Visual reinforcement audiometry
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Visual Reinforcement Audiometry (VRA) has been developed over the last 30 years and is now used in most diagnostic audiological centres and in some community clinics.

Purpose of Test
The test is a behavioural test which can be carried out with young children between the developmental ages of 6 months and 3 years. It can also be used for children with complex needs. Sound field thresholds can be measured with and without hearing aids.

Rationale
Sounds are presented through a loudspeaker or insert earphones and the child responds by turning his/her head and is rewarded with a visual stimulus. The visually-interesting stimulus encourages the child to respond to the sound more often than is the case in the distraction test. Frequency-specific thresholds using warble tones or narrow band noise can be determined using this technique. This is not a test of location.

Criteria
The test can be carried out by a child who is able to sit on his/her own or on a parent/carer’s lap and by children with complex needs who may need to be lying down. The testers need to be appropriately trained. It is not a distraction test and different skills are needed.

The child is seated comfortably at a small table/high chair or if very young or shy may prefer to sit on parent/carer’s lap. The child has a few toys to occupy him/her.

A very young baby is often content with something to hold.

Two room arrangement for VRA. T1 and T2 are the testers.
The sound and visual reward (usually a flashing light or a moving puppet) are presented at the same time and the child is shown where to look for the reward. The sound stimulus is presented at an intensity level and frequency where it is thought the child may be able to respond.

This conditioning is repeated until the child is able to anticipate the visual reward and look as soon as the sound is presented.

When the child is regularly anticipating the reward the sound only is introduced and the visual reward is given after a definite head turn.

Fairly long gaps in the presentation of sounds are required, otherwise the child will keep checking and it will be difficult to be sure of the response.

There is no rigid protocol for presenting stimuli. The most useful information is gathered before the child tires. Minimum responses are recorded at 1khz, 4 khz, and 500 khz to gain information across the frequency range.

Thresholds below normal limits are not usually investigated.

In the majority of cases two appropriately trained testers are needed:

Tester 1 operates the audiometer and gives the visual reward.

Tester 2 is with the child and helps to manage his/her behaviour. This is a low key activity which keeps the child facing forward. S/he gives encouragement during conditioning and is responsible for deciding when /if a different toy needs to be introduced. It is not always necessary for this tester to manage the child’s attention after conditioning as some children sit quite happily with a toy and respond to the sounds appropriately. A young child can often be managed effectively by the parent/carer with instructions from the tester.

It is possible to use only one loudspeaker located at 45, 60 or 90 degrees azimuth.

**VRA and Bone Conduction**

This behavioural test is also used to gain information about bone conduction thresholds using a conventional bone conduction vibrator and headband.

**VRA with Insert Earphones**

Small earphones can be inserted into the ears which enable sound stimuli to be presented at the tympanic membrane. Thresholds of detectability at specific frequencies can be measured in each ear. Sounds are normally warble tones or pure tones.

This method enables babies as young as 6 to 7 months to give results that can be plotted as a bilateral audiogram and is essential for hearing aid fitting and audiological management.