

Understanding Your Child's Hearing Tests

A child is never too young to have his hearing checked. There are multiple reliable techniques used to measure hearing. A “hearing test” is actually an “Audiological Evaluation” made up of several tests for parts of the ear and hearing (auditory) system. A “hearing screening” is a quick procedure done to rule out concerns and can happen at any age and even when a baby is just hours old.

Hearing screenings can be done by technicians or nurses. Results are usually either “pass” or “refer” (sometimes described as “fail”) when a referral is necessary for more in-depth testing. Hearing can change at any age so screenings are conducted as early as possible and repeated over time. When a child is referred for an evaluation it is to diagnose how a child is hearing.

In many countries, audiological evaluations are done by a licensed audiologist, a health care professional trained to evaluate hearing. A complete audiological evaluation may include several objective and subjective tests. Both sensory and neural hearing losses are permanent, and hearing aids, cochlear implants or auditory brainstem implants might be considered.

Objective Tests

Objective tests measure the function of the outer ear, middle ear, inner ear, hearing nerve and the brainstem. Objective tests can be conducted regardless of the child's age and functioning abilities.

Objective tests include:

- Tympanometry
- Acoustic Reflexes
- Otoacoustic Emissions (OAE)
- Auditory Brainstem Response (ABR), Auditory Steady State Response (ASSR)

Tympanometry and Acoustic Reflexes

Tympanometry measures the movement of the middle



ear system. The results show if there is middle ear fluid or negative pressure requiring medical treatment by a pediatrician or Ear, Nose and Throat (ENT) doctor. This test provides helpful information to doctors if a child has a cold or chronic congestion. A small puff of air measures the movement of the ear drum, and a volume reading indicates if the middle ear size is normal. Acoustic reflexes measure the contraction (reflex) of the middle ear muscles in response to loud sounds. This test uses the same equipment as tympanometry. Acoustic reflexes and tympanometry take about one minute to complete.

Otoacoustic Emissions

Otoacoustic Emissions (OAEs) examine the function of the cochlea, the organ of hearing. When sound reaches the cochlea, hair cells in this organ produce a response called an emission, which is like an “echo.” OAEs can usually be completed in a minute. A small probe is inserted into the ear canal. It emits sounds and records the response from the cochlea. Present otoacoustic emissions usually reflect normal inner ear function. Absent otoacoustic emissions may indicate a problem in the middle or inner ear and/or a hearing loss.

Auditory Brainstem Response and Auditory Steady State Responses

The Auditory Brainstem Response (ABR, BERA, BAER) and Auditory Steady State Response (ASSR) tests measure how the hearing nerve responds to sounds and conveys information to the early centers of the brain. Abbreviated

Ask

Parents have the right to fully understand hearing testing and what the results mean for their child's development. Obtaining information is a part of the process. Some questions might include:

- Which tests were done and what were the conclusions?
- When will further testing be needed?
- Is there a diagnosis and can it change?
- What do these results mean for my child?

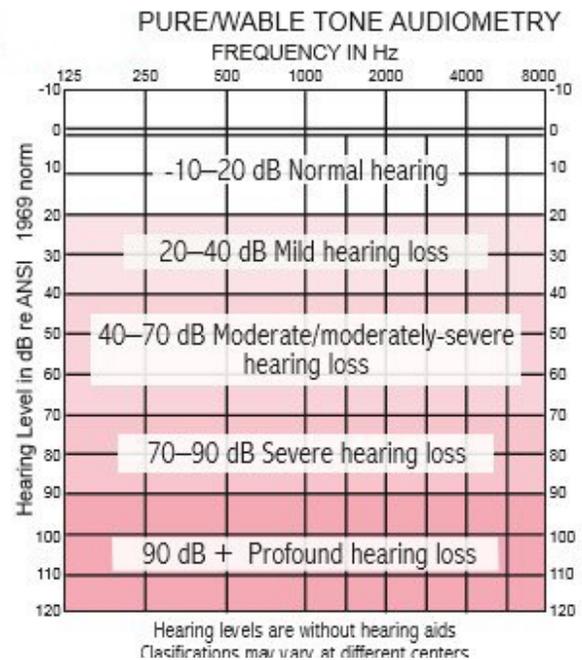
versions of these tests may be conducted at birth to screen for hearing loss. A comprehensive ABR evaluation for diagnosis of hearing loss can take one to three hours and is conducted by an audiologist. Small disks are placed on the child's ears and scalp. The child must be asleep (either naturally or by medically-monitored sedation) for the auditory system's responses to sound to be accurately recorded. Results of the ABR test can be used to determine if a hearing loss exists, define the level of hearing and identify the type of hearing loss.

Subjective Tests

Subjective tests, also called behavioral tests are used with children able to respond to sounds, either by turning their heads, playing a game or raising their hands. Behavioral testing is performed using headphones or speakers in a sound booth (sound treated room).

Behavioral tests include:

- Behavioral Observation Audiometry (BOA): used primarily with infants and children not ready to clearly turn toward sound. A baby's general responses to sounds are observed.
- Visual Reinforcement Audiometry (VRA): used often with toddlers and children able to be taught to turn in the direction of sound. When a child notices and turns toward a sound, a lighted visual image such as a moving toy or video appears to make this test a fun exercise.
- Conditioned Play Audiometry (CPA): used mainly with preschool and older children. The child is shown how to place an object into a container when a sound is heard.
- Conventional Audiometry: used predominately with older children. The child raises a hand or pushes a button when the sound is heard.



Results of behavioral testing can be used to reliably determine the softest sounds a child hears in each ear across a number of different frequencies (itches). Hearing levels are recorded on an audiogram to determine if a hearing loss exists, measure the degree of hearing and categorize the type of loss. Children using hearing aids or cochlear implants may also be tested with their hearing technology. There are also other tests to evaluate a child's auditory skill development or speech perception.

Audiograms

The results from behavioral testing are recorded on an "Audiogram". The numbers across the top of the audiogram indicate frequency (pitch) measured in "Hertz" abbreviated "Hz". On the far left of the graph are very low deep pitches and on the far right are very high squeaky pitches. Testing is done across frequencies, but most speech sounds occur between 250Hz and 8000 Hz.

Ask More

Parents may request more time or another appointment to fully discuss results. Listing questions can be a useful strategy. Writing down answers or bringing another person to help with the appointment can be helpful.

- What additional appointments can be expected or requested?
- When will other health concerns related to hearing loss be checked?
- Where can more information and support be obtained?
- How can contact be made with families of children with hearing loss?

The numbers along the left side of the audiogram indicate the level of loudness measured in “decibels” abbreviated “dB.” Near the top are soft sounds like whispers and at the bottom are loud sounds like firecrackers. The softest sounds a child hears at each frequency are plotted on the graph. Degrees of hearing are measured from -10 to 120 dB from normal to a profound loss.

Audiogram symbols indicate right and left ears, head-phone or speakers, and hearing aids or implants. A “key” on the audiogram explains what each symbol represents. Families can ask that the results be explained each time behavioral testing is done because it takes time to understand the complexities of an audiogram. Parents can be given copies of the audiogram and it can be sent to other professionals working with a child to help with decisions about listening devices or services.

Testing is the Starting Point

Objective and subjective tests measure both level of hearing and type of hearing loss. Hearing levels are categorized as mild, moderate, moderately-severe, severe and profound. A hearing loss located in the outer or middle ear is conductive and can usually be treated by a physician. A hearing loss related to the cochlea is called a sensory hearing loss. If the hearing nerve (VIII cranial nerve) is not transmitting sound well, the loss is referred to as a neural hearing loss. Both sensory and neural hearing losses are permanent and hearing aids or a cochlear implant may be considered to improve hearing.

Testing is not a one-time event. Ongoing follow-up hearing tests check if hearing levels have changed and how listening devices are functioning. Children with hearing loss benefit from being tested in a sound booth every three or four months until their second birthday and then every six months from ages two to eight years. Children not identified with hearing loss may have regular hearing screenings as part of health check-ups. Screenings can also occur anytime parents feel concern about their child’s responses to sounds.

If testing shows that a child has a hearing loss, there are other conditions to check and more appointments to be made. An audiological evaluation can be lengthy. It is not uncommon for the audiologist to see a child more than once to evaluate the ear, auditory system and hearing levels. The answers from the hearing tests are just the beginning of the questions families have about hearing loss,

development and intervention. Then the process begins for considering and deciding about listening devices (hearing aids or implants) and how to meet a child’s needs. Language development is impacted by hearing loss and parents will have concerns about what actions are best for their family. There will be options to consider for communication, education, intervention and family support. There is no one right choice because every child and family is different.

The diagnosis of hearing loss can be frightening for parents, but it also provides an opportunity for families to gather information and obtain any help their children might need.

Knowing test results, parents can begin to make informed decisions and explore services to support a child’s language and learning growth. Experienced service providers and other families can assist parents in their new role advocating for their children.

Hearing loss presents challenges but it does not prevent children from having the life their parents dreamed. There are no limits to what children with hearing loss can achieve. More questions will arise but parents can become skilled in searching for and securing answers!

Ask yourself (after reading this topic)

- What are some of the different hearing tests?
- How are hearing evaluations a starting point for parents?
- What are questions I want to ask to get more information?

