

Hearing Loss, its Relationship to Cognitive Decline, and Treatment Options Available

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Disclaimer

I work for an office that allows me to make commission off my hearing aid sales. This presentation focuses on the understanding of hearing loss, the concerns of hearing loss and cognitive decline, and treatment options that can be available for all patients. I did not include hearing aid manufacturers or the cost of specific hearing aids.

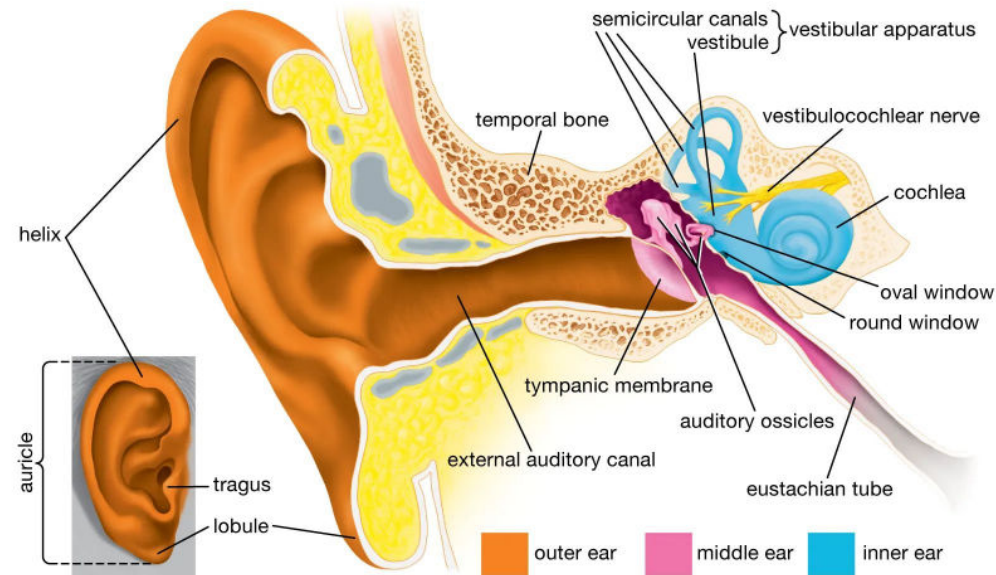
Overview

- Objectives:
 - Understand how to interpret and explain an audiological assessment
 - Make appropriate recommendations on when to refer out, discussing over the counter hearing aids vs prescribed hearing aids, and the importance of monitoring ones hearing thresholds
 - Treatment options for individuals that experience tinnitus
 - When to refer out when it comes to cognitive health and concerns



Anatomy of the Ear

- 3 parts of the ear
 - Outer Ear
 - Made up of skin and cartilage. Includes the Pinna (outer ear), ear canal, and the tympanic membrane (eardrum).
 - Middle Ear
 - Air filled chamber that houses three bones; malleus, incus, and stapes. These bones connect tympanic membrane to the inner ear.
 - This air chamber has the eustachian tube, which connects to the back of the nose.
 - Inner Ear
 - Includes the cochlea (fluid filled hearing organ), the vestibule, and the labyrinth (semicircular canals).

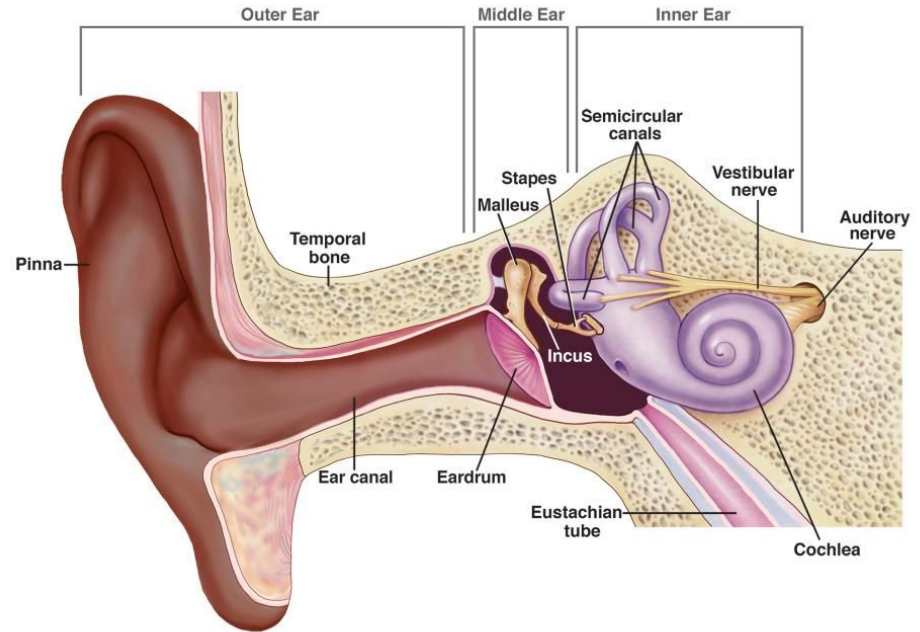


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<https://www.britannica.com/science/ear>

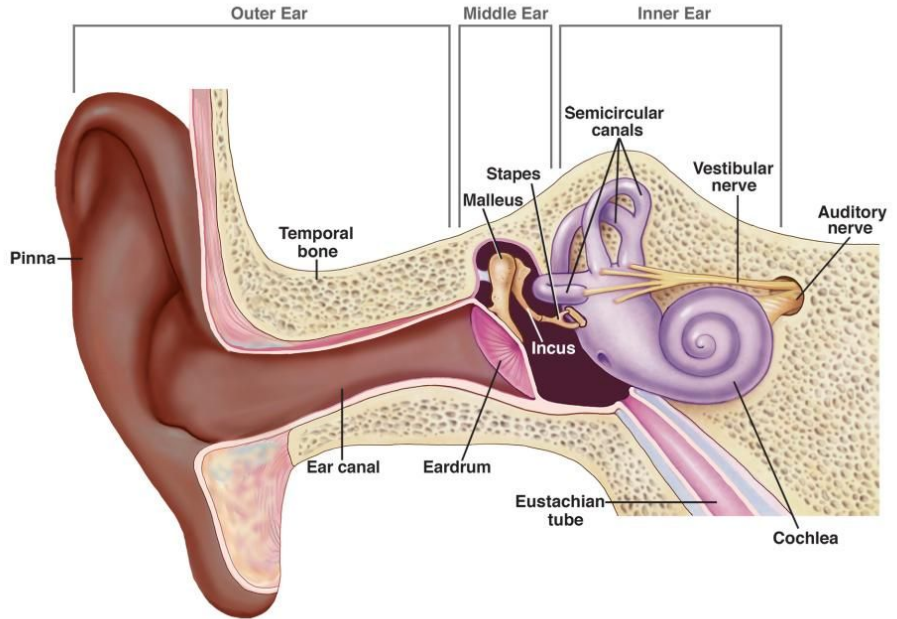
The Transmission of Sound

- Sound enters the ear canal and vibrates the tympanic membrane
- This vibration activates the middle ear bones, amplifying the sound and sending them to the cochlea
- Fluid in the cochlea begins to ripple, activating hair cells in an up and down movement
- As these hair cells move, stereocilia that sit on top of these cells actively allowing electrical signals to enter
- The auditory nerve then carries these electrical signals to the brain, allowing us to understand and recognize speech and sounds



Types of Hearing Loss

- Four types of hearing loss
 - Conductive Hearing Loss (CHL)
 - Sensorineural Hearing Loss (SNHL)
 - Mixed Hearing Loss (MHL)
 - Auditory Neuropathy Spectrum Disorder (ANSD)



Audiological Assessment

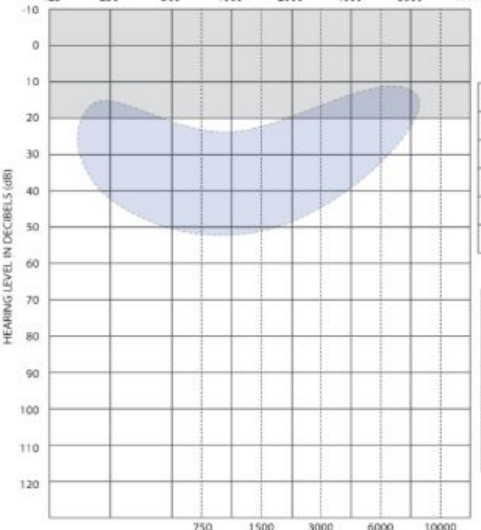
- Tympanometry:
 - Evaluation to measure the compliance of the tympanic membrane
- Pure Tone Audiometry:
 - Air conduction and bone conduction thresholds
- Speech Audiometry:
 - Speech Recognition Threshold (SRT)
 - Word Recognition Score (WRS)
 - QuickSIN*

Name _____

Date of Birth _____ Date of Test _____

Referred By _____ MRN _____

PURE TONE AUDIOMETRY (RE: ANSI 1996)



KEY

R	Stimulus	L
○	Air	X
△	Air - Mask	□
<	Bone	>
[Bone - Mask]
✓	No Response	
←	Discomfort Level (UCL)	→
	Vibro - Tactile - VT	
	No Response - NR	
	Soundfield - S	

TRANSDUCER

Insert	
Supra-Aural	
Sound Field	

TYMPANOMETRY

Probe Tone:	Right	Left
Ear Canal Volume (cm ³)		
Tympanometric Peak Pressure (DaPa)		
Static Admittance (cm ³)		
Tympanometric Width (DaPa)		
Jerger Type		

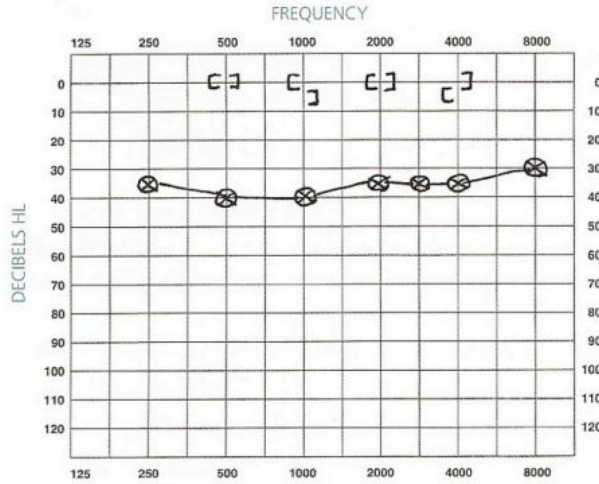
SPEECH AUDIOMETRY

Ear	Speech Thresholds		Word Recognition Scores				NCL	UCL
	SAT SRT	dB Masking	% Correct	dB Level	dB Masking			
Right								
Left								
SF								
Binaural								

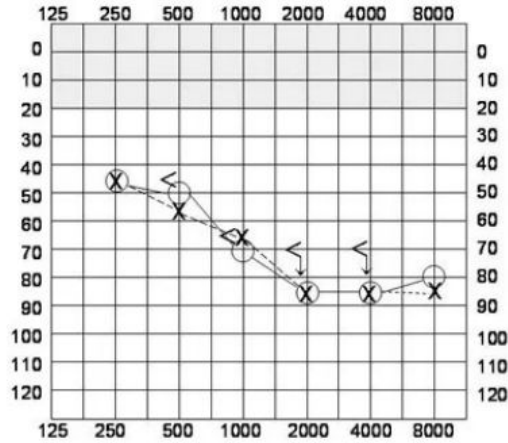
Material: MLV Rec. MLV Rec.

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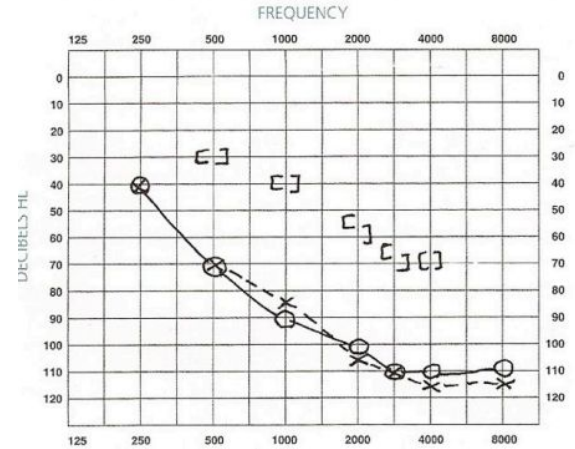
Audiogram Examples



Conductive Hearing Loss



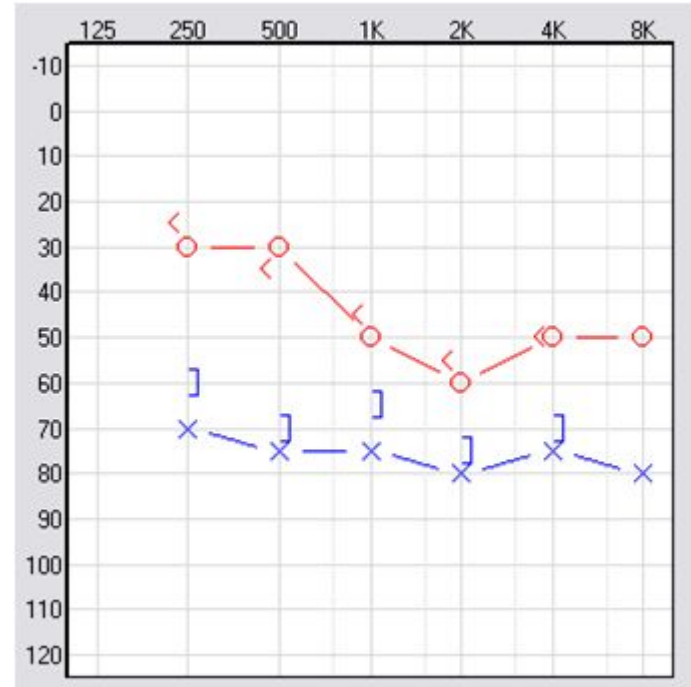
Sensorineural Hearing Loss



Mixed Hearing Loss

Red Flags on an Audiogram

- Asymmetrical hearing loss
- Significant decline since last audiogram
 - Greater than 20dB decline
- Conductive or mixed hearing loss
- Significant difference in word understanding
 - Greater than 20% decline



Signs and Symptoms of Hearing Loss

- Tinnitus, or ringing in the ears
- Difficulty hearing other people clearly and misunderstanding, especially when background noise is present
- Asking people to repeat themselves
- Hearing the television, radio, or talking on the phone
- Not engaging in social activities; choosing to stay isolated



Hearing Loss in the Geriatric Population

- Presbycusis
 - Commonly called “Age Related Hearing Loss”
 - 1 in 3 adults 65-74 years of age experience hearing loss, with over half experience hearing loss over the age of 75 years of age (U.S. Department of Health and Human Services).
 - Starts as a high frequency hearing loss and progresses
 - Permanent damage to the inner ear structures
- Causes of Presbycusis:
 - Age
 - Noise Exposure
 - Genetics

Hearing Loss and Comorbidities

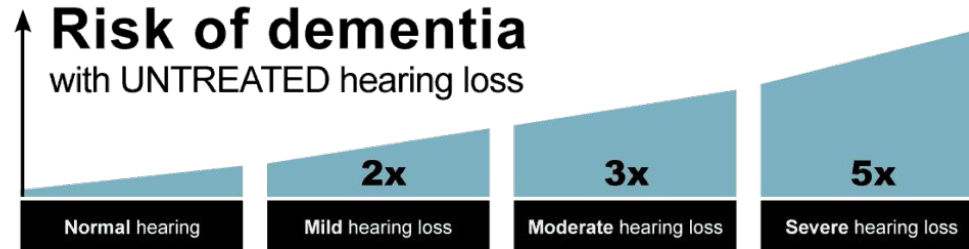
- From the American Speech - Language Hearing Association, hearing loss is the third most common chronic condition for older adults.
- Health conditions that may be risk factors for hearing loss:
 - Diabetes
 - High Blood Pressure
 - Heart Disease
 - Sleep Apnea
 - Kidney Disease
 - Some medications (chemotherapy drugs)

Hearing Loss and Comorbidities cont.

- Patients with hearing loss can experience:
 - Depression
 - Anxiety
 - Cognitive decline
 - Dementia
 - Falls
 - Unintentional injuries

Dementia and Hearing Loss

- Increased research suggests a correlation between hearing loss and cognitive decline
 - Hearing loss increases atrophy in the brain
 - The more severe of hearing loss, the increased risk of poorer cognitive function



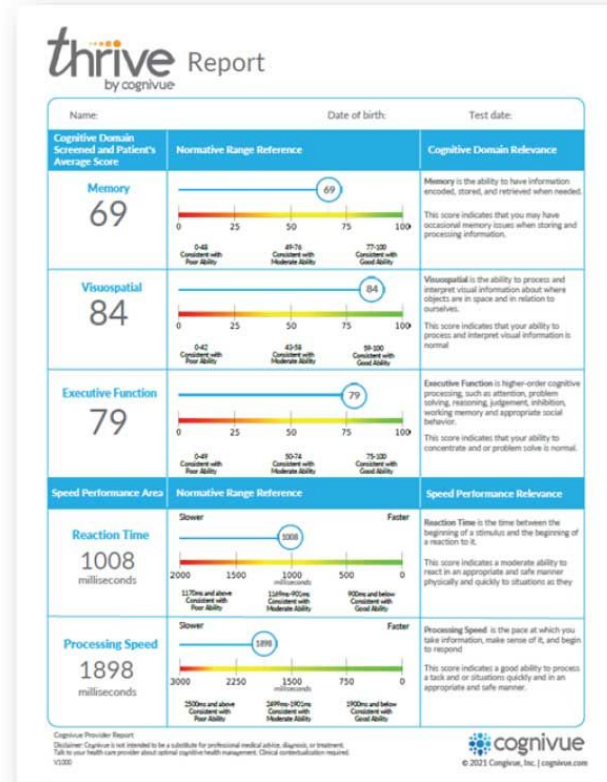
Source: Lin et al. (2011). Compared with normal hearing, increased risk of dementia: 1.89 for mild hearing loss, 3.00 for moderate hearing loss, and 4.94 for severe hearing loss.

Research Highlighting Hearing Loss and Cognitive Decline

- Published from the Journal of Neurology in 2020, revealed a direct correlation between hearing loss and dementia³.
- Additionally, in 2020 the Lancet Commission identified hearing loss as the leading modifiable midlife risk factor for developing dementia⁴.
- The proactive management of hearing loss can help delay or slow the onset or progression of cognitive decline⁵ and the rate of reduction in those most at risk was found to be nearly 50%⁶.

Cognivue Testing

- Complete an assessment with Cognivue
 - Evaluates three cognitive domains:
 - Memory, Visuospatial, and Executive Function
 - Two speed performance domains:
 - Reaction time and Processing speed
- Results give us a baseline of cognitive ability, while showing areas that may be of a concern
- Complete this assessment yearly to monitor cognitive status



Tinnitus

- Defined as a sound or noise that someone hears in one or both ears
- Typically caused by an underlying condition, such as hearing loss, ear injury, or a problems with the circulatory system
- Impacts every person differently
 - May be periodic, constant, and even bothersome
- Red Flags for Tinnitus
 - Pulsating tinnitus
 - Unilateral tinnitus
 - Impacting everyday life / being able to sleep

Ways to Treat Tinnitus

- Monitoring diet:
 - Reduction of sodium intake
 - Limiting caffeine, alcohol, and nicotine use
- Adjusting lifestyle:
 - Quality of sleep and sleep schedule
 - Stress
- Properly fit hearing aids and / or masking devices
- Different counseling tools and potential Cognitive Behavioral Therapy (CBT) if needed

Over the Counter (OTC) Hearing Aids

- Devices that can be purchased without an audiological assessment
- Best for mild to moderate hearing losses
- Anyone over the age of 18 years old
- Costs can range from \$100-\$2000



Prescriptive Hearing Aids

- An audiological assessment completed within 6 months of a fitting
- Appropriate for mild to profound hearing losses
- Used by pediatrics and adults
- Costs typically vary from \$2000-\$7000



Pros and Cons of OTC vs Prescribed Hearing Aids

OTC Devices:

Pros:

- Cost
- Purchase quickly
- Good for simple hearing losses

Cons:

- Lack of follow-up services
- Patient has to learn everything by themselves
- Lack of knowledge before buying

Prescribed Hearing Aids:

Pros:

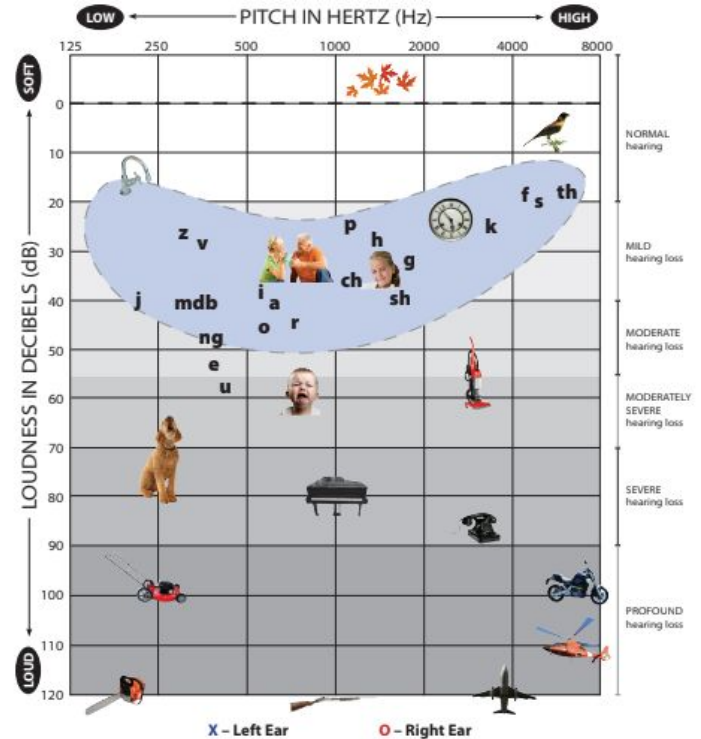
- Good for any hearing loss
- Fit by a licensed audiologist with follow-up services
- Many types and levels of technology to meet the needs of a patient
- Longevity is typically 5-7 years

Cons:

- Cost, mostly private pay.
- Patients can be manipulated to purchasing devices without underlying knowledge to make an informed decision

Hearing Loss Severity Example

- CDC Hearing Loss Simulator:
 - <http://wwwn.cdc.gov/niosh-mining/hlsimweb>



Citations:

- 1) U.S. Department of Health and Human Services. (n.d.) Age-related hearing loss (presbycusis) - causes and treatment. National Institute of Deafness and Other Communication Disorders. Retrieved April 19, 2023, from <https://www.nidcd.nih.gov/health/age-related-hearingloss#:~:text=It%20is%20one%20of%20the,than%2075%20have%20difficulty%20hearing>
- 2) The Hidden Risks of Hearing Loss. (2022, November 1). The Hidden Risks of Hearing Loss | Johns Hopkins Medicine. <https://www.hopkinsmedicine.org/health/wellness-and-prevention/the-hidden-risks-of-hearing-loss>
- 3) Clinician-judged hearing impairment and associations with neuropathologic burden; Neurology 95(12), Sept 2020
- 4) Dementia prevention, intervention and care: 2020 report of the Lancet Commission; The Lancet 396, Aug 2020
- 5) The effect of hearing aid use on cognition in older adults: Can we delay decline or even improve cognitive function?; J Clin Med 9(1): 254, Jan 2020
- 6) Hearing intervention vs health education control to reduce cognitive decline in older adults with hearing loss in the USA; The Lancet 402, Sept 2023

Questions?

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