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## Hearing tests

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### Summary

- Hearing tests check a person's ability to hear sounds of different pitch and loudness.
  - These tests are usually conducted by professionals called audiologists.
  - The audiologist charts the results of your hearing tests on a graph called an audiogram, which helps to pinpoint the severity and possible causes of your hearing problems.
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Hearing tests check a person's ability to hear the loudness and pitch of sounds. The results are charted on a graph (audiogram) to help pinpoint the severity and causes of hearing problems. Tests include pure tone audiometry, using an audiometer, and speech discrimination tests. Special tests are available to test hearing in babies and children.

### How we hear

The vibration of air molecules makes up a sound wave. Gentle vibrations make a soft sound, while large vibrations create a loud noise. The loudness of sound is measured in decibels (dB). A sound's pitch or frequency is its number of vibrations per second. This is measured in hertz (Hz).

Slow vibrations make a low frequency sound (such as a foghorn), while rapid vibrations make a high frequency sound (such as a whistle). Hearing tests check a person's ability to hear sounds of different loudness and pitch. These tests are usually conducted by hearing specialists called audiologists.

### Signs that you need a hearing test

Some signs that you may need to have your hearing checked include:

- ringing sensation in the ears (**tinnitus**)
- people complain that you talk too loudly
- you often have to ask people to repeat what they say
- you find it hard to hear conversations, especially if there is background noise
- others complain that you watch television with the volume turned too high.

### A range of hearing tests

There are various types of hearing tests available, including:

- pure tone audiometry – a machine called an audiometer produces a range of beeps and whistles (pure tones). You press a button or otherwise indicate when you hear the sounds. If you listen to the pure tones through headphones, your air conduction hearing is being tested. This tests your outer hearing pathway as well as your inner ear. If you listen to the sounds through a bone conductor – a vibrator held against the mastoid bone (located behind the ear) – the sounds your inner hearing pathways can hear are measured
  - speech discrimination tests – this is a test of how clearly you hear speech. Speech discrimination tests require you to repeat words said to you. Age-related hearing loss (presbycusis) typically begins with the loss of higher frequencies, so that certain speech sounds (such as 'p', 'f' and 't') end up sounding very similar
  - online hearing test – wearing headphones, people can check their hearing in background noise. Developed by National Acoustics Laboratories, Australia, this test takes less than five minutes and evaluates hearing ability according to age. Designed for adults.
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## Hearing tests for babies and children

Some babies are at increased risk of hearing problems. Risk factors include premature birth, low birth weight and jaundice. The type of hearing tests used depends on the age of the child, but can include:

- **objective tests** – such as otoacoustic emission testing, auditory brainstem response testing, electrocochleography and tympanometry do not require a response from the listener. These tests provide the most accurate indication of hearing ability in most babies aged under six months
- **behavioural observation audiometry (BOA)** – for babies under seven months of age. BOA consists of making noises, such as shaking a rattle nearby, and then observing the baby's response.
- **visual reinforcement orientation** – the baby is taught to move their head towards sound by pairing it with an interesting visual stimulus, such as a puppet. The baby will turn its head at the sound so that it can see the puppet. Their response to different sounds can then be measured. The ears can be tested individually if the baby will tolerate headphones
- **play audiometry** – older children are taught to respond to sounds by playing a game, such as dropping a marble when they hear the sound
- **Sound Scouts** – is an Australian, award-winning game app test for children. Go to [www.soundscouts.com](http://www.soundscouts.com) for more information.

## Objective hearing tests

Objective hearing tests include:

- **otoacoustic emission testing** – to check the function of the tiny hairs in the cochlea. The faint sound made by the hairs in response to sound is called the otoacoustic emission
- **auditory brainstem response testing** – to check the electrical activity in the brain in response to a sound. Electrodes are placed on the head to measure the brain waves
- **electrocochleography** – to check the cochlea for signs of electrical activity in response to sound. An electrode is threaded through the eardrum to touch the cochlea
- **tympanometry** – a rubber tip is inserted into the ear and air is pumped into the ear canal. This is not a test of hearing, but checks if the eardrum can move normally.

## Audiogram explained

The audiologist charts the results of your hearing tests on a graph called an audiogram. Graphed results usually include your hearing threshold (the softest sounds you can hear) for a range of frequencies for both ears.

By comparing the figures, the audiologist can assess your degree of hearing loss and find clues to its origin. For example, if the air and bone conduction results are the same, then the audiologist knows that the hearing loss is caused by problems of the inner ear, and not the outer or middle ear.

## Types of hearing loss

Hearing tests can distinguish the type of hearing loss, including:

- **conductive** – a sound blockage in the middle or outer ear (or both), usually caused by middle ear infections or by wax build-up in the ear canal
- **sensorineural** – the cochlea or cochlear nerve is damaged
- **mixed** – the hearing loss is caused by a combination of conductive and sensor neural problems.

Hearing loss can also be described as:

- **congenital** – when the hearing loss occurs before or just after birth. Exposure to certain diseases in utero or soon after birth can harm the hearing mechanism of the baby
- **acquired** – when the loss happens later (for example, due to disease or trauma).

## Severity of hearing loss

Hearing loss is measured in decibels (dB). Conversational speech is around 65 dB. The degrees of hearing loss include:

- mild (21 – 45 dB) – soft sounds may be difficult to distinguish
- moderate (46 – 60 dB) – conversational speech is hard to hear, especially if there is background noise (such as a television or radio)
- moderately severe (61 – 75 dB) – it is very difficult to hear ordinary speech
- severe (76 – 90 dB) – conversational speech cannot be heard
- profound (91 dB) – almost all sounds are inaudible. Most people with profound hearing loss benefit from a hearing aid.

### Where to get help

- Your doctor
- Audiologist
- Ear, nose and throat specialist
- **Australian Hearing** Tel. 131 797, TTY (02) 9412 6802
- **Better Hearing Australia**, Victorian branch Tel. (03) 9510 1577, or 1300 BHA VIC (242 842), TTY (03) 9510 3499

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