Performance test of hearing in a low-resource setting

From 2½ years

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In the performance test, the child is conditioned to do something to indicate that they have heard a signal. Primary health care workers can use this test as a screening tool to determine whether a child needs to be tested by an audiology team.

Although the performance test can be also used as a diagnostic test for hearing loss, this is usually in the context of an audiology department and requires far more extensive training. In this article, we will solely focus on using the test as a screening tool at primary level.

Age range

This test can be carried out as soon as a child is able to wait before responding to a signal. This is usually possible by the age of 2½ years and a performance test should therefore be attempted when a child reaches this age. If the child's ability to wait has not yet been established by then, you can attempt a distraction test (see page 7), though it becomes increasingly difficult once children are over the age of one year.

Performance testing can be used up to the age when children can accept the wearing of headphones and be tested by pure tone audiometry, which is usually by the age of 4 years.

The test is valid for older children if a pure tone audiometer is not available.

Limitations

Performance testing does not test the ears separately, but will indicate the hearing level of both ears listening together. Sometimes, it is possible for the test to indicate a marked difference in hearing between the two ears (see below), but not the actual degree of difference.

Test requirements

1 **A normal-hearing trained person to make the signals and interpret them**
The signals used in the test are the word 'Go' (a low-frequency signal) and 'ss' (a high-frequency sound).

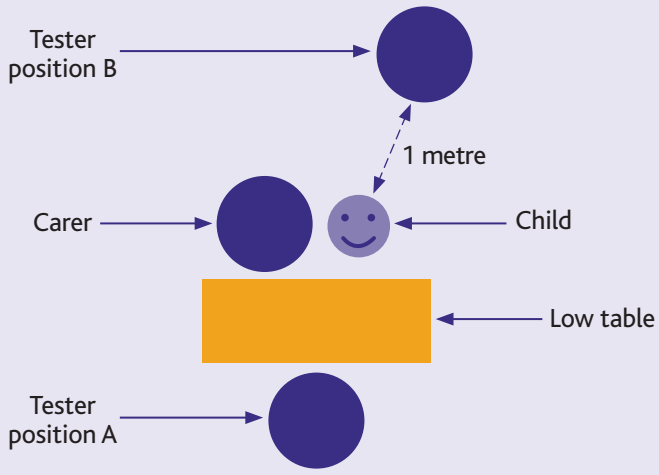
2 **A play item for the child to use to indicate that the signal has been heard**
If possible a toy requiring repetitive action should be used in the test. The action should be simple (e.g. it should not involve matching different shapes or colours), as this would distract the child's attention from listening to the sound signal. Examples of suitable toys are rings of equal size to put on a stick or plain wooden cubes to drop into a box. However, objects such as smooth stones could be used to drop into a receptacle, e.g. a cooking pan. There should be several of these objects so that the child is not merely dropping the same stone or cube each time and is not at risk of becoming bored and uncooperative.

3 **A quiet room**
The room should be quiet throughout the test (background noise should not exceed 35 dBA).

4 **Additional requirements**
You will need a chair for the parent and, if available, a low chair on which the child can sit alongside or in front of the parent and a low table on which the toy can be rested.

If you do not have a small chair and a low table, the child can be sat on the parent's knee. The toy is then held by the parent.

FIGURE 1 PERFORMANCE TEST ARRANGEMENT IN WHICH THE CHILD SITS ALONE AT A LOW TABLE



Alternatively, the child could sit on the parent's lap, while the tester's positions A and B remain the same.

Conditioning the child for the test

Conditioning (or training) the child to carry out the test is done by giving visual clues (or tactile clues if the child is blind). This is in order to check that the child can wait for the sound signal and carry out the action required. It is **not** testing hearing at this stage. The signal 'Go' is used initially to condition the child.

If the child has good sight

- The tester kneels on the floor in front of the child if the child is sitting on a low chair (Figure 1) or sits on a chair if the child is sat on the parent's knee.
- The tester holds the toy, e.g. a wooden cube, close to his/her mouth to draw the child's attention to the visual (conditioning clue). The tester then says 'Go' in a normal voice and puts the cube in a box. This is repeated a few times, varying the interval between the signals, to avoid the child responding as a result of anticipating the signal.
- The child is then given the cube and encouraged to watch the tester's face. When the tester says 'Go', then the child should put the cube in the box.
- Most children will be eager to hold the cube but, if a child is reluctant, then the parent can be asked to hold their hand over the child's hand. The parent needs to be instructed to be careful not to help the child by moving the hand in response to 'Go', but to let the child make the move. After a few trials with the parent, the child will usually respond alone.

- Alternatively, the parent can 'play the game' themselves at first, by waiting and dropping the cube for a few trials in order to give the child confidence. The child is still encouraged to watch the tester's face.
- Once the child responds reliably alone, the screening test can start.

If the child is blind

If the child will allow the tester to hold their hand, then conditioning is performed by both tester and child carrying out the action together. If not, then the tester can kneel at the child's side and say 'Go' close to the ear, allowing breath on the outer ear to provide a tactile clue. Again, the parent can be used at first to give the child confidence: the parent responds to the sound, holding the child's hand, and at the same time the child is able to feel the tactile (breath) signal.

The screening test

Once the tester is satisfied that the child has been conditioned, the screening test can proceed. Moving from Position A (see Figure 1), the tester goes behind the child to about a metre away and slightly to the side, bending or kneeling so that the tester's mouth is at the level of the ear vertically (Position B). It is necessary to go behind the child as, when testing hearing, it is important to avoid the visual clues which may be given if staying in front and covering the mouth with a hand.

This performance test is a 'pass/fail' test and tests whether or not the child can hear the sound signal at very quiet sound levels (this is equivalent to 35–40 dBA, as measured on a sound level meter).

Using the sound 'Go'

Having made sure that the child is ready and waiting and looking forward, the tester says 'Go' softly. After the child has waited a few more seconds and responded, the tester repeats 'Go' for a second time.

Some testers will then go to the other side of the child and one metre behind as before and test with 'Go' twice again. The reason this is done is to check the original responses, but also to see if it indicates a difference between the two sides.

A 'pass' is given if the child responds correctly to 'Go' twice out of three trials at this very quiet sound level.

Using the sound 'ss'

The conditioning and screening test described for 'Go' is repeated with 'ss'. A 'pass' is two correct responses out of three trials, with the tester standing a metre away from the child.

If some equipment is available

If a handheld instrument which produces warble tones is available, then this can be used to supplement the 'Go' and 'ss' tests by checking the middle frequencies at 1 kHz. Alternatively, the warbler can be used for the whole test, using warble tones at 0.5, 1 and 4 kHz.

A child who can be tested easily using the performance test is ready for pure tone audiometry if an audiometer is available.

ISMAEL K BYARUHANGA

Performance test: child waiting for a sibilant 'ss' signal on the left. DEMOCRATIC REPUBLIC OF CONGO

Acting on test results

To pass the test, the child should respond correctly twice (out of three trials) to each sound ('Go' and 'ss') at minimal level.

To avoid referral for what might turn out to be a temporary condition (e.g. a cold), a child who has not passed the test can be re-tested after one month.

A child found to fail a second time should be referred to an ENT doctor or audiologist as soon as possible after the test, so that the hearing loss can be measured and the appropriate help given.

UNILATERAL HEARING LOSS

A child has unilateral hearing loss when one ear has normal hearing and there is a hearing loss in the other.

If the hearing loss is very slight, this would not be expected to cause the child much difficulty. If the hearing loss is moderate or more in degree, there is a significant difference between the two ears. This will cause problems for the child, such as:

- difficulty locating the source of a sound
- difficulty listening in an environment where there is a noise source on the side of the better ear, even though hearing may be good in quiet environments
- educational difficulties
- difficulty crossing roads safely.

A unilateral hearing loss may be suspected in the distraction test or performance screening test if the child:

- has difficulty locating the sound source during the distraction test
- shows normal results on one side only during the performance test.

The following behavioural test can be used as a further verification with infants and young children: make a loud noise (e.g. bang a drum) behind and on one side and see the child's reaction. If the child does not know which way to turn or turns to the wrong side, they may have unilateral hearing loss.

What can help children with unilateral hearing loss:

- making the teacher aware of the child's difficulty and sitting the child at the front of the class
- sitting the child with their good ear toward the speaker in social situations.