Colour Overlays and Coloured Lenses

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Frequently Asked Questions
There is now scientific research to show that both coloured filters (worn as spectacles) and coloured plastic sheets laid over text (known as overlays) can help some children to read.

What are coloured overlays?
Coloured overlays are sheets of translucent or transparent coloured plastic that can be placed over a page of a book so as to colour the text beneath without interfering with its clarity.

What do they do?
Coloured overlays reduce the perceptual distortions of text that children sometimes describe. They enable some children to read text more fluently and with less discomfort and fewer headaches. It is important to assess the effects of a wide range of colours because individuals do not all benefit from the same colour.

What proportion of children can benefit?
In several studies, children in county primary schools were - individually shown a passage of text covered in turn by a variety of coloured overlays, including grey or clear overlays for comparison. About 20% of the children found one or other of the colours improved the clarity of the text. They continued to use an overlay of that colour without prompting for more than three months. They read more quickly with their overlay, both before and after they had become accustomed to its use.

How should an overlay be used?
The reader should place the sheet over the page, when reading. The text should be positioned to avoid reflections from the surface of the overlay caused by lighting. The overlay should not be creased, and it is a good idea to keep it in an envelope when it is not in use. Pupils should nevertheless feel free to touch the overlay in order to point when reading. If teasing is a problem, it may help for staff to explain to the class that the use of overlays to correct sight is similar to the use of glasses. It may also be helpful to trim the overlay so that it is less conspicuous.

What are visual perceptual distortions?
Some people can experience distortions when they look at certain materials, particularly text. The distortions of text include blurring movement of letters, words doubling, shadowy lines, shapes or colours on the page, and flickering. These distortions are characteristic of a condition that some have

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called Meares-Irlen Syndrome, Irlen Syndrome or Scotopic Sensitivity Syndrome.

How can visual perceptual distortion be spotted?
Visual perceptual distortion should be suspected in children who have trouble learning to read, particularly if they report headaches and eye- strain from prolonged exposure to the page. If the child reports any illusory movement of the letters or words, or glare from the white paper, then treatment with coloured overlays or filters should be considered.

One possible question to ask is: 'After you have been reading for a while, do the words or letters do anything different?'. If open-ended questions such as the above fail to provoke reports of distortions, more direct questions can be given. The child can be shown a page of text, and asked the following questions: 'Do the letters stay still or do they move?'; 'Are the letters clear or are they blurred?'; 'Is the page too bright, not bright enough or just about right?'. Reports of movement, blurring and glare are more likely in children who benefit from overlays.

How are visual perceptual distortions caused?
The cause of the distortions is not known with any certainty. Some authors have hypothesised that the distortions are due to a dysfunction, perhaps a hyper-excitability, of nerve cells in the visual cortex, an area of the brain at the back of the head. Individuals with migraine are particularly susceptible to the distortions.

What is Meares-Irlen Syndrome?
The term Meares-Irlen syndrome is sometimes used to refer to the collection of symptoms and signs of visual fatigue when reading that are reduced when colour is used. Other terms are Irlen syndrome or Scotopic Sensitivity Syndrome (SSS)1. (The syndrome is not yet widely recognised by the medical and scientific communities, and there is no universal agreement on its name.) The symptoms of visual perceptual distortion in children with reading difficulty were first described by Olive Meares2, but have been listed by Helen Irlen, as follows.

What are the symptoms of Meares-Irlen Syndrome?
Some of the main symptoms are:

- glare from the page

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- headaches when reading
- sore eyes when reading
- movement/blurring of print
- onset of symptoms varies and may depend on lighting conditions, style of text and quality of paper

What are the signs of Meares-Irlen syndrome?
Some of the signs may be:

- rubbing eyes
- excessive blinking
- poor concentration
- inefficient reading
- difficulty in keeping place

Which texts show a benefit from colour?
Coloured overlays and coloured glasses can increase the speed of reading, although with conventional text the improvement may only be apparent after ten minutes continuous reading when the child would begin to tire were an overlay not used.3 If the text is closely spaced, the benefit is more immediate.

Which children benefit?
The children who benefit may be good readers, but more often they have difficulty reading. They usually suffer visual discomfort when reading and, when questioned, will often report perceptual distortions of the text. These distortions usually include apparent movement or blurring of the letters and words. Often there is a family history of migraine.

Does visual perceptual distortion relate directly to learning difficulties,

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or dyslexia?
Children with reading difficulty are more likely than others to report visual perceptual distortion, and to benefit from coloured overlays. A smaller proportion of good readers also show similar benefits. Individuals with dyslexia may have difficulties with visual perception, but usually also have difficulties of a linguistic nature which need to be addressed separately.

Why can children have 'perfect eye sight' and still experience distortion?
An optometrist (previously known as an ophthalmic optician) will report 'perfect eye sight' when someone can see a letter chart without needing refractive correction (glasses), and when there are no (orthoptic) problems of co-ordination between the eyes. The perceptual distortions may occur quite independently of any refractive error, although they are often, but not always, associated with a mild binocular vision difficulty (i.e. a difficulty in moving the eyes together, keeping the direction of gaze appropriately co-ordinated). In most cases the binocular difficulties do not appear to be the basis for the distortions.

Does visual perceptual distortion occur in families, and if so, why?
Many traits run in families and visual perceptual distortions are no exception. The genetic contribution is the subject of investigation.

Does visual perceptual distortion cause writing to deteriorate?
The visual perceptual distortions that people experience can affect all aspects of visual function, but they are more likely when the visual material has many similar contours (letters). Text is unlike natural scenes in that it is composed of many identical elements. These are at their most confusing in small closely spaced printed text, but they also occur in hand-written work.

Do children need coloured overlays or coloured glasses permanently?
It seems that children benefit most from colour if it is offered as soon as any reading difficulty is suspected, before the cycle of failure has begun. Many 7 year-olds appear to use coloured overlays for a year or two and then discard them as unnecessary. This may be because the acquired familiarity with text makes the distortion less distracting.

Can overlays or glasses harm the eyes?
Just as some colours are reported as being beneficial, others are often reported to be uncomfortable. Individuals sometimes show a marked aversion to these uncomfortable colours. Provided the appropriate colour is

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chosen, it seems unlikely that overlays can have any detrimental effect. The possible long-term effects of wearing coloured glasses are unknown at present.

Should coloured glasses be worn all the time?
In our view, children should be free to wear the glasses if they find it helpful to do so, but not encouraged to wear them if they would not otherwise do so. The response to colour is subjective and individual, and the wearer is the best person to judge whether there is any benefit.

Should children with binocular difficulties who are undergoing orthoptic eye exercises or other medical treatment continue to use overlays?
In our opinion, overlays can be used regardless of any simultaneous eye exercises or medical treatment. However, visual perceptual distortions can sometimes be caused solely by binocular vision problems, so it is sensible to have these corrected first. If the distortions remain then coloured filters need to be tried.

How long should overlays be used before coloured glasses are considered?
There are many factors involved. First, are the overlays obviously beneficial? If so, only a short trial period, say six weeks, is necessary, particularly if headaches have been reduced but not eliminated, and if untidy writing continues to be a problem. Under these circumstances glasses may further reduce the headaches and may well improve the handwriting.

If, on the other hand, the response to overlays is less marked, it seems sensible to see whether the child continues to use overlays without prompting for, say, a school term or longer, before considering coloured glasses. Coloured glasses are more expensive than overlays, and it may be wise to wait before incurring the cost.

Another factor to consider is the age of the child. It is often difficult to assess a child for coloured glasses below the age of 8.

Are coloured glasses necessary?
Children who persist in using their overlay usually find coloured glasses more convenient to use. Classes can help with writing, whereas overlays cannot. The degree of precision in the choice of colour is critical for obtaining the best results, and the precision available with lenses is far greater than with

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overlays. Perhaps for this reason glasses often give better results 4.

Are glasses the same colour as overlays?
It is essential to realise that the appropriate colour for use in glasses is not the same as that in overlays 5. For example, a child may choose a yellow overlay and benefit from blue lenses. The colour of the lenses can only be assessed by optometrists or orthoptists who use the Intuitive Colorimeter 0, or by the use of a very large number of coloured trial lenses. Other methods of selecting coloured lenses may be less likely to select the optimal colour.

Why are glasses a different colour from overlays?
When you wear glasses everything you see is coloured, but you are often unaware of the coloration because you adapt to it and make allowances for it. (Example, the colour of light from a normal household light bulb is very yellow in comparison to daylight, but you are never aware of this.) When you use an overlay only part of what you see is coloured and the eyes are adapted to white light. The way that the brain processes what you see in the two circumstances is very different.

What is the best method for combining overlays?
The best method is that which most efficiently covers the largest number of possible colours. The Intuitive Overlays (copyright) used in - recent research 4 were scientifically developed so that similar colours can be combined two at a time in a simple yet thorough way 6. If these overlays are used and all suggested combinations are tried, a wide range of colours will have been efficiently and systematically sampled.

How reliable is the choice of overlay colour?
When tested a second time, individuals may sometimes choose a different colour, but it is usually a similar colour. The choice of colour may appear random, but it is not!

What does one do if a child reports a large range of colours beneficial, but cannot make a consistent choice?
Beneficial colours should be compared side by side. If the choice remains unreliable, then one of the chosen colours should be given a trial for a period of a week, followed by one of the other colours. Alternatively, the Wilkins Rate of Reading Test can be used.

Do children change their preferred colour?
Children sometimes seem to change their preferred colour. The precise

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reason for this is not known.

Does it matter if the child still sees areas of white page around the overlay?
Areas of white page may well affect the choice of colour. The conditions of the test should resemble those under which the overlay will be used. If neighbouring white pages are unlikely to be encountered when the overlay is used, they should be avoided during the test procedure.

Would it help children to work under lighting that is not fluorescent?
Schools are usually well lit by natural light, and in general, daylight is preferable to artificial light, particularly fluorescent lighting. Care must be taken to avoid glare by shielding work surfaces from direct sunlight. Complaints of glare from fluorescent lighting should be taken seriously; they usually result from real rather than imagined problems. Fluorescent lighting often emits high-frequency invisible flicker that can affect some people. If headaches are attributed to fluorescent lighting, the individual should be seated where the fluorescent light is 'diluted' by daylight or the relatively steady light from filament lamps.

Can adults be affected?
Yes. Although some people seem to 'grow out' of the condition, many do not. The distortions may be less pronounced when reading becomes fluent and text ceases to be a meaningless collection of confusing shapes. Sadly, visual perceptual distortion is often not recognised in children and many sufferers enter adulthood without ever having been treated.

What do I do to find out if colour might help?
First you should obtain an optometric examination. You should find an optometrist who has an interest in reading difficulties (see below). The optometrist should assess binocular(orthoptic) function. Alternatively you can be assessed by an orthoptist who has an interest in reading difficulties. Orthoptists are specialists in the assessment of binocular function and usually work in NFIS Hospital Eye Departments alongside ophthalmologists (eye doctors).

Next the optometrist or orthoptist will perform an examination with coloured overlays. Some teachers also perform this examination. The examiner should have an Assessment Pack of overlays. Several different packs are on the market with varying numbers of colours. The pack should include a wide range of colours.

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It is not sufficient to try the coloured sheets available from stationers because the colours are not subtle or varied enough.

The examiner should listen to the client's description of the distortions, and use this description when trying to decide whether a particular colour the reduces distortions.

One way of assessing benefit is for the examiner to administer the Wilkins Rate of Reading Test 7. The test consists simply of a passage of randomly ordered words that the client is required to read aloud as rapidly and as accurately as possible. The words are all very commonly used and are therefore familiar to most children, even those whose reading is very poor. The words are arranged in random order so that the person cannot guess what words come next. The text is printed in small closely spaced lettering so that any visual difficulty is maximised and affects reading speed after only a short period of reading.

The rate of reading words on this test is usually more than 10% higher with the chosen overlay than without in children who will subsequently make frequent use of their overlay.

How can I find an optometrist or orthoptist who has specialised in reading difficulties? Optometrists (previously called ophthalmic opticians) can be found in most town centre's. Optometrists examine eyes to assess their health and to determine whether glasses or eye exercises are needed. A small but growing number of optometrists have specialised in assessing people who have reading difficulties. If you or someone in your family already sees an optometrist then ask them if they know of a local colleague who has specialised in reading difficulties.

Special needs teachers and educational psychologists also often know of local optometrists who have specialised in this subject. Alternatively, you could simply phone any local optometrist and ask them to recommend someone.

Similarly, the orthoptic profession has a growing number of orthoptists who have an interest in visual perception difficulties that affect reading. If your local Orthoptic Department has expertise in this area, ask your GP to refer you. Otherwise your local Orthoptic Department may be able to inform you of the hospitals providing this service. Alternatively, the British 0rthoptic Society (Tel: 0171 387 7992) may be able to help. A few orthoptists also work

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privately. Their addresses can be obtained via the Society.

What tests should I expect the optometrist or orthoptist to do?
The precise routine will vary from one optometrist to another but the basic eye test includes refraction (tests of lens focus), acuity (ability to see small objects), tests of the health of the eyes, and basic tests of ocular motor function (how well the eye muscles work together). There are other tests that are not always included in the examination but are generally thought to be particularly important for children with reading difficulties. You can ask an optometrist whether they would do these tests before you book an appointment:

- Mallett fixation disparity test at near
- fusional reserves at near
- accommodative lag
- coloured overlay testing

Not all optometrists who have specialised in this subject have an Intuitive Colorimeter, but all should know of a colleague who they can refer you to if this further testing is needed. A standard orthoptic examination will include tests of:

- acuity
- binocular vision status including fusional reserves
- accommodation

Some orthoptic departments may also undertake coloured overlay testing. A few have an Intuitive Colorimeter.

Will there be a charge for these tests?
The NHS pays optometrists a small fee for carrying out a basic eye examination. As the tests listed above are of a specialist nature most

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optometrists have to charge a private fee for the detailed investigation of people with reading difficulties.

Where can I find out more?
The following web site describes research on colour and reading:-

http://www.essex.ac.uk/psychology/overlays

The following book provides a review of research in this area and a theoretical explanation for the effects of colour : Wilkins, A.J. Visual Stress, University Press, 1995. Oxford ISBN 0 19 8521 74 X

There is an introductory telephone helpline, courtesy of the University of Essex, on 01206 872130 (calls charged at normal rates).

If you still have important questions or need specific information you can telephone Avril Shelmerdine on 01206 372381

Notes

1 Irlen, H. (1991) Reading by the Colors. New York: Avery Publishing Group Inc.

2 Meares, 0. (1980). Figure / background, brightness / contrast and reading disabilities. Visible Language, 14, 13-29.

3 Tyrrell, R., HoUand, K., Dennis, D. and Wilkins, A.J. (1995). Coloured overlays, visual discomfort, visual search and classroom reading. Journal of Research in Reading, 18(1), 10-23.

4 Wilkins, A.J., Evans, B.J.W., Brown, J.A., Busby, A.E., Wingfield, A.E., Jeanes, R.J. and Bald, J. (1994). Double-masked placebo-controlled trial of precision spectral filters in children who use coloured overlays. Ophthalmic and Physiological Optics, 14(4), 365-370.

5 Lightstone, A., Lightstone, T. and Wilkins, A.J. (1999). Both coloured overlays and coloured lenses can improve reading fluency, but their optimal chromaticities differ.

6 Wilkins, A.J. (1994) Overlays for classroom and optometric use. Ophthalmic and Physiological Optics, 14, 97-99. 7 Wilkins, A., Jeanes, R.,

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Pumfrey, P.D., Laskier, M. (1996). Rate of reading test: its reliability, and its validity in the assessment of the effects of coloured overlays. Ophthalmic and Physiological Optics, 16, 491-497.

Provided by The Institute of Optometry