

Let's Talk About...

Hearing and Testing

This handout explains sound and hearing tests. The chart (audiogram) found in this handout will help explain some of the topics. Your child's audiologist or doctor can answer any questions you might have.

What is sound?

Every sound has two parts: frequency (pitch) and intensity (loudness).

Frequency (pitch)

A great way to understand frequency is to think of a piano. The notes on the left side of the piano are low frequency (low-pitch) notes. The notes on the right side of the piano are high frequency (high-pitch) notes.

Frequency is measured in hertz (Hz). A low frequency sound is about 500 Hz and lower. A high frequency sound is about 2000 Hz and higher.

A bass drum, a "rumble," thunder, or a man's deep voice are all examples of low frequency sounds. A shrill whistle, squeak, squeal, or a child's voice are all examples of high frequency sounds.

Intensity (loudness)

If a sound is loud, it has a high intensity. If a sound is soft, it has a low intensity.

Intensity is measured in decibels (dB). A high intensity sound (a loud sound) has a high decibel level. A low-intensity sound has a low decibel level and is very soft, like a whisper (about 25 dB).

Conversation is usually between 40 and 60 dB. We feel discomfort when the sound is over 90 dB and sounds greater than 110 dB can be painful.

What can humans hear?

Humans can usually hear frequencies between 32 Hz and 32000 Hz at intensities of 10dB and louder.

Hearing "threshold" is the lowest intensity where we begin to hear sound. The normal hearing threshold is

between 0 dB and 20 dB. The most important frequencies for speech and language are between 250-8000 Hz.

Sounds around us have a wide range of frequency and intensity. For example, leaves rustling are very soft, or very low intensity sounds, but they have high frequencies. A jet engine is a very high intensity sound and it is in the high frequency area. A cargo truck is very loud (high intensity), but has a low frequency. The sounds of speech have many frequencies and intensities. Notice on the chart that sounds requiring our voice (z, v, j, m, l, o, i) are more low-frequency sounds. Sounds that are made without our voice (sss, fff, th, t, sh) are higher frequency sounds.

How is hearing tested?

There are many ways to test hearing. The most common are:

- Behavioral testing in a sound booth
- Otoacoustic emission (OAE) testing
- Auditory brainstem response (ABR) testing

Behavioral testing

Both children and adults can have their hearing tested in the sound booth. Sometimes even babies can be tested in a sound booth. Older children and adults are tested in a sound booth with headphones or insert earphones. This hearing test measures how high the decibel level (loudness) needs to be for a person to hear each frequency (pitch or tone).

During a hearing test, an audiologist (a healthcare professional who tests and helps people with hearing loss) records a person's ability to hear different frequencies or pitches from each ear. If a person hears sound at 20 dB or less, hearing is normal.

The audiogram is a record of the hearing test. The range of hearing typically tested in the sound booth is 250-8000 Hz, the frequency range important for speech and language.

Otoacoustic Emission (OAE) testing

Otoacoustic emission (OAE) testing is another way to test hearing with babies and children. It is one way newborn babies in Utah have their hearing tested. Testing involves placing a small probe in the ear canal. This is not painful. Sounds are played and a response from the inner ear is measured. This test cannot determine the degree of hearing loss (mild, moderate, severe, or profound). There may be other reasons besides hearing loss that a baby does not pass the OAE test. This may be one test used to help us find out how your child hears.

Auditory Brainstem Response (ABR) testing

When a person cannot participate in a behavioral hearing test they may need to have an Auditory Brainstem Response (ABR) test. This is especially helpful with infants and small children. Young babies can have this test while they sleep naturally. Sometimes a child will need medicine to sleep so they are completely still during the test. For ABR testing sounds are delivered to the child's ear. The test measures how the hearing nerve responds to these sounds and can be recorded for a certain frequency range (250Hz-4000 Hz).

When compared with the broad range of human hearing, the range of this test is narrow. However, the area tested is a common area for hearing loss and important for speech and language.

What is hearing loss?

- If a child can hear low frequencies normally, but not high frequencies, they can hear most of what people say. However they may not hear high-frequency speech sounds like “sh,” “t,” and “f.” Without hearing aids, the child may not develop the sounds of speech because they cannot hear them.
- If a child has mild or moderate hearing loss in all frequencies, normal conversation may sound like a whisper.
- If a child has a severe or profound hearing loss in all frequencies, the child may need hearing aids or a cochlear implant to hear conversation.

Where do I start?

You are the most important advocate for your child. You will have a team of people to help you along the way. The team may include the following:

- Audiologist
- Early intervention specialist
- Teacher
- Speech and language therapist
- A doctor

The team will help you to:

- Answer questions
- Decide what needs to be done
- Help you find the help you need
- Provide you with information to make the best decision for your family and your child

Communication Options

As part of the journey when you have a child with hearing loss you will learn there are many different ways to communicate with your child. You will need to decide what option is best for your family. You can talk with professionals and other parents to help you make your decision.

What if I have other questions?

If you have any questions about your child's hearing, please talk with your child's audiologist or doctor.

To schedule an appointment at any of these facilities, please call 801.662.4949:

- **Primary Children's Main Campus (Inpatient Only)**
100 North Mario Capecchi Drive, 1st Floor
Salt Lake City, UT 84113
- **Primary Children's Rehab Bountiful**
280 North Main Street
Bountiful, UT 84010
- **Primary Children's Rehab Taylorsville**
3845 West 4700 South #102
Taylorsville, UT 84119
- **Primary Children's at Riverton**
3741 West 12600 South, 3rd Floor
Riverton, UT 84065

Audiogram

