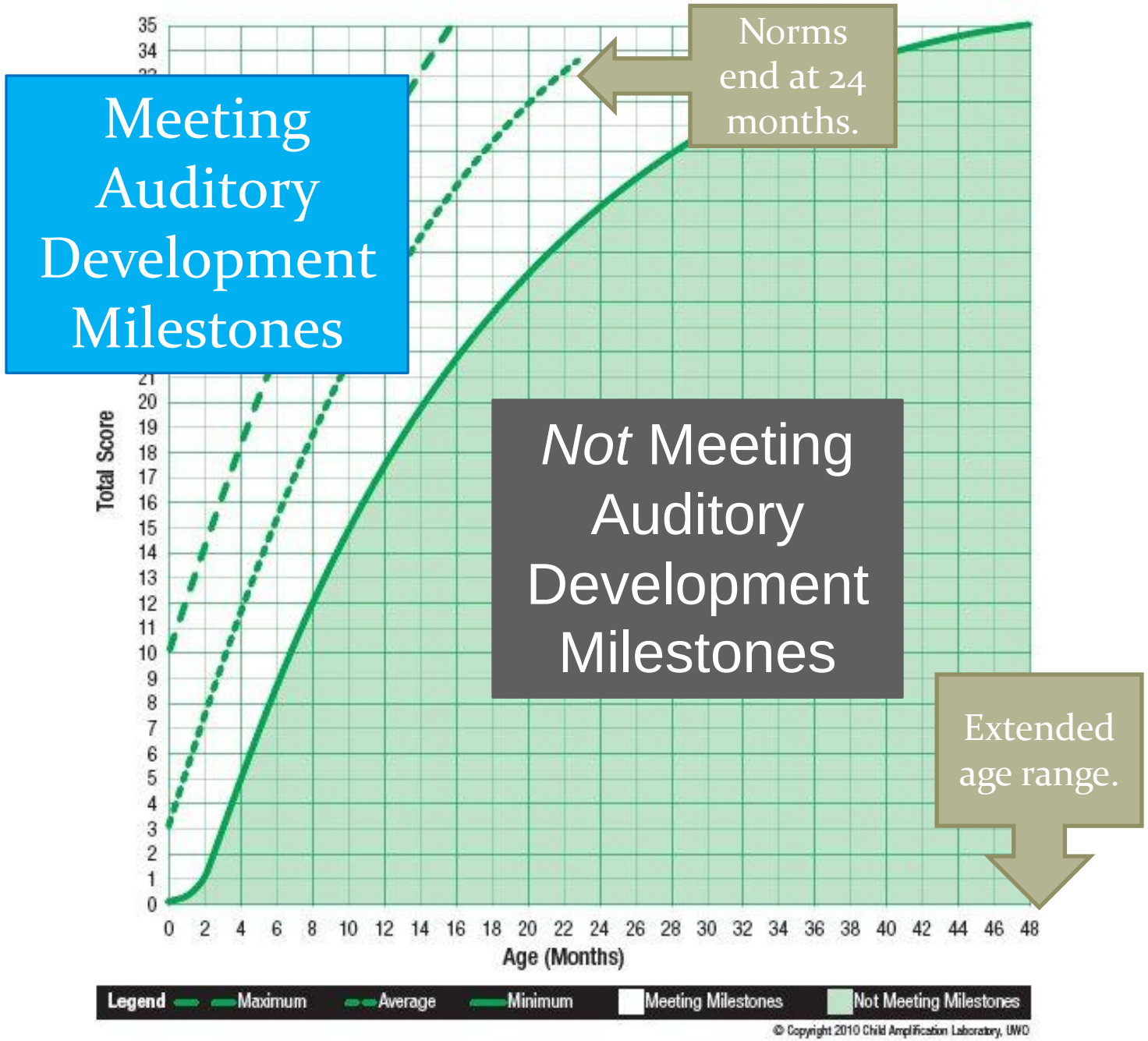
German Norm Curve: N = 218

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

Bagatto et al, 2011
Int J Ped Otorhinolaryn

LittlEARS Score Sheet (Adapted from MED-EL)



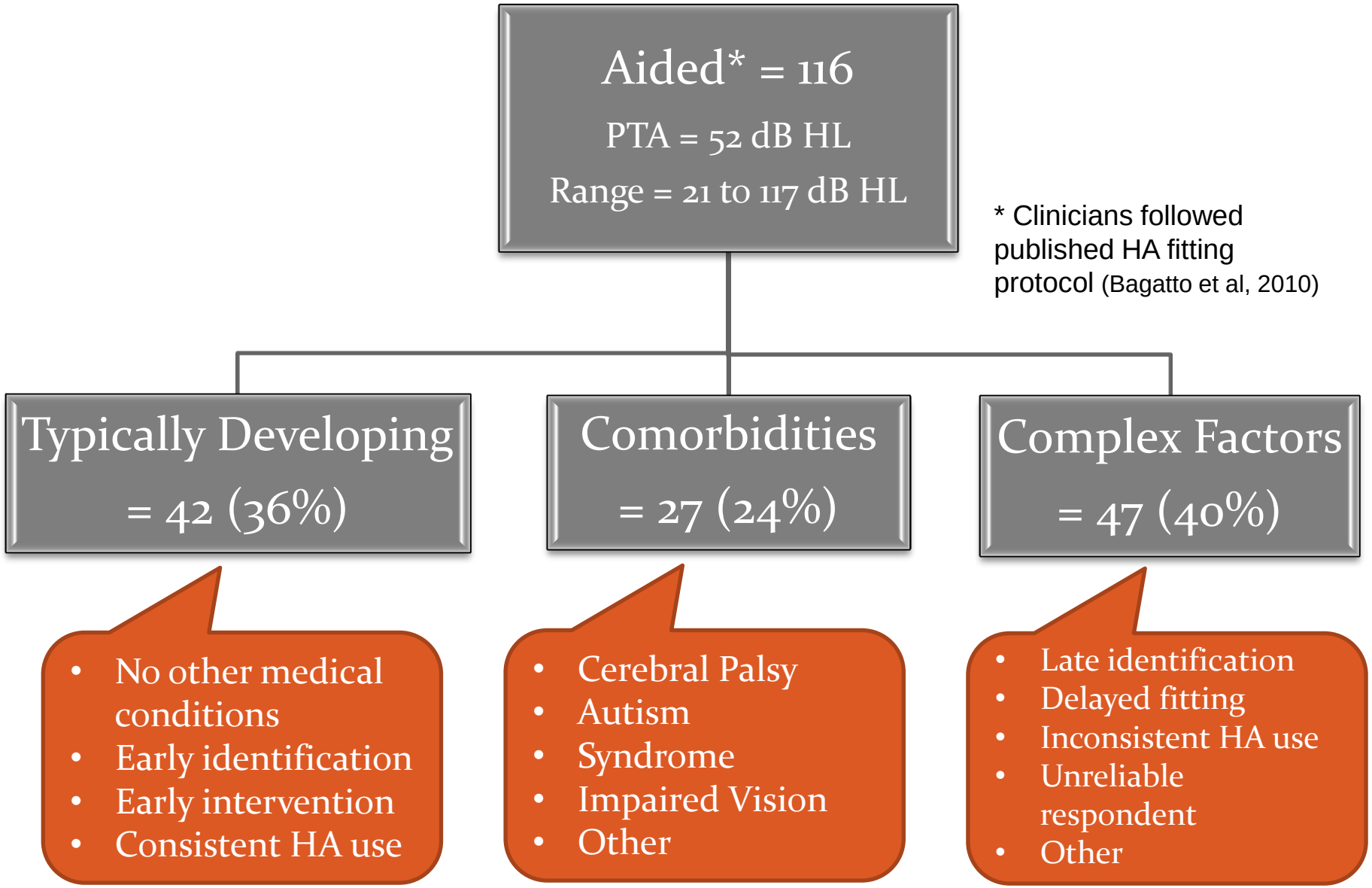
The University of Western Ontario Pediatric Audiological Monitoring Protocol (UWO PedAMP)

Bagatto, Moodie, Malandrino, Richert, Clench & Scollie

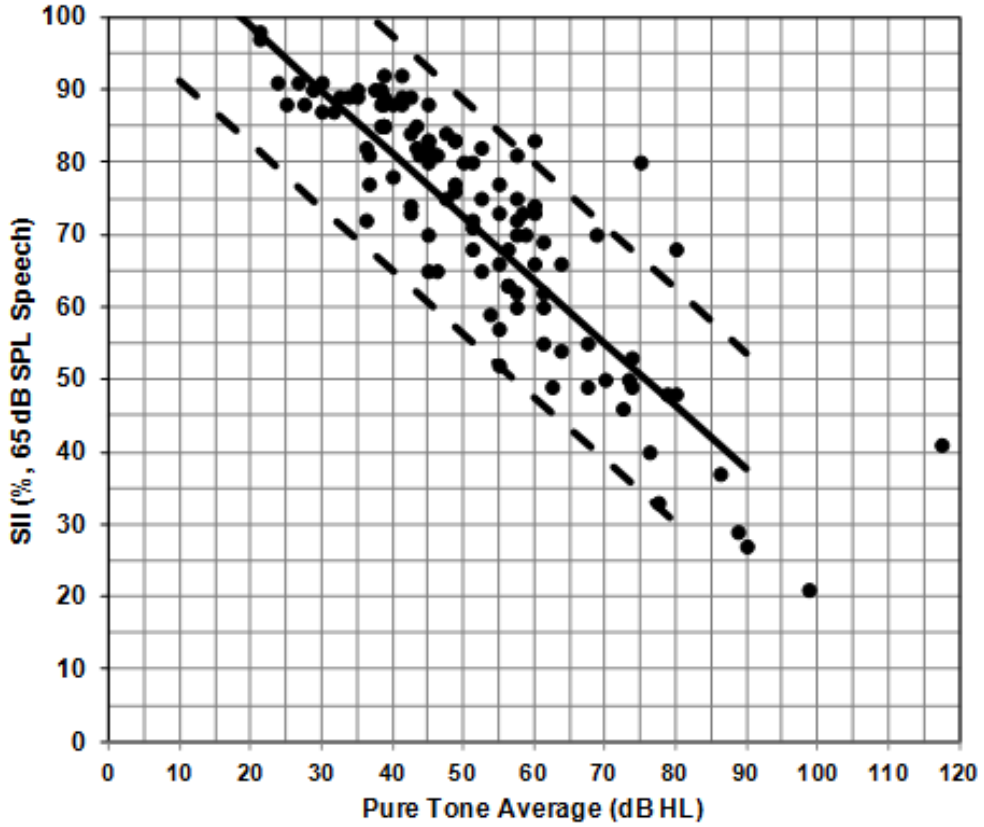
2011

Trends in Amplification
Volume 15(1): 57-76

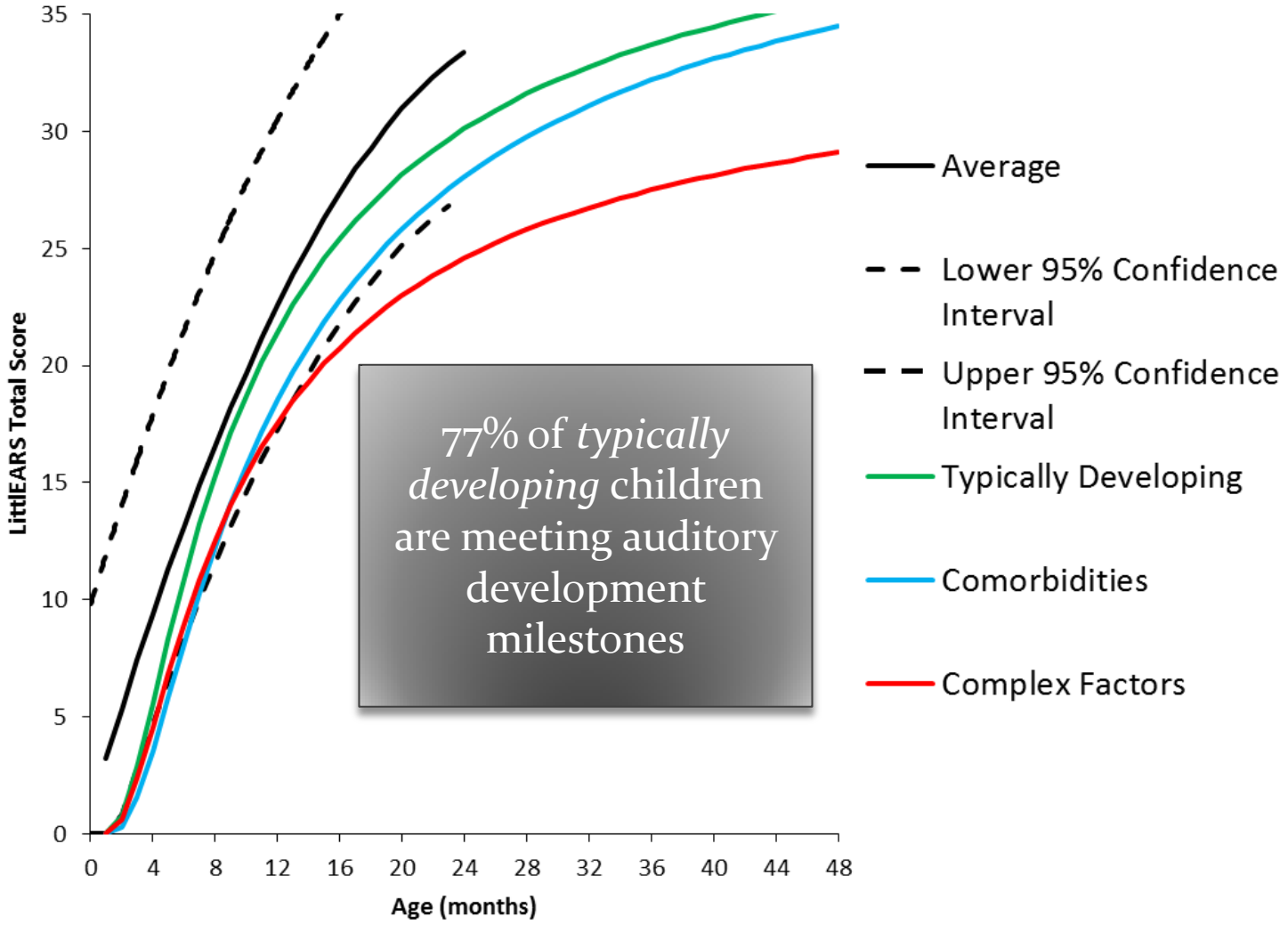
Longitudinal Clinical Observation Study



SII Data from Current Study



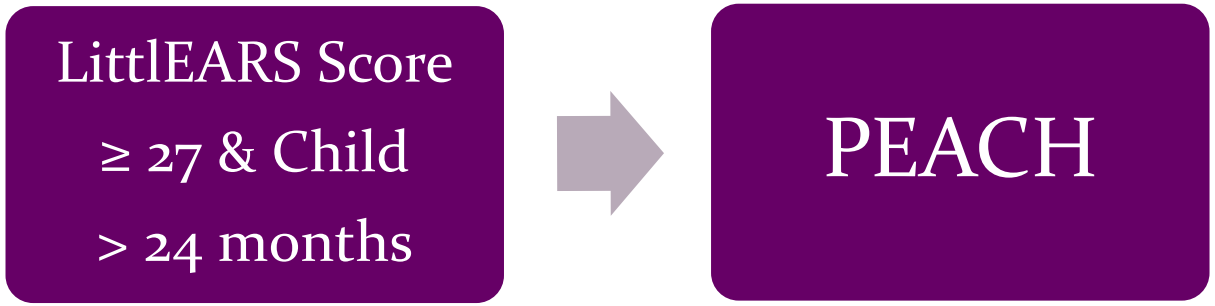
All Profiles of Children with Hearing Aids



Summary: LittlEARS

- Short questionnaire that parents and audiologists find feasible to complete
- Provides information regarding the child's auditory development in relation to normal hearing peers
  - Monitoring unaided children
- With repeated administrations provides a description of the child's progress
  - In relation to individual and normal hearing peers
  - Can contribute to the overall profile of the child

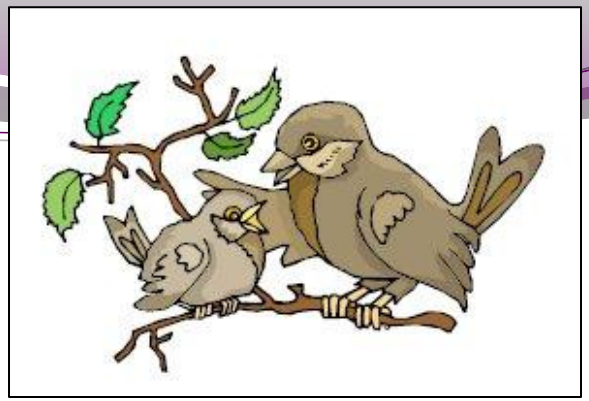
Two-Stage Outcome Measurement Process



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

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 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
- Addition and percentage scoring
- Available in 15 languages, including Mandarin

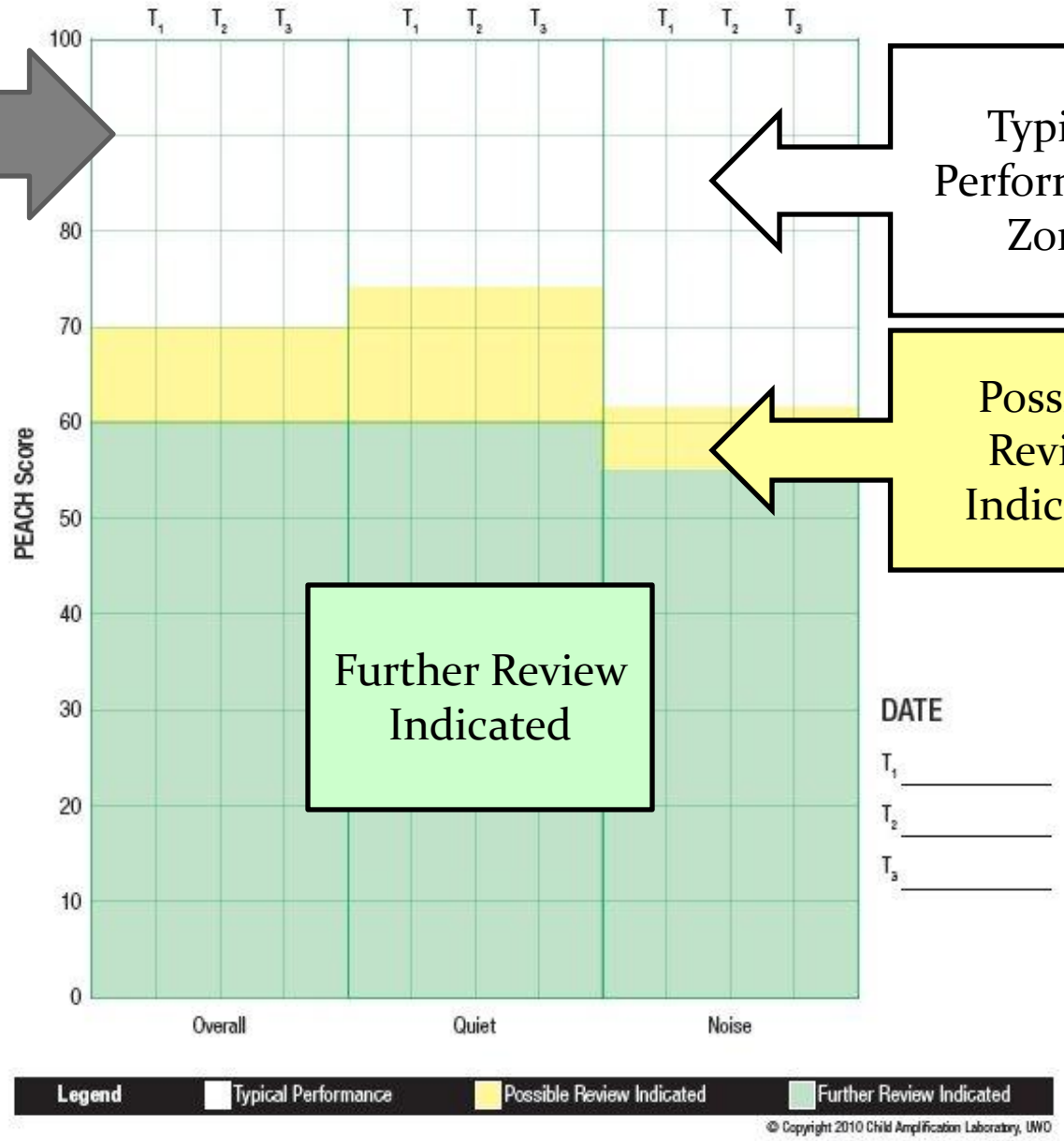
PEACH Scoring

- 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

PEACH Score Sheet

Normal hearing children perform here (90%) by 3 yrs (Ching & Hill, 2005).

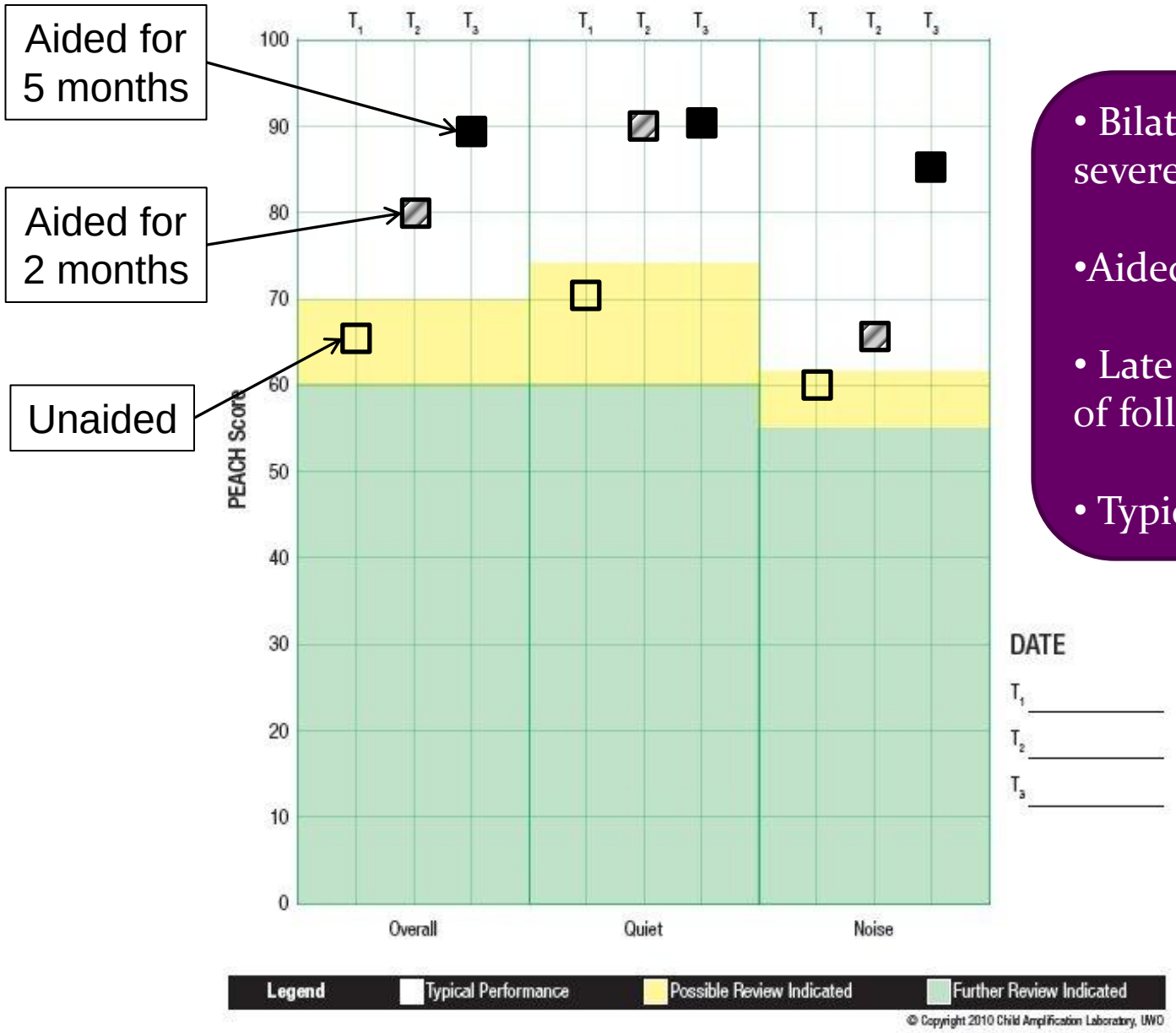


Typical Performance Zone

Possible Review Indicated

Further Review Indicated

Case Example



- Bilateral moderately-severe 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

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PEDAMP
Pediatric Audiological Monitoring Protocol

- A guideline consisting of several outcome evaluation tools that aim to measure *auditory-related 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

Process of Pediatric Hearing Aid Fitting

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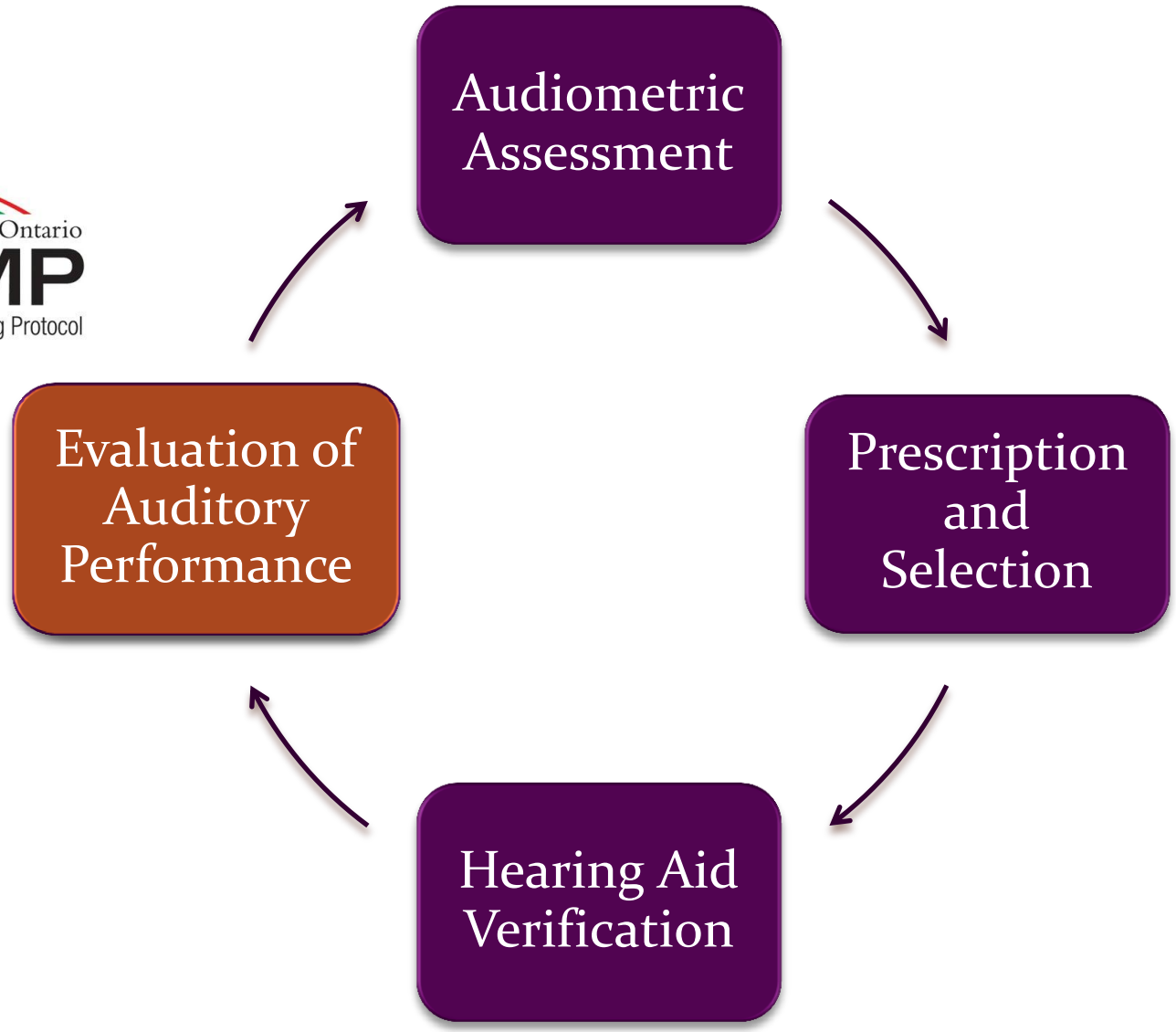

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