

## Hearing (Audiometry) Test basic level

### Overview

An audiometry evaluation is a painless, noninvasive hearing test that measures a person's ability to hear different sounds, pitches, or frequencies. Patients who have a tumor in or around the ear may undergo audiometry testing to determine whether hearing loss has occurred or to monitor their hearing before and after surgery. It is also used to evaluate whether hearing aids or surgery may improve one's hearing.

### How does a hearing test work?

Our ears have three distinct parts: the outer, middle, and inner ear (Fig. 1). Audiometry tests can detect whether you have sensorineural hearing loss (damage to the nerve or cochlea) or conductive hearing loss (damage to the eardrum or the tiny ossicle bones). During an audiometry evaluation, a variety of tests may be performed.

A pure tone audiometry test measures the softest, or least audible, sound that a person can hear. During the test, you will wear earphones and hear a range of sounds directed to one ear at a time. The loudness of sound is measured in decibels (dB). A whisper is about 20 dB, loud music ranges 80-120 dB, and a jet engine is about 180 dB. The tone of sound is measured in frequencies (Hz). Low bass tones range 50-60 Hz, high-pitched tones range 10,000 Hz or higher. Normal hearing range is 250-8,000 Hz at 25 dB or lower.

A word recognition test (also called speech discrimination test) assesses a person's ability to understand speech from background noise. If your speech discrimination is poor, speech may sound garbled. Word recognition scores can be helpful in predicting the usefulness of a hearing aid.

A tympanometry test detects problems such as fluid/wax buildup, perforated eardrum, ossicle bone damage, or tumors in the middle ear. Acoustic reflex testing evaluates the cranial nerves and brainstem.

### What does a hearing test show?

Pure tone audiometry charts the hearing level of different tone frequencies in both ears. On an audiogram chart, red O's indicate the right ear's results and blue X's the left ear's results (Fig. 2).

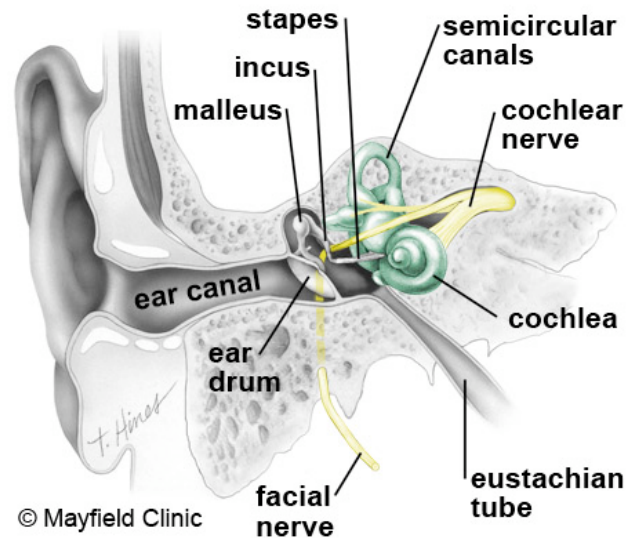


Figure 1. The outer ear collects sound waves from the environment and funnels them down the ear canal to the eardrum. Vibrations are made when sound hits the eardrum. Vibrations are passed along tiny bones (ossicles) in the middle ear. The ossicles consist of the malleus, incus, and stapes. The stapes delivers vibrations to the cochlea in the inner ear. The cochlea is a spiral tube filled with liquid and lined with hair cells that are microscopic in size. When the vibration hits the cochlea, it causes the liquid, and subsequently the hair cells, to move. The movement of hair cells generates nerve signals that our brain then understands as sound.

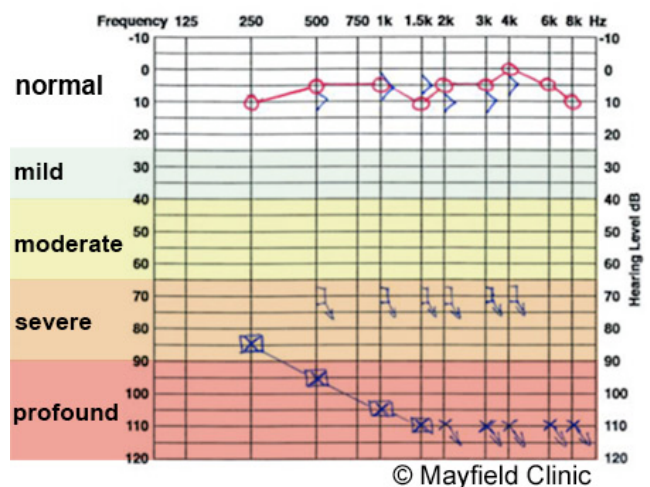


Figure 2. Audiogram of a patient with an acoustic neuroma shows hearing loss in the left ear. The red line is the right ear. The blue line is the left ear.

Hearing loss is often described as follows:

- Normal = less than 25 db HL
- Mild = 25-40 db HL
- Moderate = 41-65 dB HL
- Severe = 66-90 db HL
- Profound = more than 90 db HL

### Who performs the test?

An audiologist performs a hearing test.

### How should I prepare for the test?

There is no special preparation for the test. Try your best to remain still and quiet during the test so that an accurate recording can be made.

### What happens during the test?

The audiometry tests are conducted in a quiet soundproof room (Fig. 3). Earphones will be placed on your head. You will be asked to sit still and not talk. The earphones are connected to a machine that will deliver the tones and different sounds of speech to your ears, one ear at a time. The audiologist will ask you to raise your hand when you hear a sound. For example, if you hear a sound with your left ear, raise your left hand; if you hear a sound with your right ear, raise your right hand. At some facilities, you may be asked to push a button or make some other sign that you have recognized a sound. The audiologist will record each tone at the lowest possible volume that you were able to hear it. Before or after the general audiometry test, tuning forks are also used to conduct the Rinne and Weber tests. Each test evaluates the potential for different kinds of hearing loss.

To assess speech discrimination, you will be instructed to repeat words you hear. You will hear a series of two-syllable words at a volume that gradually decreases as the test progresses. In the second stage of the test, you will hear and repeat a series of one-syllable words at a volume that does not change.

During a tympanometry and acoustic reflex test, a soft plug is placed in your ear. The plug will change pressure, make a loud noise, and track your responses to the sound and various pressures. Movement of the eardrum is measured as well as the reflexes of the tiny muscles attached to the ossicles.

### What are the risks?

The test carries no risks.



Figure 3. A hearing test is performed in a sound proof room. You will wear headphones or earplugs connected to a device that sends sounds of different volumes and pitches to one ear at a time. You will be asked to respond by raising your hand or pressing a button each time you hear a sound.

### How do I get the test results?

The audiologist will go over the test results with you. A report is sent to your referring physician, who may be a neurosurgeon, otolaryngologist, or primary care physician. They will discuss with you what the test results mean for your condition and treatment options.

### Sources & links

If you have further questions about this diagnostic test, contact the doctor who ordered the test.

### Glossary

**acoustic neuroma:** a benign, slow growing tumor that forms on the sheath of the eighth cranial nerve. This tumor can cause hearing loss, balance problems, and facial paralysis.

**conductive hearing loss:** hearing loss caused by damage to the eardrum or ossicle bones.

**sensorineural hearing loss:** hearing loss caused by damage to the vestibulocochlear nerve.

**tinnitus:** ringing or buzzing noise in the ear.

**vertigo:** a feeling of spinning, whirling or turning.

**vestibulocochlear nerve:** the eighth cranial nerve responsible for hearing and balance.

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