

UNDERSTANDING AN AUDIOGRAM

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SUMMARY

The type, degree, and configuration of hearing loss, if one is present, can be determined by reading an audiogram. The type of hearing loss is determined by comparing auditory thresholds obtained using headphones or insert earphones (air-conduction thresholds) to those obtained using a bone oscillator (bone-conduction thresholds). By itself, the audiogram cannot tell us how an individual will perform in the real world. While tests of speech perception in quiet and in noise can greatly enhance the diagnostic value of the audiogram, the results obtained in a sound booth do not always translate directly to how an individual will perform in the real world

KEY TERMINOLOGY

Audiogram

An audiogram is a simplified graph of symbols representing the softest sounds that a person can hear across a defined range of pitches.

Decibel (dB)

Decibel refers to the loudness of sounds. A sound low in dB is perceived as soft and a sound high in dB is perceived as loud.

dB SPL vs. dB HL

Loudness of sound is typically measured in sound pressure level (dB SPL). The output of hearing aids and assistive listening devices is displayed in dB SPL; however, auditory thresholds (on an audiogram) are measured in hearing level (dB HL).

Frequency

The unit used to measure frequency is Hertz (Hz). The perceptual correlate of frequency is pitch. As frequency increases, so does pitch. Examples of low frequency (low pitch) sounds include drums and bass guitars and vowels, while high frequency (high pitch) sounds include flutes, violins, and voiceless consonants (f, th, s). Hearing is typically tested between 250 and 8000 Hz, which is where most speech sounds fall.

Auditory thresholds

Auditory thresholds are the softest sounds an individual can detect. They are plotted between -10 and 110 dB HL at octave or mid-octave intervals

from 125 to 8000 Hz. The normal hearing listener can typically hear sounds as soft as 0 dB HL and when sounds are above 100 dB HL they are generally considered to be uncomfortably loud.

KEY CONCEPTS

Conductive hearing losses (CHL)

CHL are characterized by a reduction in hearing ability despite a normal functioning cochlea (inner ear). This type of hearing loss is caused by impaired sound transmission through the ear canal, eardrum, and/or ossicular chain. Conductive hearing losses are frequently temporary and/or fluctuating in nature. Ear infections and wax impaction are two common causes of this type of hearing loss. In conductive hearing losses, air conduction thresholds are abnormal, bone conduction thresholds are normal, and an air-bone gap is present.

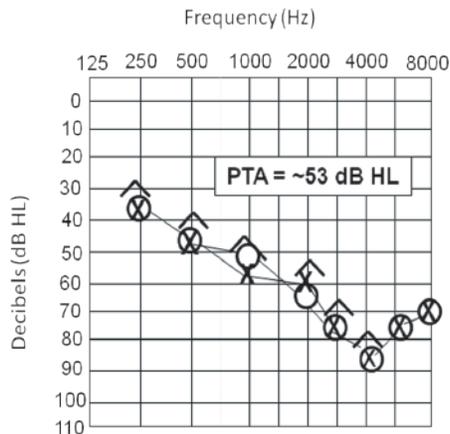
Sensorineural hearing losses (SNHL)

SNHL are characterized by a reduction in hearing ability due to disorders involving the cochlea and/or the auditory nervous system. This type of hearing loss is usually irreversible. Sensorineural hearing losses can be further divided into sensory and neural losses. A sensory (cochlear) hearing loss occurs when the damage to the auditory system is located within the cochlea. Noise induced and age related hearing losses are typically sensory in nature. A neural (retrocochlear) hearing loss occurs when the damage to the auditory system is beyond the level of the cochlea, ranging anywhere from the hearing nerve up to the brain. A tumor on the hearing nerve can be one cause of a neural hearing loss. In sensorineural hearing losses, air conduction and bone conduction thresholds are both abnormal, but are impaired to approximately the same degree (no air-bone gap present).

Mixed hearing losses

Mixed hearing losses occur when both conductive and sensorineural components are present. As in conductive hearing losses, the conductive component of a mixed hearing loss may be temporary and/or fluctuate. In mixed hearing losses, air conduction and bone

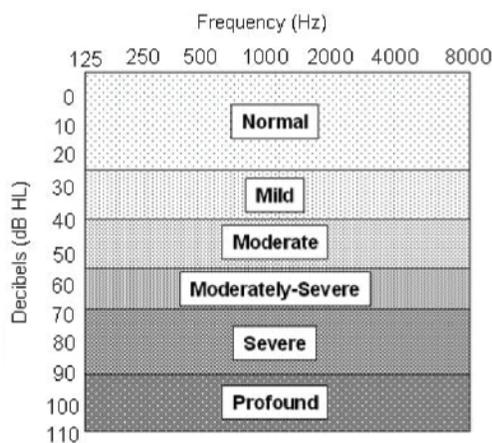
conduction thresholds are both abnormal, but air conduction threshold are worse than bone conduction thresholds (an air-bone gap is present).



(O = right ear, X = left ear, A = unspecified bone conduction threshold)

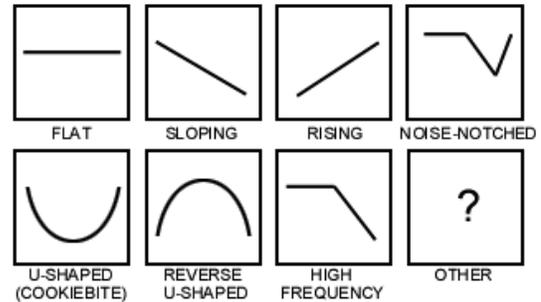
Degree (or severity) of hearing loss

is determined by looking at where one's pure tone air conduction thresholds were obtained (and are plotted on the audiogram). Degree of hearing loss can be calculated by taking the average pure tone air conduction thresholds at several frequencies and matching that number to a category of severity. A three frequency pure tone average (PTA) at 500, 1000, and 2000 Hz is commonly used, although some entities utilize higher frequencies (3000 and/or 4000 Hz) in order to encompass the higher frequency speech areas. The PTA (500, 1000, and 2000 Hz) calculated for the above audiogram is approximately 53 dB HL in each ear, a hearing loss in the moderate range. Degrees of hearing sensitivity include: normal (< 25 dB HL), mild (26 to 40 dB HL), moderate (41 to 55 dB HL), moderately-severe (56 to 70 dB HL), severe (71 to 90 dB HL), and profound (> 90 dB HL).



Configuration of hearing loss

refers to the "shape" of one's hearing loss. Audiograms are always read by looking at an individual's low frequency thresholds first, followed by their mid frequency thresholds, and high frequency thresholds. For example, most individuals have high frequency sensorineural hearing losses that are sloping in configuration, which suggests that their hearing loss gets progressively worse with increasing frequency. As an example, the audiogram with PTA of 53 dB above shows a sloping sensorineural hearing loss.



ADDITIONAL RESOURCES

- Alexander Graham Bell Association <http://www.agbell.org/>
- Association of Late-Deafened Adults <http://www.alda.org/>
- Healthy Hearing Online <http://www.healthyhearing.com/>
- Hearing Health Magazine <http://www.drf.org/magazine/>
- Hearing Loss Association of America <http://www.hearingloss.org/>
- League for the Hard of Hearing <http://www.lhh.org/>
- Academy of Doctors of Audiology <http://www.audiologist.org/>
- Academy of Rehabilitative Audiology <http://www.audrehab.org/>
- American Academy of Audiology <http://www.audiology.org/>
- American Speech-Language-Hearing Association <http://www.asha.org/>
- Educational Audiology Association <http://www.edaud.org/>

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