TutorTube: Pure Tone Audiometry

Fall 2020

Introduction

Hello and welcome to TutorTube, where The Learning Center's Lead Tutors help you understand challenging course concepts with easy to understand videos. My name is Grace, Lead Tutor for Audiology and Speech Language Pathology. In today's video, we will explore pure tone audiometry. Let's get started!

Purpose

The purpose of pure-tone audiometry is to determine the degree, type, and configuration of an individual's hearing loss. Let's look into this further.

Types of Testing

Air conduction audiometry (or air conduction testing) is testing the ability of the outer and middle ear. If a loss is detected then that means there might be a problem with the patient's outer or middle ear. Bone conduction audiometry is testing the ability of the inner ear and if a loss is detected here then it could be an issue with the patient's inner ear system. You can see the sections of the ear in figure 1.

Masked testing involves playing noise into the better hearing ear, so the other ear (which is being tested) isn't influenced by the stimulus. Unmasked testing is basic testing, where a stimulus is played into an ear to test the hearing of that ear.

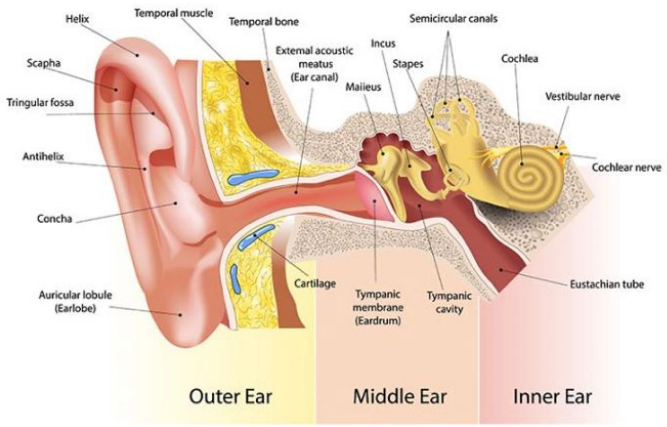

Figure 1 ("Ear Anatomy")

The Audiogram

An audiogram shows the results of pure-tone audiometry and an example can be seen on the right side of the screen in figure 2. What do all these symbols mean? If we look at this audiogram key we can see the breakdown of all of these symbols. The right ear is always represented by red and the left ear blue. A circle represents unmasked air conduction testing in the right ear and an X represents unmasked air conduction testing in the left ear and so on. Now that we have learned how to read an audiogram, let's discuss how to interpret the data.

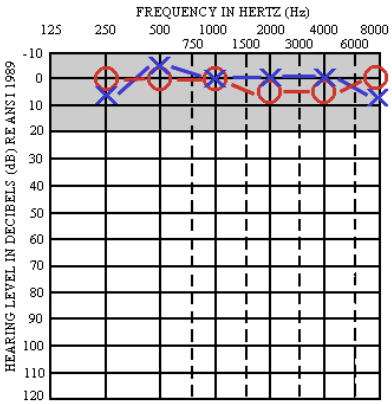

Figure 2 (Mroz)

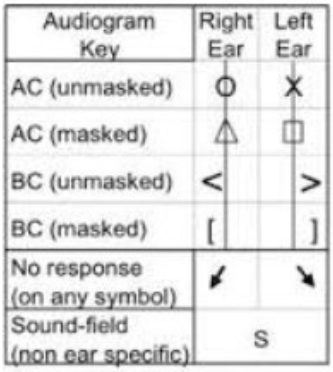

Figure 3 ("How to Interpret")

Degree of Hearing Loss

Figure 4 is a chart from ASHA (the American Speech-Language-Hearing Association) that breaks down degrees of hearing loss. 0-15 dB hearing loss (or HL) falls under normal hearing. 16-25 dB HL represents a slight hearing loss (although some organizations include 16-25 dB HL in normal hearing), 26-40 is a mild loss, 41-55 is a moderate loss, 56-70 is a moderately severe loss, 71-90 is a

severe loss, and 91+ is a profound hearing loss. You can also see this breakdown represented in figure 5.

Degree of hearing loss	Hearing loss range (dB HL)
Normal	-10 to 15
Slight	16 to 25
Mild	26 to 40
Moderate	41 to 55
Moderately severe	56 to 70
Severe	71 to 90
Profound	91+

Source: Clark, J. G. (1981). Uses and abuses of hearing loss classification. Asha, 23, 493-500.

Figure 4 ("Degree")

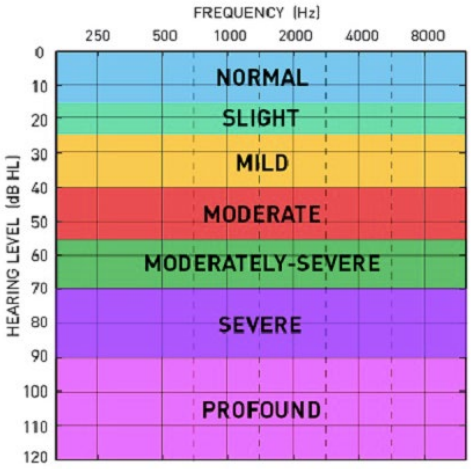

Figure 5 ("What is an")

Type of Hearing Loss: Conductive

You can determine type of hearing loss from an audiogram. An air-bone gap is a telltale sign of a conductive hearing loss. For a conductive loss this means there is a hearing loss for air conduction, but normal hearing for bone conduction, like pictured here in figure 6.

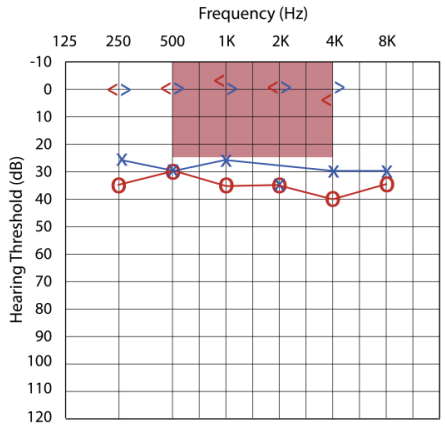

Figure 6 (Med-El)

Type of Hearing Loss: Sensorineural

A sensorineural hearing loss is characterized by a hearing loss in air conduction as well as bone conduction, the losses have to be within 10dB of each other. You can see this displayed here in figure 7.

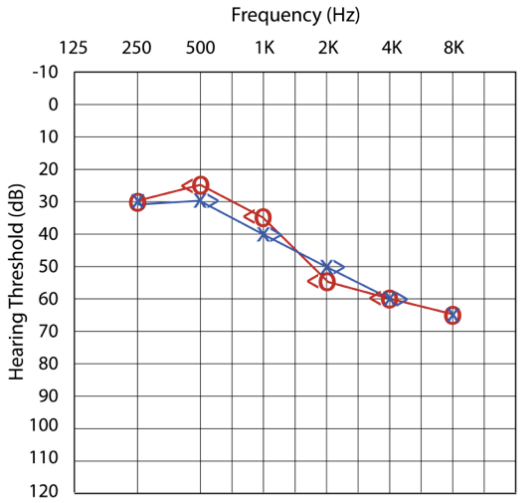

Figure 7 (Med-El)

Type of Hearing Loss: Mixed

A mixed hearing loss is characterized by a loss in both air conduction and bone conduction, with air conduction loss being greater than bone conduction. An air-bone gap is present. You can see these characteristics in figure 8.

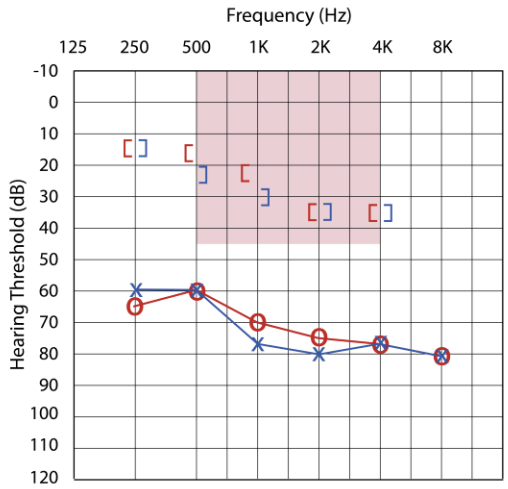

Figure 8 (Med-El)

Audiogram Configuration

All audiograms have a specific configuration or shape. You can see here in figure 9 the most common configurations: flat, sloping, rising, noise-notched, u-shaped (also known as cookie-bite), reverse u-shaped, and high frequency.

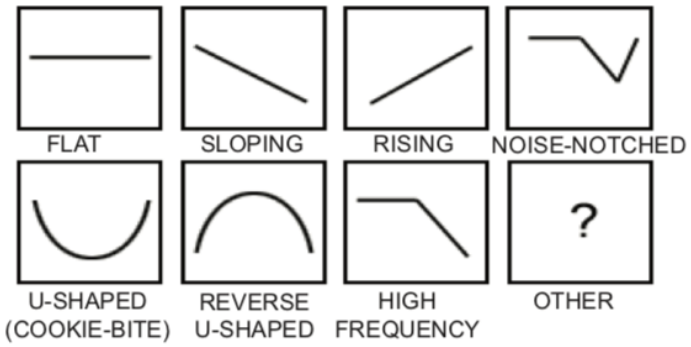

Figure 9 (Davis)

Practice

Let's use the concepts we've just covered to interpret this audiogram. Since the graph is in blue we know that represents the left ear. A right pointing arrow represents unmasked bone conduction testing. We can see here that bone conduction is well within normal hearing limits of -10dB HL to 15dB HL. The X represents unmasked air conduction and we can definitely see a loss here. We know from previous slides that a normal bone conduction and a loss for air conduction with an air-bone gap represents a conductive loss. A moderate hearing loss is from 41 dB HL to 55 dB HL and a moderately-severe hearing loss is from 56 dB HL to 70 dB HL. Since this loss has measurements in both moderate

and moderately severe (45 dB HL to 60dB HL) then it is categorized as such. This graph represents a moderate to moderately severe conductive hearing loss. Determining the configuration of this audiogram could be tricky. Some people might think it is sloping because the final measurement is below the initial measurement; however since the final measurement is within 10 dB of the original it is categorized as a flat configuration. We were able to determine the degree, type and configuration of this audiogram using the concepts we've just covered. This audiogram represents a moderate to moderately severe conductive hearing loss with a flat configuration.

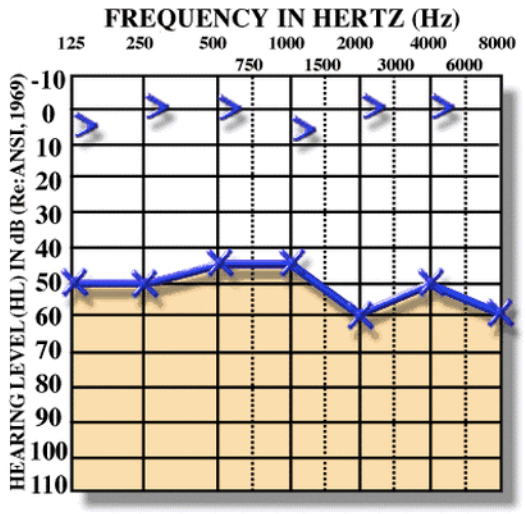

Figure 10 ("Audiograms")

Outro

Thank you for watching TutorTube! I hope you enjoyed this video. Please subscribe to our channel for more exciting videos. Check out the links in the description below for more information about The Learning Center and follow us on social media. See you next time!

References

Figure 1: "Ear Anatomy and Hearing Loss." *Beltone Tristate*, 20 Jan. 2020, beltonetristate.com/ear-anatomy-and-hearing-loss/.

Figure 2: Hain, Timothy c. *Audiometry*, 2020, www.dizziness-and-balance.com/testing/hearing/audiogram.html.

Figure 3: "How to Interpret an Audiogram." *Better Hearing Jax*, 19 Dec. 2014, www.betterhearingjax.com/interpret-audiogram/.

Figure 4: "Degree of Hearing Loss." *American Speech-Language-Hearing Association*, ASHA, www.asha.org/public/hearing/Degree-of-Hearing-Loss/.

Figure 5: "What Is an Audiogram?" *Baby Hearing*, www.babyhearing.org/what-is-an-audiogram.

Figure 6, 7, & 8: Med-El. "Air Conduction vs. Bone Conduction: Candidacy Guide for Bone Conduction Systems: MED-EL Professionals Blog." *MED*, MED-EL Professionals Blog, 2 Jan. 2020, blog.medel.pro/bone-conduction-candidacy-audiogram/.

Figure 9: Davis, Cheryl, et al. "Demystifying Hearing Assistance Technology A Guide for Service Providers and Consumers ." *Www.dcmp.org*, 2007, dcmp.org/public_content/learn/static-assets/472_demystifying-hearing-assistive-technology.pdf.

Figure 10: "Audiograms & Hearing Loss." *DHH Education*, dhheducation.weebly.com/audiograms--hearing-loss.html.