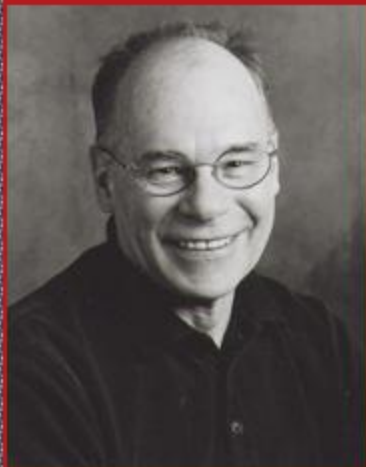


Richard Seewald

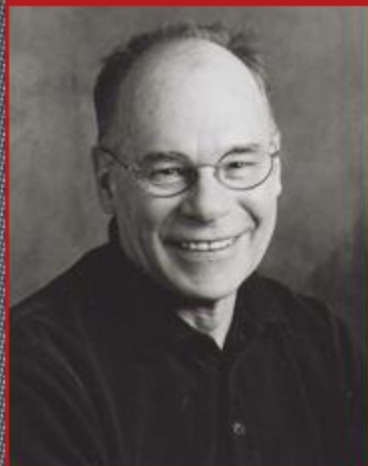
Centro de Investigación de Audición Infantil
Centro Nacional de Audiología. University of Western Ontario
London, Canadá



- Investigador pionero en el campo de la audiología y la adaptación pediátrica de audífonos
- Reconocido internacionalmente por crear el método de Nivel de Sensación Deseada (DSL) para la adaptación pediátrica de audífonos
- Director y editor de las actas de cuatro conferencias internacionales sobre tratamiento precoz de la hipoacusia en la infancia

Richard Seewald

Centro de Investigación de Audiología Infantil
Centro Nacional de Audiología. University of Western Ontario
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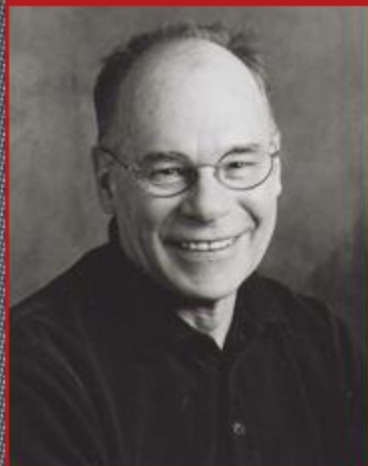


Protocolo de adaptación de audífonos en niños
de 3 a 18 meses: prescripción y selección

*Hearing instrument fitting protocols in infants
from 3 to 18 months of age: assessment
procedures*

Richard Seewald

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Protocolo de adaptación de audífonos en
niños de 3 a 18 meses: adaptación y verificación

*Hearing instrument fitting protocols in infants
from 3 to 18 months of age: fitting and
verification procedures*

Hearing Instrument Fitting Protocol in Infants 3 to 18 Months of Age:

Assessment Considerations

Richard Seewald, Ph.D.

Professor and Canada Research Chair in Childhood Hearing

National Centre for Audiology

The University of Western Ontario

London Ontario Canada

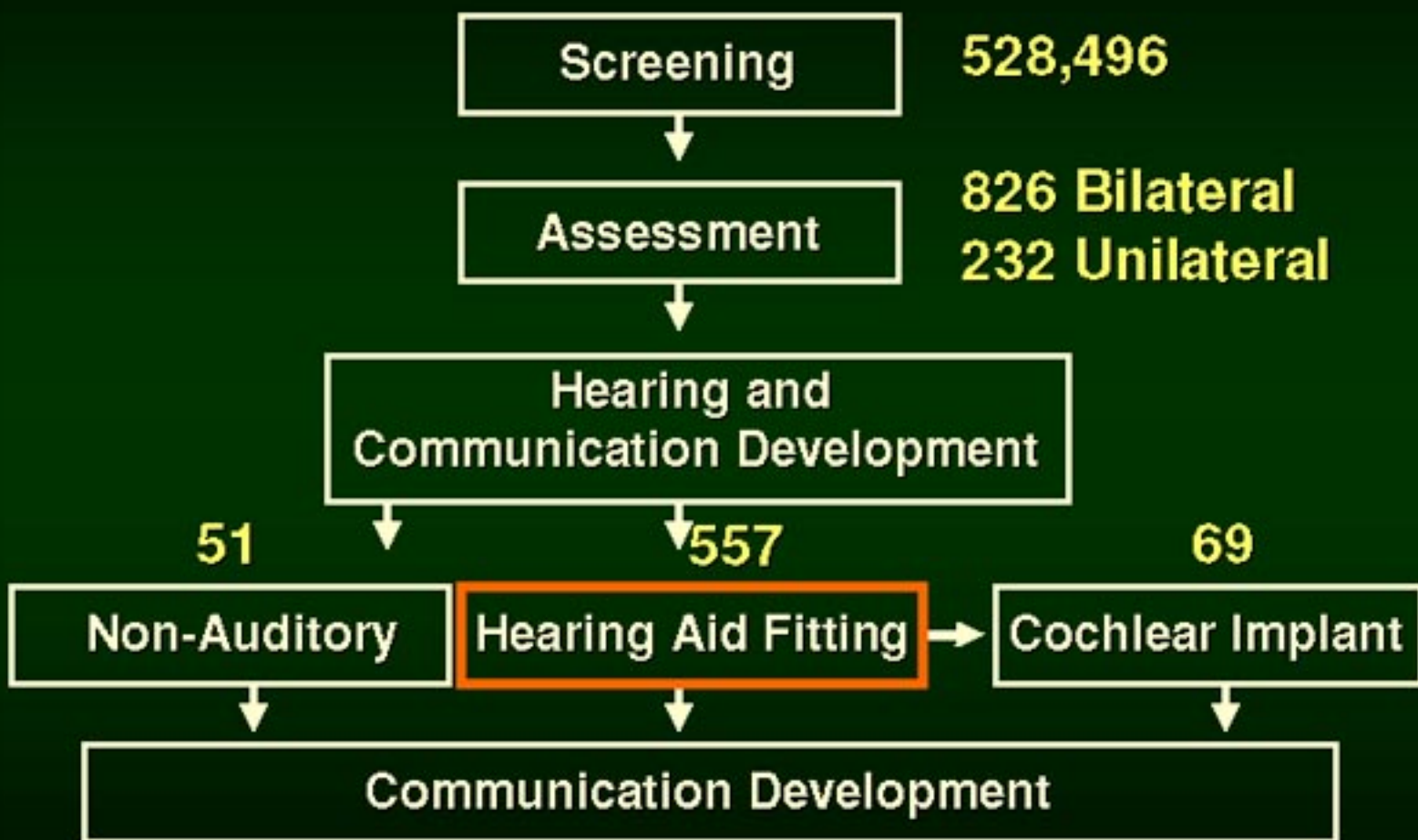




DSL Website

<http://www.dslio.com>

Early Hearing and Communication Development Program



The Fitting Process



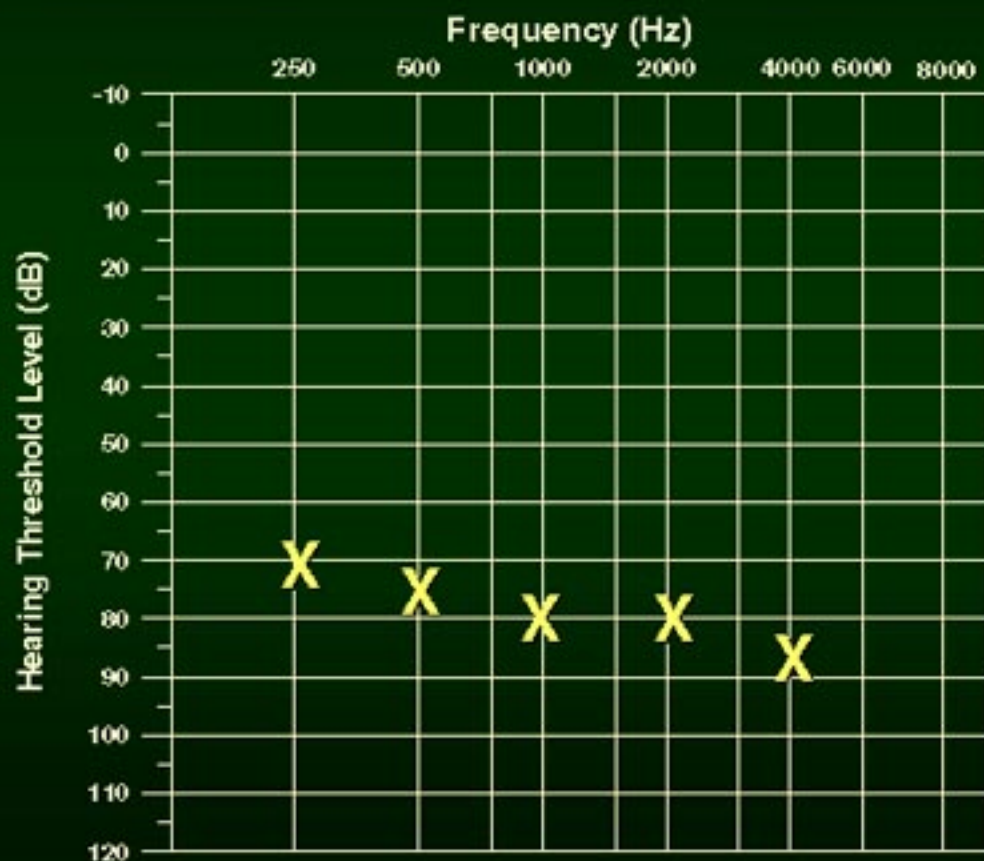
The Fitting Process



What we want to know . . .

That we have achieved a good match between the amplification characteristics of hearing instruments and the auditory characteristics of infants and children so that *the use of their residual auditory capacity can be maximized.*

dB HL Threshold-based prescription



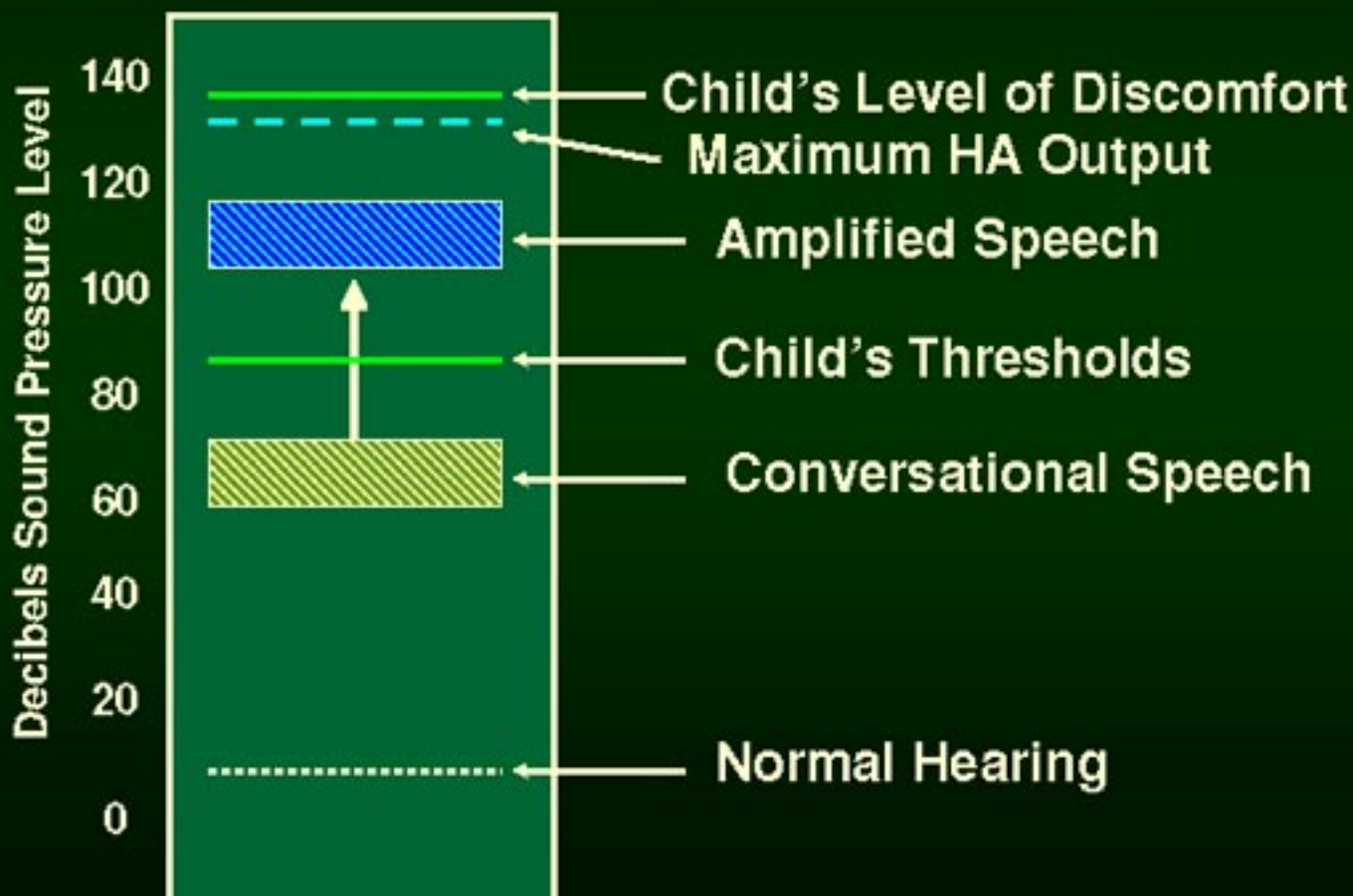
Conventional Audiometry for Hearing Instrument Fitting

All of the variables we are working with
are not defined in the same way or at
the same location.



An Electroacoustic-Based Approach to Pediatric Fitting

The Electroacoustic-based Approach to Fitting (from Erber 1973)



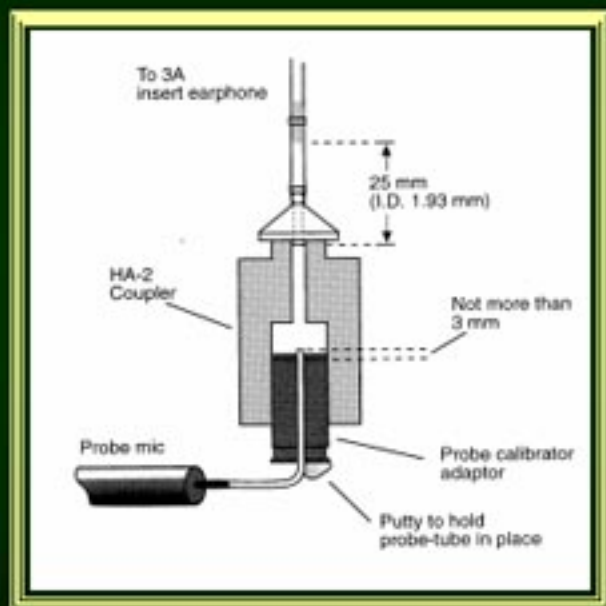
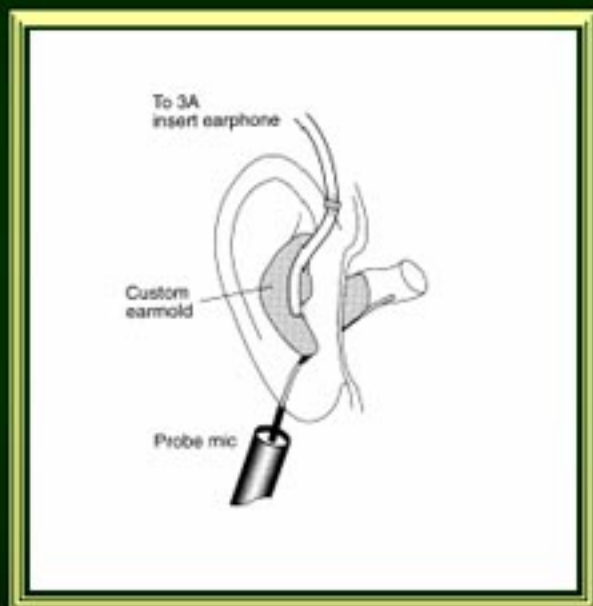
Assessment Considerations for Fitting Infants and Young Children with Amplification

- *Measuring Relevant Acoustic Characteristics*
- *Audiometric Assessment Considerations*

Acoustic Transforms



The Real-ear to Coupler Difference (RECD)



The RECD Defined

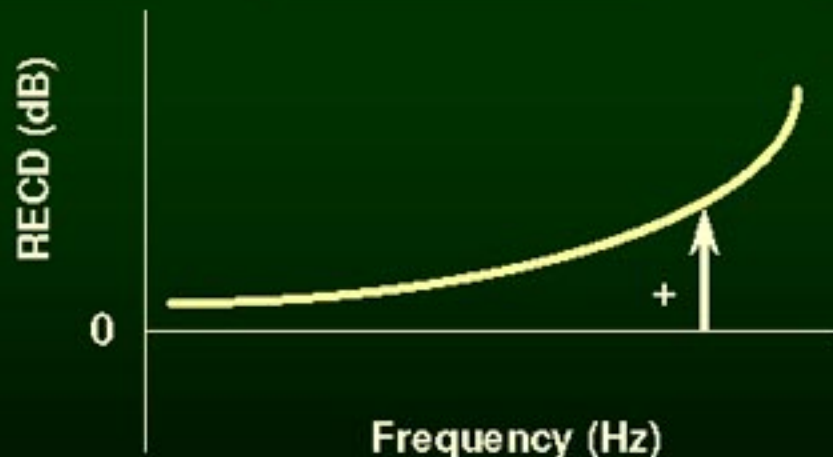
Real-Ear
Levels

-

Coupler
Levels

=

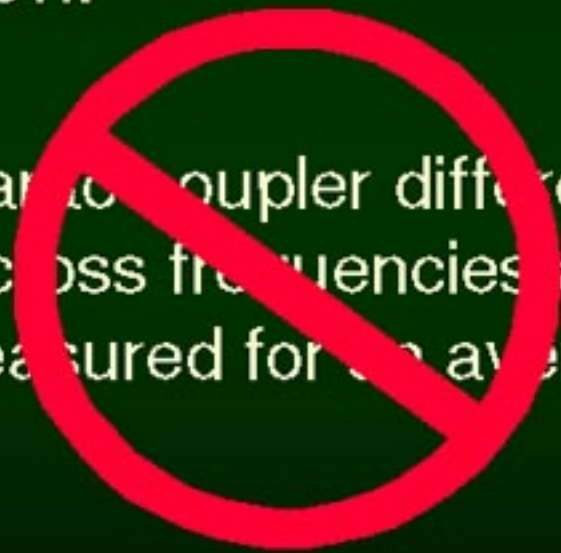
RECD
(dB)



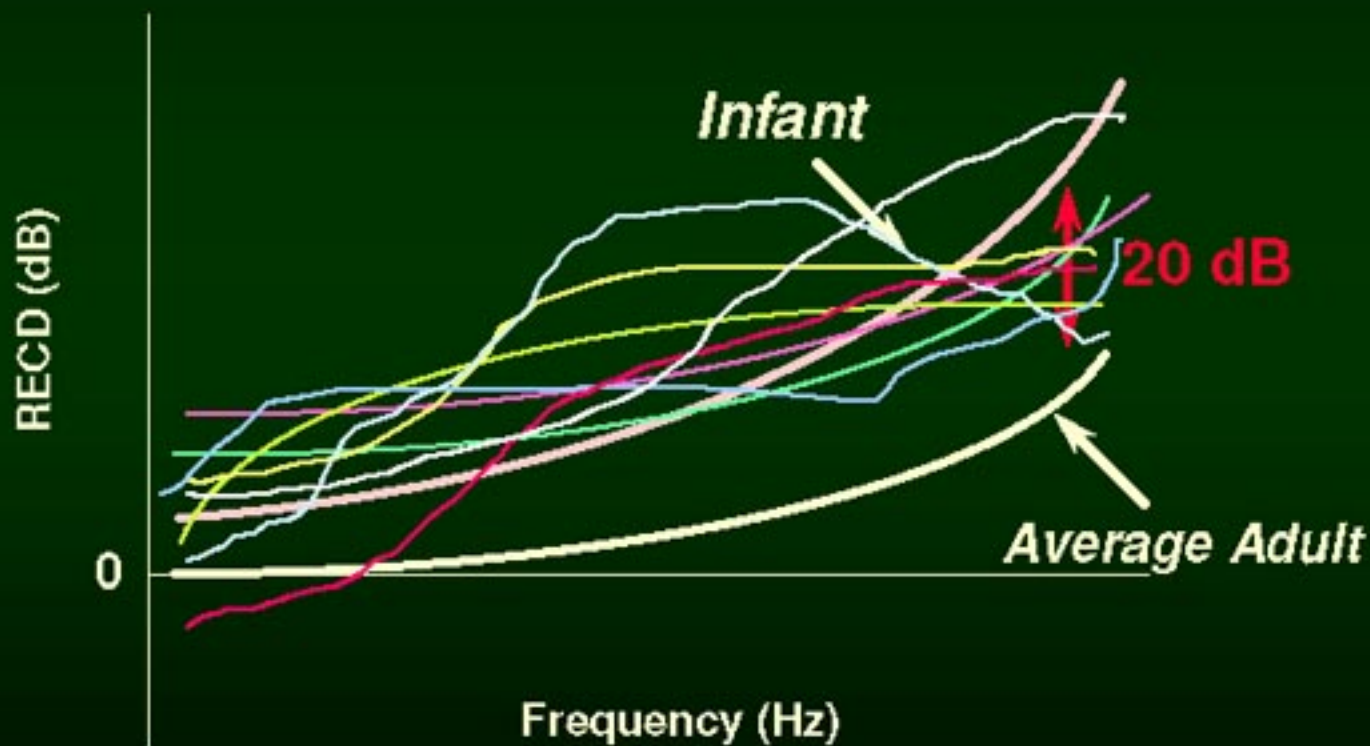
Acoustic Transforms in Hearing Instrument Fitting

Assumption:

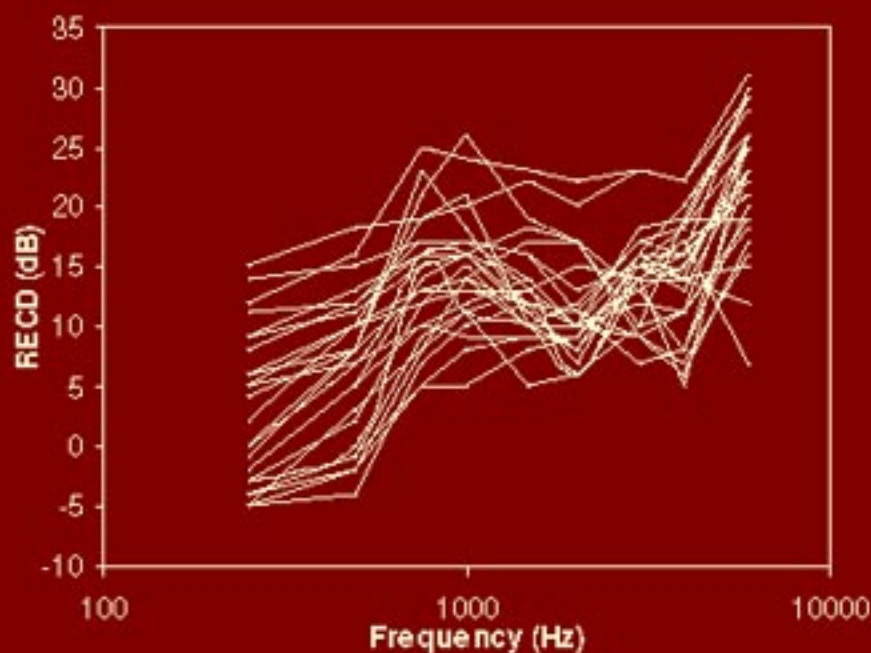
The real-ear-to-coupler difference (RECD) values across frequencies are equal to those measured for an average adult.



RECDs for Infants and Toddlers



A sample of RECD values for infants



RECDs in Infants: **Key Points**

- RECDs in infants and toddlers differ significantly from average adult values.
- RECDs vary from infant to infant.
- RECDs will change for a given infant over time.

Measuring the RECD

Each child's RECD values should be measured at the time of the:

1. audiometric assessment,
2. the initial hearing instrument fitting
3. and monitored over time.

Whenever earmold changes are made

But what if.....



Updated Average RECD values

**Real-Ear-to-Coupler Difference (RECD)
Predictions as a Function of Age for
Two Coupling Procedures**

Marlene Bagatto, Susan Scollie, Richard Seewald, K.
Shane Moodie, & Brenda Hoover

2002, JAAA, vol 13(8)

Predicted RECDs

DSL v4.1 predicted values:

- foam tip coupling only
- based on 12-month age ranges

Newly developed predictions:

- foam tip and earmold coupling
- to the nearest month

Predicted RECD Values

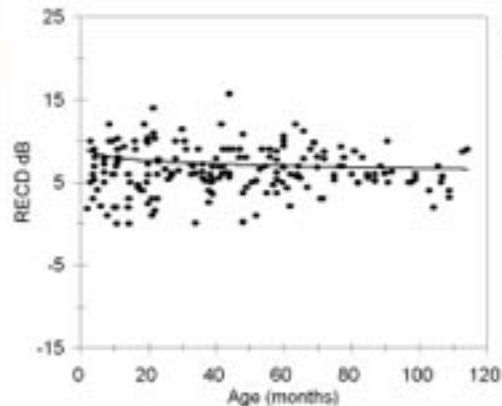
Subjects

- 392 infants & children
- ages 1 month to 16 years
- 141 ears used immittance tips
- 251 ears used earmolds
- normal otoscopic and immittance findings

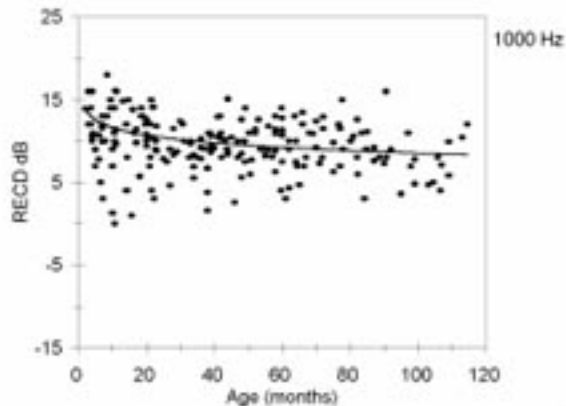
Results

- high variability in RECD measures for children of the same age

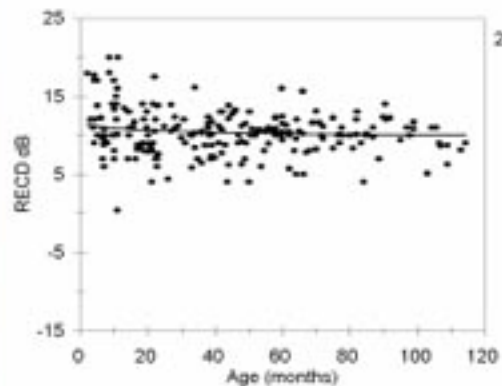
Predicted RECD Values: Earmolds



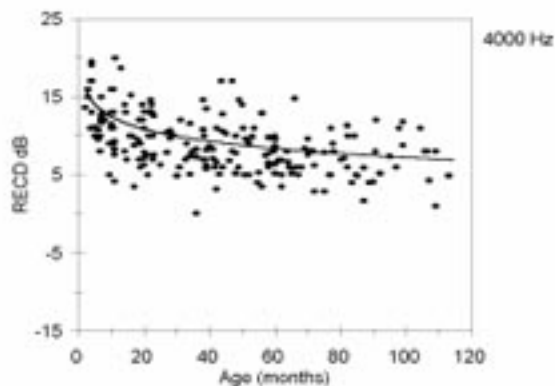
a)



b)

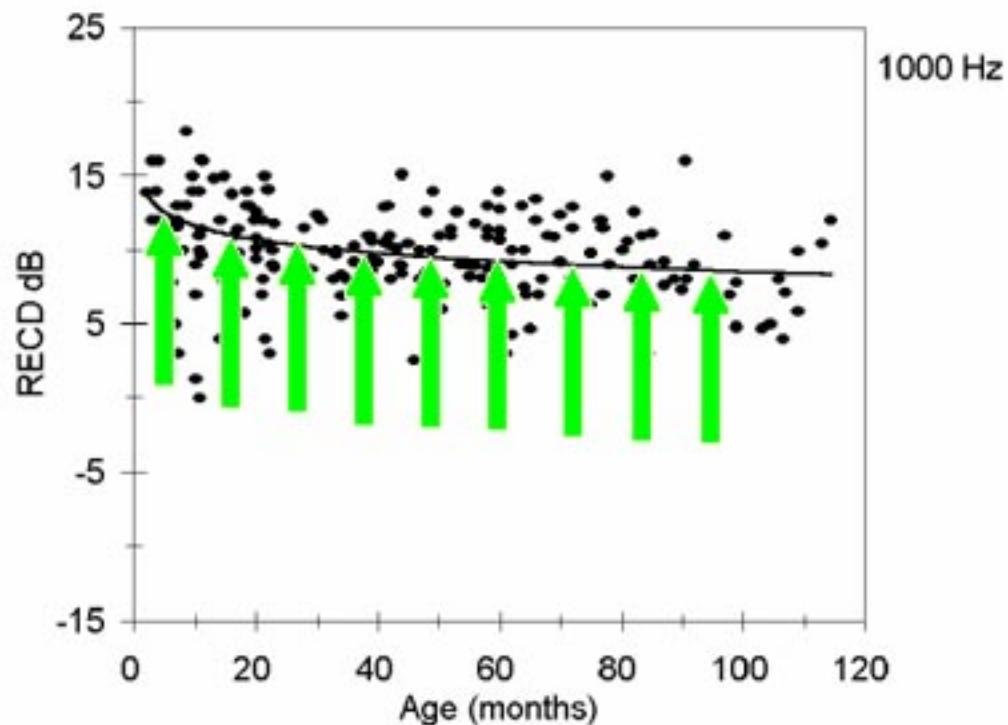


c)



d)

Predicted RECD Values: Earmolds



b)

Predicted RECD Values

Limitations:

- all subjects had normal middle ear function*
- high variability in RECD measures associated with children of the same age*

Therefore, whenever possible, predicted values should NOT replace a more precise RECD measurement.

The DSL Method uses the RECD to...

- Convert audiometric measures obtained using insert phones from dB HL to dB SPL in the ear canal
- Convert gain and output limiting requirements in the real ear to 2cc coupler equivalents
- Convert test box measurements of hearing instrument performance to estimated real-ear performance

Assessment Considerations for Fitting Infants with Amplification

- *Audiometric Assessment Considerations*

Assessment

Measuring Auditory Characteristics

- “ Appropriate hearing aid fittings in infants and children are dependent on valid audiologic test results. Results necessary for successful hearing aid fittings include ear-specific and frequency specific thresholds for air and bone conduction stimuli. ”


Acoustic Transforms in Audiometry

Audiometric Signal Transducers:

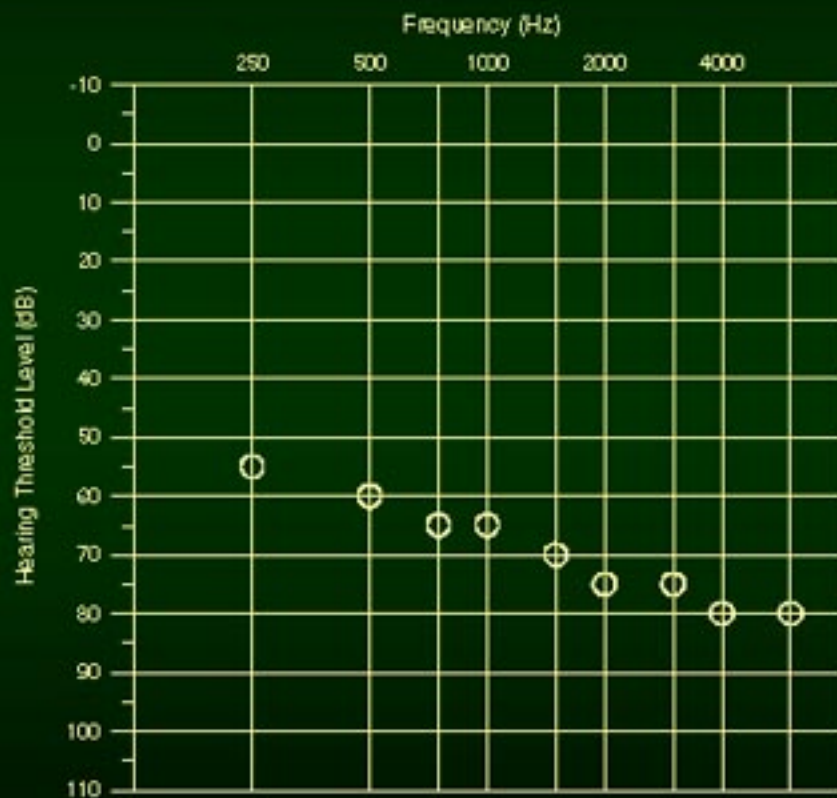
- Sound Field Loudspeaker
- TDH Series Headphone
- Insert Earphone

Assumption in Audiometry

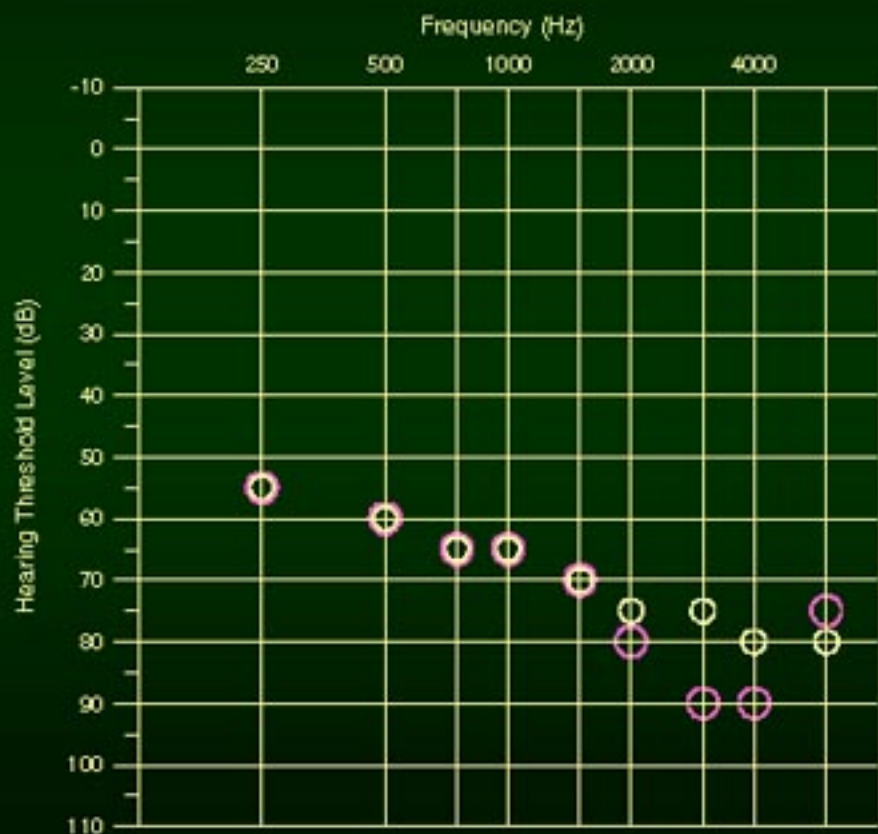
Regardless of the signal transducer used in audiometry, the thresholds in dB HL will be the same.



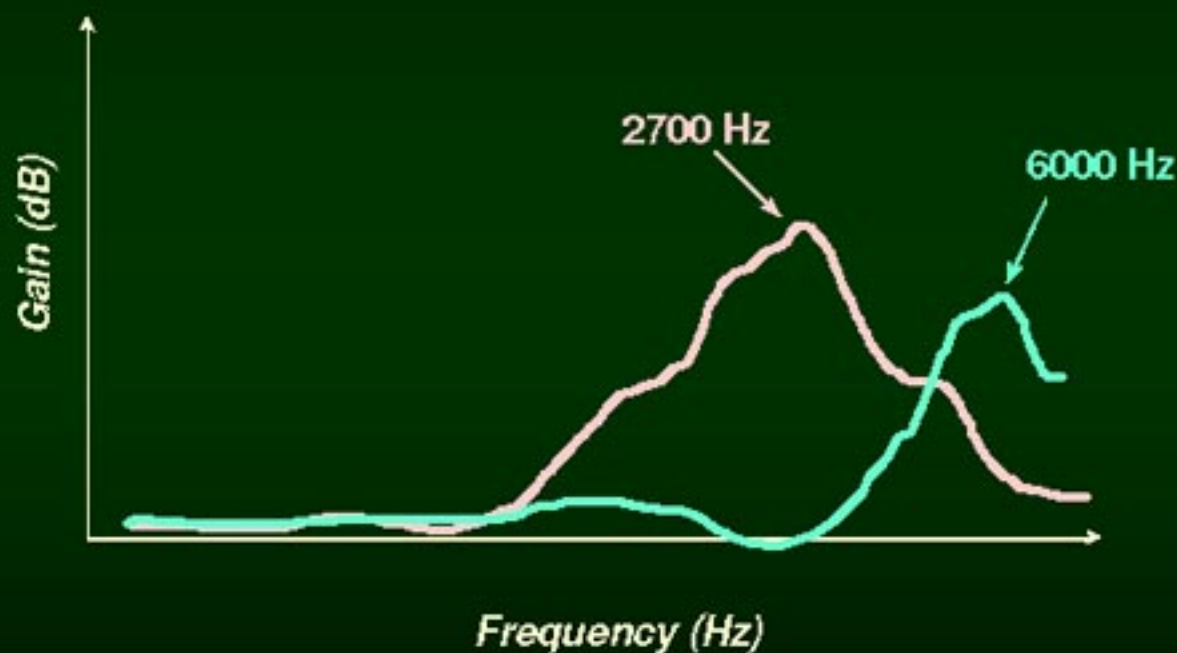
For an average adult....



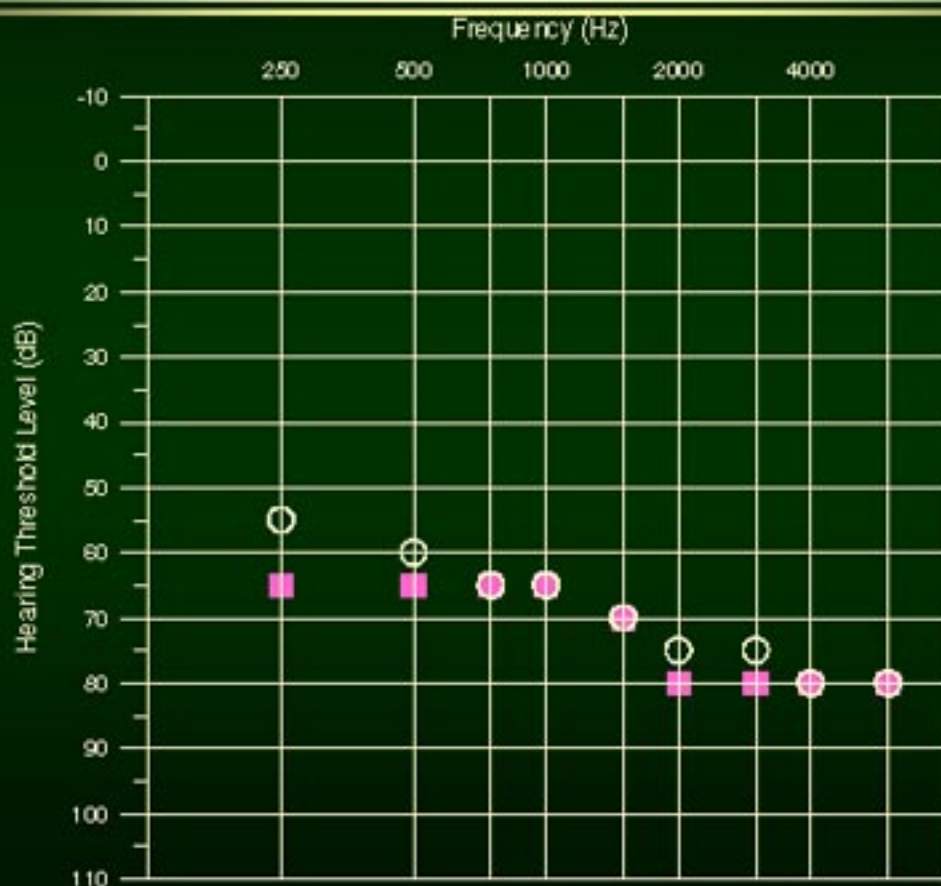
9 month old, in Sound Field...



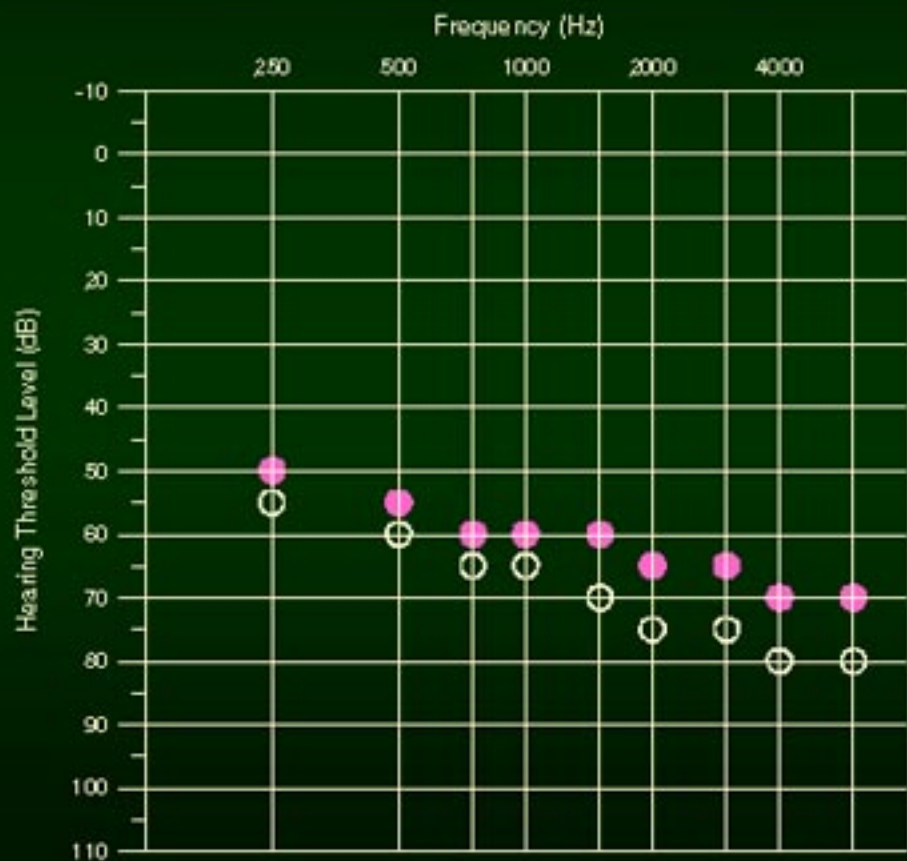
For Sound Field Testing



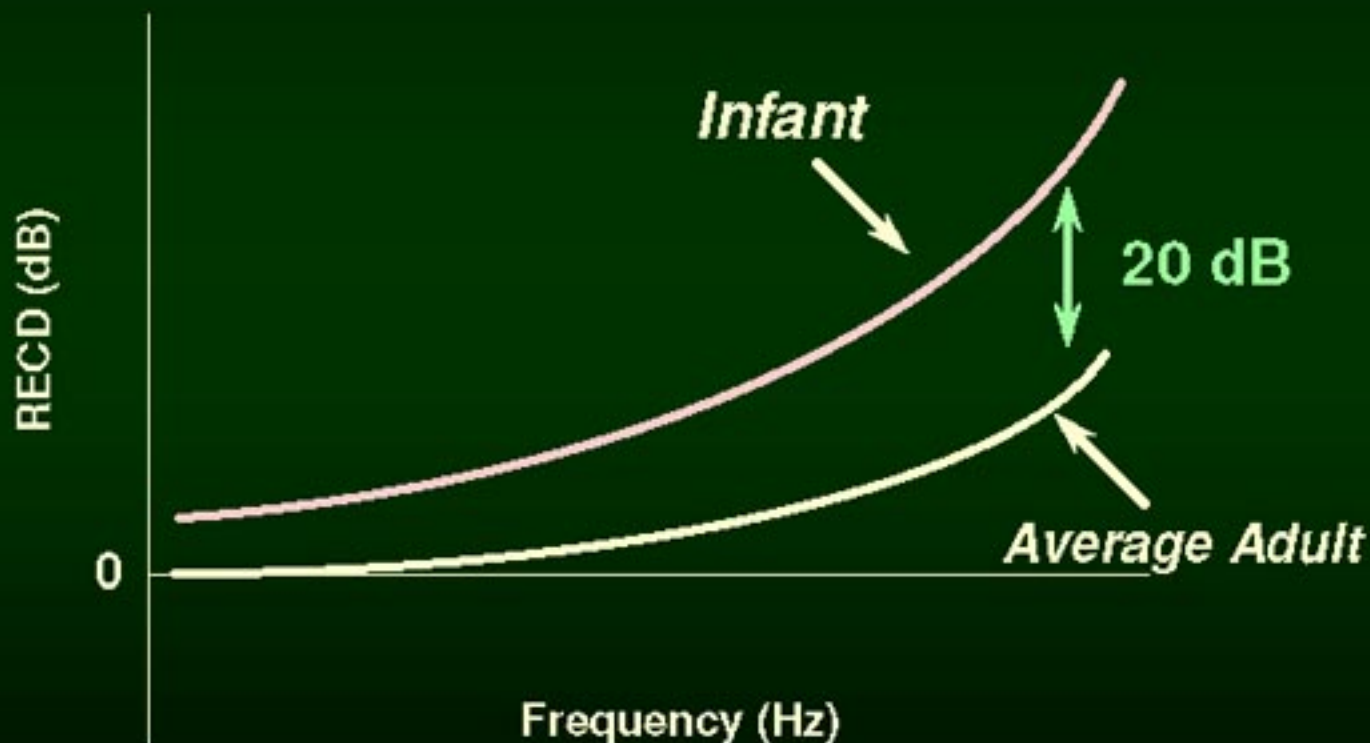
9 month old, TDH phones...



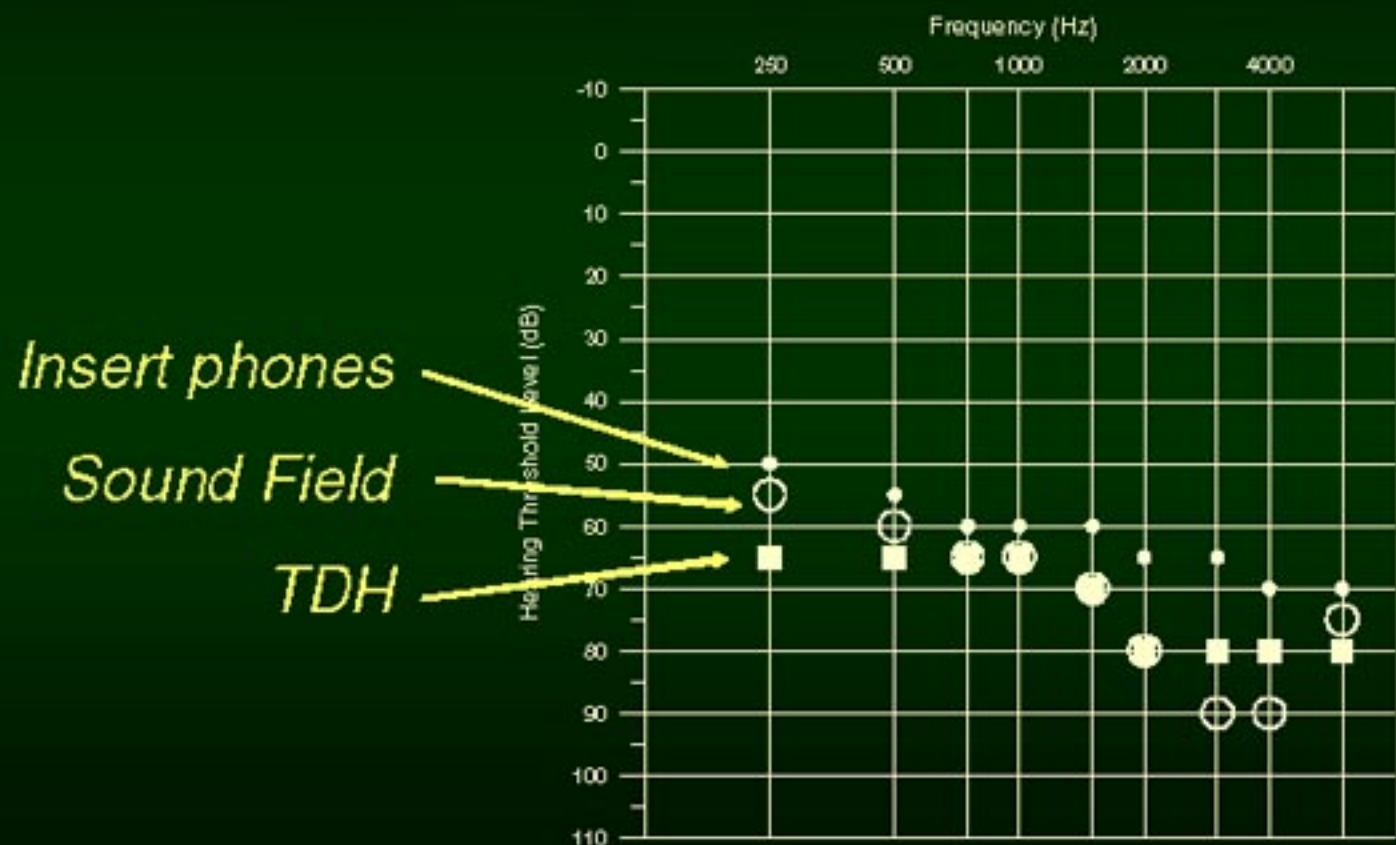
9 month old, insert phones...



RECDs for Infants and Toddlers



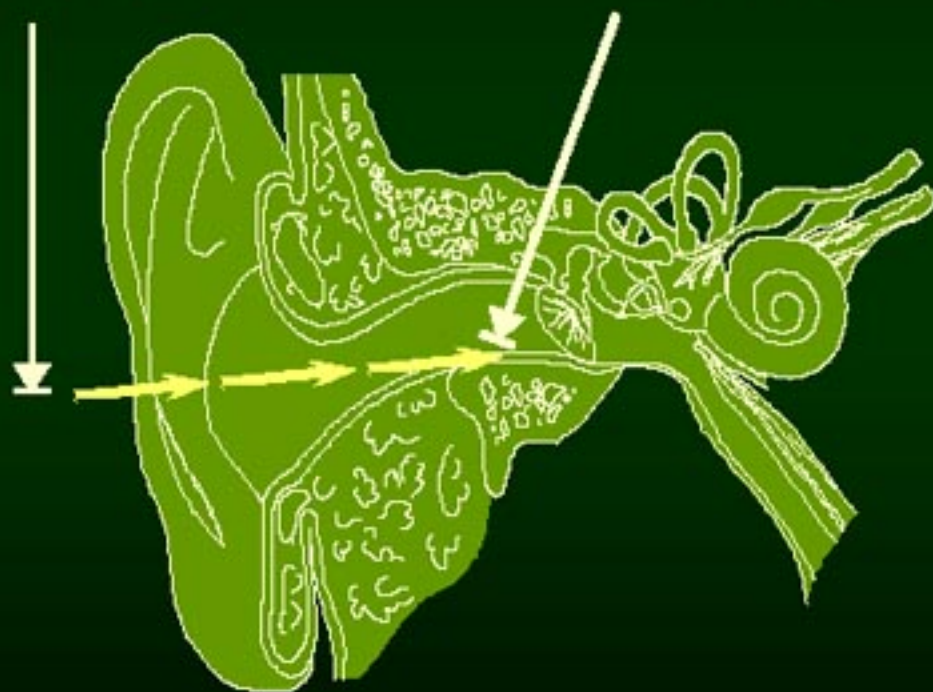
Different Transducer, Different HL Thresholds



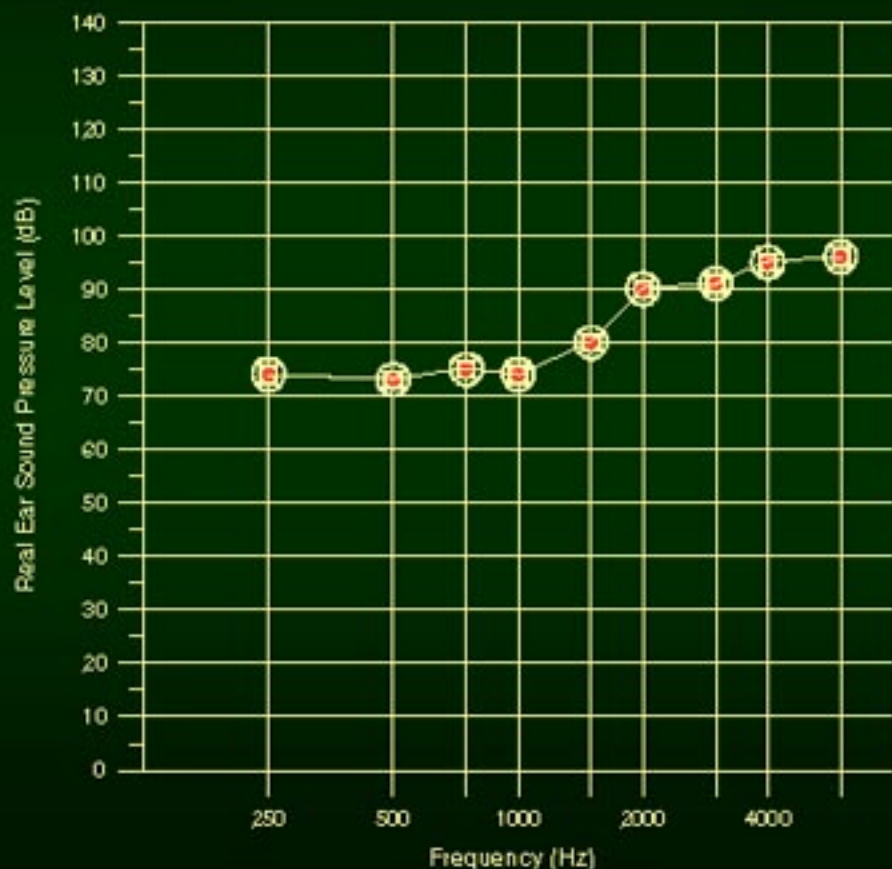
A Solution to the HL Problem. . .

dB HL

dB SPL



The SPLogram: In ear canal SPL



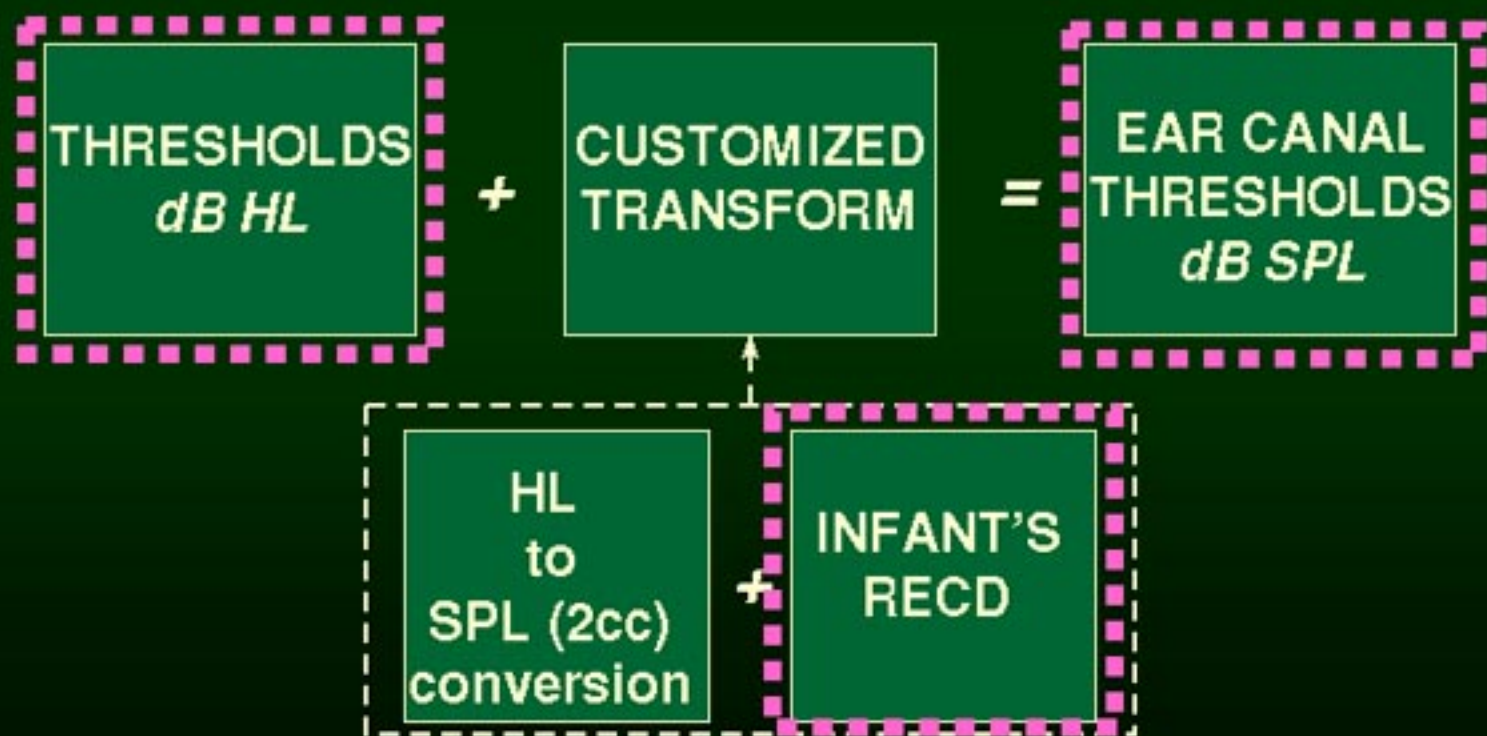
Behavioral Assessment



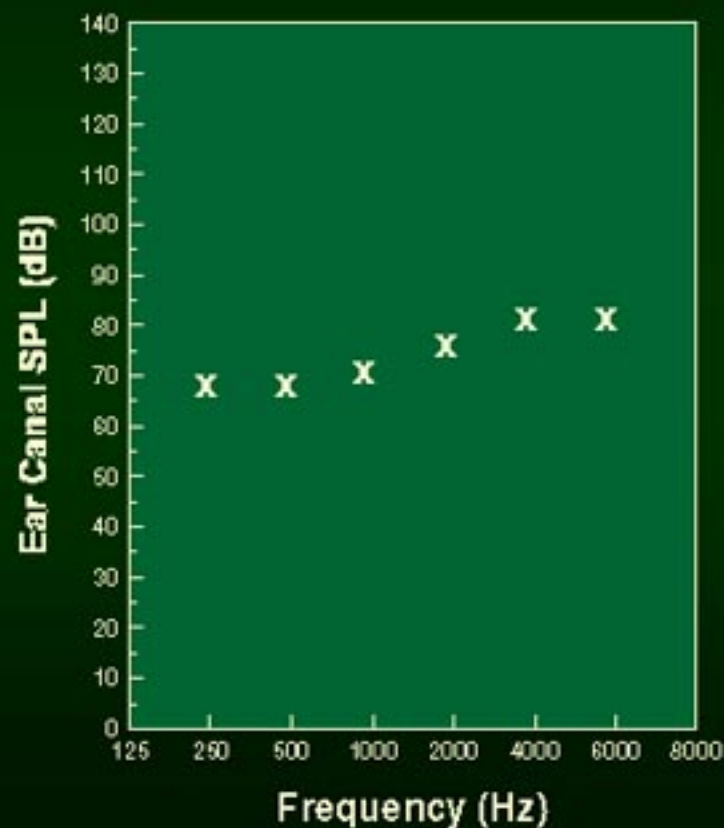
- Conducted with insert earphones
- Connect inserts to personal earmolds

*How are the RECD values used?
In AUDIOMETRY with Insert Phones*

To Predict Real-ear Thresholds in dB SPL

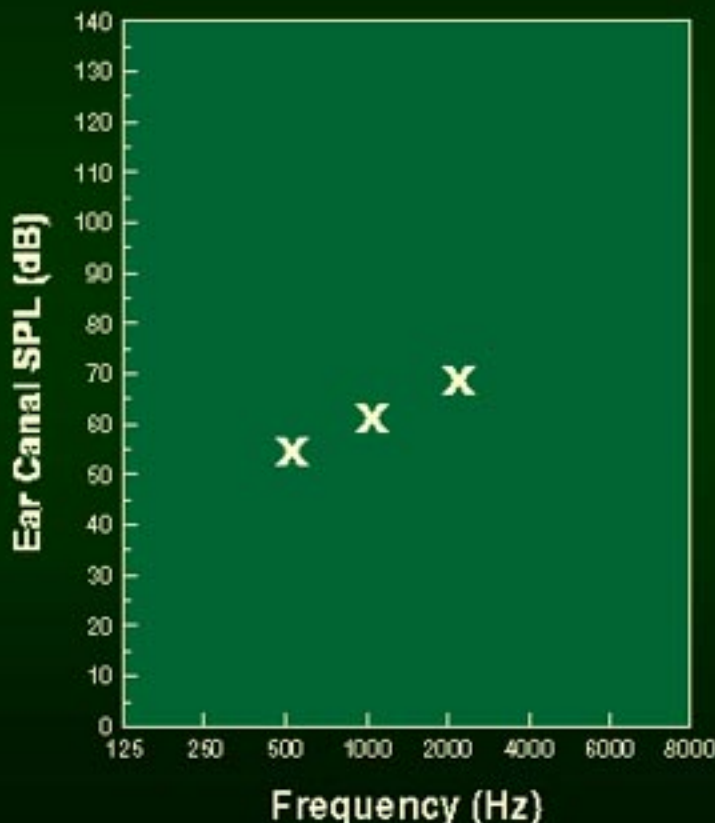


The SPLogram





The SPLogram (ABR data in dB SPL)



Summary:

What we need to fit amplification

- Ear specific and frequency specific threshold estimates (eHL) for air and bone conduction stimuli (tone-burst ABR, ASSR, VRA).
- Account for external ear acoustics in the assessment process (RECD).
- Using RECD measures, predict the ear canal SPL at threshold across frequencies.
- We can then move on to the prescription and fitting of amplification.