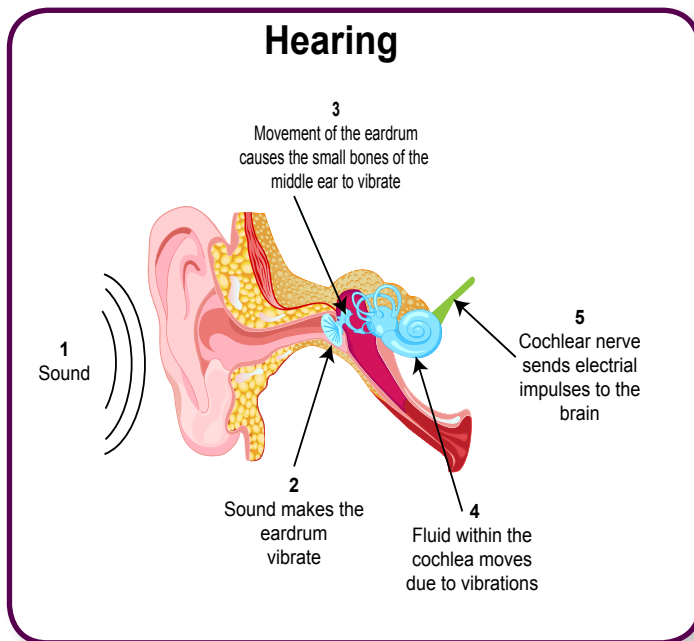


## Your Child's Hearing Test Information for Parents and Carers

### Transient Evoked Otoacoustic Emission (TEOAE) Testing

#### How Does Your Ear Work?



Sound occurs when a moving or vibrating object causes the air around it to move. Sound travels in invisible waves through the air.

When sound waves travel down the ear canal and hit the eardrum, the eardrum vibrates. Three bones in the middle ear link the vibrating eardrum to the cochlea in the inner ear.

The cochlea is filled with liquid that contains thousands of tiny hair cells. Movement of cochlear liquid causes the hair cells to bend and send electrical signals along the cochlear nerve to the brain. For normal hearing to occur, the brain has to receive the signals, then process and interpret them appropriately.

#### Background of cochlea

The cochlea contains two types of hair cells- outer hair cells and inner hair cells. Sound energy reaches the outer hair cells first, then the inner hair cells.

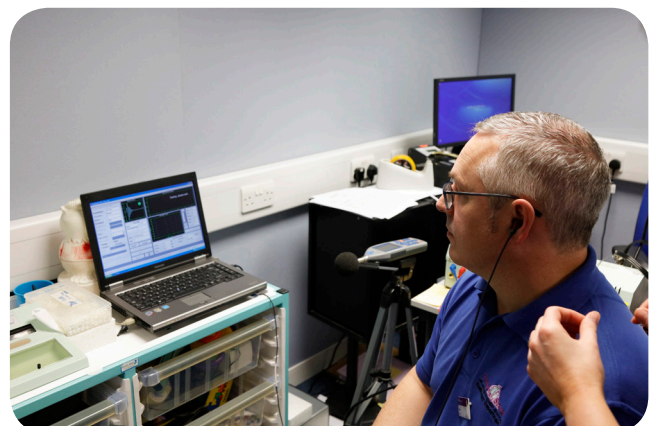
#### Transient Evoked Otoacoustic Emission (TEOAE) Testing

TEOAE testing shows how well the hearing system works, up to the outer hair cells of the cochlea. Present otoacoustic emissions show that outer hair cells have received sound energy and that they have responded.

#### TEOAE Testing Procedure

A disposable rubber tip is attached to a probe and the tip is placed in a child's ear canal.

A small speaker in the probe makes clicking sounds. When a child's hearing is working normally, the outer hair cells in the cochlea usually produce a quiet sound in response to the clicking sound. Responses from the outer hair cells travel from the cochlea back out into the ear canal and are detected by a microphone in the ear canal probe.



TEOAE testing takes about a minute to complete for children that are still and quiet during testing. If a child does not like the rubber tip being in their ear or if they are noisy, testing may not be possible or testing may be quite time consuming.

## The Results

When the test has been completed the following results are possible:

### 1) A clear TEOAE response was recorded- satisfactory result

A clear TEOAE response suggests that it is likely that some or all of the cochlear outer hair cells are working and in most cases hearing will be satisfactory.

However, a clear TEOAE response is sometimes recorded when a child's hearing is not normal. There are two circumstances when this can happen:

**a)** When some cochlear outer hair cells are working but not enough for normal hearing. For example, if the outer hair cells that process low pitched/ low frequency sounds such as the sound "oo" in "shoe" aren't working, a low frequency hearing loss will result. Despite the presence of a low frequency hearing loss, a TEOAE response will still be recorded if the outer hair cells that process high frequency sounds such as the "ss" in "hiss" are working.

**b)** When there is a problem with the hearing system beyond the outer hair cells of the cochlea. Although rare, a hearing loss caused by problems beyond the cochlear outer hair cells will not be detected through TEOAE testing.

### 2) A clear TEOAE response wasn't recorded- satisfactory result not achieved

When a clear TEOAE response has not been recorded there is a higher chance of there being a hearing loss due to a problem in any part of the hearing system, up to and including the cochlear outer hair cells. However, it is also possible to have normal hearing and no clear TEOAE response for the following reasons:

**a)** Too much noise during the test

TEOAE responses are quiet sounds. If a child makes a lot of noise during the test, it will not be possible to record a quiet response in the ear canal.

**b)** Wax in the ear canal

The Audiologist will have looked down the ear before carrying out testing and will be able to tell you whether they could see anything in the ear canal that could be blocking it. Unless the ear canal is completely blocked with wax, testing will usually be attempted.

When the ear canal is partially blocked with wax, sometimes the rubber tip in the ear canal can become blocked and a response will not be recorded. The rubber tip can be replaced and testing re-started, but if the issue keeps happening testing may have to be abandoned.

Under normal circumstances energy travels from the cochlea to the eardrum and from the eardrum out into the ear canal. The strength of the response energy reaching the ear canal microphone from the eardrum may be reduced when wax is partially blocking the ear canal. High pitched/high frequency responses in particular can be affected. The response energy reaching the microphone has to be sufficiently strong to be considered a "clear" response, so any reduction in response strength due to wax can make a difference to whether a

response is considered satisfactory.

**c) An open grommet or perforated eardrum**

There are two possible issues that can occur when the eardrum is perforated or when there is an open grommet in the eardrum:

i) The clicking stimulus sound can be affected, resulting in some parts of the cochlea receiving a louder sound than others. When this happens, the outer hair cells that receive a louder sound may give a robust response and the hair cells that receive a quieter sound may give a weak/no response. Overall, the response may be considered too weak to be a clear response.

ii) The presence of a hole in the eardrum reduces its efficiency. This can result in less cochlear response energy being passed on by the eardrum to the ear canal.

**d) Negative middle ear pressure**

The middle-ear cavity starts at the eardrum and ends at the inner ear and is normally filled with air. It is connected to the back of the nose by the Eustachian tube. The Eustachian tube is usually closed, but should periodically open so that the air pressure in the middle-ear space matches the air pressure on the outside of the eardrum. When the Eustachian tube does not open as often as it should do, the middle ear pressure becomes negative and the middle ear system becomes less efficient. Energy travelling from the cochlea to the eardrum may be reduced in strength as a result.

**e) Scarring on the eardrum**

Scarring on the eardrum can reduce its efficiency. A reduction in eardrum efficiency can cause a corresponding reduction in response energy, as previously described.

**f) Other**

A small number of people with normal hearing do not have TEOAE responses for unknown reasons

If you have any further questions about your appointment please contact us on 01 878 4577

To arrange any further appointments, please contact our secretaries on 01 8784533

Authors; Martin Cromb, Louise Keogh  
Version 1

Approval date January 2019  
Review date January 2021

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The information contained in this leaflet is correct at time of print

