

Update on Diagnostic and Speech Audiometry in Children and Adults

- ☐ The diagnostic auditory test battery needs an update
- ☐ Defining “best practices” and “standard of care”
- ☐ The concept of value added tests (VATs)
- ☐ Modern diagnostic audiology and audiologic rehabilitation
 - Acoustic immittance
 - OAEs
 - Auditory processing tests
 - Audiological rehabilitation
- ☐ Speech audiometry today

Audiology Test Battery: 60+ years Ago

- Test battery at the beginning of our profession, in order of test administration
 - Air-conduction pure tone audiometry
 - Bone-conduction pure tone audiometry
 - Speech reception thresholds
 - Word recognition (PB word lists)
 - Uncomfortable loudness level (UCL), i.e., loudness discomfort level (LDL)

Source: Wiener F & Miller G. Hearing aids. In Combat Instruments II. Washington, D.C. NDRC Report 117, 216-232, 1946

Audiology in the 1950s and 1960s: *Equipment*



GSI 162
Speech
Audiometer

GSI E800
Bekesy
Audiometer



Early Maico Audiometer

Best Practices in Audiology: *Modern Audiometers*



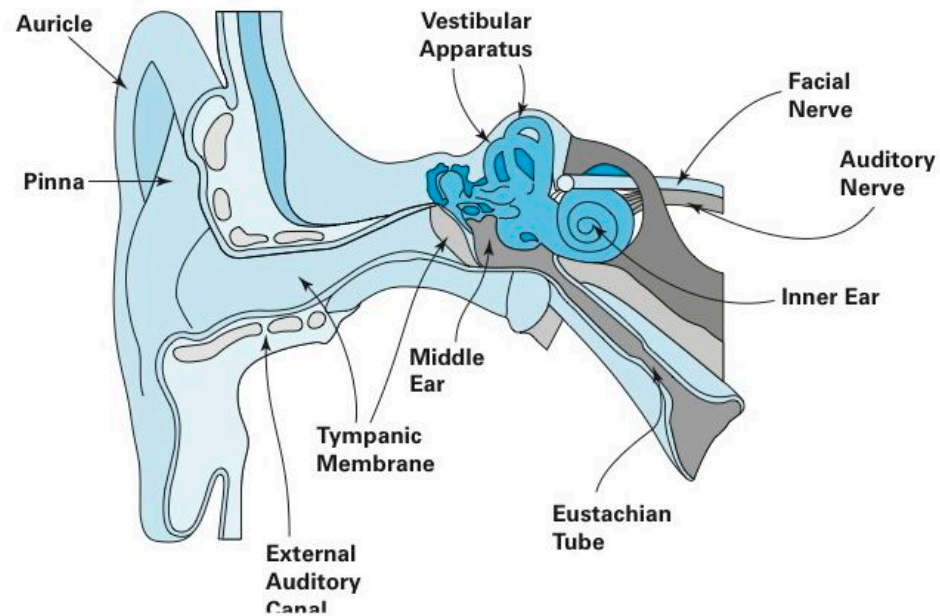
GSI AudioStar Audiometer



KUDUwave Automated Audiometer

Best Practices in Audiology: Efficient and Sensitive Assessment of the Peripheral Auditory System

(Figure: Hall JW III (2014). Introduction to Audiology Today. Boston: Pearson)

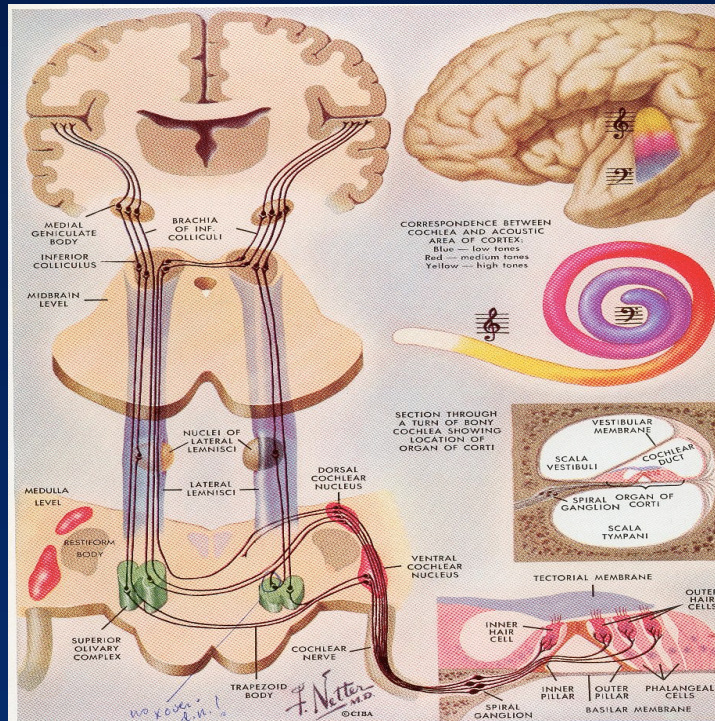


A Modern Diagnostic Audiologic Test Battery

(In the order of testing for new patients. Test time < 1 hour.)

- ❑ Objective measures
 - Otoacoustic emissions (OAEs)
 - Aural immittance measures
- ❑ Behavioral measures
 - Pure tone audiometry
 - ✓ Air conduction
 - ✓ Bone conduction (*as indicated*)
 - ✓ Automated technique as appropriate
 - Speech audiometry
 - ✓ Simple procedures
 - ✓ Central auditory procedures (*as indicated*)

We Hear with Our Brain! Efficient and Sensitive Assessment of the Central Auditory Nervous System



Procedures for Central Auditory Assessment (As Indicated)

- ❑ Behavioral measures
 - Speech-in-noise tests
 - Distorted speech tests
 - Dichotic listening tests
 - Temporal processing and sequencing tests
- ❑ Objective measures
 - Auditory brainstem response
 - ✓ Non-speech signals (clicks and tone bursts)
 - ✓ Speech signals
 - Cortical auditory evoked responses

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Best Practices are Evidence-Based

"Those who fall in love with practice without science are like a sailor who steers a ship without a rudder or compass, and who can never be certain whither he is going."

Leonardo Da Vinci (1452-1519)

General Definitions of Standard of Care

- ☐ **Consistent with local, regional or national clinical practice**
- ☐ **Follows guidelines or recommendations on clinical practice approved by national multi-disciplinary professional committees or panels, e.g., Joint Committee on Infant Hearing or NHS 2013**
- ☐ **Follows guidelines on clinical practice approved by national professional organizations, e.g., AAA or BSA**
- ☐ **Is consistent with statements of**
 - **Scope of Practice**
 - **Code of Ethics**
- ☐ **Is in compliance with Federal guidelines for clinical practice and services**

Best Practices in Audiology: Specific Sources for Practice Guidelines (Standard of Care in the USA)

- ❑ Guidelines for different clinical practices, e.g.,
 - Diagnostic audiometry in adults
 - Pediatric diagnostic audiology
 - Preschool hearing screening
 - Hearing aids and amplification
 - Ototoxicity monitoring and assessment
 - APD assessment and management
 - Tinnitus assessment and management
 - Cochlear implants

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The Concept of Value Added Tests (VATs): Fundamental Criteria for Inclusion in a Test Battery

- ❑ Value added tests (VATs)
 - The procedure adds value to the description of auditory status for the patient ... information that's
 - ✓ Not available from other procedures,
 - ✓ Obtained quicker than with another procedure
 - ✓ Useful in managing the patient
 - ✓ Contributes to better outcome for the patient
- ❑ OAEs are an example of a VAT
- ❑ Some traditional test procedures do **not** always add value, e.g.,
 - Speech recognition threshold (SRT)
 - Bone conduction pure tone audiometry
 - Word recognition only in quiet at 40 dB SL

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Linkage between Diagnostic Procedures and Intervention Outcome: *Aural Immittance Measurement*

□ Diagnostic information

- Middle ear versus sensory auditory dysfunction
- Objective confirmation of sensory hearing loss
- Objective evidence of retrocochlear auditory dysfunction
- Objective evidence of central nervous system dysfunction

□ Impact on Intervention Outcome

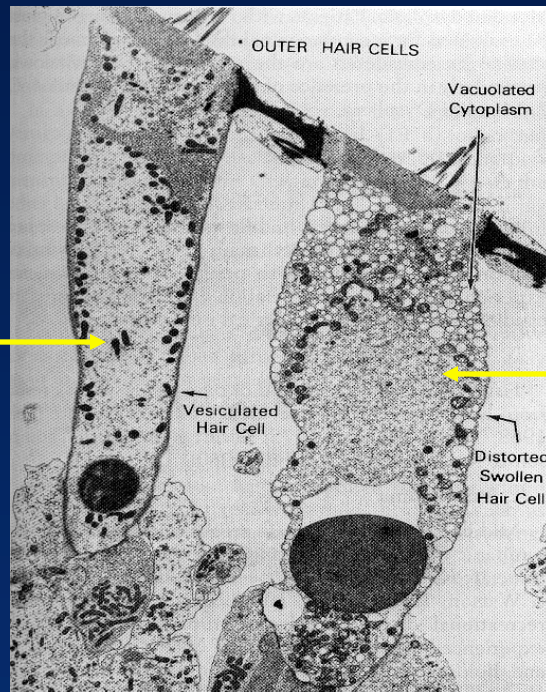
- Prompt medical management of middle ear disorder
- Cost effective and lower risk decisions regarding further diagnostic test procedures (e.g., ABR under anesthesia)
- Referral for otologic consultation and MRI referral
- Referral for APD assessment or neurological consultation

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OAEs in Early Detection of Outer Hair Cell Dysfunction

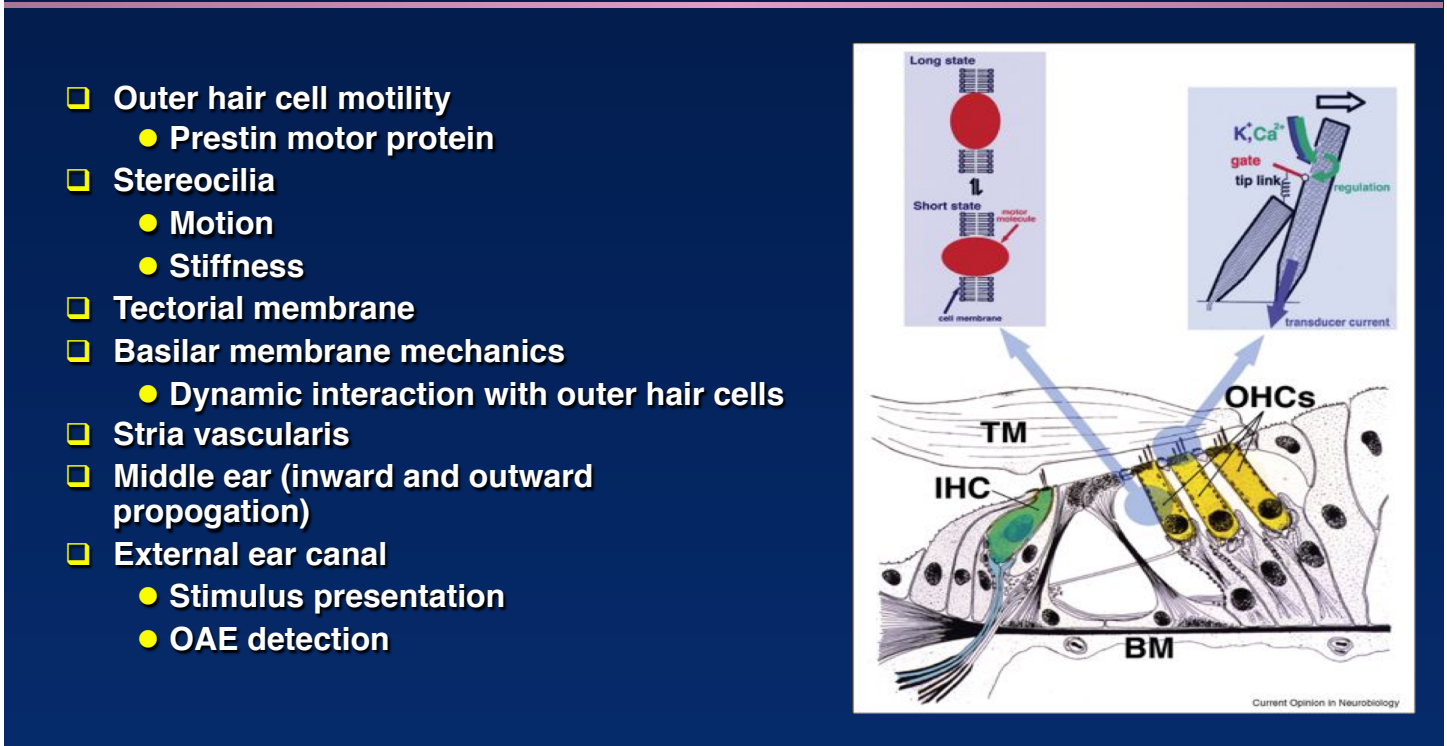
**Normal
OHC
(OAEs)**



**Abnormal
OHC
(OAEs)**

Cochlear Origins of OAEs

- ❑ Outer hair cell motility
 - Prestin motor protein
 - ❑ Stereocilia
 - Motion
 - Stiffness
 - ❑ Tectorial membrane
 - ❑ Basilar membrane mechanics
 - Dynamic interaction with outer hair cells
 - ❑ Stria vascularis
 - ❑ Middle ear (inward and outward propagation)
 - ❑ External ear canal
 - Stimulus presentation
 - OAE detection
- The diagram illustrates the dynamic interaction between the cochlea and the middle ear. The top part shows a schematic of the cochlea with labels for the Tectorial Membrane (TM), Inner Hair Cells (IHC), Outer Hair Cells (OHCs), and Basilar Membrane (BM). The bottom part shows a detailed view of the OHCs, highlighting the motor protein (Prestin) and the transducer current (K⁺, Ca²⁺). The diagram illustrates how the OHCs' motility (Prestin) and the transducer current (K⁺, Ca²⁺) contribute to the dynamic interaction between the cochlea and the middle ear.
- Current Opinion in Neurobiology



Best Practices in Audiology: Evidence-Based Clinical Applications of OAEs in Pediatric Populations

□ Pediatric Applications

- Infant hearing screening
- Diagnosis of auditory dysfunction in infants and young children
 - ✓ Identification of auditory neuropathy spectrum disorder
- Monitoring ototoxicity
- Pre-school/school screenings
- Identification of pseudohypacusis



Best Practices in Audiology: Evidence-Based Clinical Applications of OAEs in Adult Populations

- ❑ Sensitive measure of middle ear status
- ❑ Sensitive and specific measure of auditory dysfunction in noise/music exposure
- ❑ Diagnosis of false or exaggerated hearing loss
- ❑ Cochlear versus retrocochlear dysfunction
- ❑ Assessment of tinnitus & hyperacusis
- ❑ Auditory processing disorders (r/o cochlear deficit)
- ❑ Industrial hearing screening and conservation

OTOACOUSTIC EMISSIONS

PRINCIPLES, PROCEDURES
AND PROTOCOLS



SUMITRAJIT DHAR
JAMES W. HALL III



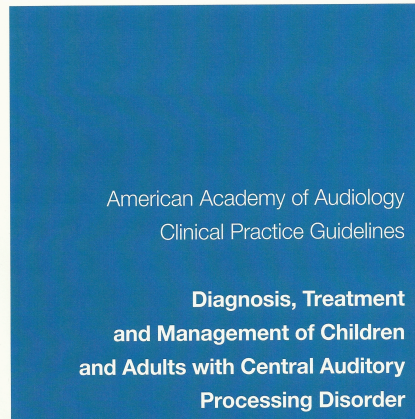
Linkage between Diagnostic Procedures and Intervention Outcome: *Otoacoustic Emissions (OAEs)*

- ❑ **Diagnostic information**
 - Early detection of cochlear (outer hair cell) dysfunction
 - Objective confirmation of sensory dysfunction in infants
 - Frequency specific details on cochlear dysfunction
- ❑ **Impact on Intervention Outcome, e.g.,**
 - Preventative measures for persons at risk for sound hearing loss
 - Preventative measures or modification of drug therapy for persons at risk for ototoxicity related hearing loss
 - Effective and appropriate management of pseudohypacusis
 - Effective and appropriate management of tinnitus
 - Early intervention for permanent infant hearing loss
 - Early intervention for ANSD

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AAA Clinical Guidelines on Auditory Processing Disorders (www.audiology.org)



August 2010

AMERICAN ACADEMY OF AUDIOLOGY 
www.audiology.org



Risk Factors for APD in Children: Team Work for Early Identification and Assessment

- ❑ Neurological dysfunction and disorders (*physicians*), e.g.,
 - Neonatal risk factors (e.g., asphyxia, CMV)
 - Head injury
 - Seizure disorders
- ❑ Chronic otitis media in preschool years (*otolaryngologists*)
- ❑ Language disorders resistant to treatment (*speech pathologists*)
- ❑ Older siblings with APD (*parents, teachers*)
- ❑ Academic underachievement or failure (*pre-school and Head Start teachers, classroom teachers, and educational psychologists*)
- ❑ Poor listeners (*pre-school and Head Start teachers, classroom teachers, and educational psychologists*)
- ❑ Family history of academic underachievement (*parents*)
- ❑ Co-existing disorders (*multiple professionals*)

Auditory Processing Disorders in Adults: *Etiologies*

- ❑ Aging of the central auditory nervous system
 - Longstanding evidence
 - Recent findings
- ❑ Combined peripheral and central auditory disorders
 - Central auditory dysfunction with progressive peripheral hearing loss
 - Peripheral hearing loss with progressive central auditory dysfunction
- ❑ Dementia and psychiatric/Neurological disorders, e.g.,
 - Neoplasms
 - Cardiovascular disease
 - Dementias (Alzheimer' s dementia)
 - Schizophrenia?
 - Parkinson' s Disease
- ❑ Traumatic head injury
 - Motor vehicle accidents
 - Gunshot wounds
 - Military blasts and explosions

Auditory Processing Disorders in Adults: Risk Factors and Clinical Indications

- ❑ Medical history (etiologies in previous slide)
- ❑ Audiological history
 - Communication complaints greater than expected by audiogram
 - Deterioration in communication abilities with stable audiogram
 - Unusually poor benefit from amplification
- ❑ Audiological findings
 - Abnormality for crossed versus uncrossed acoustic reflexes
 - Speech audiometry
 - ✓ Very poor speech perception
 - ✓ Rollover on PI PB functions
 - ✓ Problems with speech in noise
 - Slow response time and processing speed
 - Poor benefit from amplification

Consequences of Late Identification of Auditory Processing Disorders (APD)

- **Children**
 - Reading failure
 - Academic failure
 - Psychosocial problems
 - May require long-term remediation
- **Adults**
 - Unemployment
 - Under employment
 - Psychosocial problems
 - Incorrect diagnosis, e.g.,
 - ✓ Dementia
 - Mismanagement
 - Poor quality of life

Assessment of APD: Peripheral Test Battery (< 20 minutes)

- ❑ Otoacoustic emissions (OAEs)
 - Diagnostic protocol, e.g.,
 - ✓ 500 to 8000 Hz
 - ✓ ≥ 5 frequencies per octave
 - OAEs are abnormal in 35% of children undergoing APD assessment
- ❑ Aural immittance measures
 - Tympanometry
 - Acoustic reflexes
 - ✓ *crossed vs. uncrossed conditions* Pure tone audiometry
 - Inter-octave frequencies (e.g., 3000 and 6000 Hz)
 - High frequency (> 8000 Hz) audiometry (as indicated)
- ❑ Speech audiometry
 - Word recognition (10 most difficult words first)

APD ASSESSMENT: Behavioral Test Battery for Auditory Processes (1) (ASHA, 2005; AAA, 2010)

- ❑ **Auditory Discrimination Tests:** Tests with similar acoustic stimuli that differ in frequency, intensity, and/or temporal parameters, e.g.,
 - Difference limens for frequency, intensity, and duration
 - Psychophysical tuning curves
 - Phoneme discrimination).
- ❑ **Auditory Temporal Processing and Patterning Tests:** Tests of ability to analyze acoustic events over time, e.g.,
 - Sequencing and patterns
 - Gap detection (Gaps in Noise, GIN, test)
 - Forward and backward masking)
- ❑ **Dichotic Speech Tests:** Tests of ability to separate (i.e., binaural separation) or integrate (i.e., binaural integration) disparate auditory stimuli presented to each ear simultaneously, e.g.,
 - Dichotic CVs
 - Dichotic digits
 - Dichotic words
 - Dichotic sentence identification

APD ASSESSMENT:
Behavioral Test Battery for Auditory Processes (2)
(ASHA, 2005; AAA, 2009)

- ❑ **Monaural Low-Redundancy Speech Tests:** Recognition of degraded speech stimuli presented to one ear at a time (e.g., filtered, time-altered, intensity- altered, e.g.,
 - Performance-intensity PI-PB functions
 - Speech-in-noise or speech-in-competition
 - ✓ Synthetic sentence identification with ipsilateral competing message (SSI-ICM)
 - ✓ Listening in Spatialized Noise-Sentences (LiSN-S) procedure
 - Hearing In Noise Test (HINT)
 - Speech In Noise (SIN or QuickSIN) test
- ❑ **Binaural Interaction Tests:** Assess binaural (i.e., diotic) processes dependent on intensity or time differences of acoustic stimuli, e.g.,
 - Masking level difference
 - Localization & lateralization (e.g., LiSN-S)

Linkage between Diagnostic Procedures and Intervention Outcome

Measures of Auditory Processing

- ❑ Diagnostic information
 - Identification of central auditory nervous system dysfunction
 - Differentiation among types of auditory processing deficits
- ❑ Impact on Intervention Outcome
 - Timely referrals for
 - ✓ Comprehensive APD assessment
 - ✓ Speech-language consultation
 - ✓ Neurological consultation
 - ✓ Neuro-psychological consultation
 - Implementation of treatment, including:
 - ✓ Auditory training, e.g., Earbobics or LACE (Listening and Communication Enhancement)
 - ✓ FM technology
 - ✓ Amplification

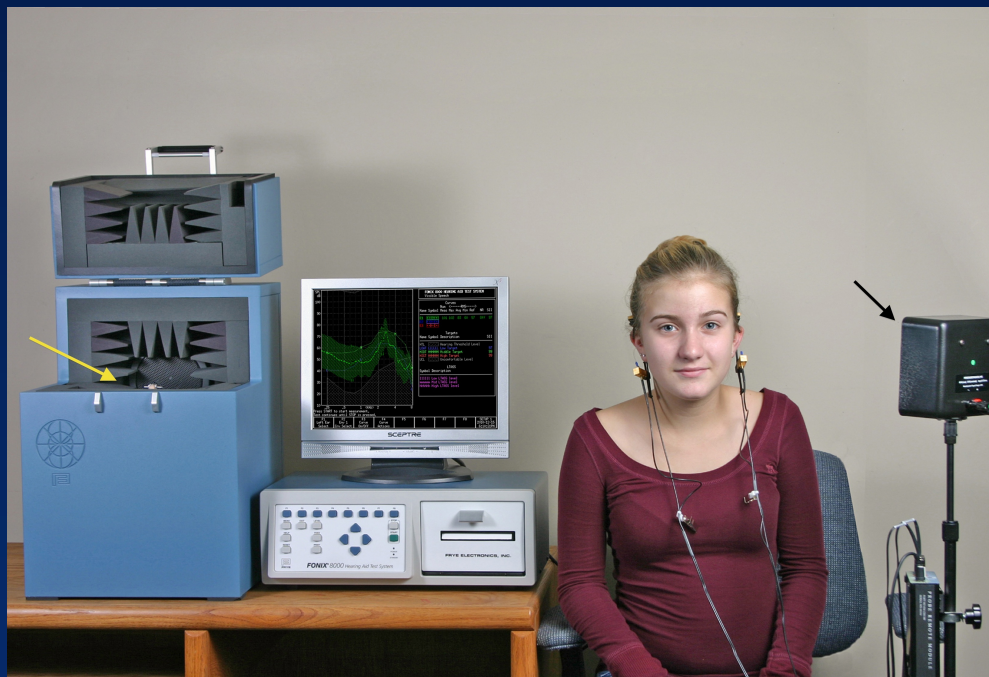
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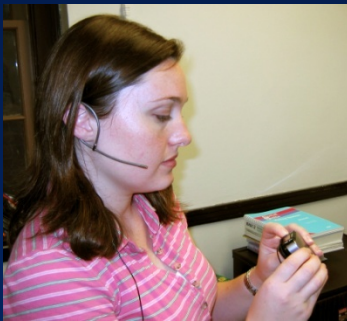
Best Practices in Audiology: Hearing Aid Technology in Rehabilitation



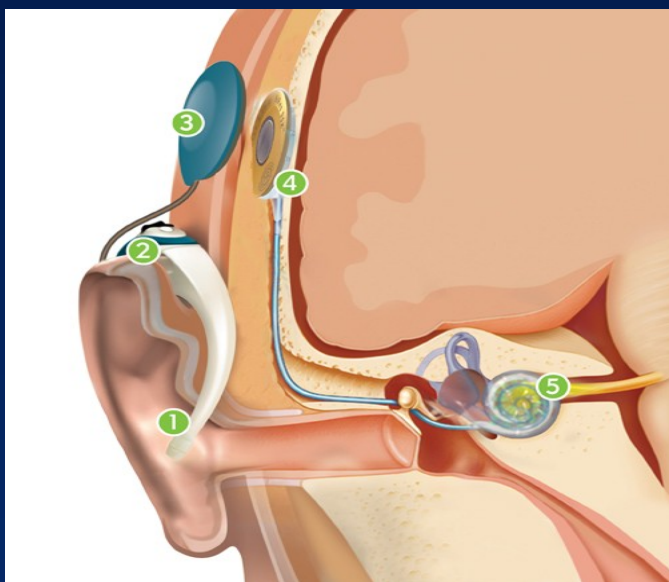
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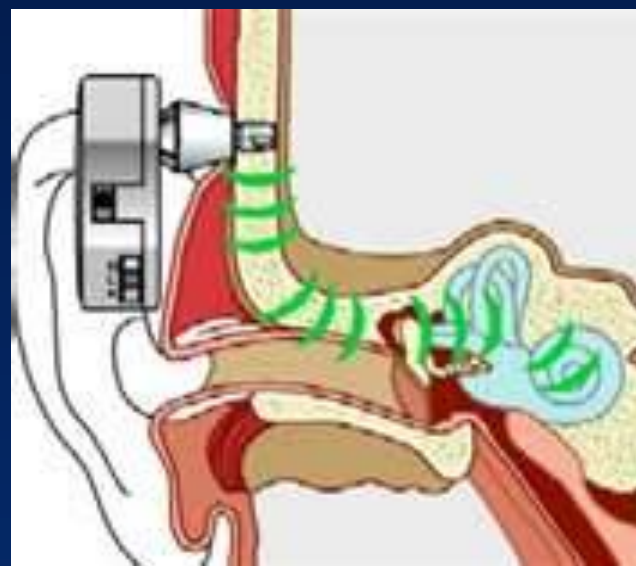
Best Practices in Audiology: FM Technology in Rehabilitation



Best Practices in Audiology: Implant Technology and Rehabilitation




Cochlear Implants



Bone Anchored Hearing Devices

Best Practices in Audiology: Auditory and Cognitive Training in Rehabilitation



Competing VoiceMoney Matters18/26

Degraded Speech Training
Competing Voice Task

In this task, two competing voices are heard. Discriminating between two voices can be difficult. The second voice will often "mix" with the primary voice. It's this "mixing" effect that creates difficulty when trying to block out a competing voice. Listen to the **female** voice in the next segment.

Press "PLAY" to begin.

1234

← NO → YES
Left Space Bar Right

Esc MENU ← NEXT

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- ❑ **Speech audiometry today**

Update on Diagnostic and Speech Audiometry in Children and Adults: Speech Audiometry Today

- ❑ Historical perspective**
- ❑ Speech audiometry is important**
 - An essential component in a diagnostic test battery**
 - Types of speech audiometry procedures**
 - Advantages of recorded test materials**

Foundation of Speech Audiometry: Bell Telephone Laboratories



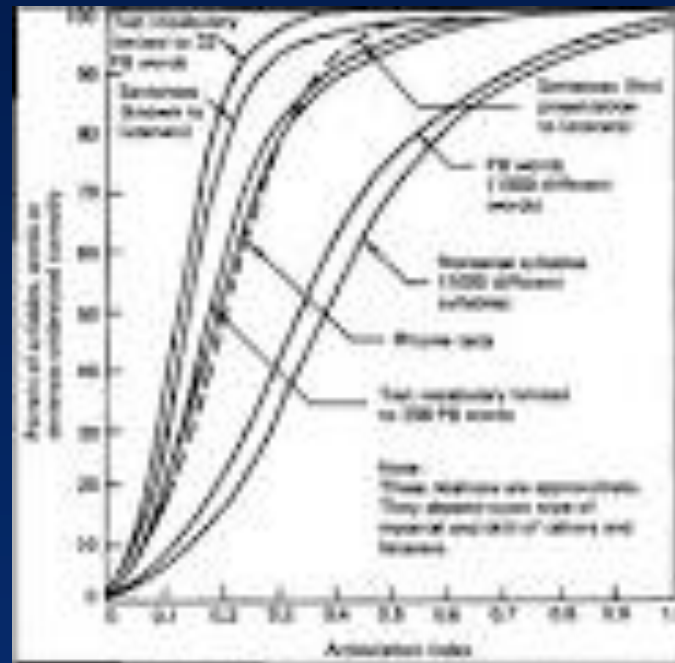
**Harvey Fletcher
(1884-1981)**



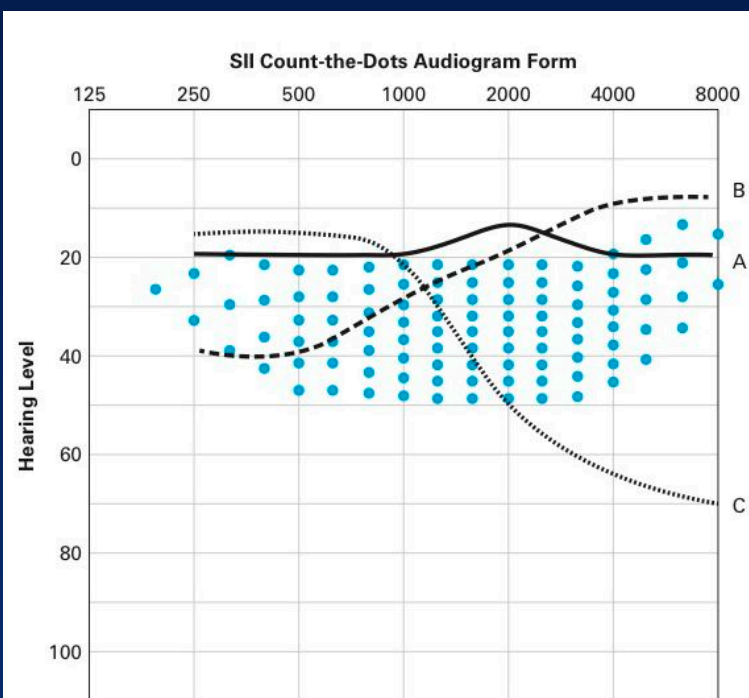
**Western Electric Speech Audiometer
Bell Labs**

Foundation of Speech Audiometry: Bell Telephone Laboratories

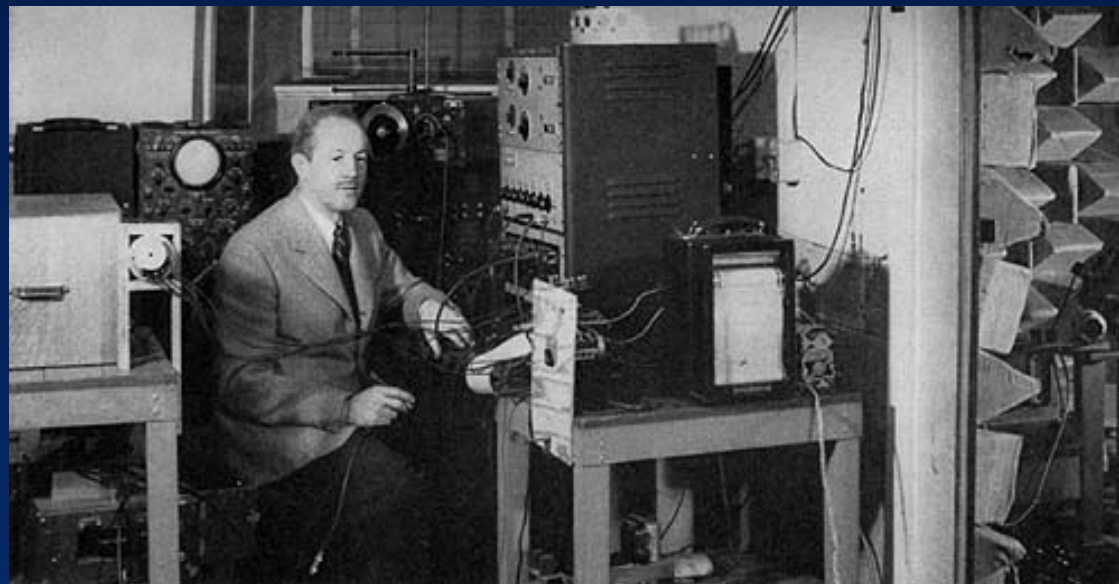
- ❑ Fletcher H (1929). Speech and Hearing. New York: D Van Nostrand
- ❑ Fletcher H & Steinberg JC (1929). Articulation testing methods. Bell System Technical Journal, 8, 806-854



Foundation of Speech Audiometry: Articulation Index Research is Applied in the “Count-the-Dots” Audiogram

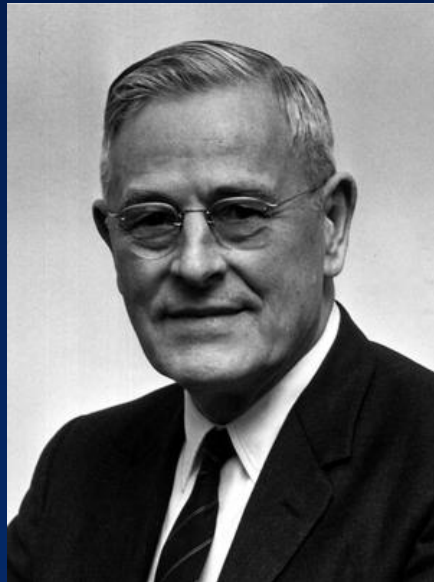


**Foundation of Speech Audiometry:
Psychoacoustics Laboratory (PAL)
Harvard University (1940s and 1950s)**

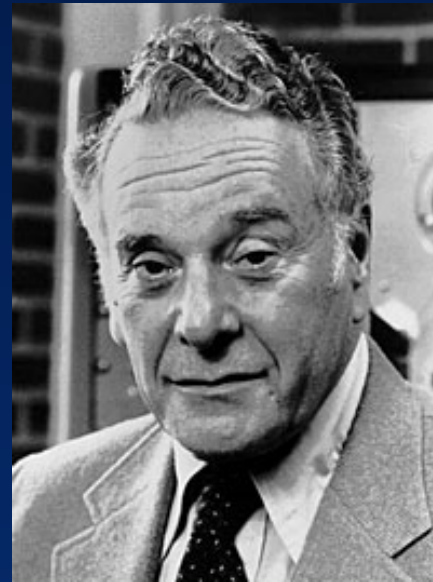


SS Stevens
(1906-1973)

**Foundation of Speech Audiometry:
Psychoacoustics Laboratory (PAL)
Harvard University (1940s and 1950s)**



Hallowell Davis
(1896-1992)



Ira Hirsh
(1922-2010)

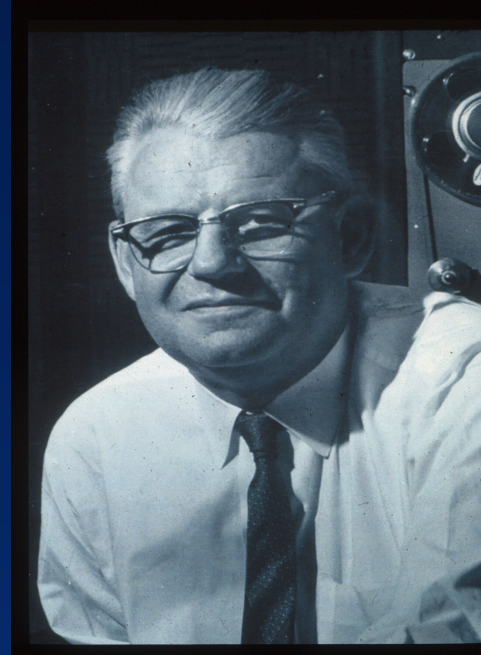
**Foundation of Speech Audiometry
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- ❑ Davis H (1948). The articulation area and the social adequacy index for hearing. *Laryngoscope*, 58, 761-778
- ❑ Egan JP (1948). Articulation testing methods. *Laryngoscope*, 58, 955-991
- ❑ Hirsh IJ, Davis S, Silverman et al (1952). Development of materials for speech audiometry. *Journal of Speech & Hearing Disorders*, 17, 321-337
- ❑ Hudgins CV, Hawkins JE, Karlin JE & Stevens SS (1947). The development of recorded auditory tests for measuring hearing loss for speech. *Laryngoscope*, 40, 57-89

Audiology Test Battery: 60+ years Ago

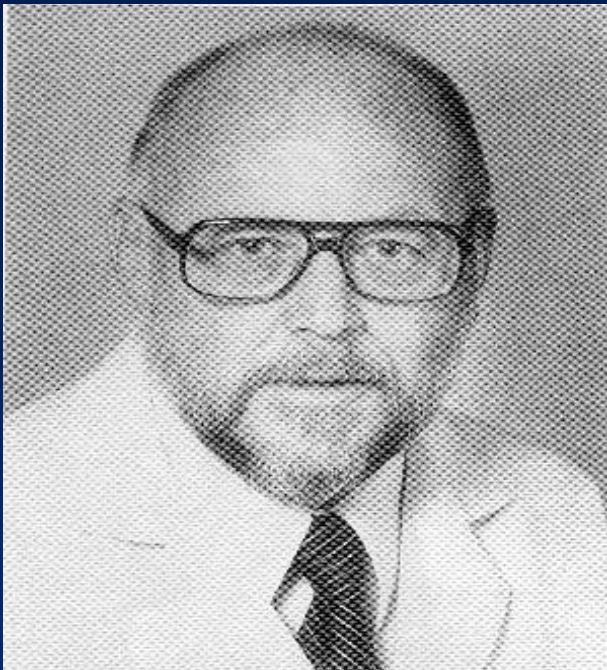
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Source: Wiener F & Miller G. Hearing aids. In Combat Instruments II. Washington, D.C. NDRC Report 117, 216-232, 1946



Raymond Carhart

James Jerger
“Father of Diagnostic Audiology”
Developed Speech Audiometry Procedures in the 1960s



GSI 162 Speech Audiometer

Audiometers for Speech Audiometry from the 1970s to the Present



GSI 10



GSI 61



GSI 16



GSI
AudioStar

A Modern Audiometer for Speech Audiometry GSI AudioStar Pro



A Modern Audiometer for Speech Audiometry

GSI AudioStar Pro

(Speech Reception Threshold)

Joe Frank

Speech

Channel 1

0 dB HL

INT A Left

PTA AC: 47 BC:

Ear	Test Type	Int Ext Mic

Playground	
Padlock	
Oatmeal	Greyhound
Stairway	Woodwork
Workshop	Pancake
Farewell	

Score - SRT

%

Word Lists

Favorites:

Source: Internal

CD Name: Basic Auditory Tests - Adult

Word List: Spondee A

Save Cancel

Channel 2

0 dB HL

Left Speaker2

Aid	%	dB HL	dB EM

Iceberg	
Whitewash	
Hothouse	
Railroad	
Sidewalk	

Test Type Word Lists Word Nav Aided 5 dB Step

11:50 AM 9/23/2013

A Modern Audiometer for Speech Audiometry

GSI AudioStar Pro

(Speech Reception Threshold)

The screenshot displays the 'AudioStar Pro Config' window with the 'Audiometry' tab selected. The interface is divided into two main sections: 'Front panel controls' and 'Screen menu controls'. On the right side, there is a vertical sidebar with buttons for 'General', 'Pure tone', 'High Hz', 'Speech', and 'Norm values', with 'Speech' currently highlighted.

Front panel controls

	Channel 1	Channel 2	Speech Display
Stimulus	INT/EXT A	SN	<input type="radio"/> Audiogram <input checked="" type="radio"/> Status
Transducer	PHONE	PHONE	Filter settings: Linear
Level (dB)	0	0	<input checked="" type="checkbox"/> AutoAdvance on Score
Routing	RIGHT	LEFT	QuickSIN/BKBSIN scoring method: Use incorrect button
			Internal Wavefile Auto-Play mode: Wait for Score
			TimeOut (sec): 5

Screen menu controls

dB Step	5	Source	<input checked="" type="radio"/> Internal <input type="radio"/> External
Test Type	SRT		

Note: If the Speech Display option is set to Audiogram and the Test type selected is WRS, the setting becomes WRS-S

A Modern Audiometer for Speech Audiometry GSI AudioStar Pro (Word Reception)

Speech

Channel 1

30

dB HL

INT A Right Insert Phone

-20 -10 -5 -3 -2 -1 0 +1 +2 +3

Score - WRS

Channel 2

0

dB HL

Speech Noise Left Insert Phone

-20 -10 -5 -3 -2 -1 0 +1 +2 +3

PTA AC: 22 BC: SII: 70% Right Reliability

PTA AC: 23 BC: SII: 72% Left

Ear	Test Type	Int Ext Mic	Word List	Aid	%	dB HL	dB EM
R	SRT	INT	Spondee A			30	

Ear	Test Type	Int Ext Mic	Word List	Aid	%	dB HL	dB EM
L	SRT	INT	Spondee A			30	

Basic Auditory Tests - Child : PBK-50 List 1A Page 1/2

Please	Great	Sled	Pants	Rat	Bad	Pinch
Such	Bus	Need	Ways	Five	Mouth	Rag
Put	Fed	Fold	Hunt	No	Box	Are
Teach	Slice	Is	Tree	Smile	Bath	Slip
Ride	E				art	Scab
Lay	Cl				ee	Few

Manual
☒ Auto Advance
3 AutoPlay Timeout (sec)
Close

Test Type Word Lists ☒ Word Nav ☐ Aided 5 dB Step

3:40 PM
1/20/2014

A Modern Audiometer for Speech Audiometry GSI AudioStar Pro (Automatic Scoring in Speech Testing)

Front panel controls

Speech Display
☐ Audiogram ☒ Status

Filter settings Linear ▼

☒ AutoAdvance on Score

QuickSIN/BKBSIN
scoring method Use incorrect button ▼

Internal Wavefile
Auto-Play mode Wait for Score ▼

TimeOut (sec): 5

A Modern Audiometer for Speech Audiometry

GSI AudioStar Pro

(A Variety of Speech Test)

The screenshot displays the 'AudioStar Pro Config' window with the 'Audiometry' tab selected. The interface includes a top toolbar with icons for Download, Upload, Default, Load, Save, Configure, and About. The main content area is divided into several sections:

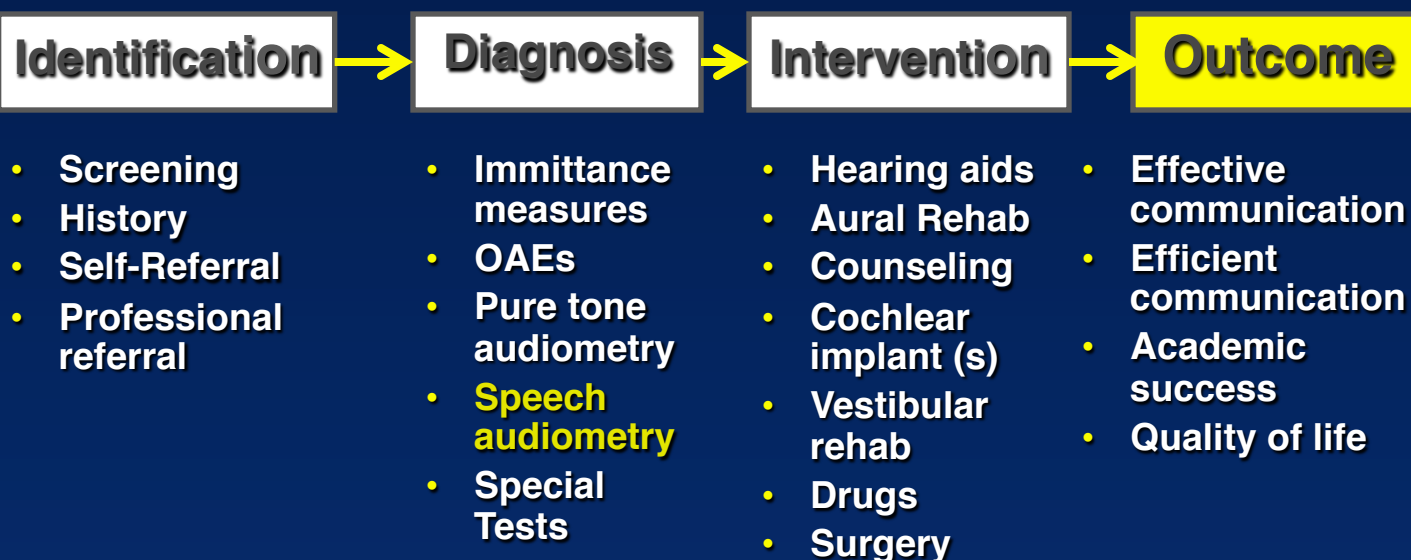
- Remove Internal Word List from Instrument:** A section with instructions to press the upload button to see word lists on the instrument. It contains a list of 'Internal Word Lists on the Instrument' (AZBio Sentence Test, DOD VA Tonal and Speech CD2, CID Everyday Speech, DOD and VA Speech Materials CD2, LNT MLNT, NU-CHIPS, Scan-3) and a 'Delete From Instrument' button.
- External CD names:** A section with a text input field and buttons for Delete, Edit, Replace, and Enter.
- Word List Favorites:** A section with a dropdown menu (currently showing 'CID Everyday Speech') and a list of word lists (List A through List F). To the right of this list are checkboxes for various test types: SRT, SDT, WRS, WRS-M, WRS-S, SRS (checked), MCL, and UCL. Below the list is an 'Add Favorite' button.
- Table:** A table with columns 'Cd Name', 'Word List', and 'Test'. It contains two rows: 'CID Everyday Speech' with 'List A' and 'SRS', and 'CID Everyday Speech' with 'List B' and 'SRS'. To the right of the table are buttons for 'Move Up', 'Move Down', and 'Delete'.
- Clear list:** A button at the bottom right of the Word List Favorites section.

A vertical sidebar on the right side of the window contains buttons for Security, Facility, Printout, Word lists, and Log.

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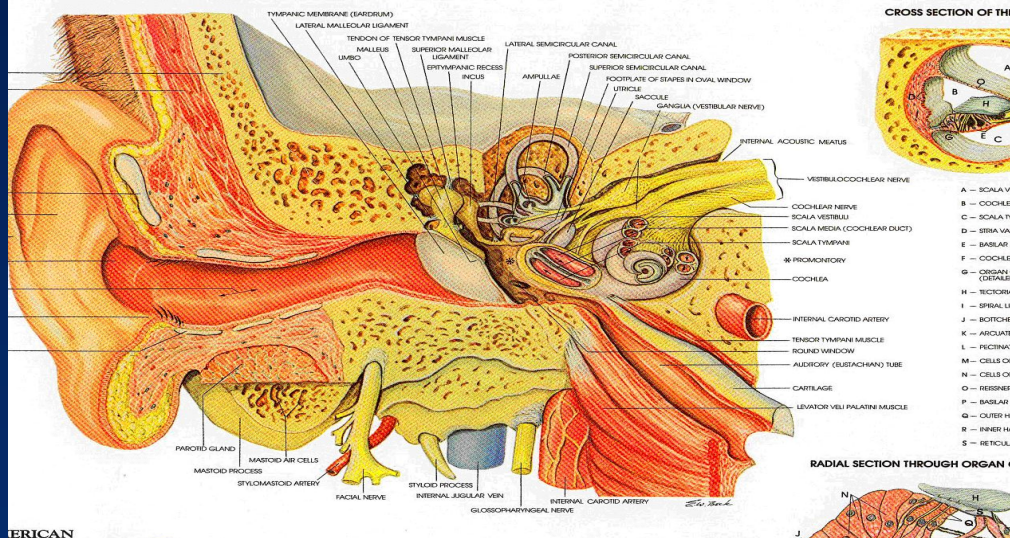
- ❑ **Historical perspective**
- ❑ **Speech audiometry is important to evaluate communication**
 - **Types of speech audiometry procedures**
 - **Advantages of recorded test materials**

Speech Audiometry in Evidence-Based Practice: Categories of Research Evidence (ASHA, 2004)



Speech Audiometry Assessment of the Peripheral Auditory System

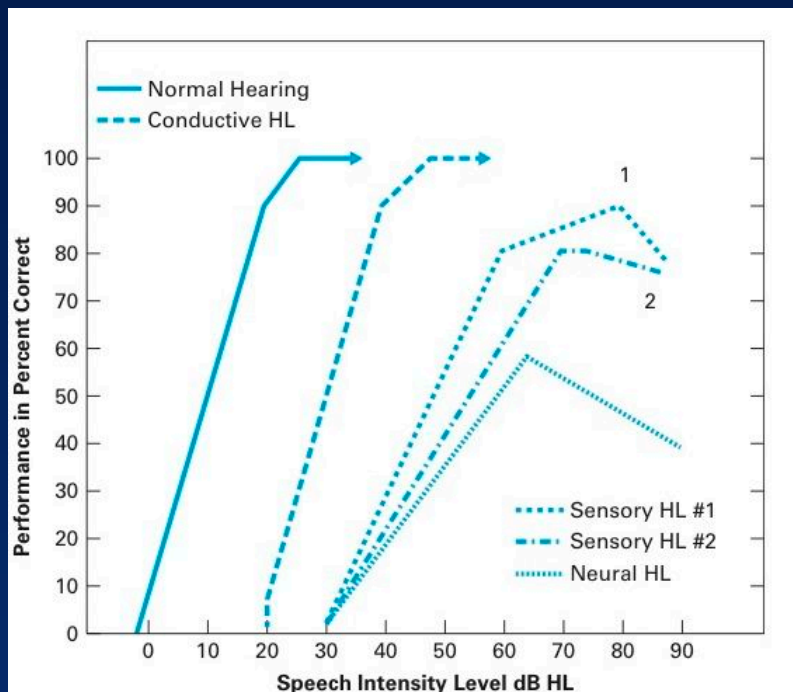
ANATOMY OF THE HUMAN EAR



Speech Audiometry Procedures for General Auditory Assessment

- ❑ Threshold measures
 - Speech awareness or detection tests (SAT or SDT)
 - Speech recognition threshold (SRT)
- ❑ Word recognition tests
 - Phonetically balanced word lists (≥ 25 words)
 - Verbal or picture pointing response mode
 - Efficiency is increased with 10 most difficult words first
 - **Performance intensity functions are most accurate measure**
- ❑ Speech-in-noise tests, e.g.,
 - **Speech-in-noise (SIN) or QuickSIN**
 - Hearing in Noise Test (HINT)

Speech Audiometry Procedures for Performance Intensity Functions for PB Words



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Hall JW III. *Introduction to
Audiology Today*

A Modern Audiometer for Speech Audiometry GSI AudioStar Pro with QuickSIN

Joe Frank QuickSIN

Channel 1

70 dB HL

INT A Left Speaker2

20 -10 -5 -3 -2 -1 0 +1 +2 +3

Group 1 SNR Loss Averages

	R	B	L
Basic			
HFE			
HFE-LP			

Group 2 SNR Loss Averages

	R	B	L
Basic			
HFE			
HFE-LP			

Channel 2

0 dB HL

INT B Left Speaker2

20 -10 -5 -3 -2 -1 0 +1 +2 +3

BVRA

PTA AC: 47 BC: SII: 24% Right Reliability: None PTA AC: BC: SII: Left

Test Results Group 1

Ear	Word List	SNR 50	SNR Loss

Test Results Group 1

Ear	Word List	SNR 50	SNR Loss

Test Results Group 1

Ear	Word List	SNR 50	SNR Loss

QuickSIN Practice List A (Track 21)

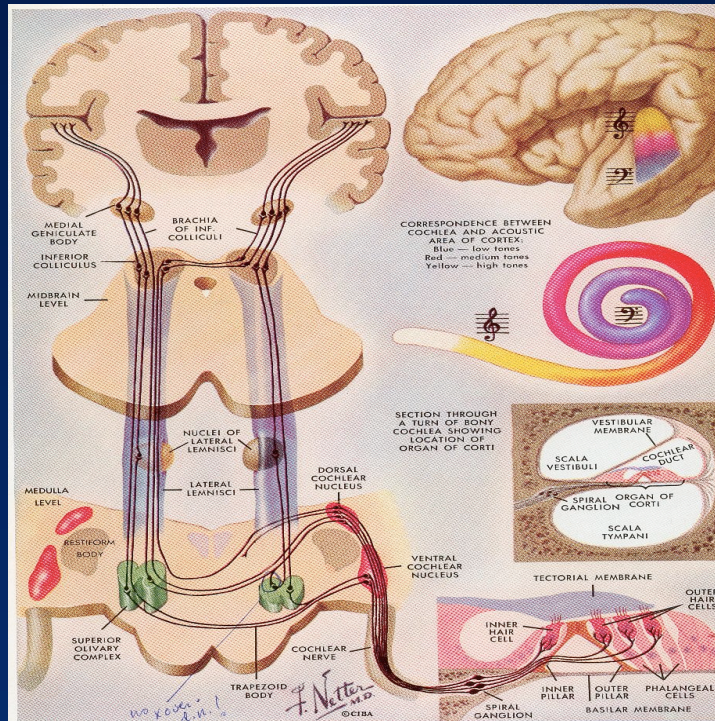
The LAKE SPARKLED in the RED HOT SUN.	S/N 25	-
TEND the SHEEP WHILE the DOG WANDERS	S/N 20	-
TAKE TWO SHARES as a FAIR PROFIT	S/N 15	-
NORTH WINDS BRING COLDs and FEVERs	S/N 10	-
a SASH of GOLD SILK will TRIM har DRESS	S/N 5	-
FAKE STONES SHINE but COST LITTLE	S/N 0	-
Sum		0

Word Lists ☐ Word Nav ☐ Aided ☐ 5 dB Step 1 Group ☐ Research ☐

11:54 AM 9/23/2013

We Hear with Our Brain!

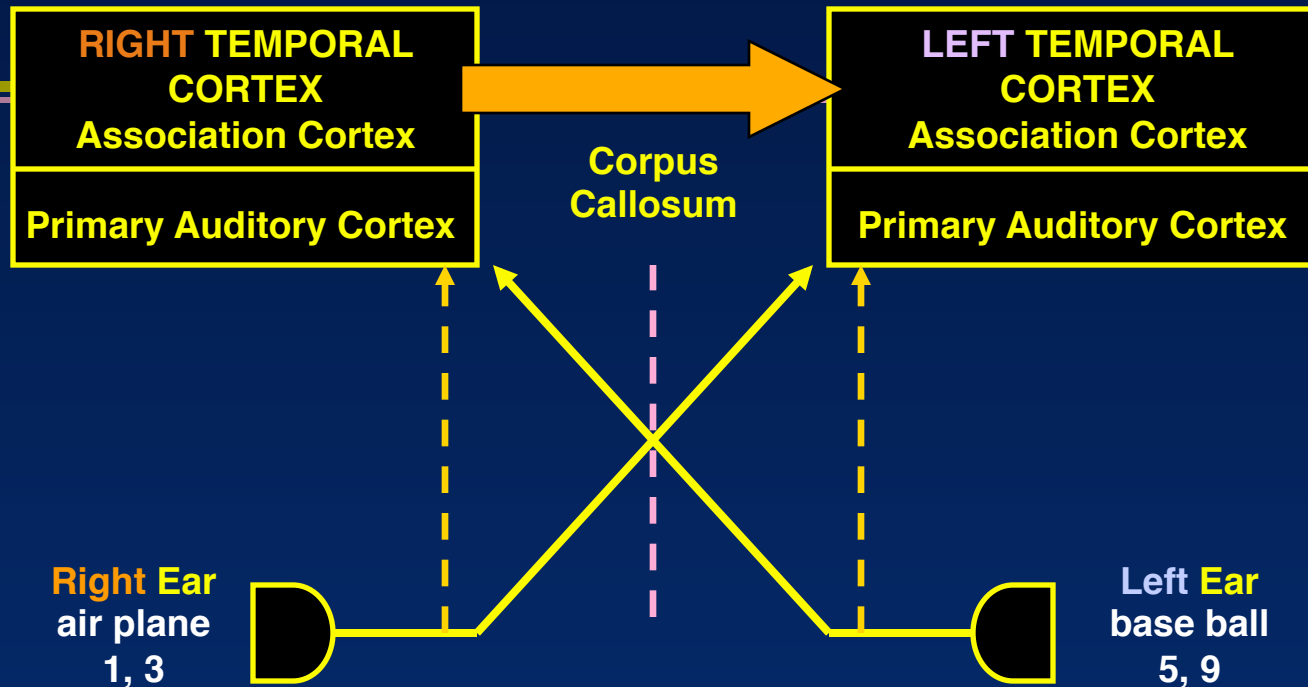
Speech Audiometry Permits Efficient and Sensitive Assessment of the Central Auditory Nervous System



Speech Audiometry Procedures for Central Auditory Assessment

- ❑ Behavioral measures
 - Speech-in-noise tests
 - Distorted speech tests
 - ✓ Filtered speech materials
 - ✓ Time compressed speech materials
 - Dichotic listening tests
- ❑ Objective measures
 - Speech evoked auditory brainstem response (ABR)
 - Speech evoked cortical auditory evoked responses

Dichotic Listening Paradigm



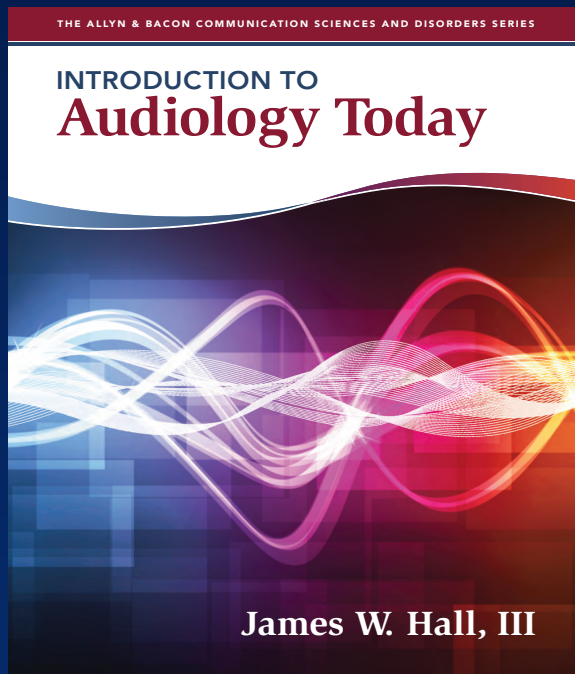
Update on Diagnostic and Speech Audiometry in Children and Adults: Speech Audiometry Today

- ❑ **Historical perspective**
- ❑ **Speech audiometry is important to evaluate communication**
 - **Types of speech audiometry procedures**
 - **Advantages of recorded test materials**

Speech Audiometry Tests: Advantages of Recorded Test Materials

- ☐ Tests consist of carefully selected words spoken by a single person without a distinct dialect
- ☐ Materials are available for male or female speakers
- ☐ Speech is professionally recorded in a sound studio with high quality equipment
- ☐ Speech intensity level is calibrated with an audiometer and presented consistently throughout the test
- ☐ Variability in patient performance is minimized permitting comparison of test results over time
- ☐ Speech materials are the same
 - Each time they are used in a clinic
 - From one clinic to the next

**Source of More Information of
Speech Audiometry and Much More:
Thank You! ... Questions?**



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