Eligibility Criteria in 2023 – Are We Reaching Everyone?

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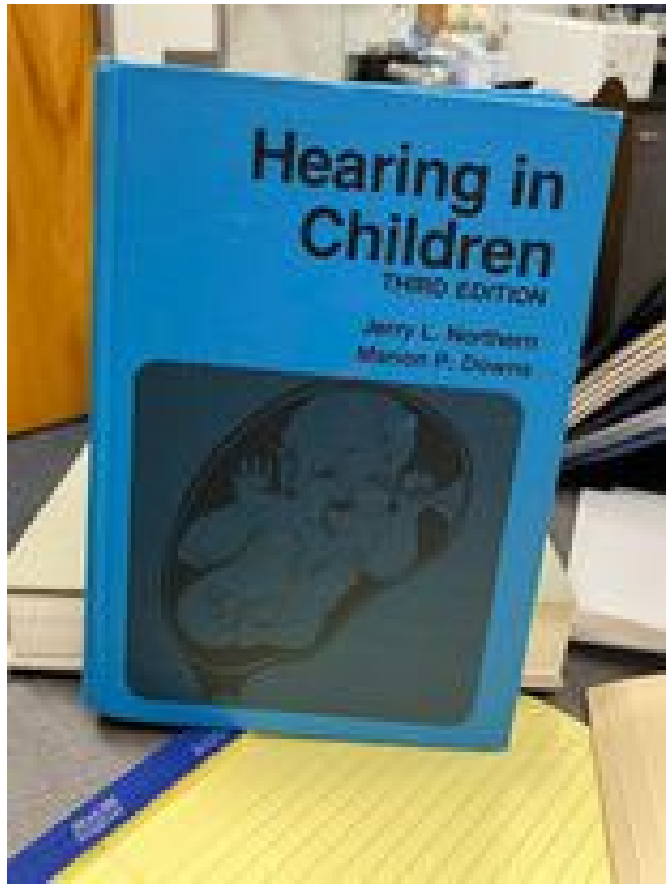
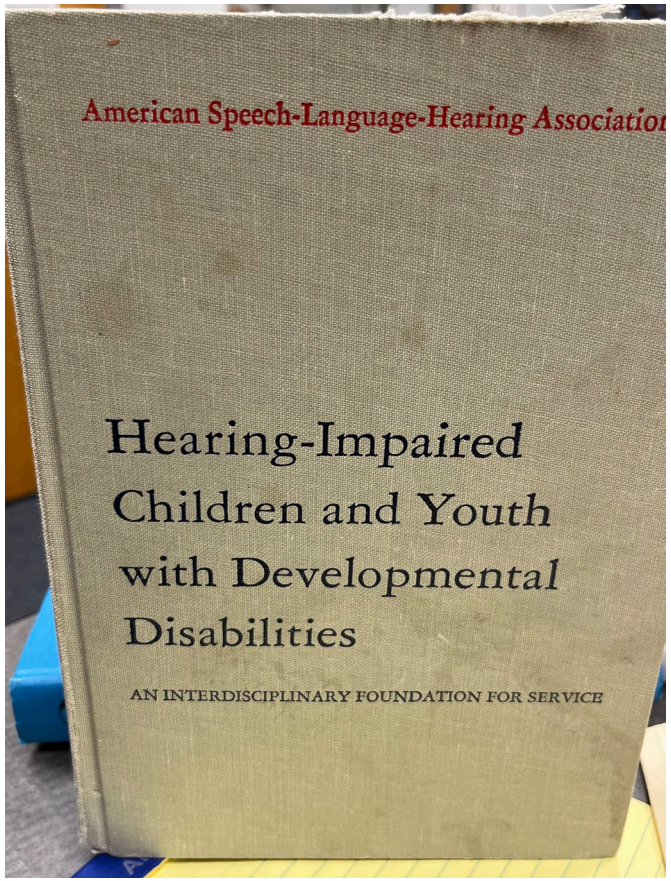
Considerations and framing this presentation

- Defining hearing loss
- Who needs our services?
- Hearing screening / identification
- How do they access our services?
- What is an evidence-based approach to eligibility?
- What is our “call to action”?

Books that changed my life…

How is hearing loss defined?





Northern and Downs (I actually used the first edition in my MA program—the only book with a yellow cover that I ever loved)

- Defining hearing loss
  - At that time, the emphasis was on serving children with severe and profound hearing loss
  - The average age of identification of children with hearing loss was greater than 2 ½ years of age
  - There was limited technology (analog hearing aids, cochlear implants did not exist)

Northern and Downs (I actually used the first edition in my MA program—the only book with a yellow cover that I ever loved)

- A glimmer of hope for me was the 15 dB HL “low fence” as guidance for “normal” hearing in children
  - My love of functional hearing loss, my love of listening to children and their parents, my love of understanding more (the auditory neuropathy discussions before it was a “thing”)

Northern and Downs

- Forward to 2023:
  - Research is showing us so much more
    - Real ear audiometry using in ear measurements (started more than 20 years ago based on personal conversation with my colleague at OSU, Rachael Holt, and currently being investigated by Ryan McCreery and Beth Walker)
    - Speech in Noise testing in adults: The value of high frequency audiometry

From Hearing-Impaired Children and Youth with Developmental Disabilities (Gallaudet College Press, 1985)

- From the Forward by then ASHA President, Dr. David Yoder
  - “The problems of providing humane and liberating service to hearing-impaired developmentally disabled people and to their families are at times overwhelming. Perhaps that is why we in the responsible professions have so often chosen the more traveled way and hence why services to hearing-impaired developmentally disabled people and their families have so often been limited in scope, poor in quality, or nonexistent.” (p xi)
  - This was a decade after the “Education for All Handicapped Children Act” (now IDEA) was enacted
  - “we’ve come a long way, baby”
  - MUCH HAS BEEN DONE AND MUCH REMAINS TO BE ACCOMPLISHED
- THE VIEW FROM 2023: How we define d/hh, how we define “disability”, who needs our services

The lyrics have changed, but the song remains the same

- Under IDEA, what defines “educationally handicapping” hearing loss
  - Is it a “number”: Throw back to the Ohio Blue Book
  - Is it being “below average”
  - How are other things factored in: developmental issues (the idea that 50% of kids or more have hearing loss and another concomitant condition)
  - What about a throw back to Yoder’s comment about services/support being ”non-existent”

The lyrics have changed, but the song remains the same

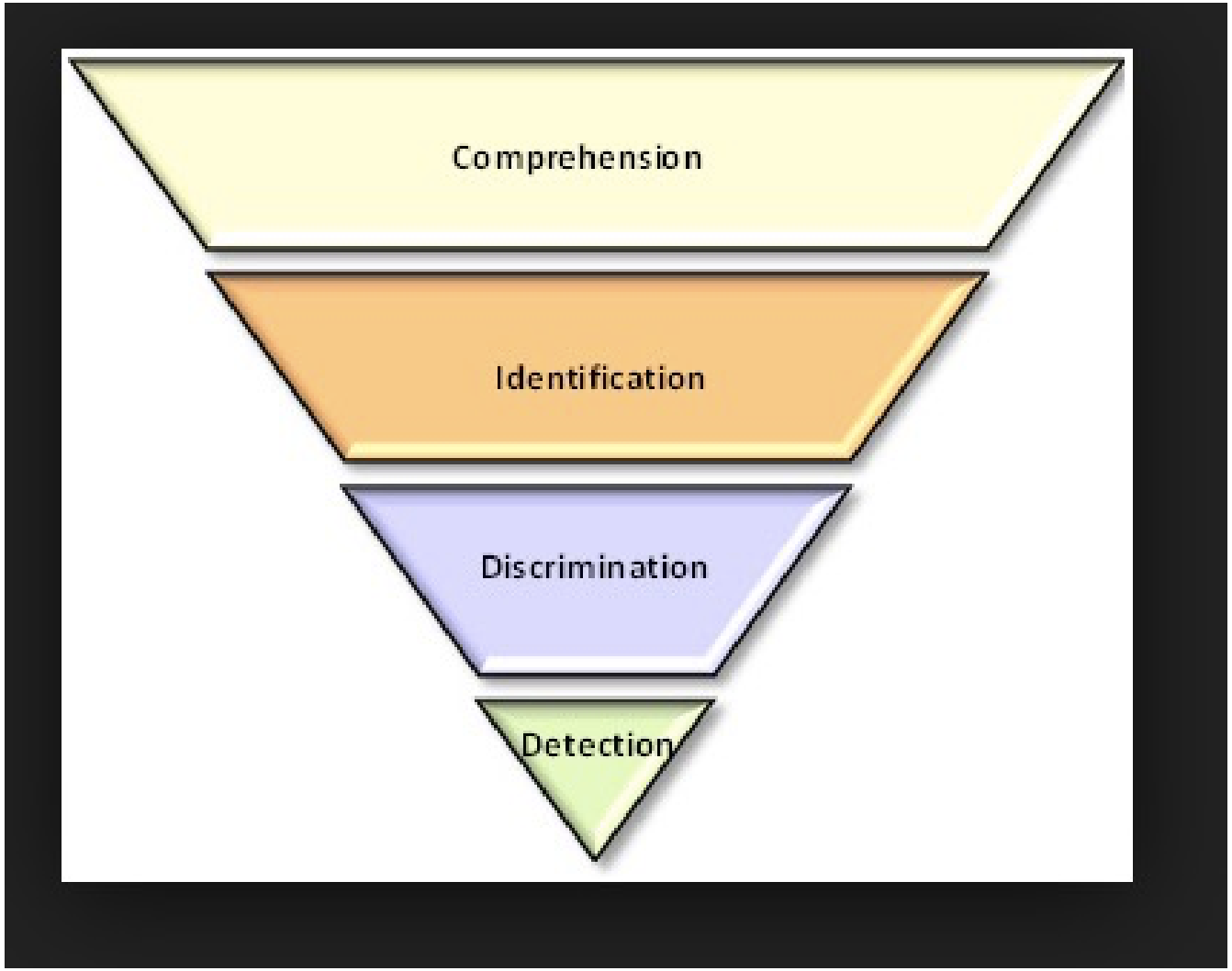
- What are the goals of IDEA/IEP services?
- No consistency
- Technology
  - campUS, the transition camp for teens that Carrie Spangler and I co-direct
    - Demands from teens and their families
    - Critical of educational and clinical audiologists

Looking at the obvious: The audiogram

What does it tell us?

“If it’s not on the audiogram, it doesn’t exist”

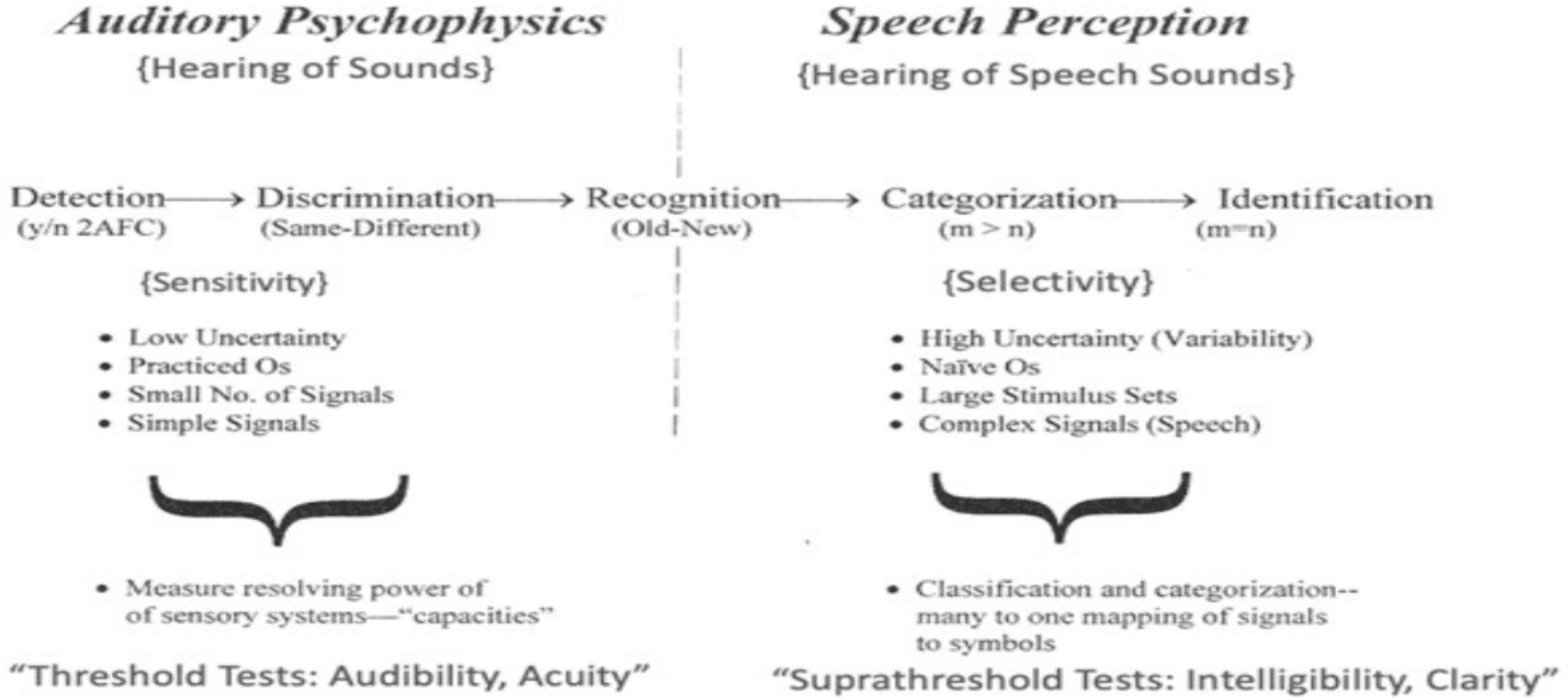
Erber's Hierarchy (1992. 1996)
The recent story of the 17 year old in the booth



“Unpacking” Erber’s hierarchy

- **Detection** is the ability to respond to the presence or absence of sound. It is the essential first step listening and represents pure tone audiometry
- **Discrimination** is the ability to perceive similarities and differences between two or more speech stimuli
- **Identification** is the ability to label by repeating, pointing to or writing the speech stimulus heard
  - Identification involves the suprasegmental & segmental of speech
- **Comprehension** is the ability to understand the meaning of speech by answering questions, following directions, paraphrasing, or participating in a conversation.
- Comprehension is demonstrated by the listener when his/her response is qualitatively different than the stimuli presented.

Another view (Herbert & Pisoni, 2023)



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For what reasons are you unable to qualify children for DHH services?

WHERE ARE WE RIGHT NOW?

Overview and context for eligibility criteria*

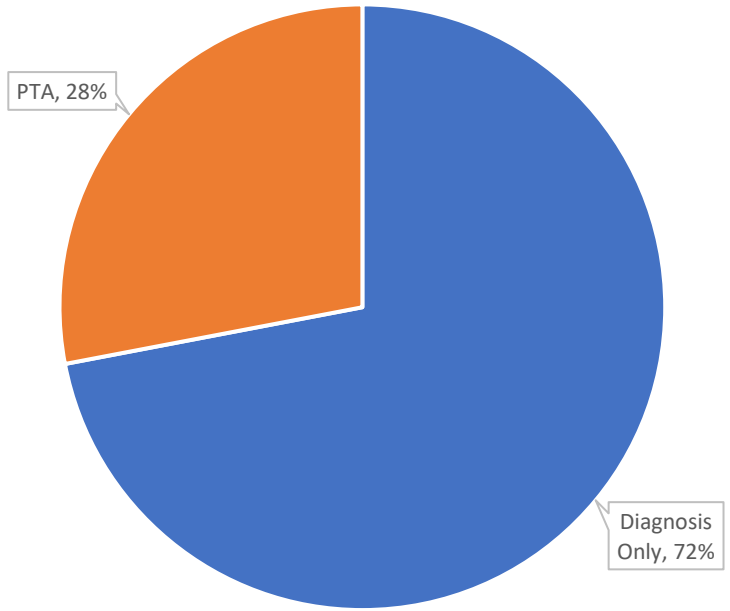
We have a wide range of criteria to determine eligibility

*From data compiled by Jennifer Schmitz, AuD – ISD 287, Minnesota

Eligibility Criteria in the U.S.

PTA

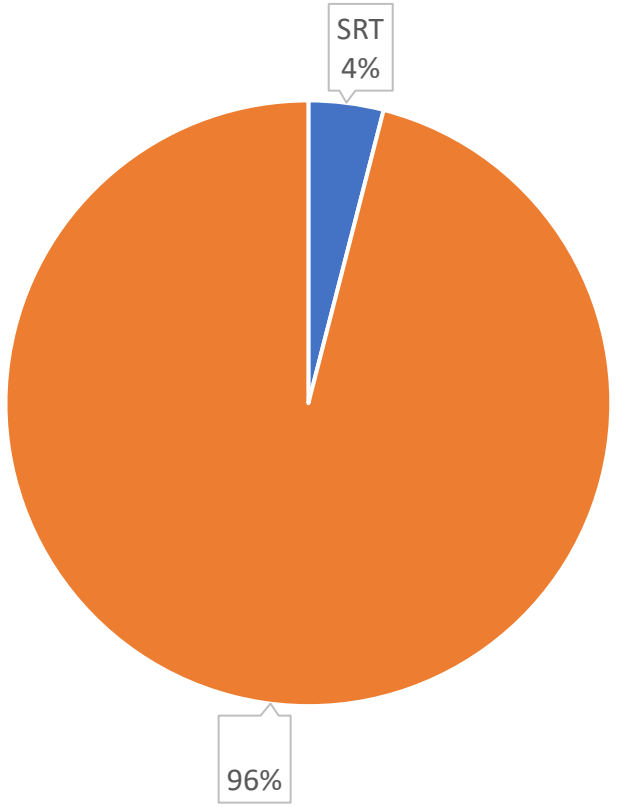
- 14 states require PTA
- Average min threshold = 25 dB
- Range: 20 – 35 dB



Eligibility Criteria in the U.S.

SRT

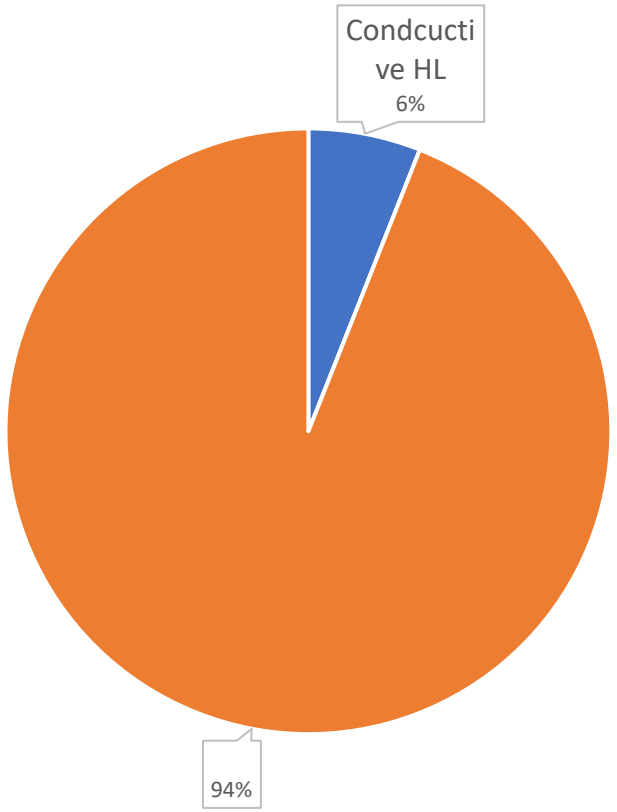
- 2 states
- Both use 20 dB minimum



Eligibility Criteria in the U.S.

Conductive HL

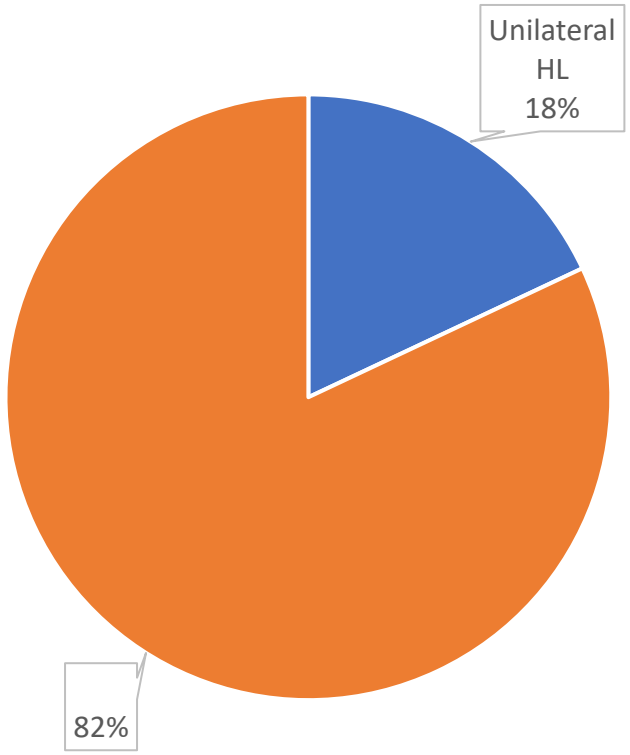
- 2 states
- Average min threshold = 23 dB
- Range: 20 – 30 dB



Current Eligibility Criteria in the U.S.

Unilateral HL

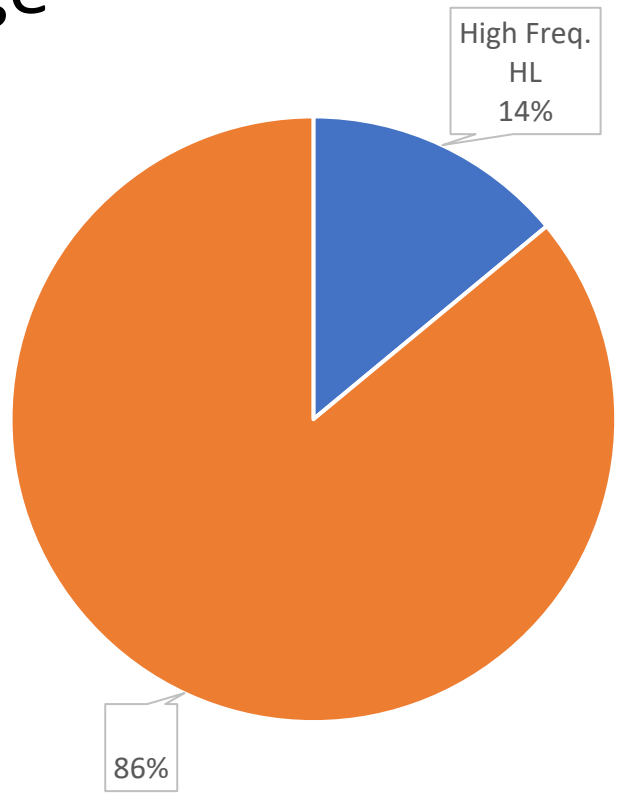
- 9 states
- Average min threshold = 42 dB
- Range: 20 – 60 dB



Current Eligibility Criteria in the U.S.

High Frequency Average

- 7 states
- Average min threshold = 36
- Range: 25 – 35 dB
- Freqs:
  - 2k – 4k
  - 2k - 6k
  - 2k / 4k / 6k
  - 3k / 4k / 6k



Current Eligibility Criteria in the U.S.

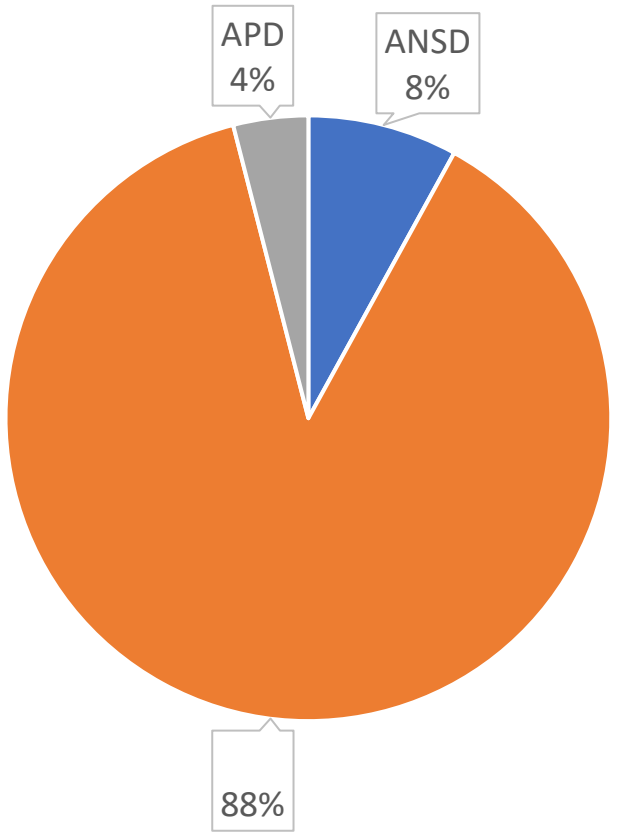
ANSD

- Included by 4 states

APD

- Included by 2 states

(1 state includes both)



Let’s consider some of these further…

Pure Tone Average?

"Throughout the U.S., for years operators, technicians and even otologists have been adding up the decibel loss of the three frequencies 512, 1024 and 2048, averaging for the loss for these frequencies, and multiplying by .8. Not one person in a hundred performing this calculation could give any logical explanation for it, or why the resulting figure should represent an individual's percentage of hearing loss."

- Leland Watson in *Hearing Tests and Hearing Instruments* (Williams & Wilkins, 1949)

Pure Tone Average?

- Intended for adults
- Omits important high frequency speech cues (for children!!)
- Used as a cross-check for SRT

- Is this appropriate?

Speech Reception Threshold

- Closed set task – not appropriate predictor for educational performance
- Does not predict real-world performance

IDEA Language

Sec. 300.8 (c) (5)

"*Hearing impairment means an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance but that is not included under the definition of deafness in this section.*" (and more…)

- PROs
  - Leaves eligibility up to the expert (you!)
  - Makes eligible children with a wide array of auditory difficulties

- CONs
  - No direction on what constitutes eligibility
  - Does this allow administrators to limit services?

IDEA Language

Sec. 300.8 (c) (5)

"*Hearing impairment means an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance but that is not included under the definition of deafness in this section*." (and more…)

- Do states have authority to be more specific?

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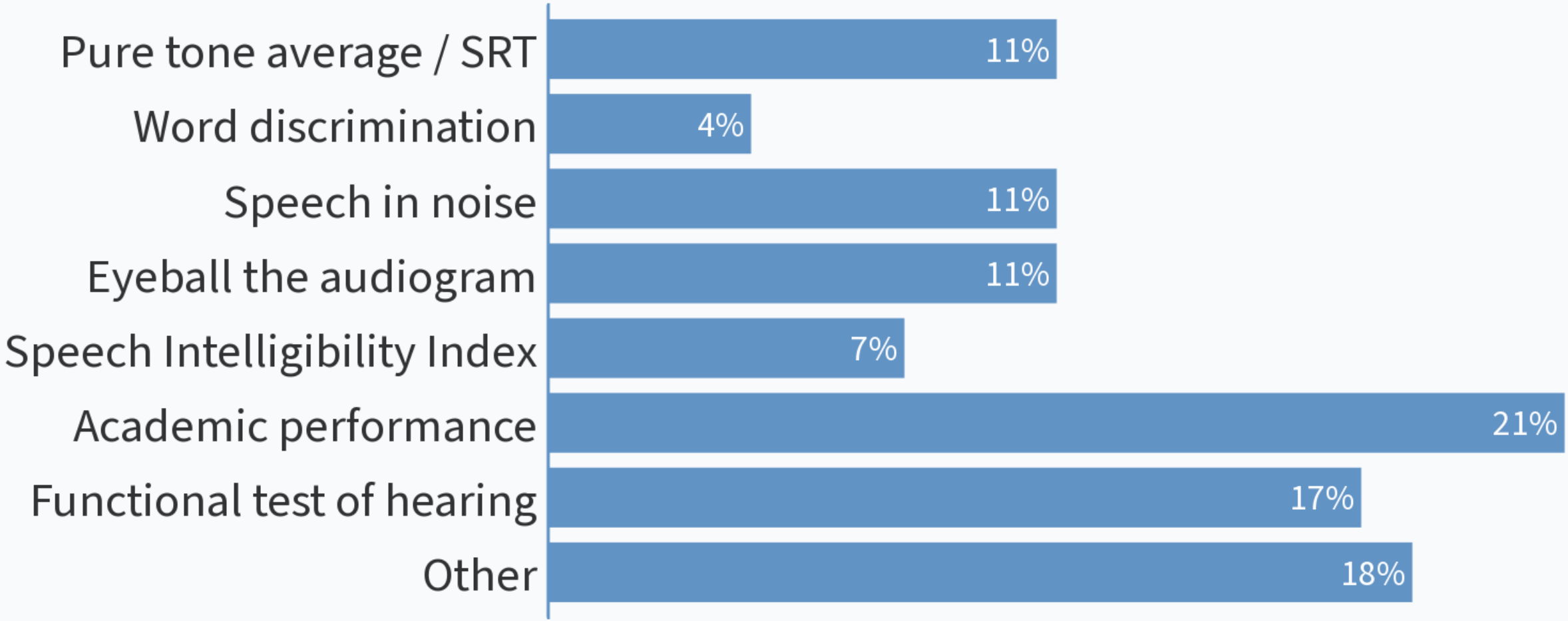
How do you determine eligibility for d/hh services?



Describing Audibility with SII

- ANSI Standard S3.5
- Former AI
- Predicts audibility of speech based on hearing levels and noise

Reaffirmed by ANSI
April 22, 2002

Reaffirmed by ANSI
May 18, 2007

ANSI S3.5-1997
Revision of
ANSI S3.5-1969 (R 1986)

American National Standard

Methods for Calculation of the Speech Intelligibility Index

Secretariat
Acoustical Society of America

Approved 6 June 1997
American National Standards Institute, Inc.

Abstract

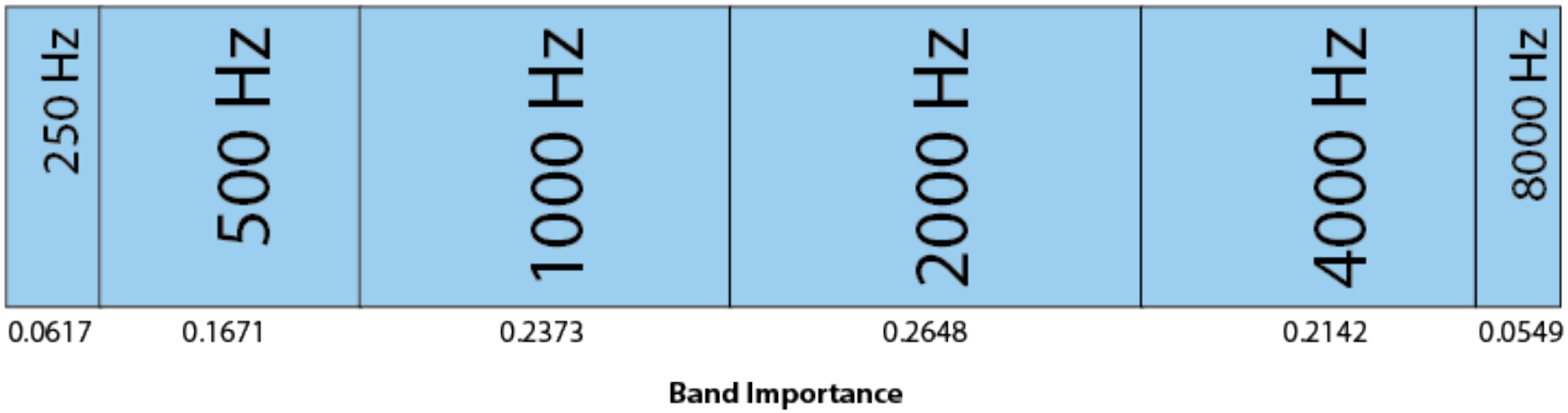
This Standard defines a method for computing a physical measure that is highly correlated with the intelligibility of speech as evaluated by speech perception tests given a group of talkers and listeners. This measure is called the Speech Intelligibility Index, or SII. The SII is calculated from acoustical measurements of speech and noise. This standard is **not** a substitute for ANSI S3.2-1989 (R 1995) *American National Standard Method for Measuring the Intelligibility of Speech over Communication Systems.*

Describing Audibility with SII

- Calculations
  - Critical Band (weighted)
  - Third-octave band (weighted)
  - 17 equal-bands (non-weighted)
  - Octave Band (250, 500, 1000, 2000, 4000, 8000)

Describing Audibility with SII

- Weighting:



Describing Audibility with SII

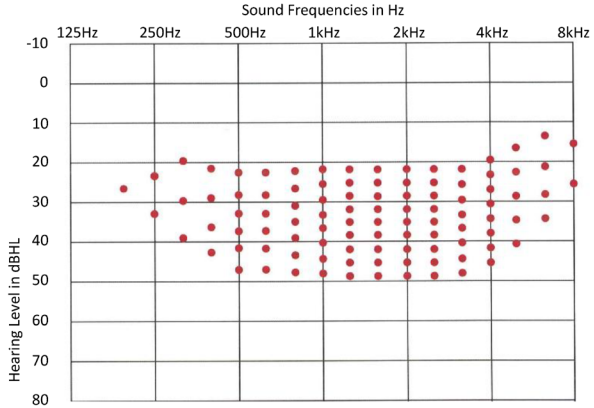
- **Methods**
  - Apps
  - “Count the Dots”

The New Count-the-Dot Audiogram

by Killion & Mueller: the Hearing Journal January 2010 vol 63 No 1 page 10.

Form devised (Jun 2014) by Peter Keen, Consultant Educational Audiologist, Keenhearing: peter.keenhearing@btinternet.com

Name	date of birth
Address	
School	**AI** of **%:**



This is the Speech Intelligibility Index (SII) based method of calculating the Articulation Index (AI). There are 100 dots indicating the importance of different frequencies and intensities for the perception of speech. Instead of the technically correct ‘audible speech cues weighted by the importance function at each frequency’, the authors recommend calling them ‘audible dots’. This supersedes the first black and white (and grey) count-the-dot PTA from 1990 and has more dots above 4kHz now, acknowledging findings of more recent research. There is no copyright on this format (by original authors or Peter Keen) so that people can use it!

How to use it: Put the thresholds for both ears onto the Audiogram as normal. Count the dots below the (straight) lines joining the O and X symbols (use the better ear for each frequency). For Aided thresholds, add these to the audiogram using the A symbol, then count the audible dots. All thresholds must be in dBHL, so Aided results using a sound level meter must be converted – see chart below. The total ‘audible dots’ represent the percentage Articulation Index, so 65 audible dots = an AI of 65%. For children who are still developing their phonology and acquiring speech and language, Peter Keen recommends:

Good	AI of 90% to 100% (still benefits from Radio Aid)
Satisfactory	AI of 70% to 89% (must use Radio Aid in all learning situations)
Concern	AI of 69% or less (advise hearing aid review)

Conversion chart: **dBA** (Sound Field, sound level meter reading) **to dBHL**. System developed by Dr Mike Nolan

Frequency	250Hz	500Hz	1kHz	2kHz	3kHz	4kHz	6kHz	8kHz
	-17	-8	-10	-10	-11	-10	-15	-12

e.g. at 500Hz: **55dBA - 8dB** converts to **47dBHL**

Describing Audibility with SII

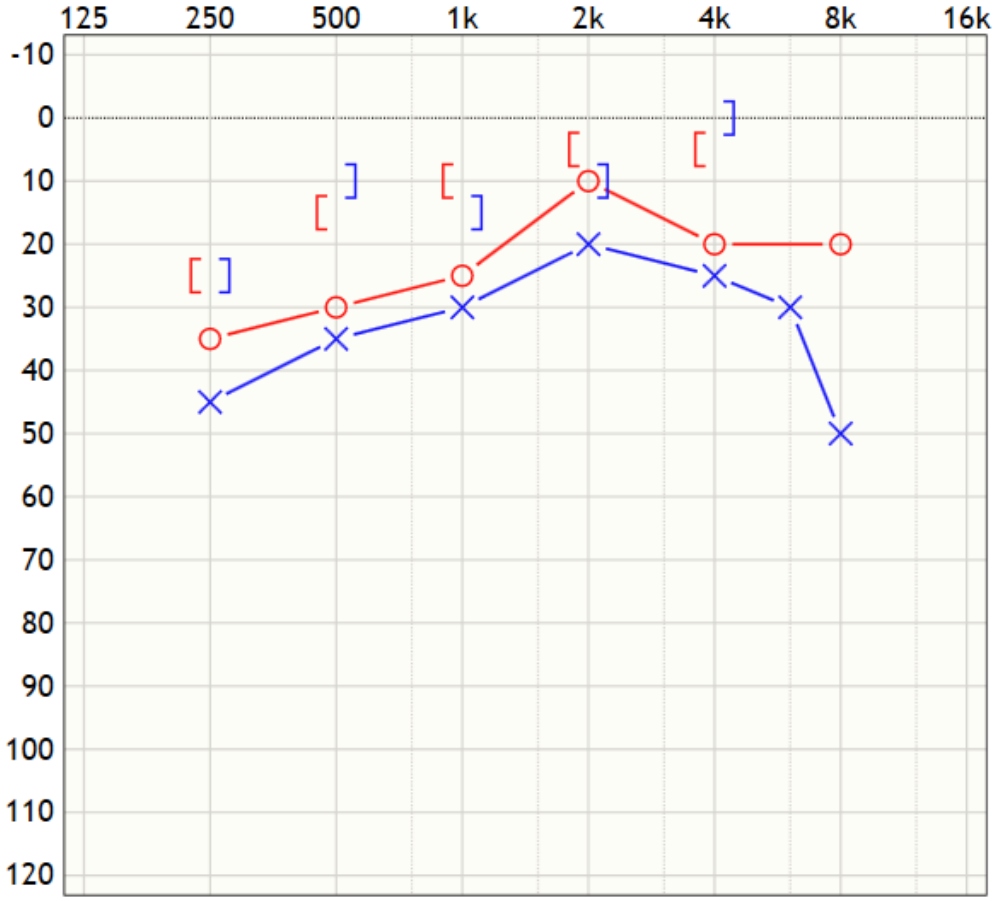
- SII includes a calculation of noise
  - Internal noise
  - External noise

Describing Audibility with SII

- Applications to education
  - Determining amount of average speech that is audible (eligibility?)
  - Measuring impact of noise in the learning environment (intervention)

Rate the audiogram:

Is this child in need of d/hh services?



SRT-R: 20
WRS-R: 100% @ 65

SRT-L: 25
WRS-L: 100% @ 65

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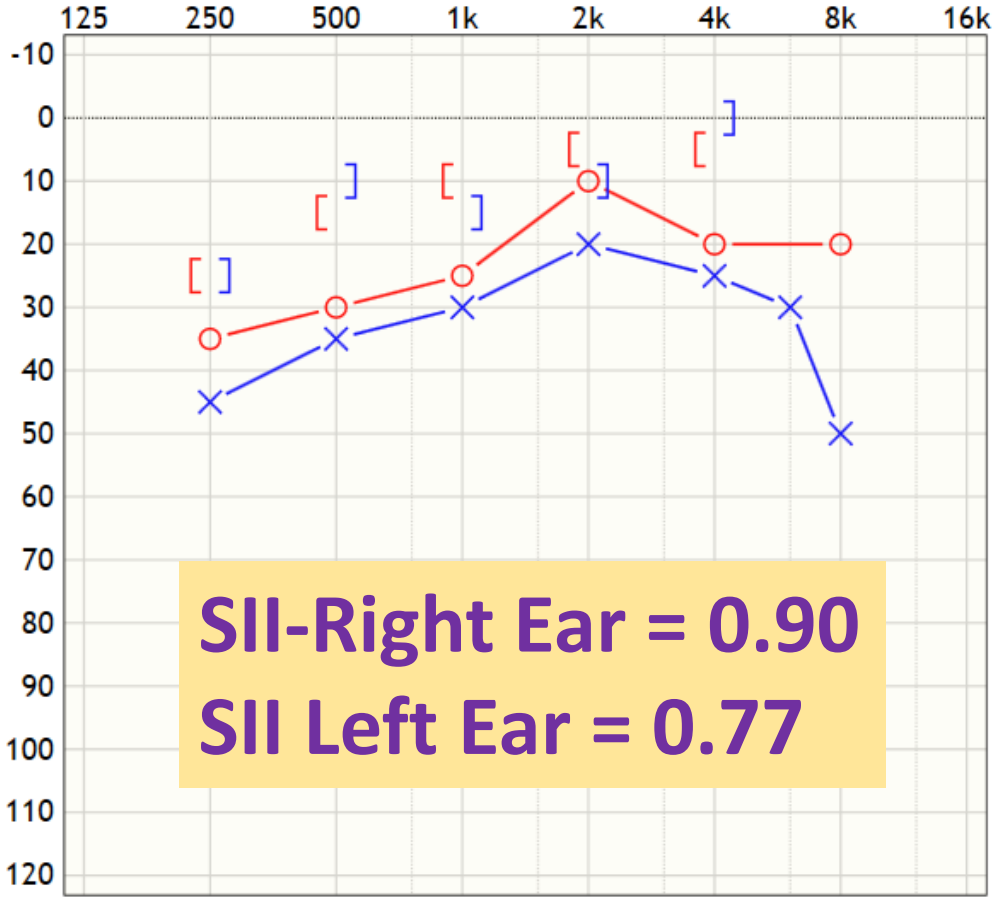

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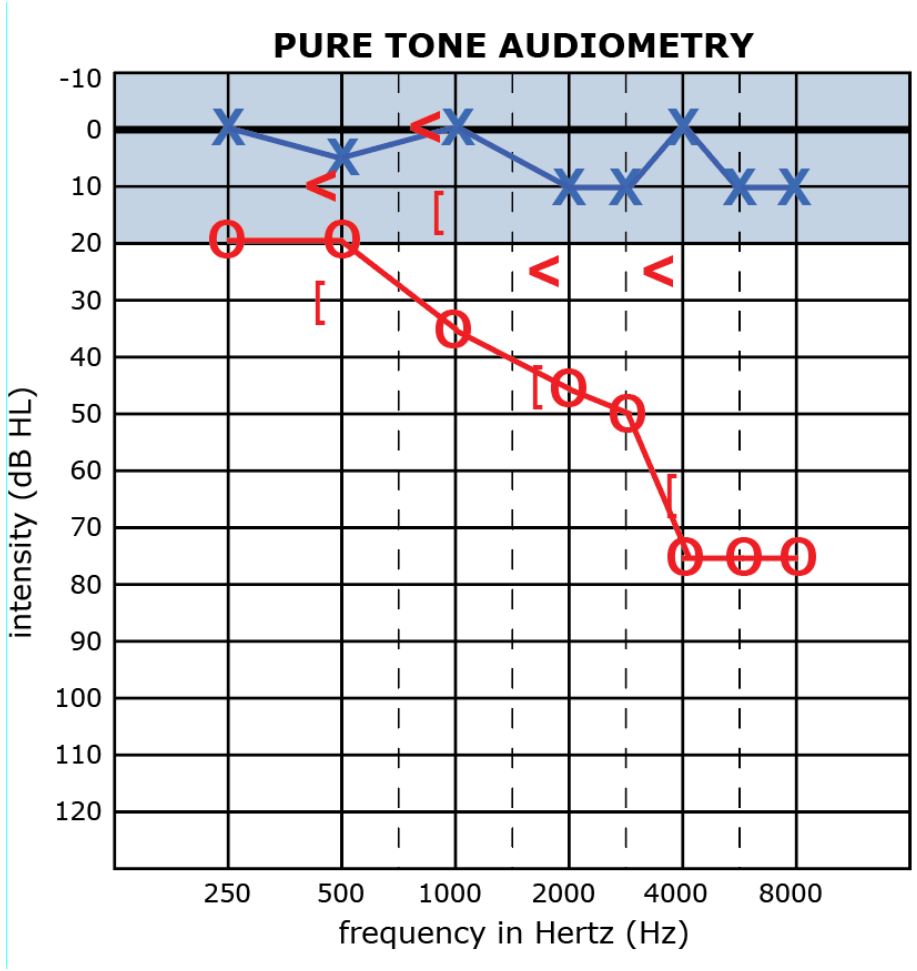

SRT-R: 35

SRT-L: 15

Rate the audiogram:

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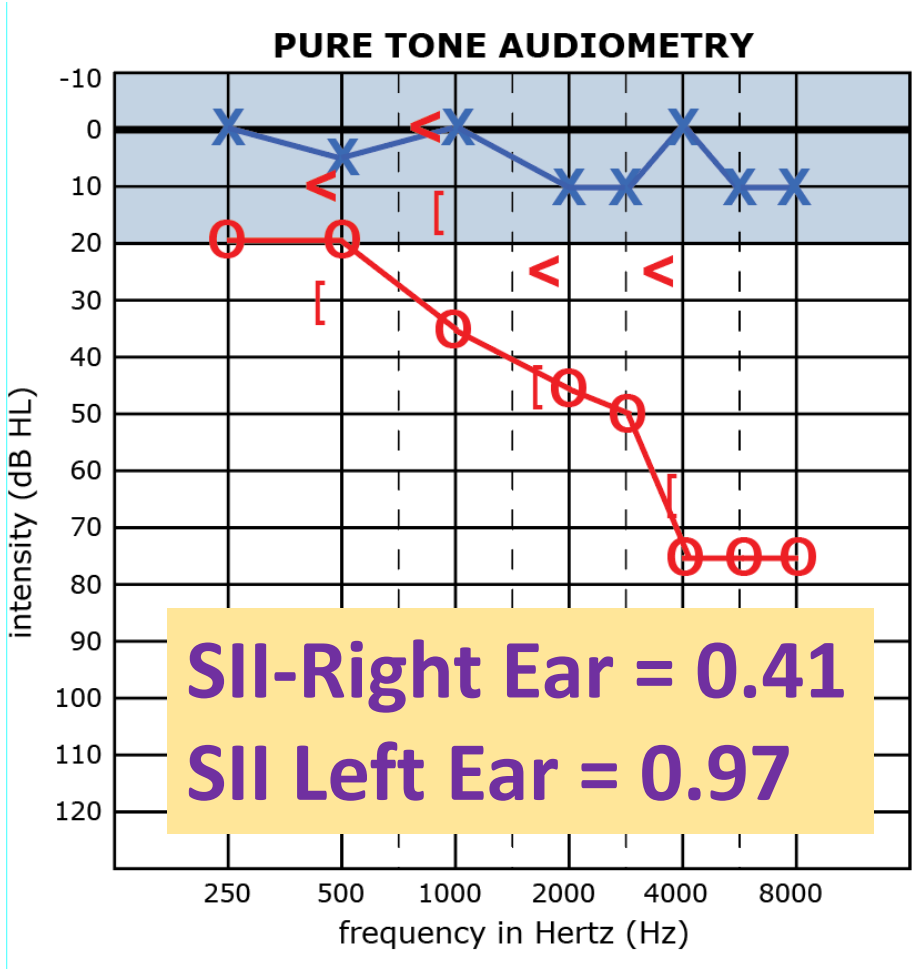

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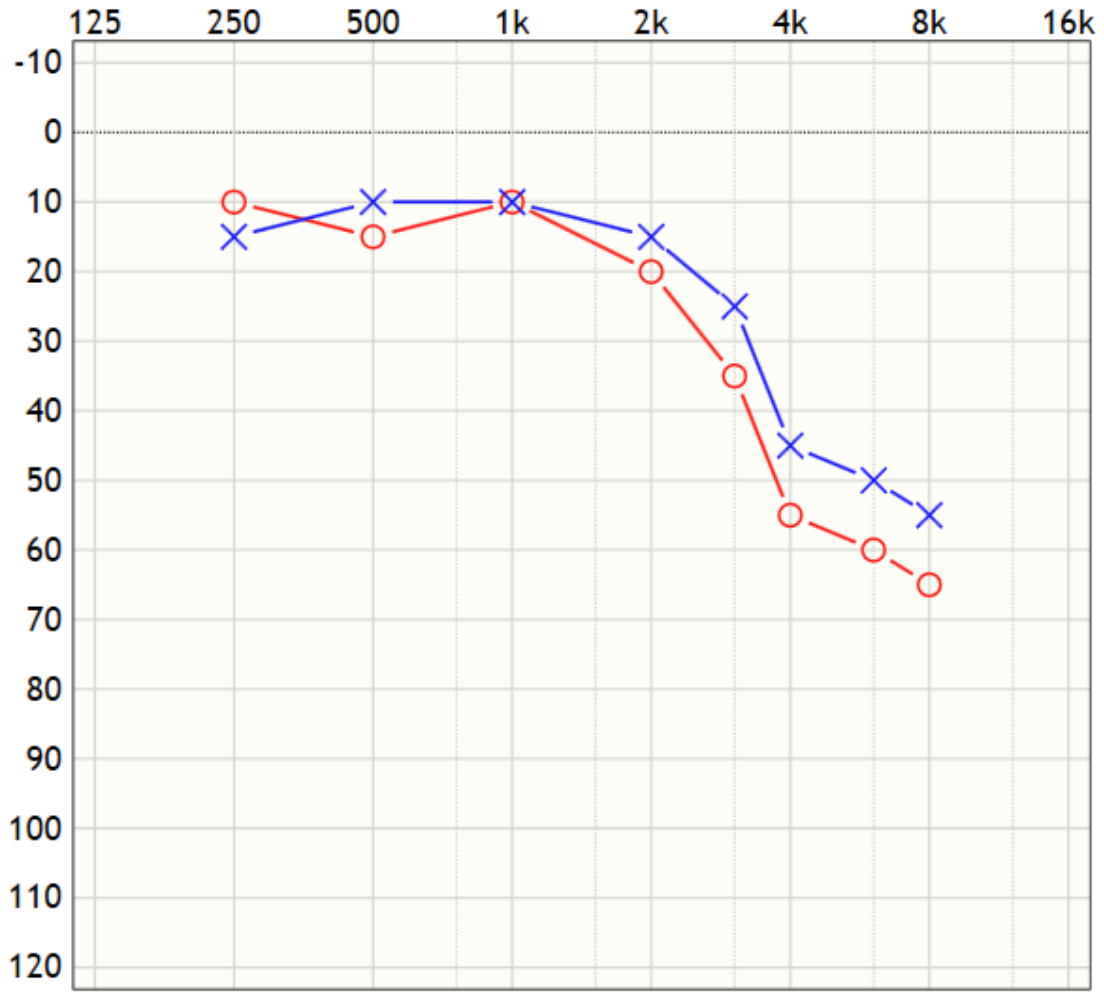

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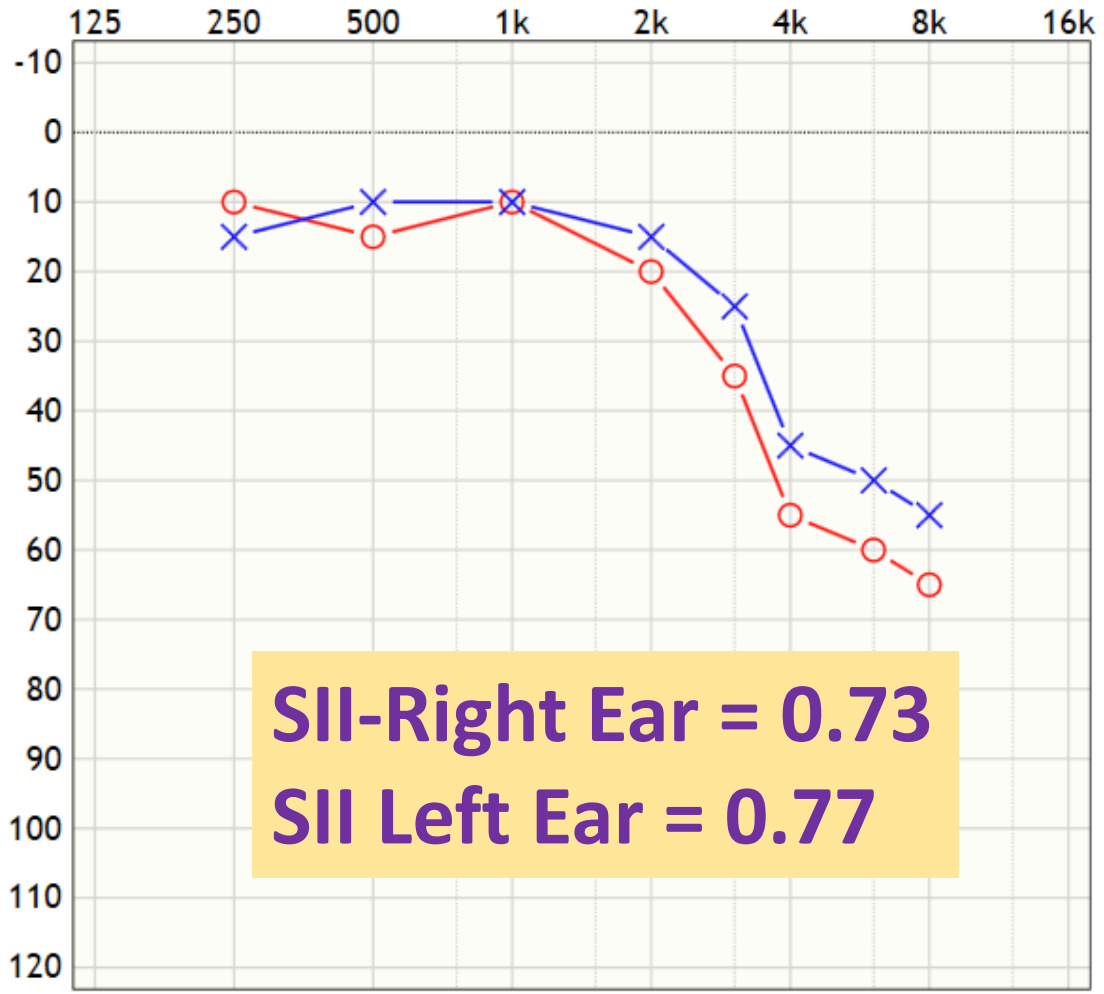

Beyond the Audiogram

- **Minimal hearing loss**
  - Underserved population
  - Children with moderate HL do better than those with mild HL
  - EAC acoustics as children grow

Beyond the Audiogram

Auditory fatigue

- Anecdotal by parents
- Research to explore listening fatigue in school aged children
  - The Vanderbilt Fatigue Scale-Pediatrics are a suite of questionnaires designed to assess listening-related fatigue in children ages 6-17 years
  - https://www.vumc.org/vfs/sites/default/files/public_files/VFS/VFS-Peds%20Manual_v1.pdf

  - Davis, H., Schlundt, D., Bonnet, K., Camarata, S., Hornsby, B., Bess, F.H. (2021). Listening-Related Fatigue in Children with Hearing Loss: Perspectives of Children, Parents, and School Professionals. *American Journal of Audiology*. *30*(4), 929-940. DOI: 10.1044/2021_AJA-20-00216

  - Bess, F., Davis, H., Camarata, S., & Hornsby, B.W.Y. (2020). Listening-Related Fatigue in Children With Unilateral Hearing Loss. *Language, Speech & Hearing Services in Schools*, *51*(1), 84–97. DOI: 10.1044/2019_LSHSS-OCHL-19-0017

Beyond the Audiogram

Auditory effort

- Anecdotal by listeners
- Parent perspective:

  “the marathon vs. the leisurely stroll”

Beyond the Audiogram

Auditory effort

- More challenging to explore in school aged children
  - Understanding Effortful Listening (Pichora-Fuller et al., 2016)
    - Factors such as adverse acoustics, talker accent, and listener language abilities can all contribute to increasing listening effort
    - Compounded by hearing, auditory processing, etc.
  - Research in adults using the NASA TLX (Task Load Index)
    - Addresses mental demand, physical demand, temporal demand, effort, frustration, and perceived performance
    - Very sensitive measure to addressing listening effort

Beyond the Audiogram

Auditory effort

Does this factor into how we assess children in the classroom?

Beyond the audiogram

Students who excel academically

- Is this masking a learning barrier?
- Do we have a responsibility to help them excel?
- Education “driving all students to the middle”

Beyond the audiogram

- Auditory neuropathy
- Auditory processing disorder
- Hearing and listening issues in children who are neurotypical
- Tinnitus and sound tolerance issues
- Vestibular disorders

Interprofessional practice/interdisciplinary team

- Time and effort
  - SLP
  - TOD
  - Technology specialist
  - Clinical/community audiologist

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How can we more effectively reach children we are missing?

“No Child Left Behind”

- Are we?
- Do we even know how many children in our schools have auditory difficulties?

Barriers to Serving Children

- Lack of universal school-age screening
  - Hearing loss occurs after birth
  - We need to identify children with developing and progressive conditions
- Communication
  - Communicating with clinics
  - Family advocacy
- Awareness of conditions that don’t show up on the audiogram

Barriers to Serving Children

- Funding
  - Districts limiting services
- Availability of Educational Audiologists
  - Perceived need
  - Need for more providers

Considerations for Criteria

Audibility-based

Measures of hearing difficulties beyond acuity

Measures of listening fatigue & effort

Treatment-based (as per non-auditory conditions)

Considerations for Criteria

The case for providing services to all children with amplification

What about those who don't?

- APD
- Tinnitus & sound disorders
- Children who don't receive amplification
  - Can't / Won't / Not Allowed
- Cultural considerations / sense of community

THANK YOU!

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