Coalition for Global Hearing Health

# Essential Knowledge in Hearing, Hearing Loss and Hearing Aids for Non-Hearing Professionals


**Presenters:**

Edward Garcia, Au.D.

California State University, Long Beach

Terrance Yuen, B.A., H.A.D.

A.T. Still University – Arizona School of Health Sciences

# Disclosure Statement

We do not have any relevant financial or non-financial relationships to disclose.

Coalition for Global **Hearing** Health

# Topics

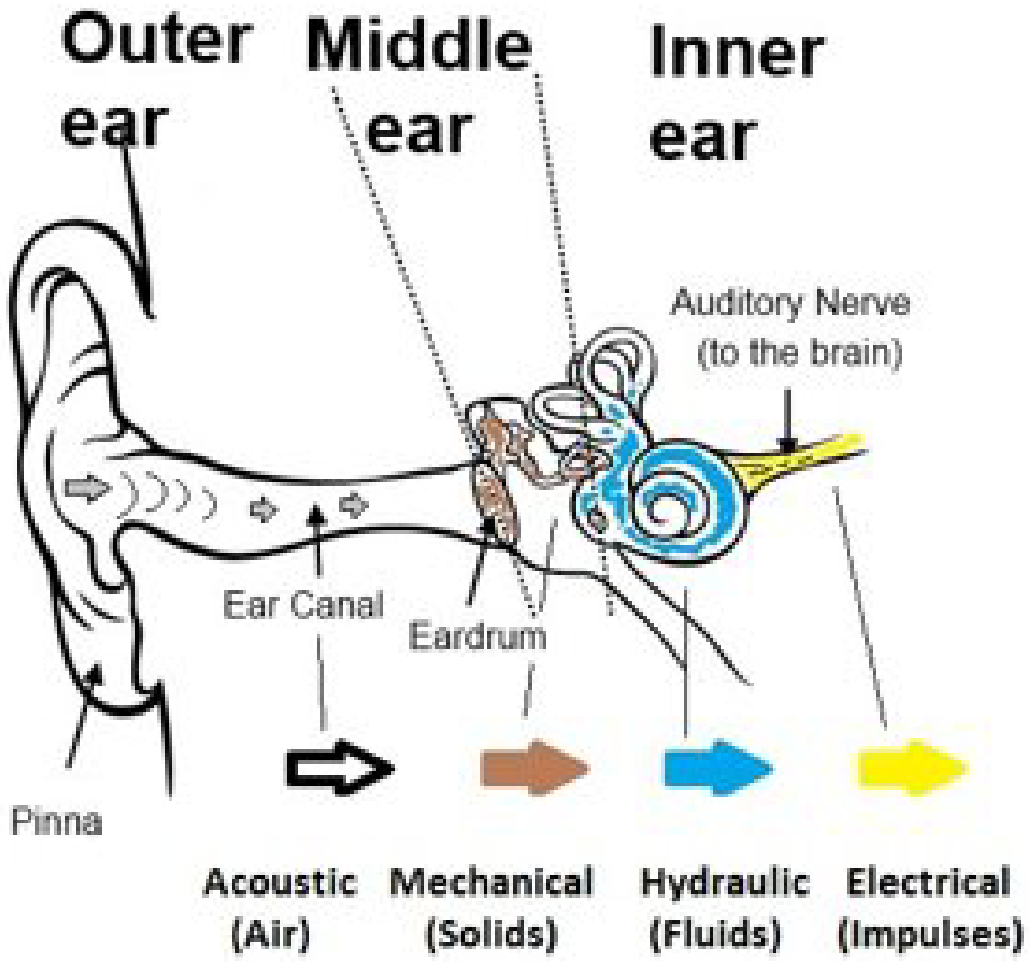
**Changes in Hearing, Hearing Testing and Hearing Losses**

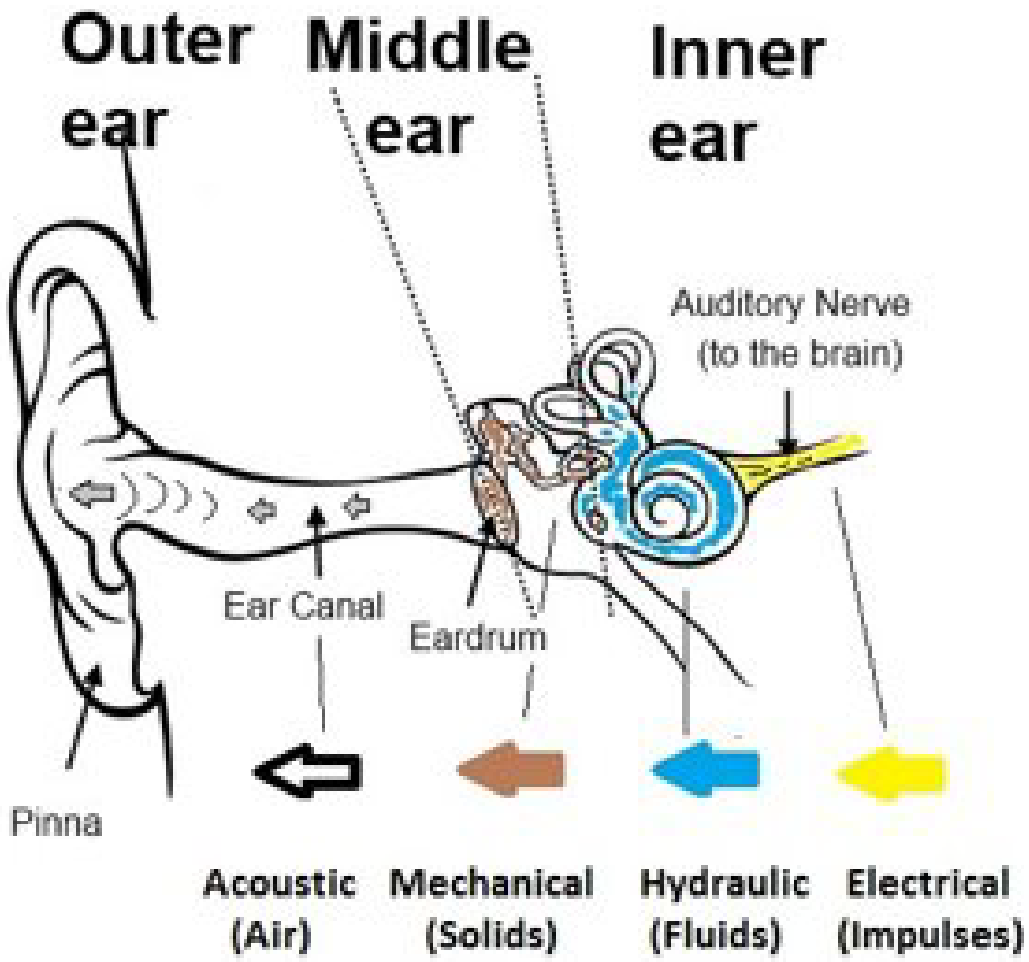
**Newborn Hearing Screening**

**Cognitive Decline and Hearing Loss**

**Over the Counter (OTC) hearing devices**

# Hearing


Outer ear
Middle ear
Inner ear
Auditory Nerve (to the brain)
Ear Canal
Eardrum
Pinna
Acoustic (Air)
Mechanical (Solids)
Hydraulic (Fluids)
Electrical (Impulses)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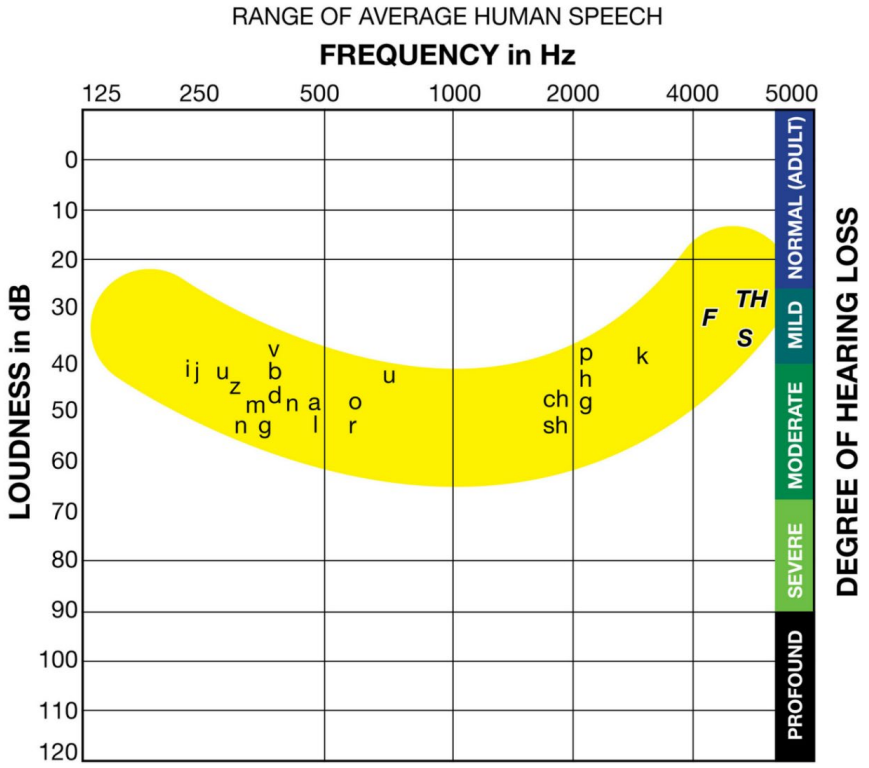
# Normal Hearing




**“Hearing,” or is it the detection of sound?**

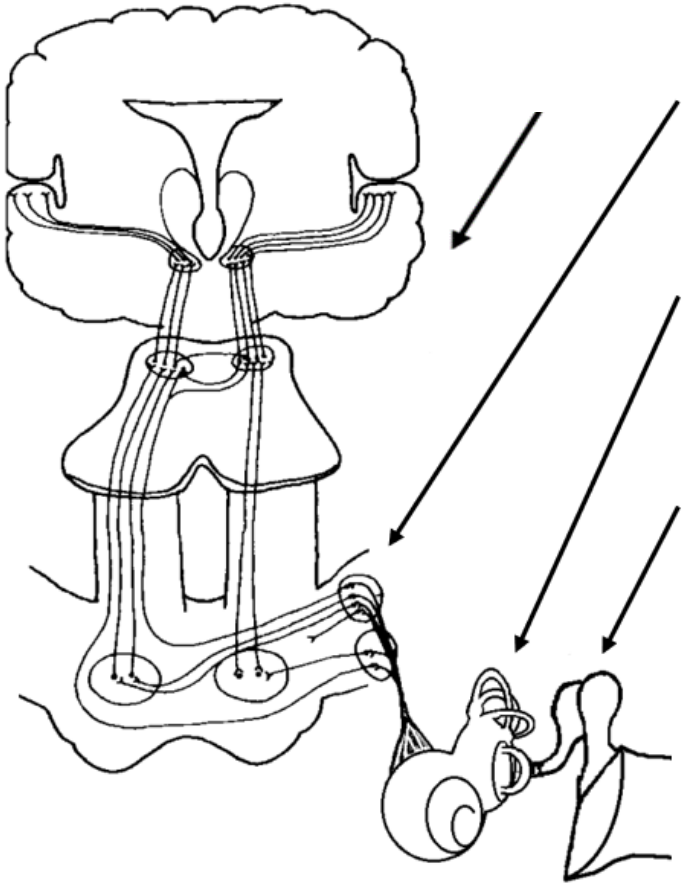
**Can you understand/process what you detected?**

**Can you understand/process in background noise?**

**Can you focus on what was detected/processed?**

**Can you retain/retrieve this information?**

# Types of Hearing Loss



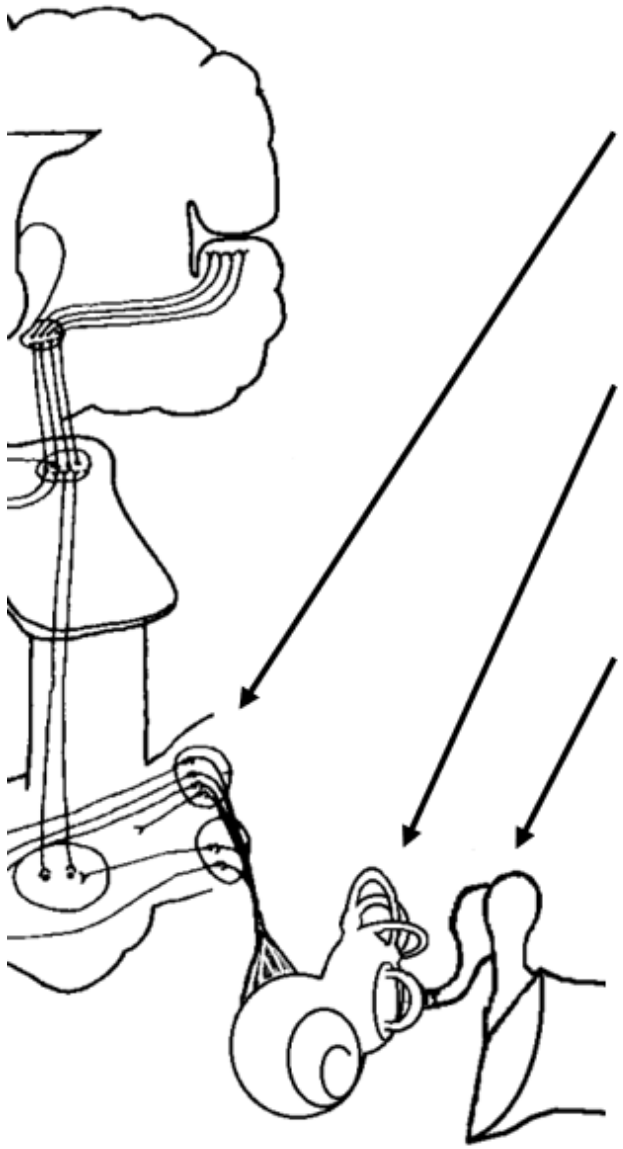

4. a **processing issue** or a hearing in **background noise issue**?
3. a **sensorineural** hearing loss or a **desynchrony** disorder ?
2. a **conductive** loss in the middle ear (**fluid/infections**)?
1. a **conductive** loss in the outer ear (**wax/foreign object**)?

Is there……

# Physiological Testing

We let the physiological tests
guide our hearing Assessments

(there is no standard protocol)



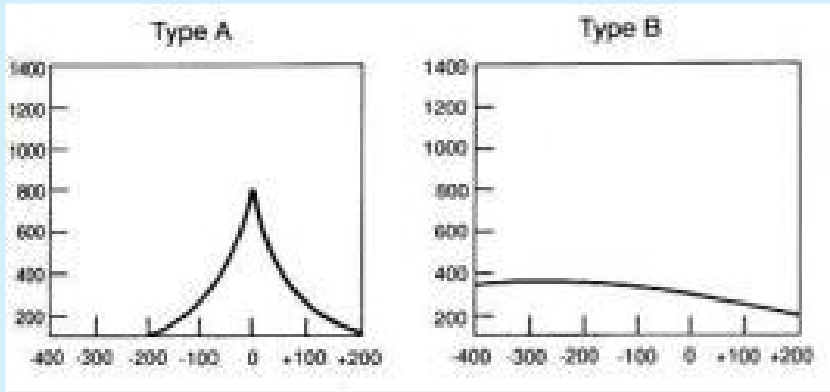
4. **Auditory Brainstem Response (Evoked)**

3. **Otoacoustic Emissions: Cochlear (OHC)**

2. **Acoustic Reflex Testing**

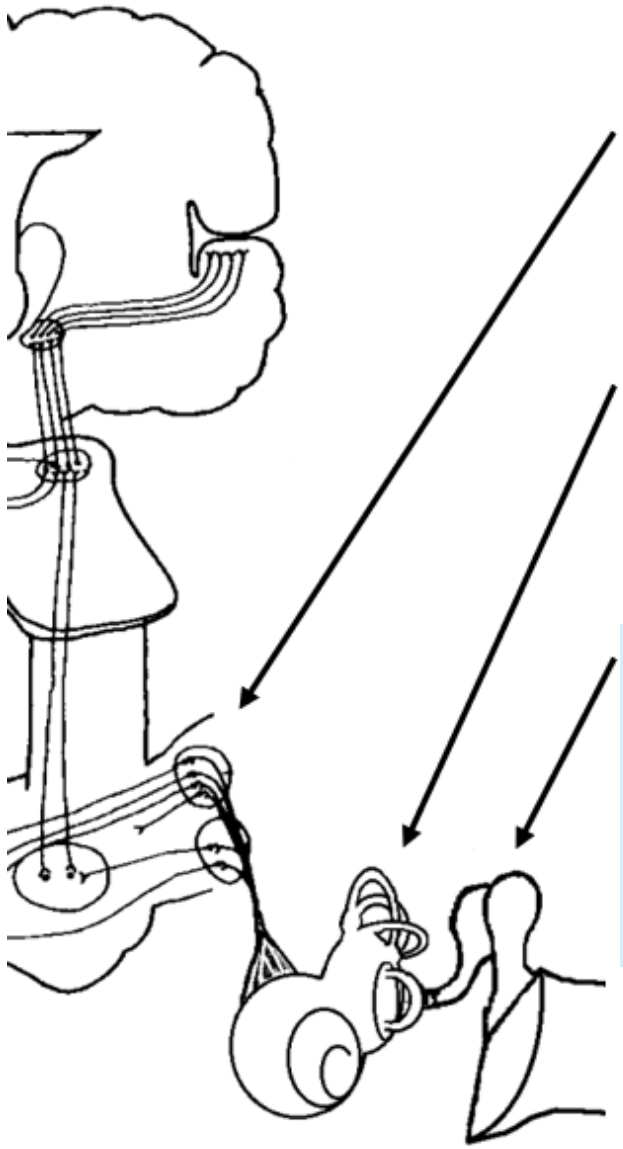
   a. Middle Ear Ossicles

   b. Neural function (7th and 8th)




**1. TYMPANOMETRY**

- Graphic representation of compliance of eardrum
- Detects fluid behind the eardrum
- Detects perforations of the eardrum

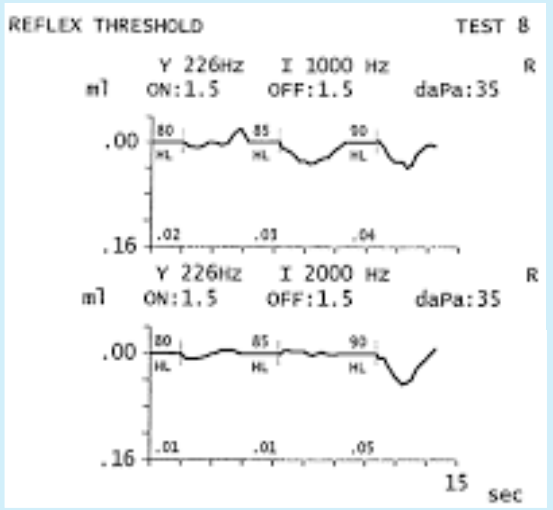


**4. Auditory Brainstem Response (Evoked)**

**3. Otoacoustic Emissions: Cochlear (OHC)**

**2. ACOUSTIC REFLEX TESTING**

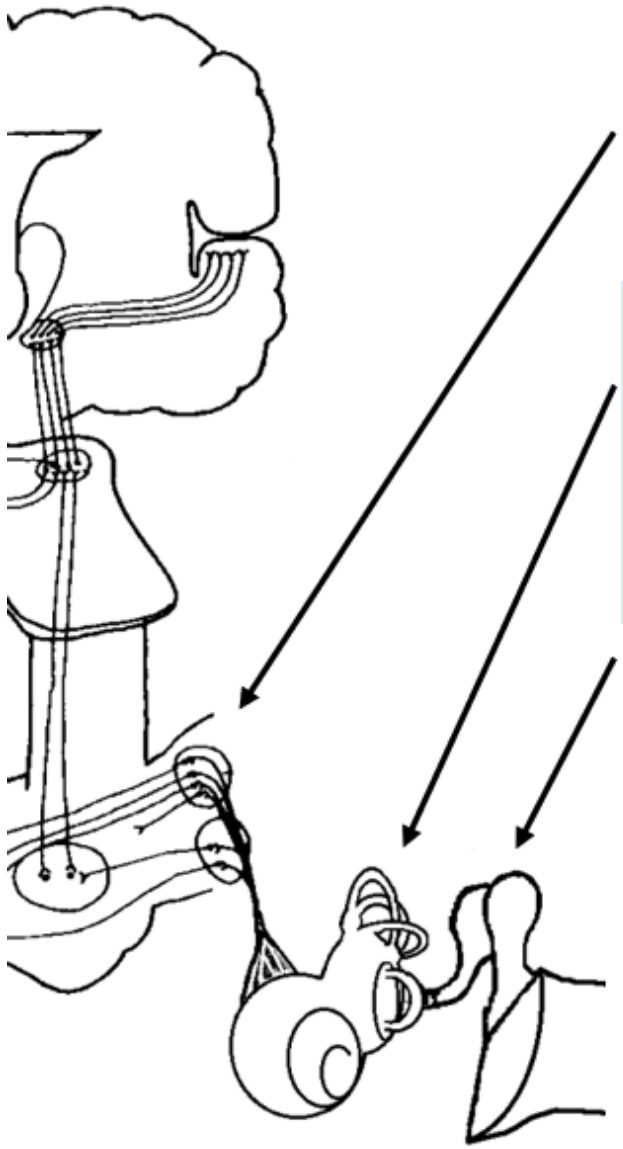
- Response to loud sounds
- Muscle contraction
- Movement of the ossicular chain



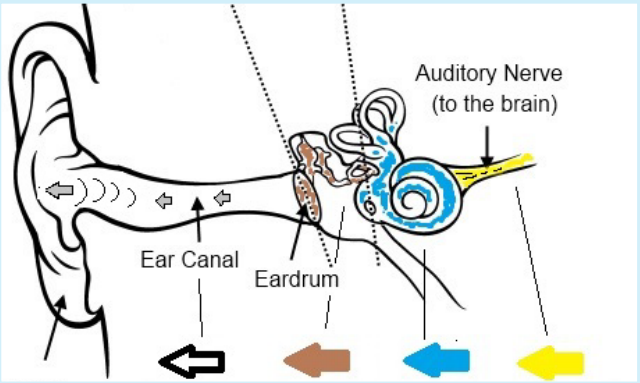

**1. Tympanogram: (Eardrum)**

a. Peak compliance

b. Canal volume



**4. Auditory Brainstem Response (Evoked)**



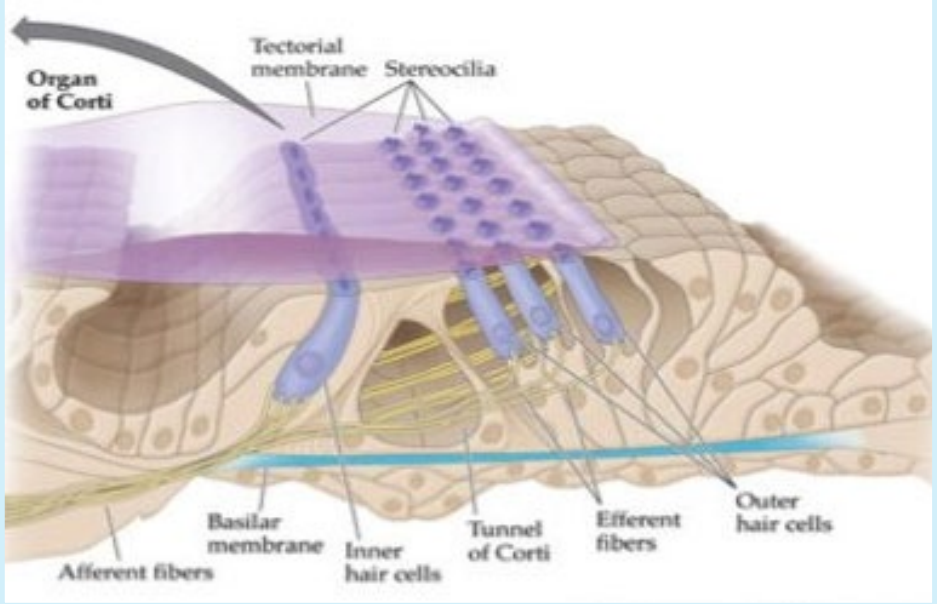

**3. OTOACOUSTIC EMISSION**

- Loud sounds emitted from ear
- Present in almost everyone with normal hearing
- Generated by outer hair cell movement
- Spontaneous or evoked (distortion or transient)

**2. Acoustic Reflex Testing**

a. Middle Ear Ossicles

b. Neural function (7th and 8th)

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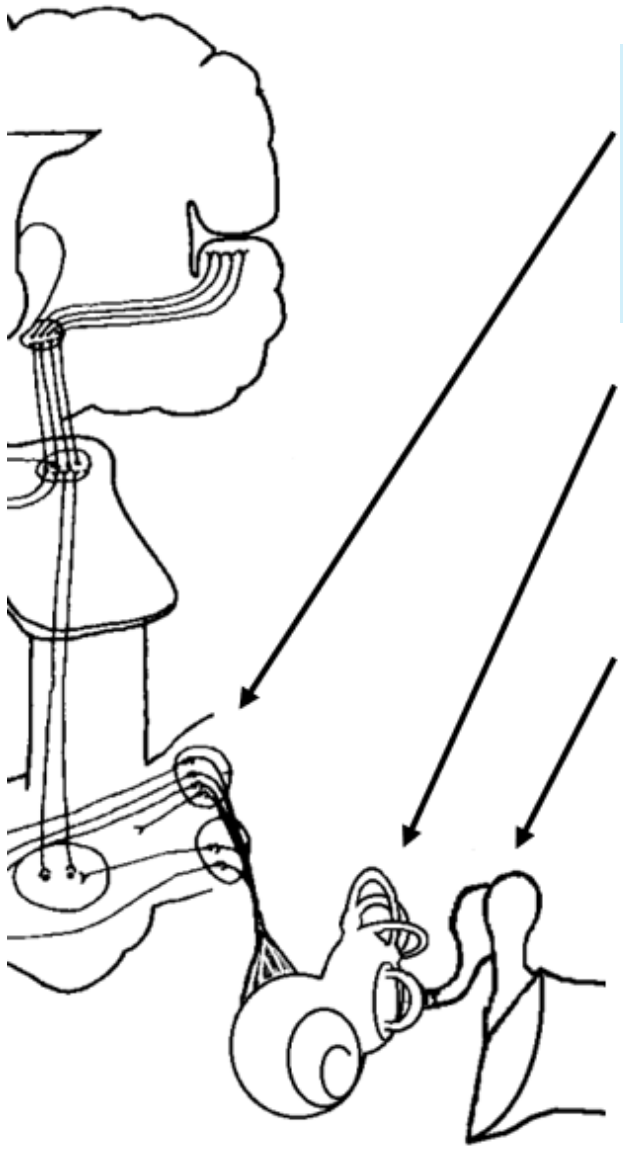
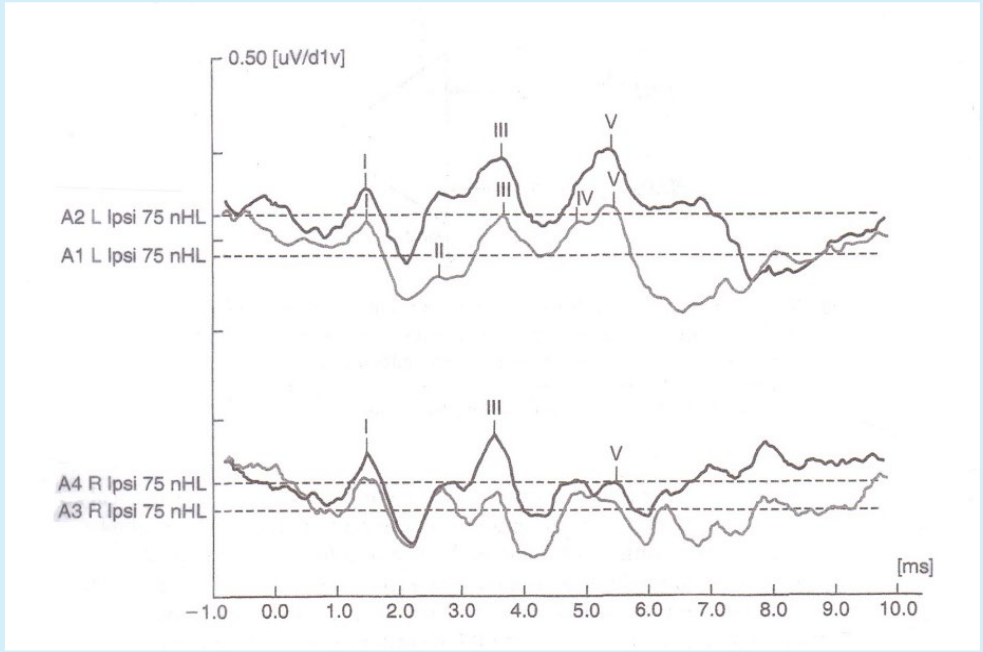


**4. AUDITORY BRAINSTEM RESPONSE (ABR)**

- Follow a signal up the auditory neural pathway for 10 ms.
- Five distinct waves are formed
- Waves correspond to certain specific areas




**3. Otoacoustic Emissions: Cochlear**

**2. Acoustic Reflex Testing**

a. Middle Ear Ossicles

b. Neural function (7th and 8th)

**1. Tympanogram: (Eardrum)**

a. Peak compliance

b. Canal volume

# Newborn Hearing Screening (NBHS)

Up to 50% of children who passed their newborn hearing screenings were later diagnosed with hearing loss.

We did not anticipate the prevalence of late onset, progressive hearing loss.

# Newborn Hearing Screening (NBHS)

Future protocols

# SNHL and Cognitive Decline

The risk for cognitive decline is proportionate to the degree of hearing loss.

- The greater the hearing loss, the greater the risk of cognitive decline.

Untreated hearing loss causes social isolation, which can lead to loneliness.

# SNHL and Cognitive Decline

Higher degrees of loneliness has shown increases in:

- Cognitive decline
- Depression
- Mortality rates

Loneliness was found to be as hazardous as smoking 15 cigarettes a day.

Source: Deal, J. A. Reed, N. S., Kravetz, A. D., Weinreich, H., Yeh, C., Lin, F. R., & Altan, A. (2019) Incident hearing loss and comborbidity: A longitudinal administrative claims study. *JAMA Otolaryngol Head Neck Surg., 145*(1), 36-43. doi:10.1001/jamaoto.2018.2876

# SNHL and Cognitive Decline

- Hearing loss is associated with increased loneliness
- Loneliness is linked to more amyloid plaque in the brain
- Amyloid plaque formation is associated with dementia

Source: Kim, S. Y., Lim, J. S., Kong, I. G., & Choi, H. G. (2018). Hearing impairment and the risk of neurodegenerative dementia: A longitudinal follow-up study using a national sample cohort. *Sci Rep.*, *8*(1), 15266. doi:10.1038/s41598-018-33325-x

# Over-The-Counter Devices

These devices basically use the same fundamental technology as hearing aids, but less expensive and are available without a professional consultation

Source: Bailey, A. (2018). Over-the-counter hearing aids: What are they, and when will they be available? Retrieved from: https://www.hearingtracker.com/over-the-counter-hearing-aids#timeline-heading

# Potential Benefits of OTC devices

Considering the link between hearing loss and cognitive decline, these less-expensive devices can reduce health disparities and increase access to hearing health

Source: Cox, R. M., Johnson, J. A., & Xu, J. (2014). Impact of advanced hearing aid technology on speech understanding for older listeners with mild to moderate, adult-onset, sensorineural hearing loss. *Gerontology, 60,* 557-568. doi: 10.1159/000362547

# In Conclusion…

Hearing thresholds are not functional hearing

How we evaluate is not based on a standard test protocol

Hearing can be **affected** by many factors

**Thank you.** ☺