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MODULE 10:2 • COURSE CODE: C-5193

Paediatric Optometry: Optometric examination of children

Lynne Speedwell

Sjostrand and Abrahamsson (1990) suggested that children in Sweden should be screened at the age of four years in order to be able to detect and successfully treat most cases of amblyopia. The Hall report (2003) in the UK recommended that orthoptists should undertake vision screening but that this should be carried out at between 4-5 years of age (once the child is in education). Referral to an orthoptist usually only occurs if the school nurse is not happy with their findings. School nurses are not trained in vision testing and children can be expert at cheating by not properly covering a better eye or learning the charts. So even where children have had a vision check, it is not possible to assume that the results are accurate. The NHS in the UK allows children of any age to have a free eye examination. This results in optometrists often being the first people to examine a child's eyes.

Children as patients

Children, like adults, are all different. Some are easy to examine and respond well to the various techniques while others are upset and it can be almost impossible to achieve any meaningful results.

Young children are better in familiar surroundings and a full eye examination may not be possible. It may help to bring them back for a second or even third visit to complete all the necessary tests.

It is a matter of debate as to what age children can be examined in practice. A young child may be asleep in a pushchair or feeding from a bottle in the parent's arms, brought along with an older sibling. It is then easy to carry out a quick retinoscopy check and view the fundus. Some children will continue to sleep through instillation of dilating drops and a reasonably thorough examination can be carried out. The child may be brought back on another day to assess visual acuity and binocular status, if at that stage, it is deemed necessary.

Going to have an eye test

Having an eye examination can be a frightening time for a child. They are taken to see a complete stranger who asks lots of questions before turning the room lights off and looking into their eyes with bright torches and funny machines. This can result in them being very naughty at the first visit or not saying anything at all even if the parent tells you they are able to read their letters.

It can be useful to have a leaflet, explaining in easy terms what the various pieces of equipment are and what the eye test consists of. This can be issued when the appointment is made.

When the child enters the consulting room, ask them if they want to sit on the parent's lap or on the chair on their own. Explain what test is being done and give plenty of praise after each result has been achieved. Have stickers available to give out at the end of the eye examination. Children remember them and will look forward to receiving one next time.

History and symptoms

A full history includes all the usual information but also the child's birth and developmental history.

With very young children, any information relating to the patient relies totally on the parent or carer who attends with them. As with adults, specific questions usually elicit more useful answers. Start by asking general questions "Have you any concerns about his vision", "Why have you come to see me today?" and then more specific questions such as "Have you noticed her eye turning?" "Does she sit very close to the television?" Older children will answer their own questions which should be directed to them specifically, although the parent may need to be discouraged from answering for them.

Children will not usually volunteer relevant information themselves but if you ask the right questions and take the time to listen, it is amazing what useful information can be gained. Ask about headaches and 'fuzzy vision'. Find out about the

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classroom, "Do you sit at a table near the teacher?" "Can you read the teacher's writing?", "Are there some colours that the teacher writes with that you can't see properly?" "Do you have to share your books?" A myope may have been labelled a slow learner or having disruptive behaviour, when in fact they can't see well and sit in a position in class which affords them a poor view of what the teacher is doing. A child with an amblyopic right eye, who has to share a book with a child on their right, will find it difficult to see and their ability to learn becomes impaired.

Gaining the child's attention

It is important to make the test interesting for the child. Before starting the consultation, take a few minutes to discuss topics such as football or what their favourite television programme is. Look at their date of birth, if it is imminent, ask what they hoping to get for their birthday. Discuss school holidays, what they ate over Christmas, if they are going away on summer holidays etc.

Distracting techniques can be useful to gain attention – singing, making funny noises, using squeaky toys etc.

Table 1 Approximate visual acuity according to age

Age	Approximate Snellen acuity
Birth	6/300
1 month	6/200 - 6/90
3 months	6/90 - 6/60
6 months	6/36 - 6/30
9 months	6/24
1 year	6/18
18 months	6/12
2 years	6/12 - 6/9
3 years	6/9 - 6/6 singles
4 years	6/9 - 6/6 crowded
5 years	6/6 - 6/5

Age	Type of test	Example of test
3-12 months	Preferential looking	Keeler cards (Figure 1)
1-3 years	Vanishing optotypes (looking and / or naming)	Cardiff cards (Figure 2)
2.5 - 4 years	Single or crowded letter or picture matching	Sheridan Gardner at 3 or 6 metres, logMAR or Kay crowded pictures (Figure 3)
4-6 years	Crowded letter matching or naming	logMAR crowded, Snellen, Sonksen Silver

Table 2 Tests used to equate to distance visual acuity

Suggest that there is a cartoon character (eg a Teletubby) that may appear in the light and they must look out for it. Get them to hold a pentorch in order to help you. There are innumerable ways of gaining attention, but taking a little extra time at the beginning reaps dividends when the actual testing is carried out.

Visual acuity

Visual acuity tests must be age and ability appropriate and the routine must be altered as necessary. Some children are able to read at a very young age, others may have learning disabilities of varying degrees. Children who were born prematurely take time to catch up with their chronological peers. Approximate distance acuities for each age are shown in Table 1 and the age-appropriate tests in Table 2.

Young children are usually keen to do their best but may 'cheat' in order to achieve a better result. They know that they will be expected to read the chart, so as soon as they walk into the test room and while the parent is giving symptoms and history, they may be trying to learn the chart. Where one eye is known to be worse than the other, it is advisable to test that eye first. Projection charts, in particular randomised charts, are useful as the letters cannot be learnt before they are displayed.

It is good to end on a positive note when measuring acuity.

For example, if a child is able to see the 6/18 line but cannot see any letters on the 6/12 line, move back up to the 6/18 line to finish with. Be encouraging; tell them how well they are doing. Remind them that this is a vision test not a reading test and it doesn't matter if they get the letters or words wrong.

Figure 1
Testing vision using the Keeler acuity cards

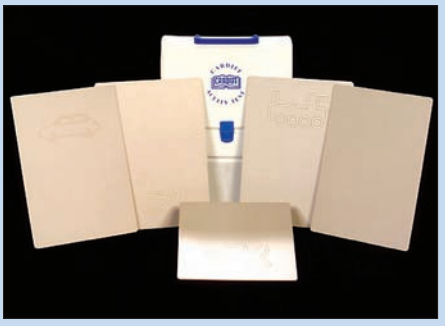

Figure 2
Cardiff cards

Figure 3
Having vision checked using the crowded 3 metre logMAR Kay picture cards (courtesy of Bronwen Walters)

Age	Type of test	Example of test	Near acuity at 25cm
2-3 years	Picture naming	Reduced Kay pictures	6/12 - 6/6
3-5 years	Matching singles	Reduced single Snellen	6/9 - N5
4-6 years	Naming reduced letter charts	Snellen, logMAR	6/6 or N5
5 years onwards	Reading	McClure reading book	6/6 or N5

Table 3 Tests to measure near acuity

Near vision

Near acuity should be tested in all children as their education depends on the ability to see close, but it is not possible to test it properly until the child is old enough to name pictures (see Table 3). Comfortable single vision is essential for children to learn to read, and where binocular vision breaks down, children quickly lose interest in school work.

When assessing near acuity, ask the child to start reading (letters or words) in the middle of a paragraph and to continue for at least one minute. They may make more mistakes or lose their place after the first few words. This can demonstrate the difficulties they will have in a real reading situation.

Just because a child can read a line of N8, doesn't mean that is the correct size of print for them. They need print at least three times the N value with good contrast in order not to tire rapidly when reading (ie if they can just manage N8, they should be given N24).

Binocular vision testing

Young infants are likely to exhibit abnormal ocular alignment although intermittent esotropia should stop by the age of two months and exotropia by six months (Sondhi et al, 1988). Children over these ages who are demonstrating an intermittent tropia, or a constant tropia at any young age, should be immediately referred to an ophthalmologist.

A basic cover test can usually be carried out on a young child. The information gained from it may be all that is needed to work out whether a referral is necessary or not. If the child consistently objects to one eye being covered but not the other eye, it is likely that the preferred eye sees better and either ametropia or amblyopia should be suspected. Because very young children frequently have a wide epicanthus, as one eye adducts slightly, the other eye appears to abduct much more (Figure 4a-c). Many wide epicanthal folds are mistaken for strabismus and referred for an unnecessary ophthalmological opinion. The Hirschberg reflective test can be useful in deciding whether there is a true squint in such cases. A pen torch is held in front of the child and the reflections should appear in the same position within the pupil of each eye. However, this test is not accurate and more reliable testing is recommended (see difficulty of assessing corneal reflections in Figure 4).

If no manifest squint is apparent by cover test or corneal reflections, a prism cover test should be used. There are three types of prism test that are useful on young children:

1. The base OUT prism test assesses motor fusion and gross binocular function but it is not ideal for amblyopia assessment. The child fixes a toy and a 20Δ base OUT lens is placed in front of one eye. Both eyes should move in the direction of the prism apex and then the eye not being covered by the prism should be seen to refixate to the centre. If no refixation movement is seen with one eye, it is likely that there is only weak fusion, suggesting one eye has poorer vision. While some people advocate using a weaker prism (5Δ or 10Δ), the movement is much more readily seen with the larger prism.
2. A 20Δ base IN lens will assess fixation preference and will therefore demonstrate if one eye is amblyopic. The prism is held in front of first one eye then the other, whilst the child fixes a light. The eye underneath the prism should move outwards (in the direction of the prism apex). If the eye under the prism is amblyopic, it will not move when the prism is placed in front of it. Because there is no possibility of fusing the two images, an older child can be questioned about the resultant diplopia.
3. This test is the same as (2) but instead of a horizontal prism, a 10Δ base DOWN is used in front of each eye in turn. The upward vertical movement is easy for the observer to see.

Older children can usually carry out the standard tests to measure phorias,

tropias, fusional reserves and fixation disparity.

When assessing foveal suppression (FS) on the Mallett Unit, a poor result can be the effect of FS or reduced visual acuity in one eye (Tang & Evans, 2007). Evans et al (1994) found that increased degrees of FS were positively correlated with vergence instability in a group of children with dyslexia.

Accommodation, AC/A ratio and near point of convergence (NPC)

The amplitude of accommodation is usually the same monocularly as binocularly in children up to five years old and the measurement decreases from the age of two years. According to Hofstetter (1950) the amplitude of accommodation can be calculated from the formula:

Accommodation (D) = 18.5 – 0.3 x Age (in years)

Reduced accommodation has been found in people with dyslexia (Evans et al, 1994) and also in children with Down's syndrome and cerebral palsy (Woodhouse, 1998).

The AC/A ratio (the amount of accommodative convergence per unit of accommodative response) can be measured in cooperative children by introducing spheres binocularly in front of the eyes while at the same time measuring the change in the phoria using a Maddox wing. Mutti et al (2000) found that myopic children have a higher AC/A ratio (6.39/D) than emmetropes (3.94/D) and that hyperopes have the lowest ratios (3.40 /D). A high AC/A ratio is associated with a divergence excess exotropia (Kushner, 1988).

The NPC is usually less than 5cm for children under five years old and increases at a rate of 0.24cm/year up to 15 years (Chen et al, 2000). Where the NPC is poor, the usual problems of asthenopia occur with reading and schoolwork.

Ocular motility

A useful method of assessing an infant's ocular motility is to pick them up and, while facing them, slowly move the baby from side to side and up and down, keeping their attention by making noises etc. They should move their head and/or eyes in order to maintain fixation on the practitioner's face. Older children will cooperate with more formal tests but the target should be interesting for them, for example a squeaky finger puppet.

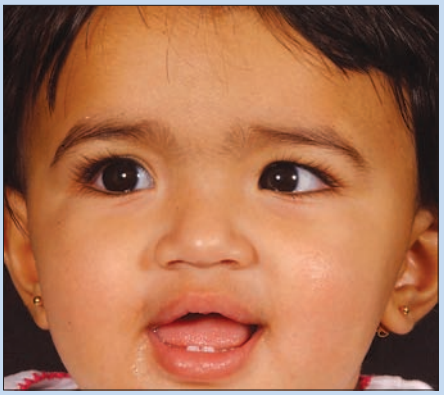

Figure 4a
The child is looking to the right, with epicanthus shown in three positions of gaze. This child was found to have no movement on cover test and equal acuities (courtesy of Chris Timms). The child is looking to the right, appearing to have a left convergent strabismus

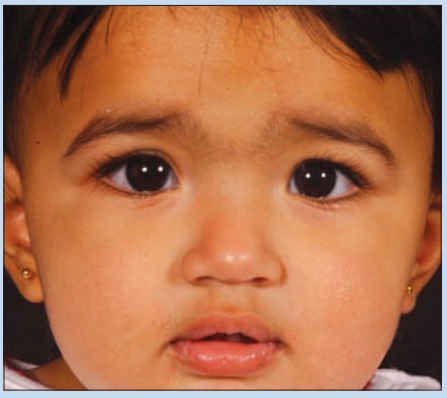

Figure 4b
Looking straight ahead (note how difficult it is to accurately assess the corneal reflections)

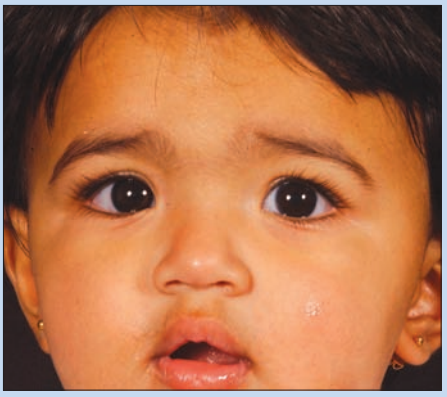

Figure 4c
Looking to the left, appearing to have a right convergent strabismus

Refraction

A three month old child has approximately 3D of hypermetropia. This gradually reduces to around +0.50D by the age of four years (Table 4). However, normal infants may exhibit low myopia or astigmatism, which can emmetropise over the first two years.

Age	Average Rx
3 months	+ 3.00
6 months	+ 2.50
9 months	+ 2.25
1 year	+ 2.00
18 months	+ 1.50
2 years	+ 1.00
3 years	+ 0.50
4 years	+ 0.50
5 years	+ 0.50
6 years	+ 0.50

Table 4 Average prescription according to age

High refractive errors are found in 3.7% of 1-year olds, and 48% of 1-year old children with +3.50D or more of hypermetropia have been found to be amblyopic (Ingram et al, 1986).

With a young child or a child with learning disabilities, it is not practical to use a trial frame or refractor head when carrying out refraction.

For slightly older children, there are some good trial frames available such as the Inami which is available in three sizes.

Retinoscopy

To get a quick idea of the prescription in both eyes, hold a pair of +2.00DS

trial lenses like a pair of spectacles in front of the child's eyes in a darkened room (Figure 5). With the child fixing on the retinoscope light at half a metre, quickly move the retinoscope horizontally and then vertically across both eyes.

Static retinoscopy

Accurate retinoscopy relies on the patient being able to fixate in the distance. However, much of the time, a child's fixation varies as they may look away or accommodate and the final result will be inaccurate.

To dilate or not to dilate

A dilated refraction may not be necessary, especially if the acuity can be measured as normal and there is good binocular vision. However, it is safer to err on the cautious side by dilating a young child on at least one occasion in order to be sure of obtaining an accurate refraction and a good fundus view. Pupils should be checked as part of a routine examination and prior to any dilation.

The drugs used for cycloplegia are antimuscarinics. These block the muscarinic receptors in the ciliary muscle. The drop most commonly used in practice for cycloplegic refraction is cyclopentolate hydrochloride 0.5% or 1%. Most children require 1% but for infants less than six months, 0.5% is used. In light coloured irides, one drop of 1% will give adequate cycloplegia in 20 minutes although 30-40 minutes will produce more complete cycloplegia. For darker irides, two drops are usually necessary and even this may not induce adequate cycloplegia.

There are drawbacks to cycloplegics. There is a risk of an adverse reaction to the drug and it is important to check during history and symptoms whether a previous reaction has occurred with any drops or other drugs. Side effects are rare but include ataxia, hallucinations and tachycardia (rapid heart rate).

The other effect of cyclopentolate is pupil dilation. This can last several hours or, on rare occasions, several days. The child may be affected by photophobia during this period.

Risks are greater in those children who are learning disabled, including patients with Down's syndrome. In order to reduce the risk of an adverse reaction occurring, cyclopentolate 0.5% may be advisable.

Where the accommodation is still active and it is not possible to refract adequately, 1% atropine sulphate ointment may be necessary. This should be given to the parent to apply for three days prior to the appointment date. Atropine is not often used because although it gives complete cycloplegia and is long-lasting, it has the adverse systemic side effects of rapid and irregular heartbeat and even death. Care also must be taken in cases of poorly controlled squints as they may break down.

Static retinoscopy can be carried out on a sleeping child although it is not possible to assess the accommodative state. After dilating, it is easy to achieve accuracy if the child is asleep.

Many older children who have experienced drops previously will fixate really well in the distance when offered the choice of good fixation or dilation!

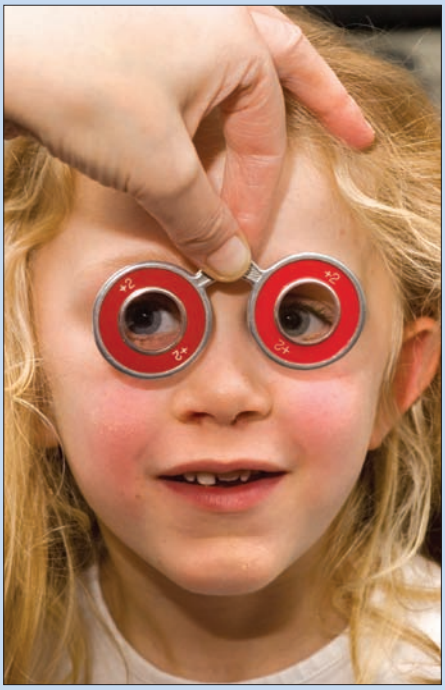

Figure 5
Holding a pair of + 2.00DS trial lenses up in front of a child's eyes in order to carry out a quick retinoscopy

Mohindra retinoscopy

Possibly the easiest and most commonly used retinoscopy technique is that of Mohindra (1975). The child is examined in a darkened room and one eye is covered if possible. Working at a distance of half a metre, with the child fixing the retinoscope light, the reflex is neutralised. A lens rack is useful for this technique in order to speed up the process. The final prescription is found by subtracting 1.25DS from the findings. This allows for the lack of accommodative stimulus in the darkened room (Owens et al, 1980).

Borghi and Rouse (1985) found that dilated retinoscopy produced 0.50 – 0.75 more plus than the Mohindra technique.

Dynamic retinoscopy

Dynamic retinoscopy used to measure accommodation

Dynamic retinoscopy is particularly useful for children who are under-performing at school and children with learning disabilities who often have poor accommodation (Woodhouse, 1998). An object held at a certain distance in the plane of the retinoscope should produce a neutral reflex if the patient is wearing their full distance correction to fixate the target and plus lenses are held in front of both eyes (for example 4D at 25cm). If the child is underaccommodating (accommodative lag) when looking at the near target there will be a with movement on retinoscopy and if they are overaccommodating, there will be an against movement. By moving towards or away from the patient by a known distance or by using different neutralising lenses, an estimate can be made of the accommodative error. There is usually a small amount of lag in those patients with normal accommodation of up to 1D and this should be taken into account during the assessment.

Subjective refraction

Children do not understand the subtleties of cross-cyl or small changes in prescription, therefore an accurate retinoscopy is necessary as a starting point. Then explain in simple terms what is required from the child and if

they are unable to comprehend, use an easier test.

With children of around seven years old, the lens can be changed by +/- 0.75D or the cylinder axis moved by 20 degrees in order to demonstrate a change of acuity. When necessary, pinhole acuity can usually be carried out once the child is able to read the chart.

As the child gets older, the tests used for adults become more applicable.

What spectacles to prescribe

It is a matter of continuing debate amongst eyecare professionals as to when and what spectacles to prescribe. Lyons et al (2004) in a survey of optometrists and ophthalmologists in the USA found that 33% of optometrists, but only 5% of ophthalmologists, prescribed correction for 3-4D of hypermetropia in six-month olds whilst the majority of eyecare practitioners prescribed for two-year olds with +5D or more of hypermetropia. Most ophthalmologists prescribed the full amount of astigmatism and less than the full amount of cycloplegic spherical component, while most optometrists prescribe less than the full amount of both. In another survey of American ophthalmologists, Harvey et al (2005) found that 50% prescribed spectacles for children of six-months old if the astigmatism was more than 4D but this decreased to 2D of astigmatism by the age of two years. In cases of anisometropia, Miller and Harvey's survey (1998) found that more than 50% of American ophthalmologists would prescribe spectacles for anisometropia of more than 1.50D for a child at any age.

Farbrother carried out a survey in 2006 amongst UK hospital optometrists and found similar inconsistencies.

There are, however, some guidelines which apply in all cases:

- Give the full prescription in cases of accommodative convergent strabismus.
- Children with reduced acuities are more likely to need their maximum prescription.
- Cylinders in infancy of 2.00D will usually emmetropise, even if not completely, so don't prescribe immediately, and not before one year of age. Where it is possible to measure acuity and the vision is found to be reduced, prescribe the full cylinder and review regularly.
- Children with anisometropia of more than 1.50D will benefit from wearing their prescription and contact lenses may be beneficial.

Highly myopic children appear to do well without correction and cannot always tolerate their full prescription. A two-year-old myope needing -20.00DS may cope better with -10.00DS for a few months before gradually increasing the prescription. It can also help the parents come to terms with their child's problem - if contact lenses are fitted, the full prescription is more easily tolerated.

Hypermetropes may also require a reduced prescription although if the child is amblyopic, or has a convergent squint, the full prescription should be given as soon as possible. Giving cyclopentolate drops for a day or two when the spectacles are issued may help them to adapt.

The management of refractive error in paediatric cases will be discussed in greater depth by Dr Margaret Woodhouse in the May 4 issue of *OT*.

Fundus examination

Children will usually look directly at a bright light stimulus and no amount of encouragement will get them to look elsewhere. The result is that it is easy to view the macula but the disc and peripheral fundus cannot be seen. Dilating the pupils will make it easier to view the rest of the fundus using a direct ophthalmoscope, but for a full examination, a binocular indirect ophthalmoscope is better. If an indirect ophthalmoscope is not available, ask an adult to attract the child's attention so that the disc and periphery can be more easily viewed.

The fundus examination can be carried out before or after retinoscopy and should be performed in reduced illumination, not in a dark room, as it is less frightening for the child.

Colour vision

Careful questioning during symptoms and history, making special mention of the maternal grandfather, will usually elicit whether there is a likelihood of the child having the most common form of colour anomaly, an X-linked red-green anomaly. It is useful for both child and parent to know early in life if the colour vision is affected so that the school can be informed and future career guidance can be tailored.

Once children know their numbers, the Ishihara colour plates are ideal for checking for congenital red/green colour deficiencies. Before that stage, the tracing cards can be used in the Ishihara plates. Alternatively, the Ishihara 10 plates for Unlettered Persons and Children is a paediatric version of the Ishihara colour vision test which uses pictures (circle, star, square etc) instead of numbers for the child to identify or match. Other children's colour vision tests are available, for example the Matsubura Colour Test for Infants. The web-based City University colour vision test can also be used for older children.

The City University test can be used to grade the severity of any colour deficiency. This has the advantage of being able to assess tritan defects as well as protan and deutan. Young children should only be asked to do the first part of the test to screen for colour vision defects. The second part, to quantify the severity of the colour vision defect, is usually too difficult for them.

As with adults, where congenital anomalies are being investigated, both eyes are tested together. If there is any suspicion of an acquired defect, each eye must be tested separately.

Stereopsis

Stereopsis starts to develop in infancy. Ciner et al (1991) found the near stereo acuity to be at least 250 seconds of arc in children under 23 months of age, improving to 60 seconds of arc by age five years. Kulp & Mitchell (2005) used the Randot stereoacuity test and suggested that most four-year-olds should have a stereoacuity of 70 seconds of arc or better while most young school-aged children should have at least 50 seconds of stereoacuity. Babies can have their stereopsis assessed using a Lang stereotest. When presented with the plate, they will look carefully at an object standing out and may try to 'pick it up'.

Both the Lang stereotest and the Frisby tests are carried out without supplementary spectacles making them easier for young children to use.

The Frisby-Davis 2 (FD2) test is a relatively new test which is available to measure distance steropsis, although it is only likely to be used in specialist practice. It comprises a box containing four back illuminated animals or geometric shapes mounted on rods. One of these is set closer to the observer and they are asked to decide which one. Children are able to carry out the test from around 39 months. Adams et al (2005) found that older children give better and more reliable results. Of the 76% of their population who could perform the test at six metres, the mean steropsis was 29.6 seconds of arc.

Contrast sensitivity (CS)

CS improves with age but adult values are not reached before the age of 10 years (Mantyjarvi et al, 1989). Children under five years old cannot reliably complete the Vistech CS test (Rogers et al, 1987) and Leat & Wegerman (2004) found that in those tests available for children, the Hiding Heidi test and the Lea low-contrast symbols, the lowest contrast is visible for all those with normal vision. However, they found that the Lea test showed most agreement to the Peli-Robson chart and could be useful for children with low vision.

In cases of unilateral amblyopia, measuring CS may be useful and successive measurements can be carried out to monitor the improvement in CS with amblyopia therapy. It is important that measurements are made with the same test, as different tests are not comparable (Mantyjarvi et al, 1989).

Slit lamp

Slit lamp examination is not always necessary. However, getting a child used to the slit lamp from an early age makes it easier to examine them when the need arises. Children are usually quite keen to be examined on the 'motorbike machine' and will sit on their own or on a parent's lap (Figure 6). Volk lens fundus assessment can also be carried out at the same time.

Visual fields

This is another area where children of as young as six or seven years old are remarkably good at doing formal fields. For very young children, in order to assess the peripheral field, sit facing the child and catch their attention with a noisy toy or by making funny faces

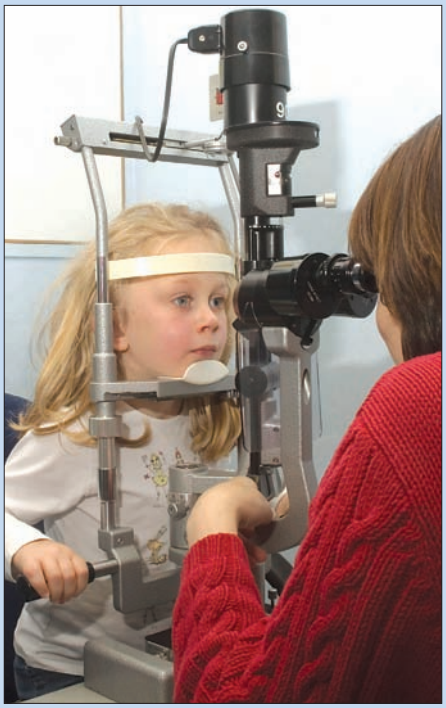

Figure 6

A child kneeling up on a chair to use the slit-lamp

and noises, then introduce a bright silent toy from the opposite side.

An alternative is to have a second person stand behind the child and silently introduce a toy or light into the child's field of vision while the practitioner is keeping their attention straight ahead. As the object enters the child's visual field, they will look towards it. This method is also useful where children are malingering and claim to have a reduced field of vision.

For slightly older children, hold two hands up at different positions in the visual field, one still and the other moving and ask the child which one is waving. Alternatively, hold a number of fingers up on one hand while the child maintains fixation on the practitioner and ask how many fingers are held up. These methods will show any gross field loss but not subtle defects.

Children with learning difficulties

Children with learning difficulties are much more likely to need a visual correction. 54% of children with Down's syndrome and up to 76% of children with cerebral palsy have ocular problems compared to 4.5% of the general population (Woodhouse, 1998). Whatever the capability of a child, they require their optimum vision in order to reach their best potential. Tests may take a little longer than normal to achieve but patience will usually pay off. It is still important to explain the tests and be prepared to adapt the routine to accommodate the child's fears and responses.

Stewart et al (2005) found that because of their reduced accommodation, children with Down's syndrome benefit from wearing bifocals with a D28 segment and advised giving a +2.50D addition with the segment top in line with the pupil.

Conclusion

Some useful hints when working with children

- Sleeping infants are easy to examine (except for checking vision!)
- Talk to both child and parents and listen to the problems
- Observe the child's visual behaviour eg head turn, closing one eye
- Small children have short attention spans - do the most important things first rather than sticking to a strict routine
- Give choices, eg which eye should we check first, right or left?
- Explain what you are doing and never lie
- Take care when giving unfavourable news, such as the child becoming more myopic or having a colour vision defect. Explain that these are not major problems and what the likely effect is
- Occasionally it is better to send the child out of earshot while discussing their condition but usually they prefer to know what is going on
- At the end of the consultation ask both child and parents individually if they understand everything and if they have any questions.

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Module questions

Course code: c-5193

Please note, there is only one correct answer. Enter online or by form provided

An answer return form is included in this issue. It should be completed and returned to CET initiatives (c-5193) OT, Ten Alps plc, 9 Savoy Street, London WC2E 7HR by March 7 2007.

1. Which report provided recommendations for children's screening in the UK?
a) Royal College of Ophthalmologists Report (2000)
b) Hall Report (2003)
c) British Orthoptic Report (2002)
d) Sjostrand and Abrahamsson Report (1990)

2. An 18-month old child should have their acuity checked using which of the following?
a) Snellen chart
b) Keeler cards
c) Cardiff cards
d) Sonksen-Silver cards

3. A child who can just read N12 should be given print size:
a) N8
b) N12
c) N24
d) N36

4. A 5-year old child with normal vision should have a near acuity of:
a) N5
b) N8
c) N12
d) N24

5. According to Sondhi and colleagues, intermittent exotropia should stop by what age?
a) 2 months
b) 6 months
c) 12 months
d) 3 years

6. A 20Δ base out prism can be used to assess which of the following?
a) Diplopia
b) Stereopsis
c) Abnormal retinal correspondence
d) Motor fusion

7. Which one of the following is correct?
a) Accommodation is reduced in people with Down's syndrome
b) People with dyslexia usually overaccommodate
c) Children under 5-years old have a near point of convergence of 10 cm or more
d) The average prescription for a 2-year old is around +2.50D

8. Which one of the following is correct regarding the AC/A ratio?
a) Hypermetropes have a high AC/A ratio
b) Hypermetropes have a low AC/A ratio
c) Myopes have a lower AC/A ratio than Hypermetropes
e) A low AC/A ratio is associated with divergence excess exotropia

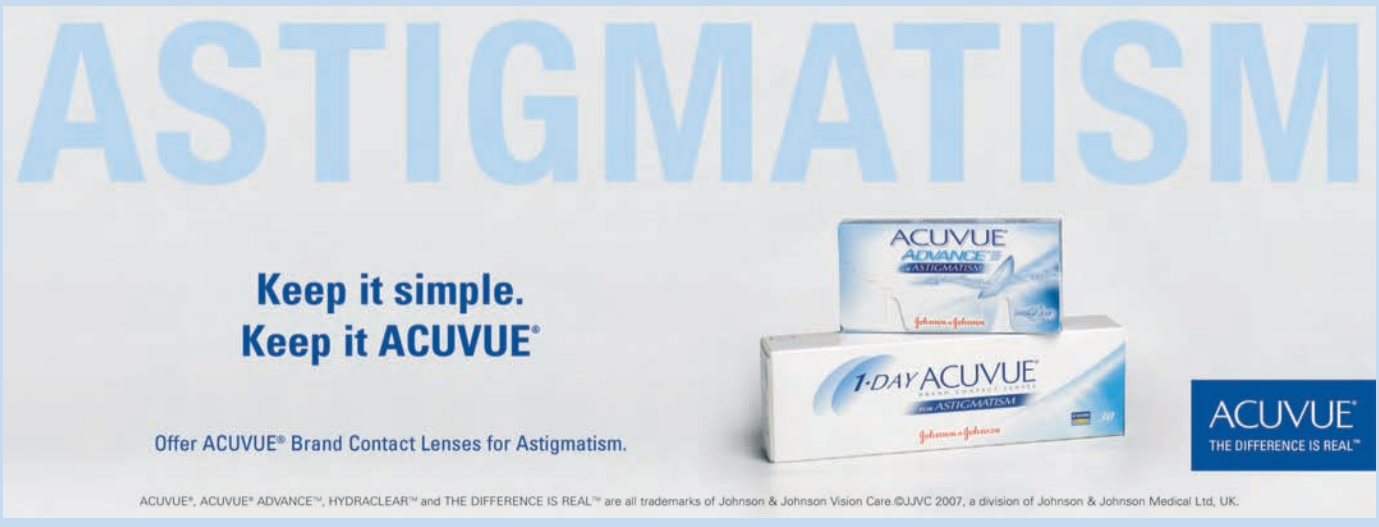
9. Which one of the following is incorrect regarding dilation?
a) It makes viewing the disc easier
b) Side effects of cycloplegics include tachycardia
c) Atropine sulphate can result in the patient's death
d) Adequate cycloplegia is achieved with cyclopentolate 1% after 10 minutes

10. Which of the following is incorrect regarding Mohindra's technique?
a) When working at half a metre, 1.25D should be subtracted from the results found
b) The technique is carried out in a darkened room
c) One eye should be occluded if possible
d) Dilated retinoscopy will produce approximately 0.5D less hypermetropia than Mohindra findings

11. Which one of the following is correct?
a) Young children should only do the second part of the City University colour vision test
b) Young children cannot have their stereopsis assessed
c) A 5-year old child should have a stereo acuity of 70 seconds or better
d) Adult levels of contrast sensitivity are reached by the age of 5 years

12. Which one of the following is incorrect regarding children with learning difficulties?
a) A high proportion of children with learning difficulties need visual correction
b) A strict-set routine should be followed in order to complete the whole eye examination
c) Bifocal spectacles can benefit children with learning difficulties
d) The tests should be explained even if they don't completely understand

Please complete on-line by midnight on March 7 - You will be unable to submit exams after this date – answers to the module will be published in our March 9 issue



CET answers

Course code: c-5192

These are the correct answers to Module 10 Part 1, which appeared in our January 12, 2007 issue

1. Correct answer is D
Colobomas are typically bilateral and occur infero-nasally. Patients are at risk of developing amblyopia as a result of co-existing myopic astigmatism. They can be inherited in an autosomal dominant fashion.

2. Correct answer is B
The extraocular muscles are derived from mesoderm and the iris sphincter musculature from neuroectoderm. Both the lens and lacrimal gland are derived from surface ectoderm.

3. Correct answer is D
The anterior chamber angle is complete by month eight. The retinal vessels extend towards the temporal periphery by month nine. The eye appears to develop in the 3rd gestational week. Optic nerve myelination occurs in month seven.

4. Correct answer is C
The anterior chamber angle is complete by month eight. The retinal vessels extend towards the temporal periphery by month nine. The eye appears to develop in the 3rd gestational week. Optic nerve myelination occurs in month seven.

5. Correct answer is A
The secondary vitreous contributes to the vitreous proper whereas its tertiary counterpart contributes to the lens zonules. The primary vitreous regresses by the third gestational month. The papillary membrane is comprised of the anterior component of the tunica vasculosa lentis.

6. Correct answer is D
The morning glory disc is an axial disc coloboma. The remainder are all remnants of the hyaloid system.

7. Correct answer is B
Cones differentiate in month six, one month prior to the rods. Amacrine cells make up the inner nuclear layer. Formation of the neural retina begins with the establishment of the ganglion cell layer. The inner plexiform layer is acellular.

8. Correct answer is A
Smooth pursuit movements are not present until two months of age.

9. Correct answer is D
Infants will demonstrate a preference to facial stimuli by two months and facial expressions by month five. Visual levels are comparable to the adult at approximately four years of age.

10. Correct answer is C
Approximately 20% of the LGN input is from ganglion cells from both retinae. There are six layers. Layers 2,3 and 5 receive input from the ipsilateral eye whereas layers 1,4 and 6 receive input from the contralateral eye.

11. Correct answer is C
The parvocellular layer comprises 80% of the total ganglion cell population.

12. Correct answer is D
Optic nerve myelination occurs at the chiasm.
Stereopsis is not present at birth. The macula is immature at birth as the cone density is 50% of its adult counterpart. Cells of the magnocellular layer contribute to motion perception.

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