Assessing vision in children

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The GP is often the first point of contact if parents are concerned about their child's vision. The earlier a visual problem is detected and appropriately treated, the better the visual outcome. Here is a guide to the major tests for assessing vision in children from infancy to school age.

The ability to accurately assess vision in children is a skill that is useful to all medical practitioners. Assessment may lead to the detection of amblyopia, strabismus, cataract, retinal abnormalities and retinoblastoma, as well as other visual disorders that distort or reduce vision. Diagnosis of these problems during childhood allows treatment to be started early to restore sight within the timeframe that visual development is still occurring, thus preventing permanent visual loss.

This guide to assessing vision in children outlines the most appropriate visual tests to use in children of various ages and will help health professionals choose the most appropriate methods of vision assessment.

Preparation

Comfortable waiting rooms and clinic rooms, with a range of toys and books, allows children to settle in and feel comfortable in the environment in which they will be assessed. Friendly, welcoming staff members who can relate to children also assist in creating a relaxed setting.

Establish rapport with the child you are assessing by introducing yourself and talking with him or her. This will allow the child to feel comfortable around you, and may also enable you to determine what the child's capabilities may be when vision is assessed.

Figure 1. A child with unusual head posture – chin is up and the head is tilted to the right.

History

A general eye history should be taken detailing the reason for the child attending. Also enquire about prematurity, birth history, any systemic abnormalities or illness, medications, visual history and development. A family history should also be taken, including that of any family members with a similar visual problem (and their consanguinity), and any other

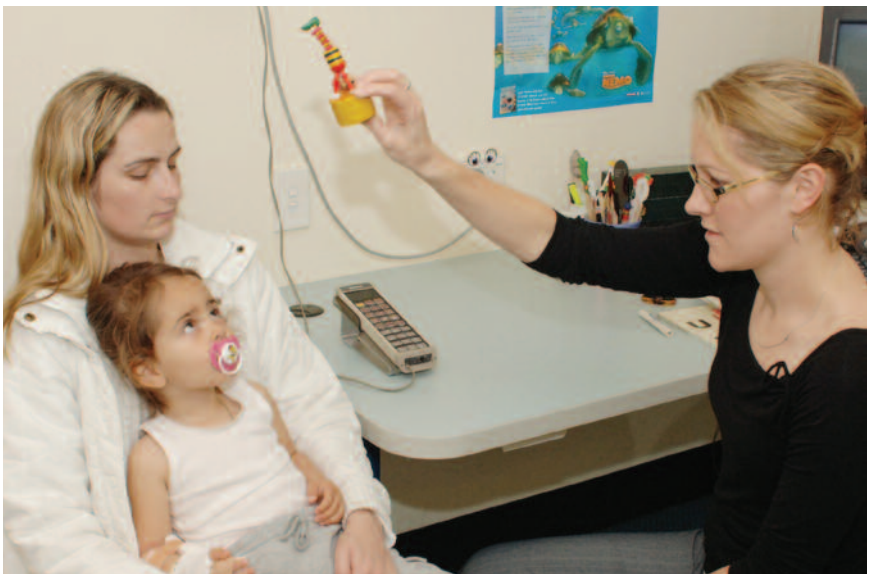

Figure 2 (left). Testing ocular movements to investigate extraocular muscle function.

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Performing the cover/uncover test

- Step 1: Hold an object, preferably a torch or a toy with a torch light in it, 33 cm from the child's eyes. Ensure he or she is fixating on the object.
- Step 2: Cover one eye and observe whether any movement occurs in the other eye (e.g. convergent or divergent movement).
- Step 3: Uncover the eye.
- Step 4: Repeat by covering and uncovering the other eye in the same way. If there is a manifest squint present, you will see movement of the affected eye to take up fixation.
  If the movement is convergent, an exotropia is present.
  If the movement is divergent, an esotropia is present.

significant ocular problems that the family may be concerned about.

Parents often give a detailed account of what they believe their child can see. Ask parents how the child can see compared with his or her siblings and if they have made any observations about the child's vision, such as photophobia.

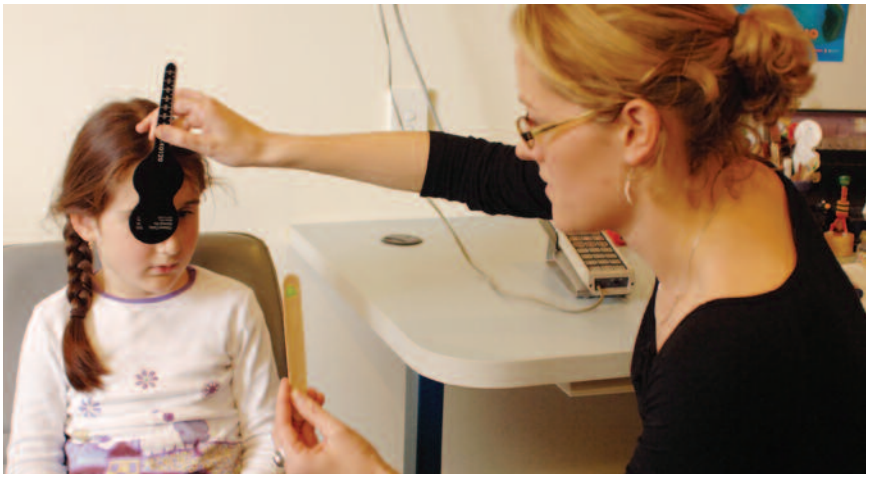


Figure 3. The cover/uncover test for determining the presence of strabismus.

Observation

Observation is an essential part of any vision assessment, particularly in preverbal children. It is useful to observe a child's response to a smile, his or her ability to make eye contact, and if he or she looks at objects around the room as a gross indicator of his or her level of vision. Observe any unusual presentations, such as an unusual head posture (Figure 1), nystagmus or strabismus, as these might indicate visual implications.

Clinical evaluation

Vision assessment in children can be performed at any age. In newborn babies examination may include observation of ocular alignment and corneal reflections to determine early visual responses. Using an ophthalmoscope (racked up to approximately +10) to look for a red reflex in each eye is the most important test in newborn babies. The absence of a red reflex or a difference in reflex between the eyes could signify cataract, retinoblastoma or other ocular pathology.

A more detailed assessment of vision may be performed when the infant is

Table 1. Suggested vision surveillance protocols for children

Vision test	Age groups of children suitable for each vision test					
	1 to 4 weeks	6 to 8 weeks	4 months	6 to 8 months	18 months	2.5 to 3.5 years
Observation	Yes	Yes	Yes	Yes	Yes	Yes
Fixation	No	Yes	Yes	Yes	Yes	No
Corneal light reflections	Yes	Yes	Yes	Yes	Yes	Yes
Response to occlusion	No	Yes	Yes	Yes	Yes	Yes
Ocular movements	No	No	Yes	Yes	Yes	Yes
Red reflex test	Yes	Yes	Yes	Yes	Yes	Yes

continued

Assessing visual acuity in preverbal children

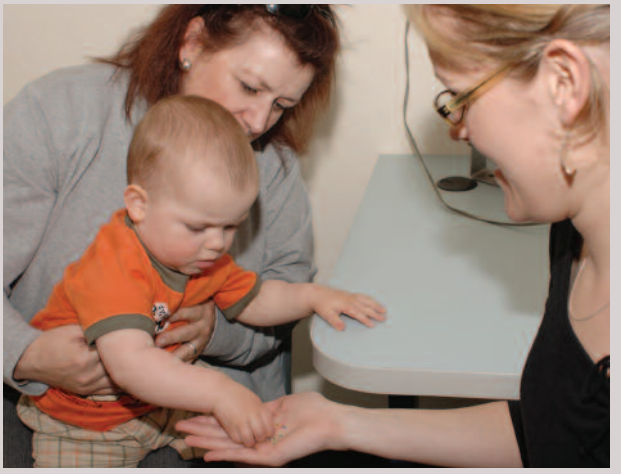


Figure 4. The '100s and 1000s' method for gross determination of small object discrimination.

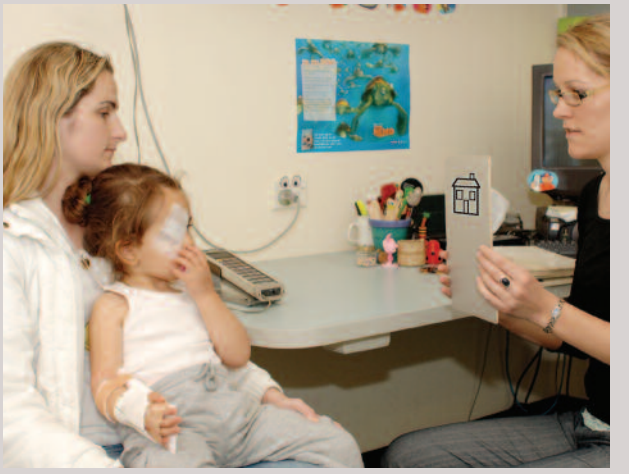
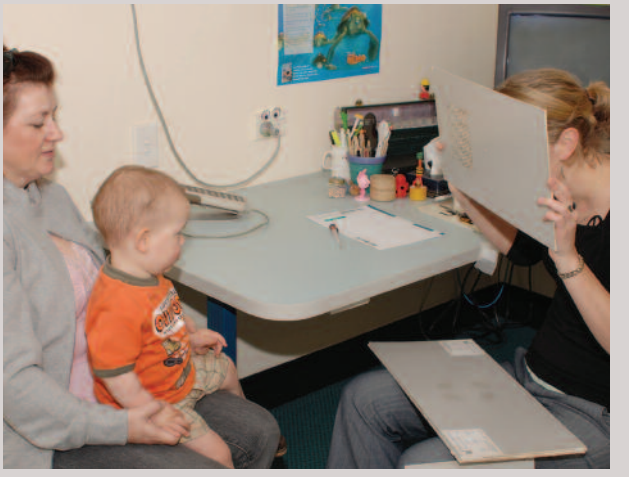


Figure 5. Cardiff acuity card test.



Figures 6a (left) and b (right). Teller acuity card test. Note the attracting of the child's attention before the card is displayed.

aged 3 to 4 months, including determination of the level of binocular vision by observing corneal light reflections and ocular movements (Figure 2) and performing the cover/uncover test. Obser - vation of corneal light reflections involves using a torch to observe whether the light reflections fall in the same position on each pupil. This can give an indication to ocular alignment. The cover/uncover test is performed to determine whether there is a manifest strabismus present (Figure 3). The box on page 72 gives a brief guide to performing this test.

Assessment of visual acuity can also be carried out at this age. Confrontation visual fields are used to assess the presence or absence of visual field defects. However, these are only possible from approximately 1 year of age, and are a gross indicator of marked field defects.

The type of visual test selected will depend on the age and ability of the child, whether the child is preverbal or verbal, and whether he or she knows the letters of the alphabet. Suggested vision surveillance protocols for children of various ages are listed in Table 1.

Assessing visual acuity in preverbal children

Subjective methods of assessing vision are used in preverbal children. In a GP's

Assessing visual acuity in verbal children

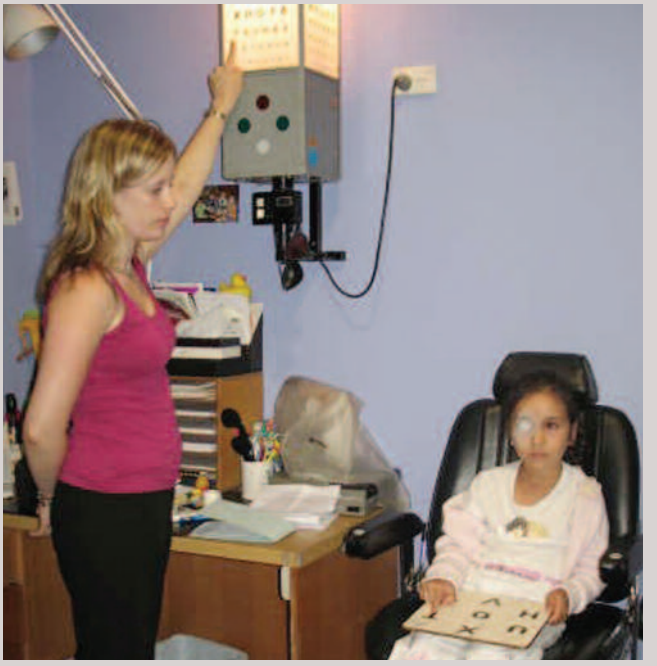


Figure 7. Sheridan Gardiner vision test. a (above). Using a single letter flipbook. b (right). Using a line of letters.

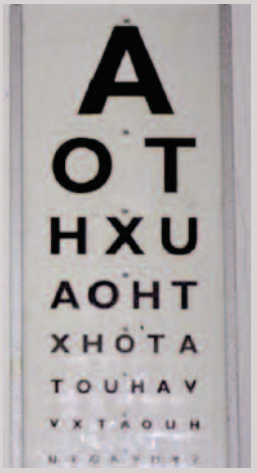


Figure 8. Standard Snellen acuity chart.

Figure 9a (above left) and b (above right). Lea symbols test with child holding a matching board.

room, a child's ability to fixate on and follow toys of various sizes is an excellent method to determine visual capabilities. The '100s and 1000s' method is also used to grossly determine a preverbal child's ability to discriminate tiny objects. In this test, 100s and 1000s are held in the examiner's hand. If the child can see them, he or she will usually reach for them and pick them up (Figure 4). Toys of various sizes can also be used to assess a child's vision in this way.

In the ophthalmic clinical setting, preferential looking tests, such as the Cardiff acuity card test and the Teller acuity card test, are used to determine the Snellen equivalent of a preverbal child's visual acuity (Figures 5, 6a and 6b).

Table 2. Recommended visual acuity tests for verbal children of various ages

Age	Vision test
2 to 3 years	Lea symbols test or Kay pictures test, with or without matching cards
3 to 4 years	Sheridan Gardiner test or Sonksen LogMAR test. Linear (one line of letters) or three lines of letters (depending on ability), with or without matching cards
5 years+	Snellen acuity chart test

In the Cardiff acuity card test, a card with a target picture is presented to the child on a grey background. The picture is presented at either the top or at the bottom of the card. If the child has sufficient acuity to recognise the picture, he or she will look at the bottom or top of the card depending on where the picture is drawn. The examiner is required to observe whether the child looks directly at the picture.

The Teller acuity card test is similar to the Cardiff test but the cards have on them grey/white striations that correspond to Snellen acuity equivalents. Again the examiner is required to observe whether the child's eyes look to the side of the card where the stripes appear. When the stripes are too small for the child to see, they will blend with the grey background. The examiner will not get a definite response from the child at this point, and the child will usually act disinterested.

Points to remember when assessing vision in a child

- Establish a relationship with the child.
- Determine the child's capabilities before choosing a test.
- Observe any abnormal visual signs, e.g. nystagmus.
- Perform vision assessment quickly if you suspect the child will lose concentration.
- Choose an occlusion method appropriate to the child's age.
- Subjective assessment of visual acuity is often the only way that vision can be assessed in a preverbal child.
- Giving food, drink or toys to a child may settle him or her and allow you to perform assessments at the same time.
- Make the assessment as fun and friendly as possible for the child.
- Refer the child for further testing if there is any concern about vision.

Assessing visual acuity in verbal children

Objective methods of assessing vision may be used in verbal children. In a GP's room, a single letter flipbook with crowding bars is most useful to reveal amblyopia. The Sheridan Gardiner vision test (or the Sonksen LogMAR [logarithm of the minimum angle of resolution] test in the UK) can be used for young children with a limited attention span. In the Sheridan Gardiner test (Figure 7a and b), the examiner shows the child single letters or a line of letters of different sizes from a distance of 3 or 6 metres. A child who is uncertain of the names of any letters may hold a matching board and point to the letters he or she sees. For older children, a standard Snellen acuity chart is used (Figure 8).

In the ophthalmic clinical setting, or if a GP has access to them, the Lea symbols test (Figures 9a and b) and the Kay pictures test are used for young children. These tests involve matching or naming simple shapes and pictures, and are performed at a distance of 3 metres between the card and the child. A child's ability to respond to these tests, however, may depend on his or her knowledge of the given picture or shape and his or her confidence in responding to the person assessing them.

Vision acuity tests recommended for verbal children of various ages are summarised in Table 2.

Methods of occlusion

Visual acuity should be assessed in each eye by occluding one eye and assessing the uncovered eye with a visual test appropriate to the child's age. A child will usually show a marked difference in behaviour if a patch is placed over an eye with good vision and the other eye has reduced vision. This behaviour difference might be an indicator of amblyopia. Consider patching the eye with the worst vision first, as this will enable the child to become more comfortable with the testing procedure. Try to assess the child in the shortest timeframe possible to avoid loss of interest and concentration. Visual acuity should be assessed last if objection to occlusion by the child is suspected or if the child's behaviour is erratic.

Adhesive eye patches should be used for young babies and small children up to the age of 3 years. Micropore tape cut to size should fully occlude an eye and leave no spaces to allow a child to peek through. Other ready made sticky patches can also be used.

Cloth or plastic 'pirate' patches can be used for older children of about 4 to

10 years old. These patches are less obtrusive as they sit slightly further from the eye; however, care must be taken to ensure children do not peek around the patch. For older children, a plastic occluder can be held to cover the eye. Again, care must be taken to ensure peeking does not occur.

Additional visual tests

GPs might use the pinhole test when assessing the vision of older children. This test is appropriate from about 7 to 8 years of age, but is able to be used at a younger age if the child's comprehension of the pinhole is adequate. If an improvement in vision is shown with the pinhole test compared with the level of vision obtained initially, refractive error is the likely cause of reduced vision rather than ocular pathology.

GPs should know how to carry out the cover/uncover test for identifying the presence of strabismus. If strabismus is suspected, vision must be closely monitored for the presence of amblyopia; referral of the child to an orthoptist or ophthalmologist for further assessment is recommended.

Any abnormal extraocular movements may indicate strabismus or amblyopia. Pupils should also be assessed during visual assessments, noting whether they are equal or reactive and whether a relative afferent pupillary defect is observed.

Assessing vision in a difficult child

Children may be difficult to assess for a number of reasons. They may display unco-operative behaviours if they are hungry, tired or bored. If they do not understand English, assessing their vision verbally can be difficult. Developmental or behavioural problems also present challenges. If these barriers can be overcome (for example, by providing food or toys), the assessment might become more manageable.

Summary

Assessing vision is a very important part of monitoring a child's development. The GP is often the first point of contact if parents have concerns about their child's vision.

With knowledge of the methods of vision assessment and the recommended tests, screening for visual problems may assist in alleviating visual complications that otherwise might not be picked up until a later stage. Key points to remember when assessing vision in a child are summarised in the box on page 76. MT

Further reading

Taylor D, Hoyt CS, eds. Pediatric ophthalmology and strabismus. 3rd ed. New York: Elsevier Saunders; 2005.

DECLARATION OF INTEREST: None.