

## Chapter 1 : Audiometry Screening and Interpretation - - American Family Physician

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## Chapter 2 : Types of Hearing Tests for Infants and Children

*Behavioural Audiometry for Infants and Young Children Whose hearing loss has been detected in infancy Alison King, Principal Audiologist, Paediatric Services, Australian Hearing.*

Hearing Tests for Children Behavioral hearing tests The child and typically the parent is seated in a sound booth. Sounds of varying intensity are presented to the child via calibrated speakers or earphones. The sounds may consist of speech or music as well as specific frequencies that are critical to access hear the different sounds of speech. Behavioral hearing tests include the following methods for the following developmental ages: Many parents describe it as a "sound finding game. For example, the child holds a block, waits and listens for the sound. When the child hears the sound, they drop the block in a bucket. This "listening game" is demonstrated to the child by the audiologist, and once the child understands the game testing is underway. Conventional Audiometry consistently used in children ages 5 and older: Tests of auditory function These are not direct measures of hearing, but rather measures of auditory function. However, some of these measures are correlated with difference degrees of hearing or hearing loss. Small probe tip is placed in the ear canal. Sound is presented and recorded. A computer plots the movement of the eardrum by measuring the amount of sound reflected back. It is not painful, but does feel a little stuffy for a few seconds. Same probe tip assembly used as in tympanometry. Otoacoustic emission OAE measures: A probe tip is placed in the ear canal. Sounds are presented and an elicited response recorded. The response is very faint so the child must be extremely quiet during the test. Because the response is so faint, it may be obscured by the presence of ear wax, middle ear pathology for example, fluid, pressure or the presence of pressure equalization PE tubes. It is used in two ways: Sounds are presented through an earphone while three small surface electrodes one on or behind each ear and one usually placed on the forehead pick-up the response to sound from the inner ear cochlea and auditory nerve. A computer averages the auditory responses and the audiologist interprets the results. Usually, the results are shared with the family immediately following the test. The test is not uncomfortable to the patient. When this test is used to estimate hearing levels for children 6 months and older, sedation is required for ABR recording. If you have questions regarding ABR testing at our center, please contact the audiology department. If your child is scheduled for a sedated ABR and you have questions regarding sedation, please contact the Pain Free anesthesia team at

### Chapter 3 : Audiometry: MedlinePlus Medical Encyclopedia

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**Hearing tests for the newborn** There are two primary types of hearing screening methods for newborns. These may be used alone or together.

**Evoked otoacoustic emissions (EOAE).** Sounds are sent through the plug. A microphone in the plug records the otoacoustic emissions responses of the normal ear in reaction to the sounds. There are no emissions in a baby with hearing loss. This test is painless and is usually completed within a few minutes, while the baby sleeps.

**Auditory brainstem response (ABR).** As in EOAE, this test is painless and takes only a few minutes. If the screening tests identify that your child has a hearing loss, further testing is needed. It is recommended that all babies with hearing loss be identified by 3 months of age so that treatment can begin before the baby is 6 months old, an important time for speech and language development.

Also, the following may be used: A screening test used in infants to observe their behavior in response to certain sounds. Additional testing may be necessary.

**Hearing tests for the toddler** Evaluation of hearing may include the above mentioned tests, along with the following: Your child usually wears some type of earphones. This test is modified slightly in the toddler age group and made into a game. The toddler is asked to do something with a toy. This test relies on the cooperation of the child, which may not always be given.

**Visual reinforcement audiometry (VRA).** A test where the child is trained to look toward a sound source. When the child gives a correct response, the child is "rewarded" through a visual reinforcement such as a toy that moves or a flashing light.

**Hearing tests for the older child** Evaluation of hearing for the child older than 3 to 4 years may include the above mentioned tests, along with the following: The child usually wears some type of earphones. In this age group, the child is simply asked to respond in some way when the tone is heard in the earphone.

**Tympanometry** also called impedance audiometry. A test that can be performed in most physician offices to help determine how the middle ear is functioning. It does not tell if the child is hearing or not, but helps to detect any changes in pressure in the middle ear. This is a difficult test to perform in younger children because the child needs to sit very still and not be crying, talking, or moving.

### Chapter 4 : Pediatric audiometry audiometry - All medical device manufacturers - Videos

*Abstract. Congenital or acquired hearing loss in infants and children has been linked with lifelong deficits in speech and language acquisition, poor academic performance, personal-social maladjustments, and emotional difficulties.*

URL of this page: Sounds vary, based on their loudness intensity and the speed of sound wave vibrations tone. Hearing occurs when sound waves stimulate the nerves of the inner ear. The sound then travels along nerve pathways to the brain. Sound waves can travel to the inner ear through the ear canal, eardrum, and bones of the middle ear air conduction. They can also pass through the bones around and behind the ear bone conduction. A whisper is about 20 dB. Loud music some concerts is around 80 to dB. A jet engine is about to dB. Sounds greater than 85 dB can cause hearing loss after a few hours. Louder sounds can cause immediate pain, and hearing loss can develop in a very short time. Low bass tones range around 50 to 60 Hz. Shrill, high-pitched tones range around 10, Hz or higher. The normal range of human hearing is about 20 to 20, Hz. Some animals can hear up to 50, Hz. Human speech is usually to 3, Hz. How the Test is Performed Your health care provider may test your hearing with simple tests that can be done in the office. These may include completing a questionnaire and listening to whispered voices, tuning forks, or tones from an ear examination scope. A specialized tuning fork test can help determine the type of hearing loss. The tuning fork is tapped and held in the air on each side of the head to test the ability to hear by air conduction. It is tapped and placed against the bone behind each ear mastoid bone to test bone conduction. A formal hearing testing can give a more exact measure of hearing. Several tests may be done: Pure tone testing audiogram -- For this test, you wear earphones attached to the audiometer. Pure tones are delivered to one ear at a time. You are asked to signal when you hear a sound. The minimum volume required to hear each tone is graphed. A device called a bone oscillator is placed against the mastoid bone to test bone conduction. Speech audiometry -- This tests your ability to detect and repeat spoken words at different volumes heard through a head set. Immittance audiometry -- This test measures the function of the ear drum and the flow of sound through the middle ear. A probe is inserted into the ear and air is pumped through it to change the pressure within the ear as tones are produced. A microphone monitors how well sound is conducted within the ear under different pressures. How to Prepare for the Test No special steps are needed. How the Test will Feel There is no discomfort. The length of time varies. An initial screening may take about 5 to 10 minutes. Detailed audiometry may take about 1 hour. Why the Test is Performed This test can detect hearing loss at an early stage. It may also be used when you have hearing problems from any cause. Normal Results The ability to hear a whisper, normal speech, and a ticking watch is normal. The ability to hear a tuning fork through air and bone is normal. In detailed audiometry, hearing is normal if you can hear tones from to 8, Hz at 25 dB or lower. What Abnormal Results Mean There are many kinds and degrees of hearing loss. In some types, you only lose the ability to hear high or low tones, or you lose only air or bone conduction. The inability to hear pure tones below 25 dB indicates some hearing loss. The amount and type of hearing loss may give clues to the cause, and chances of recovering your hearing. The following conditions may affect test results:

### Chapter 5 : Audiometry and Infant - Reviews

*Audiometry is a relatively simple procedure that can be performed and interpreted by a trained health care professional. Family physicians should feel comfortable performing this testing on adults.*

In addition, there are many different types of hearing tests. Hearing tests for the newborn There are 2 main types of hearing screening methods for newborns. These may be used alone or together: Evoked otoacoustic emissions EOAE. Sounds are sent through the plug. A microphone in the plug records the otoacoustic emissions responses of the normal ear in reaction to the sounds. There are no emissions in a baby with hearing loss. This test is painless and is usually takes just a few minutes, while the baby sleeps. Auditory brainstem response ABR. As in EOAE, this test is painless and takes only a few minutes. If the screening tests finds that your child has a hearing loss, further testing is needed. It is advised that all babies with hearing loss be identified by 3 months of age so that treatment can begin before the baby is 6 months old, an important time for speech and language development. Also, the following may be used: A screening test used in infants to observe their behavior in response to certain sounds. Additional testing may be necessary. Hearing tests for the toddler Evaluation of hearing may include the above mentioned tests, along with the following: Your child usually wears some type of earphones. This test is modified slightly in the toddler age group and made into a game. The toddler is asked to do something with a toy such as touch or move a toy every time the sound is heard. This test relies on the cooperation of the child, which may not always be given. Visual reinforcement audiometry VRA. A test where the child is trained to look toward a sound source. When the child gives a correct response, the child is "rewarded" through a visual reinforcement, such as a toy that moves or a flashing light. Hearing tests for the older child Evaluation of hearing for the child older than 3 to 4 years may include the above mentioned tests, along with the following: The child usually wears some type of earphones. In this age group, the child is simply asked to respond in some way when the tone is heard in the earphone. Tympanometry also called impedance audiometry. It does not tell if the child is hearing or not, but helps to find any changes in pressure in the middle ear.

## Chapter 6 : NCHAM: Pediatric Diagnostic Audiology

*Speech audiometry is a fundamental tool in hearing loss assessment. Together with pure-tone audiometry, it can aid in determining the degree and type of hearing loss. Speech audiometry provides information on word recognition and about discomfort or tolerance to speech stimuli.*

Ideally, the newborn screening is completed before a baby is 1 month of age. If a baby does not pass the newborn screening, the next step is Diagnostic Audiology. The initial diagnostic tests must be completed as soon as possible so that any potential hearing loss can be diagnosed before 3 months of age. A baby identified with a hearing loss should be fit with hearing aids if appropriate and enrolled in an early intervention program well before 6 months of age. The diagnostic evaluation is performed by a pediatric audiologist. The audiologist performs a series of tests, described below, to determine if a hearing loss exists, and, if so, the type part of the auditory system affected, degree how much hearing loss exists and configuration frequencies or pitches that are affected of the loss. Key Components in a Diagnostic Audiological Evaluation of Infants and Children Case History Documentation The audiologist will collect information about family history of hearing loss, conditions that occurred during pregnancy including maternal illnesses, complications that occurred during labor or delivery, and time the infant spent in the neonatal intensive care unit NICU. This information helps the audiologist determine if there are any pre, peri- or postnatal conditions that would indicate the infant is at increased risk for a progressive or late-onset hearing loss. It is the most critical procedure in the initial test battery because it is an accurate and reliable predictor of hearing loss in infants who are too young to respond to behavioral testing. The ABR measurement provides information on the degree, type, and configuration of a hearing loss and allows the audiologist to fit an infant with a hearing aid when needed. Generally, infants less than 6 months of age do not need sedation for this test. When sedation is needed, the ABR is conducted in a special clinic room or hospital operating room. There are helpful techniques for preparing an infant for an ABR with and without sedation. Read more about ABR Techniques. The benefit of the ASSR is that the results may provide more frequency-specific threshold information for infants who have severe to profound hearing losses. This enables the audiologist to have more precise data to proceed with hearing aid fittings or determining cochlear implant candidacy. At the present time, ASSR is not available in all audiological clinics. See appendix B for sedation info. Otoacoustic Emissions OAE A cochlea that is functioning normally not only receives sound, it also produces low-intensity, measurable sounds called OAEs. It is important to note that middle ear fluid, or negative middle ear pressure associated with otitis media, can interfere with OAE measurement. The middle ear must be clear for OAE equipment to accurately assess cochlear functioning. Additional information regarding OAE screening. Tympanometry Tympanometry tests the condition of the middle ear, the mobility of the eardrum tympanic membrane and the conduction of the middle ear bones, by creating variations of air pressure in the ear canal. When tympanometry is used with very young infants their small, soft ear canals may affect the test and give inaccurate results. Therefore, specialized equipment generating a high frequency probe tone is routinely used to increase the reliability and accuracy of tympanometry for children months of age. Additional information regarding tympanometry. Behavioral Audiometry As a child matures and is able to provide hearing results behaviorally, hearing information can be plotted with even greater specificity. During audiometric testing, the audiologist finds the lowest intensity level threshold at which a child can detect sound at different frequencies. From this information, a graphic representation of the hearing loss, called an audiogram, is created. The hearing loss will typically be classified as mild, moderate, moderately severe, severe, or profound. For infants 6 to 36 months of age, visual reinforcement audiometry VRA is recommended in addition to the tests described previously. Individual ear air conduction and bone conduction thresholds can be measured at all typical clinical frequencies, 125, 250, 500, 1000, 2000, 4000, 8000, 16000, 32000, 64000, 128000, 256000, 512000, 1024000, 2048000, 4096000, 8192000, 16384000, 32768000, 65536000, 131072000, 262144000, 524288000, 1048576000, 2097152000, 4194304000, 8388608000, 16777216000, 33554432000, 67108864000, 134217728000, 268435456000, 536870912000, 1073741824000, 2147483648000, 4294967296000, 8589934592000, 17179869184000, 34359738368000, 68719476736000, 137438953472000, 274877906944000, 549755813888000, 1099511627776000, 2199023255552000, 4398046511104000, 8796093022208000, 17592186044416000, 35184372088832000, 70368744177664000, 140737488355328000, 281474976710656000, 562949953421312000, 1125899906842624000, 2251799813685248000, 4503599627370496000, 9007199254740992000, 18014398509481984000, 36028797018963968000, 72057594037927936000, 144115188075855872000, 288230376151711744000, 576460752303423488000, 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screening is designed to identify infants who have congenital hearing loss, it is important to acknowledge that some infants may have mild losses that are not detected initially and become more severe over time progressive loss. Other children experience a permanent hearing loss at some point after birth late-onset or delayed-onset loss.