How do audiologists test my child's hearing?

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The first test that is done is usually a hearing screening using **otoacoustic emissions**. A small probe is placed in the child's ear and the machine will the tester whether there is a "pass" or "refer" response. A "pass" means that hearing is most likely in the typical range while a "refer" could mean that there is some degree of hearing loss or the child has an ear infection that is affecting the screening results. The audiologist will most likely refer the child to an ENT specialist to check the middle ear and will schedule a re-screening.

Hearing could also be screened using **Automated Auditory Brainstem Response test (ABR)**. An earphone is placed completely over the child's ear and the machine will tell the tester whether there is a pass or refer response. Both tests require the child to be still and are generally more easily completed on babies.

Diagnostic testing to determine the degree and shape of the loss at the different frequencies requires more tests. The complete hearing system from the outer ear through the middle ear and inner ear is tested to determine the type of hearing loss as well as to give the audiologists some indication of appropriate audiological management and amplification options.

It is important for the audiologist to first check the outer ear with an otoscope. This gives an idea of whether the ear canals are clear, if the tympanic membrane looks inflamed and gives the audiologist some indication of the size of the ear so she knows approximately what size probe to use for middle ear testing.

The next test is **tympanometry**. This tells the audiologist about the pressure and mobility of the tympanic membrane. This test is also used to determine if there is an ear infection and if the child needs to see an ENT specialist. A probe (same as the one used for otoacoustic screening) is placed in the child's ear and pressure is applied into the ear to determine how the tympanic membrane and middle ear system responds.

Then come the tests for how loud sounds need to be for the child to hear at specific frequencies. The lowest level at which the child hears a sound is called the "threshold" for each frequency and tells the audiologist the degree of hearing loss.

There are two ways to determine the thresholds and degree of hearing loss:

1) Electrophysiology – The child is not required to give a direct response to whether the sound is heard but rather machines measure whether the hearing system has responded to a sound.

2) Behavioural testing – Sounds are presented and the child is required to give an indication of whether they heard a sound. The threshold will be the softest sound the child has responded to at each frequency.

Electrophysiology is generally used for younger children that cannot give a reliable indication of whether they have heard a sound or for children with additional challenges. The child is required to be very still or asleep as muscle movement affects the results of the test. The test may be done under sedation or general anaesthesia. The audiologist will first clean the forehead and/or earlobe with a special paste and then attach small electrodes. Insert earphones or headphones are attached to the electrodes and placed in/on the child's ears. The machine then presents a series of sounds to the ear and gets waveforms on a computer indicating how the brain has responded to the sound. The audiologist will also attach something that looks like an alice band to the child's head. This is attached to a round object that sits on the bone behind the ear. This is called a bone vibrator and is used to determine how the cochlea responds to sound if directly stimulated, so as to cut out the middle ear and the effects of a possible ear infection.

There are different types of behavioural testing depending on the child's age. Behavioural observation audiometry is used with children under 6 months of age. Sound is presented and the child s observed for any response to the sound, This could be a response like blinking, starting or stopping sucking on a bottle, or crying. Behavioural observation audiometry is generally not used in South Africa.

Once the child is able to sit independently and turn their heads, visual reinforcement audiometry can be used. Sound is presented and the child will turn to look for the source of the sound. Their response is reinforced by a flashing toy or a short video clip.

For an older child, play audiometry may be used – the child has toys and may e.g. put a toy in a bucket when they hear a sound.

Behavioural audiometry is done with earphones or insert phones as well as with the bone vibrator so the audiologist can check the functioning of the different parts of the auditory system. This may require a number of audiology appointments so as to get the child to respond appropriately and get accurate results. The results from testing will be used for programming of the child's hearing aids