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# AUDIOLOGICAL TESTING

# EARLY HEARING DETECTION AND INTERVENTION (EHDI) EARLY INTERVENTION SERVICES (Birth-School Years)

## Medical

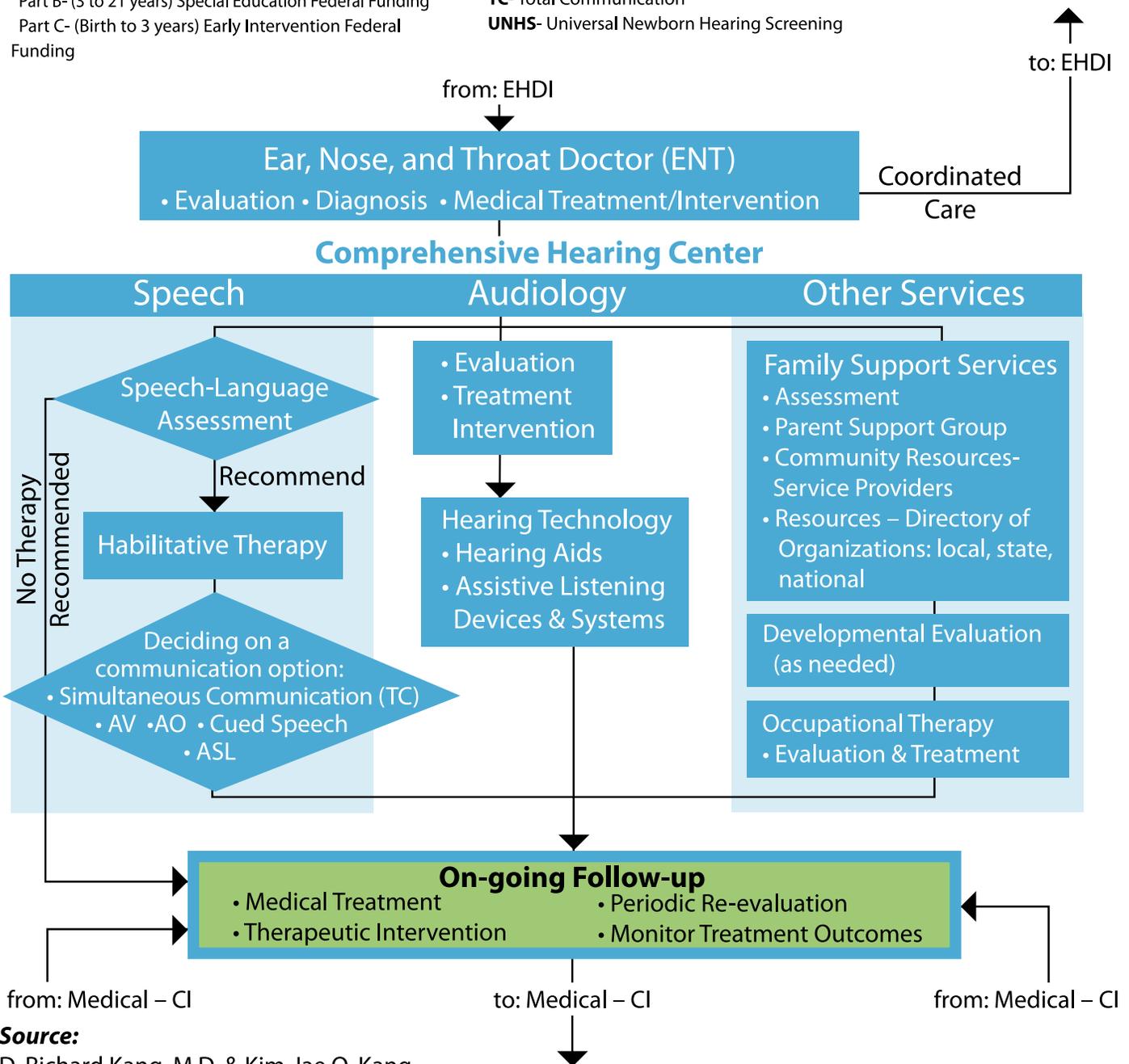
### Acronym Key:

**ALDS**- Assistive Listening Devices and Systems  
**AO**- Auditory Oral (Communication Modality)  
**ASL**- American Sign Language  
**AV**- Auditory Verbal (Communication Modality)  
**BEIS**- Bureau of Early Intervention Services- under ODH  
**CI**- Cochlear Implant  
**EI**- Early Intervention  
**ENT**- Ear, Nose, and Throat Doctor (Otolaryngology)  
**HMG**- Help Me Grow- under ODH  
**IDEA**- Individuals with Disabilities Education Act  
 Part B- (3 to 21 years) Special Education Federal Funding  
 Part C- (Birth to 3 years) Early Intervention Federal Funding

**IEP**- Individualized Educational Plan  
**IFSP**- Individualized Family Service Plan  
**LEA**- Local Education Agency  
**ODE**- Ohio Department of Education  
**ODH**- Ohio Department of Health  
**RIHP**- Regional Infant Hearing Program- under ODH  
**Section 504 Plan**- of Rehabilitation Act of 1973- Civil Rights Law, protects children with disabilities from discrimination  
**TC**- Total Communication  
**UNHS**- Universal Newborn Hearing Screening

### Color Key

 **ODH**  
 **Medical**  
 **Medical – CI**  
 **Education – ODH & ODE**



### Source:

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# AUDIOLOGICAL TESTING

It is best to have an audiologist who specializes in children administer the audiological tests. An audiologist uses many tests to find out more about your child's hearing loss. The different tests are used based on the age of the child and the child's physical and neurological development.

## Physiological Tests

Physiological testing tells us how well the hearing pathways are working, and are good estimates of hearing. Below are physiologic tests that may be used for newborns and young infants. Your child will be sleeping, resting or given medicine to help them rest during the test. These tests do not require your child to be able to respond to instructions and they do not hurt your child.

The following are physiologic tests:



**An infant during an OAE procedure.**

*Source: infantheating.org – National Resource Center for EHHDI.  
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- **Otoacoustic Emissions (OAEs)** – A probe with a rubber tip that looks like a mushroom, is placed in the baby's ear canal and a sound is sent to the inner ear (cochlea). If the inner ear is working normally and there is no blockage in the middle and outer ear, the inner ear sends a different sound ("echo") back out to the ear canal. The sound is then picked up by the microphone in the probe.
- **Auditory Brainstem Response (ABR)** – Earphones are placed on your resting or sleeping child and small electrodes are placed on the baby's head. This records electrical activity from the hearing nerve and nerve pathway that lead to (but not including) the cortex ("thinking" part) of the brain as it responds to sound.
- **Auditory Steady-State Response (ASSR)** – This test is a lot like the ABR. Electrodes are placed on the baby's head and sounds are presented to the baby's ear with earphones. The advantage of the ASSR is that it may help the audiologist determine if a baby has a severe hearing loss or a profound hearing loss.

## Tympanometry

It is a test to measure the function of the eardrum. It measures how well the middle ear is getting sound from the ear drum to



**An infant during tympanometry.**

*Picture by Mid-ear lab.*

*Source: infantheating.org – National Resource Center for EHDI.*

*Reprinted with permission.*

the inner ear. A small probe is placed in the ear canal. An air tight seal is made and sound is played into the ear canal. A microphone measures how much sound bounces off the ear drum. If too much or too little sound bounces off the ear drum, there may be a problem with the ear drum or middle ear. When less than the normal amount of sound makes it from the ear canal to the inner ear, the result is a hearing loss and is called a conductive hearing loss.

**Audiometry** is how an audiologist measures hearing. These tests are done in a sound-treated room called a sound booth. Children at different ages receive different kinds of hearing tests, based on their ability to respond. Unlike the OAE, ABR, and ASSR, pure tone and speech audiometry test the complete path of hearing. Pure tone and speech audiometry require the hearing pathway to carry the sounds to the cortical (“thinking” part) of the brain and the child or baby must then respond to the sound behaviorally. Below are common tests used with young children:

### **Behavioral Audiometry**

Behavioral testing is any test that requires an action or a reaction. Infants and young children cannot follow instructions easily (such as “Raise your hand when you hear a sound.”), so audiologists use other methods when testing young children.

- **Behavioral Observational Audiometry (BOA)** – This test is for infants younger than six months of age. It is ideally performed by a team of two audiologists. Reactions in response to sounds (such as head turning, eye opening) are used to determine a baby’s response to sound. Although subjective, experienced audiologists obtain accurate results.
- **Visual Reinforcement Audiometry (VRA)** – This testing method is used for a child who is between 6 months to 3 years of age. The child sits on the parent’s lap or in a high chair during the testing. The audiologist plays a sound and when the child turns to look for the sound a visual stimulus is presented (reinforcement), such as a moving toy or video. Sounds are played at different pitches and degrees of loudness and best responses are recorded on the audiogram.

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- **Conditional Play Audiometry (CPA)** – For this test the audiologist teaches the child to respond when they hear a sound. This is done through a game, such as dropping a block into a bucket or putting a peg on a board each time a sound is heard. The best response for each sound is recorded on the audiogram.

**Puretone Audiometry** uses tones in which an audiologist lowers the volume until the child no longer responds to the tone. This is repeated over a wide range of high to low tones, also called *frequencies*. The lowest volume at which the child responds consistently to each tone is determined to be the level of hearing or threshold for that tone. Older children wear headphones and indicate when they hear a tone by raising their hand. Testing is repeated for each ear. There are two types of pure tone testing can determine whether the hearing loss is conductive or sensorineural.

- **Air Conduction** – Tones are delivered to the child through earphones or a sound field. These tones are sent to the ear canal through the middle ear to reach the inner ear.
- **Bone Conduction** – A bone vibrator or oscillator is placed on the mastoid bone, behind the ear, or on the forehead to deliver sound vibrations to the middle ear. This test bypasses the outer and middle ear to test the sensitivity of the inner ear.

**Speech Audiometry** uses speech sounds such as phonemes (ba, ba, ba), words, or sentences. The audiologist should be made aware of your child's language abilities so that they can use the most appropriate test(s):

- **Speech Awareness Threshold (SAT)** is the softest level a child can hear speech. An infant may turn their head towards the speech sound or an older child may raise their hand to indicate that they heard the sound.
- **Speech Reception Threshold (SRT)** is the softest level a child can hear words or phrases that they consistently hear and repeat.  
For example: your child may be asked to point to the picture of a baseball or a hotdog from a picture card with four or more similar items.



- **Word Discrimination Score (WDS)** is a different type of speech test, in which standard lists of words are spoken at the same volume. The percentage of words a child hears correctly at one level is called the Word Discrimination Score (WDS).

For more information on “Diagnostic Audiology”, see Infanthearing.org National Resource Center for EHDI website: <http://www.infanthearing.org/audiology/index.html>

## **Audiogram**

### **What is an audiogram?**

An audiogram is a graphic representation of a hearing test. It shows the level of loudness (threshold in decibels of hearing level, or dBHL) that the child responds to for tone ranging from high to low pitch (pitch or frequency in Hertz ranging from 250-8000 Hz).

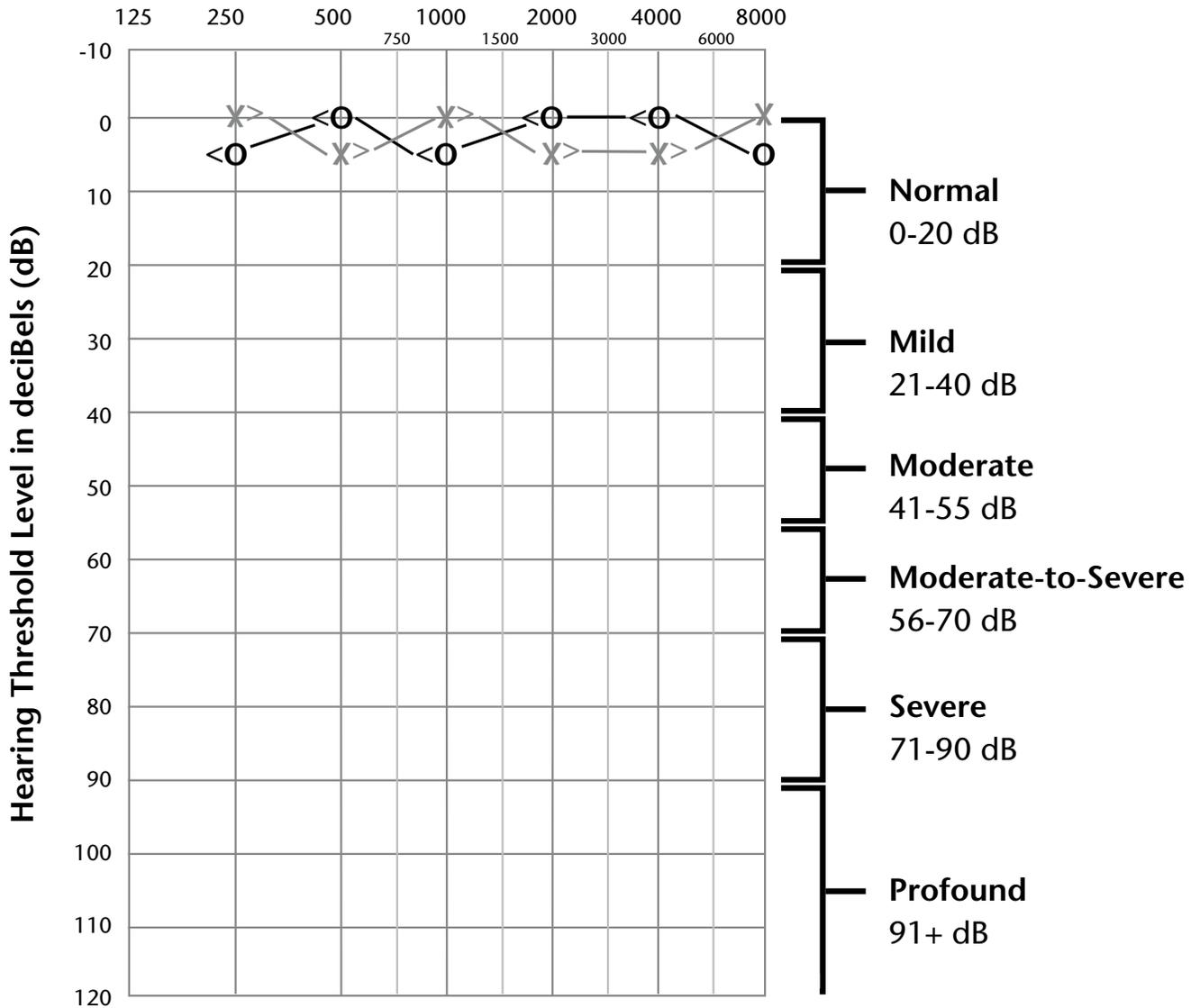
### **What Does an Audiogram Show?**

The audiogram provides a medical description of hearing loss. The pitch (frequency of the sounds) in **Hertz (Hz)** is graphed from low to high going from left to right at the top of the graph. The loudness (intensity) in **decibels Hearing Level (dBHL)** is graphed from quiet to loud from top to bottom. An “O” or “△” triangle is used to represent the responses for the right ear and an “X” or “□” box is used to represent responses for the left ear. Marks of “O” and “X” closer to the top of the graph indicate responses to softer sounds or better hearing.

Letters are heard in different pitch (frequency) and loudness (intensity), therefore the degrees of hearing loss will indicate what letter sounds your child may have difficulty hearing. The audiogram will show the degree of hearing loss your child has for each pitch (frequency). Your child’s audiologist will discuss and explain in more detail your child’s personal audiogram.

## NORMAL HEARING

Frequency in Hertz (Hz)



LEGEND OF SYMBOLS						
	EARPHONE		BONE		NO RESPONSE	SOUND FIELD
	No Mask	Mask	No Mask	Mask		
RIGHT	○	△	<	[	↙	<b>S</b>
LEFT	×	□	>	]	↘	

For more information on The American Academy of Audiology (AAA), see website: [www.audiology.org](http://www.audiology.org)

American Speech-Language- Hearing Association (ASHA), see website: [www.asha.org](http://www.asha.org)



# NOTES