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How many colours are necessary to increase the reading speed of children with visual stress? A comparison of two systems

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We measured the increase in reading speed afforded by two currently available systems of coloured overlays: the *Intuitive Overlays*, which provide a choice of 30 colours, and the *Eye level Reading Rulers*, which provide a choice of five. Forty-eight pupils from a local authority primary school who reported experiencing symptoms of visual stress were individually tested with both systems in a random order, balanced across pupils. There were no differences between the systems as regards the children's preference or the reduction in symptoms of visual stress. However, there was a significant increase in reading speed with the *Intuitive Overlays* and no increase, on average, with the *Reading Rulers*. Pupils showing an increase in reading speed of more than 5% with either overlay were tested again, on this occasion with *Intuitive Overlays* of the conventional size and those cut to the (much smaller) size of the *Reading Rulers*. There was no difference in reading speed between the large and small overlays. Participants whose reading speed increased with the *Reading Rulers* by as much as with the *Intuitive Overlays* tended to be those who chose a similar colour for both overlays. The general pattern of results suggests that the *Reading Rulers* failed to increase reading speed because they do not offer sufficient colours and hence the benefits of the *Reading Rulers* in increasing reading speed are likely to be less than obtained with the *Intuitive Overlays*.

Some children report perceptual distortions of text while reading, often associated with complaints of tiredness and headaches, and collectively referred to as visual stress, see Wilkins (2003) for a review. Often, these complaints can be reduced by the use of a coloured overlay, a spectral filter placed upon the page when reading. The *Intuitive Overlays* (Wilkins, 1994) were designed to sample colours comprehensively. Using the system, nine coloured overlays and a grey overlay can be combined by placing them one upon another so as to provide a pallet of 27 colours that sample chromaticity systematically, the logic being that, if there is a particular colour that can reduce distortion and improve reading, the overlays can closely approximate that colour. When children in mainstream education are tested using this system, about 50% report that one or other of the available colours improves the clarity or comfort of text. When provided with that colour, about half these children continue to use the overlay (or combination of overlays) for several months. The children who continue to use the overlay are those who

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read more quickly with their overlay both on immediate testing and after prolonged experience with the overlay (Jeanes et al., 1997; Wilkins, Lewis, Smith & Rowland, 2001). If a clear overlay or grey overlay is included among the overlays at the time of selection, those children who choose the clear or grey overlay do not continue to use it, and do not read more quickly with it (Wilkins & Lewis, 1999; Wilkins et al., 2001). The above studies do not rule out the contribution of placebo effects, but they paint a consistent picture. Placebo effects have been controlled in other studies that have used a double-masked protocol (Wilkins et al., 1994). Such a protocol is possible in the case of spectral filters worn as glasses, where adaptation to colour masks the identification of a chosen colour.

The overlays appear to increase reading speed: 5% of unselected children in mainstream education read at least 25% more quickly using a coloured overlay (Wilkins, 2002); the proportion may be higher among individuals selected as having reading difficulties (Kriss & Evans, 2005). The question arises as to how many overlay colours are necessary for such a benefit. There are nine differently coloured *Intuitive Overlays* that can be placed one on top of another of the same or similar chromaticity so as to provide a more saturated colour of a similar shade. Figure 1a is based on the CIE UCS chromaticity diagram that represents all the colours that can be seen at a constant brightness, and maps each of the 27 shades of colour of the *Intuitive Overlays* under white light of even spectral power. It ignores the differences in photopic reflectance; reflectance is greater for colours such as yellow than colours such as blue.

Recently, Crossbow Education Ltd have introduced a set of five differently coloured overlays, called *Reading Rulers*. They are large enough to cover one or 2 lines and are designed to be moved down the page when reading. They incorporate a 25 mm black band to act as a reading guide. The colour is therefore intended to cover only a few lines of text at a time, and instructions suggest that for younger readers the ruler may be cut down to fit just one line of text if required.

The spectral reflectances of the *Reading Rulers* when placed upon a white (spectrally uniform) surface are shown in Figure 1b. The chromaticities of the *Reading Rulers* are shown in Figure 1c for comparison with those of the *Intuitive Overlays* in Figure 1a. Although the chromaticities may appear similar, the *Intuitive Overlays* system allows for colours that are adjacent in the CIE space to be combined and fine tuned to provide up to 27 shades, whereas the *Rulers* are limited to just 5 different colours. Note that the distance from (equal energy) white in the diagram (shown by the +) is greater for the *Reading Rulers* than for the *Intuitive Overlays*, indicating that the former are more saturated. The greater saturation of the *Reading Rulers* means that were they to be combined by placing them one upon another, they would be rather dark.

Tyrrell, Holland, Dennis and Wilkins (1995) used conventional reading material and showed that although there was no effect of an overlay initially, after 10 minutes of continuous reading the use of an overlay prevented the reading speed decrement that otherwise occurred. In order to demonstrate the effect on reading speed more quickly, Wilkins, Jeanes, Pumfrey and Laskier (1996) created passages of meaningless text from randomly ordered common words. The words were within the reading vocabulary of most poor readers, and so the child was able to succeed at the task without prompting. The random word order meant that the words could not be guessed from context but had to be seen to be read. The text was printed in a small typeface to increase visual stress, so as to measure the effects of the stress in a short period of time. The rate of reading on this test predicts the use of overlays (Wilkins, 2002).

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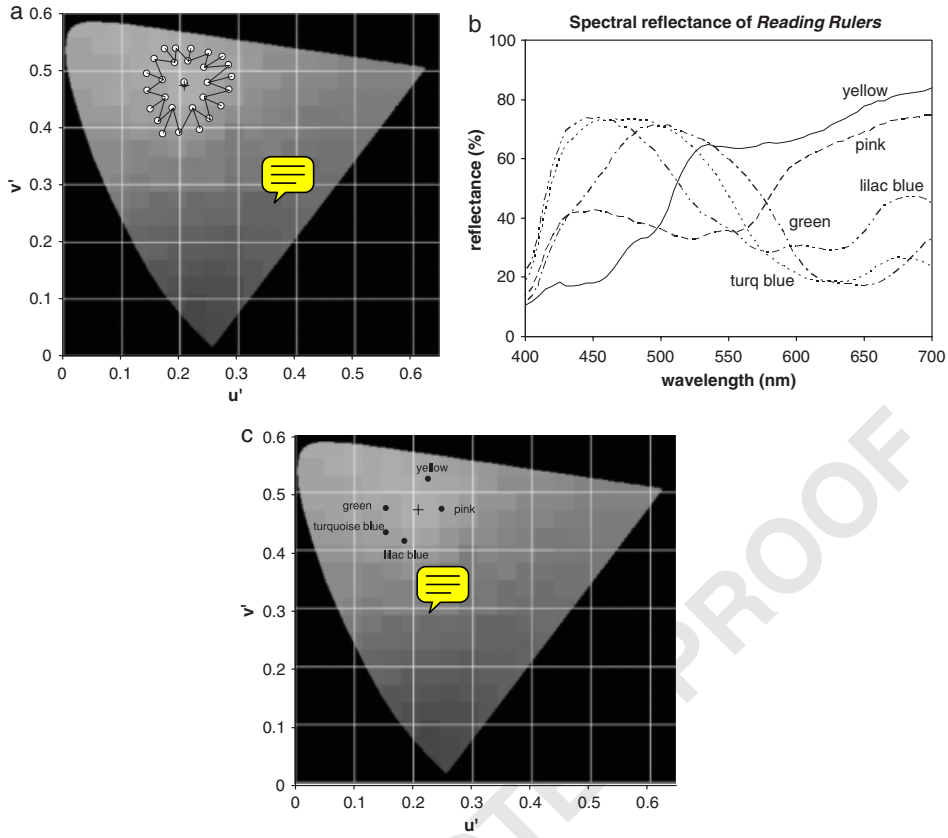

Figure 1. (a) CIE 1976 uniform chromaticity scale diagram showing the chromaticities of the *Intuitive Overlays*. Points on the inner ring are the chromaticities of the single overlays, and points on the outer ring those of the double overlays formed from a combination of two single overlays. Some double overlays are formed from two overlays of the same colour and some from overlays having neighbouring chromaticity: the lines connecting the outer points to the inner indicate which overlays are combined. The chromaticity of the grey overlay is similar to that of white, shown as a cross. Note that the diagram does not represent differences in (photopic) reflectance, hence similarity of the chromaticity of white and of the grey overlay. (b) The spectral reflectances of the *Reading Rulers*. They were measured by placing the overlay on a surface of even spectral reflectance and using a 45° oblique angle of incident light and an angle of reflectance orthogonal to the surfaces. (c) The chromaticities of the *Reading Rulers* calculated from the data in (b).

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Ever since the initial reports that colour may be effective in reducing visual stress, it has been observed that for each individual, one or two colours appear to be beneficial, and other colours may even be aversive and increase perceptual distortions (Irlen, 1983, 1991). There are several studies that confirm this experimentally.

Jeanes et al. (1997) showed that an overlay with a colour complementary to that optimal for clarity did not significantly increase reading speed. Wilkins et al. (2001) issued overlays of a colour selected at random. Children were more likely to continue to use the overlay if, by chance, it happened to be of the colour they had originally chosen as improving clarity. Ludlow, Heaton and Wilkins (in preparation) asked children to select

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their favourite colour using a process of elimination similar to that whereby overlays are selected, but with a blank page containing no text. The colour selected in this way did not increase reading speed.

If they are tested more than once, about half the children choose the same colour on both occasions, and these children show the greater reading speed increment with the overlay (Wilkins et al., 2001).

With the *Reading Rulers* teachers are often advised to make them generally available to children, who are encouraged to choose the colour that helps them best. With the *Intuitive Overlays*, a systematic assessment is usually carried out to determine whether the chosen *Reading Rulers* are actually of benefit to the child. In the following study, children who reported experiencing symptoms of visual stress were identified using a group test and later tested individually with both the *Intuitive Overlays* and the *Reading Rulers* in a random order, balanced across pupils. Using each system in turn, the pupils systematically selected the colour that best improved the clarity and comfort of vision. The reading speed increments using each system were compared.

Method

Participants

Thirty boys and 18 girls took part in the study. All were in Year 3, attending Lansdowne Primary School, Tilbury, UK. Their age ranged from 7:3 to 8:1, average 7:9. The children wore any glasses that had been prescribed for reading.

Materials

Group test of visual stress. The 'Group Test' (Appendix 4; Wilkins, 2003) was enlarged to fill an A4 page. It comprised a passage of text consisting of 20 lines, each line with the following 15 words in a different random order: come, see, the, play, look, up, is, cat, not, my, and, dog, for, you and I. The following questions were printed beneath the passage: 'Do the letters stay still or do they move?', 'Are the letters clear or are they blurred?', 'Are the words too close together or far enough apart?', 'Is the page too bright, or just about right?' and 'Does the page hurt your eyes to look at, or is it OK?'

Intuitive overlays. The *Intuitive Overlays* (Wilkins, 1994) are marketed by ioo Sales Ltd. They are A5 in size and have the following colours: rose, orange, yellow, lime-green, mint-green, aqua, blue, purple, pink and grey. Each of the colours can be combined with the same or a neighbouring colour to create a total of 27 possible shades, ignoring the grey overlay. The chromaticities of the overlays are illustrated in Figure 1a.

Reading rulers. The five *Eye Level Reading Rulers* are marketed by Crossbow Education Ltd. and include: yellow, green, turquoise blue, lilac blue and pink, the reflectances and chromaticities of which are shown in Figure 1b and c, respectively. The *Rulers* measured 200 mm wide by 60 mm high, and had a central opaque horizontal blue stripe 25 mm high across the middle, leaving a horizontal coloured margin of about 10 mm above and about 25 mm below.

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Procedure

Group testing. The Group Test questionnaire consisting of the passage of text and five questions was administered to pupils in four groups of approximately 15 pupils. The 15 common words used in the text were written on the white board to make sure that all pupils were able to read them. They were instructed to read the passage out loud, as fast as they could for 1 minute. The five questions pertaining to symptoms of visual stress ('Do the letters stay still or do they move?', 'Are the letters clear or are they blurred?', 'Are the words too close together or far enough apart?', 'Is the page too bright, or just about right?' and 'Does the page hurt your eyes to look at, or is it OK?') were read out one at a time, and pupils were instructed to respond by ticking the relevant answer box. It was made clear that there were no right or wrong answers to any of the questions, and that answers were only about what each individual could see. The number of symptoms was counted. Twelve pupils who reported no symptoms of visual stress were eliminated from further testing.

Individual testing. Apart from 3 children, who were excluded because they were unfamiliar with the words, there remained 48 participants who reported one or more symptoms of visual stress. Between 2 and 7 days after the group test, each of the 48 pupils (aged 7:3 to 8:1) was tested individually with both sets of coloured overlays. Half the children were tested with the *Intuitive Overlays* first, followed by the *Reading Rulers* and half were tested in the reverse order. The pupils were tested class by class in register order, each in a quiet, well-lit room. The procedure for selecting an optimum overlay was that suggested by Wilkins (2003) for the *Intuitive Overlays*. The same protocol was used for the selection of a *Reading Ruler*. The test material (Appendix 1; Wilkins, 2003) consisted of two identical passages of randomly ordered common words (as used in the Group Test) printed side by side. The page was positioned on a table in front of the child. The first overlay in the series was placed over the left-hand passage and the pupil was asked which of the two passages was more comfortable and clear to see. If the pupil indicated the uncovered passage, the overlay was replaced with the next in the series. However, if the passage covered by the overlay was clearer, the second overlay was placed upon the right-hand passage. The least comfortable overlay was replaced with the next from the series until an optimum colour had been chosen by a process of elimination. On the first occasion that a preference for an overlay was expressed, the two sides of the overlay were shown in turn to establish whether the gloss or matt side was the more comfortable. This side was used with remainder of the testing. If a child was unable to decide between two overlays, one of them was removed and re-introduced at the end. If no colour was preferred to white, testing was concluded. If an overlay was chosen, it was placed over one of the text passages, and the five questions from the group test were asked again. If this overlay alone did not remove all the visual stress symptoms that had previously been reported, then three stronger (more saturated) colours were provided by combining the chosen overlay with another of the same colour or one of the two with neighbouring chromaticity, placing the two overlays one on top of the another. If one of these double overlays was preferred to the single, the five questions were asked once again in order to see whether a further reduction in symptoms of visual stress had been achieved. With the final optimum overlay covering the passage of text, the rate of reading test was then conducted.

The same method of selection was used to obtain the optimum *Reading Ruler*, although the overlays were not combined. Between the two overlay tests, the text passage was read for 1 minute without an overlay.

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Results

Reduction in symptoms

There was a tendency for children to report fewer symptoms at the second overlay test, regardless of the type of overlay used at that test. This effect of order was non-significant, and so the data for the types of overlays were combined. Table 1 shows the number of symptoms reported with the white page and with the two types of overlays.

Compared with the white page, both overlays significantly reduced the number of symptoms reported, $t(47) = 4.78$, $p < .001$ for the *Intuitive Overlay(s)*, $t(47) = 3.89$, $p < .001$ for the *Reading Rulers*. There were no significant differences between the overlays in this respect. With the use of a coloured overlay from either system, about half the participants reported no symptoms of visual stress.

Effects on rate of reading

There were no differences in the number of words read with the *Intuitive Overlays* for pupils who used the *Intuitive Overlays* first and those who used them after the *Reading Rulers*, $t(46) = 0.76$, $p = .45$. Similarly, there were no differences in the number of words read with the *Reading Rulers* when they were used first or second, $t(46) = 0.55$, $p = .96$. The data for the groups were therefore combined.

Table 2 shows the average number of words correctly read in 1 minute with no overlay, with the *Intuitive Overlay* and with the *Reading Ruler*.

Significantly more words were read with the *Intuitive Overlay* than with no overlay, $t(47) = 2.10$, $p = .02$, one-tail, and significantly more than with the *Reading Ruler*, $t(47) = 3.85$, $p < .001$. The difference between the reading speed with and without the *Intuitive Overlay* accounted for 8.6% of the variance. The *Reading Ruler* did not significantly affect reading speed, $t(47) = 0.63$, $p = .26$, one-tail, and the difference accounted for $< 1\%$ of the variance.

A Pearson's correlation coefficient showed no statistically significant relationship between the number of symptoms experienced with a white page and percentage increment in reading speed with either an *Intuitive Overlay* ($r = .09$, $p = .54$) or a *Reading Ruler* ($r = .048$, $p = .74$).

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Table 1. Average number of symptoms of visual stress reported in each condition (max. 5).

Overlay condition	Mean number of symptoms (*SD*)
No overlay (white page)	2.08 (1.20)
Intuitive Overlay	1.00 (1.19)
Eye Level Reading Ruler	1.04 (1.49)

Table 2. Average number of words correctly read in 1 minute, under each condition.

Overlay condition	Mean reading speed in wpm (*SD*)
No overlay (white page)	75.7 (26.9)
Intuitive Overlay	80.5 (27.0)
Eye Level Reading Ruler	74.7 (25.8)

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Preference for an overlay system

52.1% of the participants stated that they preferred using their chosen *Reading Ruler* and the remainder preferred the *Intuitive Overlays*. Eighteen of the 25 who preferred the *Reading Ruler* did so because it provided a guide that allowed them to follow the lines of text while reading. There was no indication of an association between the overlay system that a pupil preferred and the one with which they read most quickly ($p = .25$, Fisher's exact test).

Effects of overlay size

The *Reading Rulers* were small and had to be moved down the page as the child read. This may have slowed children's reading and accounted for the failure to observe a reading speed increment from the use of the *Reading Ruler*. To see whether the differences between the overlay systems were due to the differences in overlay size, the 24 participants who showed a 5% or greater reading speed increment with the use of either overlay undertook two further rate of reading tests using the A5-sized *Intuitive Overlay* of their previously chosen colour, and an overlay of the same colour cut down to the size of a *Reading Ruler*, incorporating a 2.5 cm horizontal band of black tape, so as to resemble the design of a *Reading Ruler*. The order in which the two overlays were used was selected at random and balanced across participants.

An average of 82.1 (20.9) words per minute (wpm) were read using the A5 *Intuitive Overlays* and an average of 80.9 (21.4) with the small *Intuitive Overlays*. The difference did not approach significance, paired $t(23) = 0.67$, $p = .51$. The selection of participants should have increased the effect of any overlay, and therefore any effect of overlay size, but the difference between the two sizes of overlay accounted for only 1.9% of the variance. The effect of overlay size is therefore unlikely to explain the differences between *Intuitive Overlays* and *Reading Rulers*, which accounted for 24% of the variance in the original study.

Given that the difference in size between the two overlay systems does not appear to be responsible for the differences in their effect on reading speed, one obvious possibility that remains is the difference in spectral characteristics. The *Intuitive Overlays* are lighter and less saturated than the *Reading Rulers*, and provide a greater choice of colours.

The frequency with which the overlays were chosen with the two systems are shown by the numbers in the CIE UCS diagrams in Figure 2. With the *Intuitive Overlays*, the most frequently chosen colour was clearly 'mint green'. With the reading rulers, the most frequently chosen colours were 'turquoise-blue' and 'yellow'. There was little obvious relationship between the colours chosen on the two systems.

Given that children read more quickly with their chosen colours, and given that they choose different colours, it is possible that children select a colour that is closer to their needs with the *Intuitive Overlay* system. If this is the case, then when a *Reading Ruler* of a colour appropriate for an individual is available, it should be as effective as an *Intuitive Overlay* in increasing reading speed. When there is no appropriately coloured *Reading Ruler*, there should be no reading speed increment. In other words, the greater the difference in chromaticity between the chosen *Intuitive Overlay* and the *Reading Ruler*, the greater should be the difference in reading speed between the two. The CIE colour difference, ΔE^*, between the *Intuitive Overlay* and *Reading Ruler* was calculated for each child (assuming adaptation to a white, spectrally uniform, page). The children were divided into two groups on the median colour difference: a group who chose a similar

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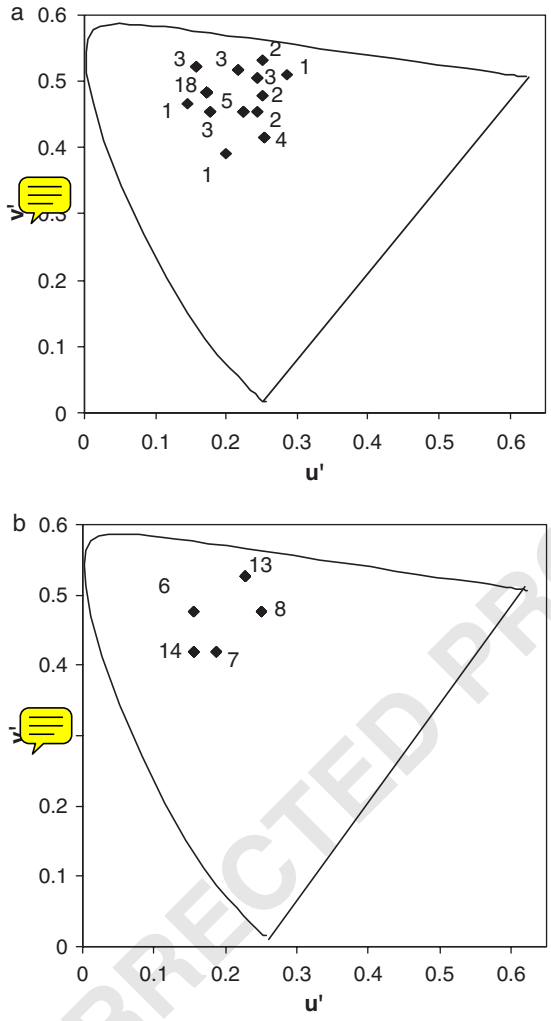

Figure 2. Frequency of choice of overlay. The numbers beside each point show the number of participants choosing the chromaticity. (a) *Intuitive Overlays*. (b) *Reading Rulers*.

colour with both overlay systems (CIE colour difference <67) and a group who chose different colours (CIE colour difference >67). In the first group there were 14 children who read more quickly with the *Intuitive Overlay* than with the *Reading Ruler*, and 9 for whom the reverse was the case. In the second group, the figures were 18 and 4 respectively ($p = .11$ by Fisher's Exact test). For each child the percentage increase in reading speed with the *Intuitive Overlay* relative to no overlay was subtracted from the percentage increase in reading speed with the *Reading Ruler* relative to no overlay. The difference averaged 4.3 wpm for the first group and 7.3 wpm for the second. The difference was marginal, $t(46) = 1.01$, $p = .15$.

In general, children who are tested twice with the same system of overlays and who consistently choose the same colour on both occasions have in a previous study tended to be the children who show the larger increases in reading speed with an overlay (Wilkins

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et al., 2001). To see whether the above difference in reading speed could be attributed to an effect of consistency, the reading speed with an overlay was compared with the reading speed without the overlay for both groups of children: those with a consistent choice of overlay on the two systems (similar colour) and those choosing a different colour. Although children who chose similar colours in general showed a slightly *smaller* reading speed increment with their overlays, the difference between groups did not approach statistical significance for either system.

Discussion

In keeping with previous research (Wilkins, 2003), the present study showed that coloured overlays reduce symptoms of visual stress. A weak positive association has previously been shown between the reduction of symptoms and the increase in reading speed (Wilkins et al., 2001). In this study, however, individuals who reported no symptoms were excluded, and, possibly as a result, there was no association between symptoms and reading performance. Reports of symptoms are likely to be more susceptible to the demand characteristics of the test situation than is reading performance. Children are often aware of the demands of a test situation and may try to give an answer that they think is required. Perhaps, this is why no differences in the reduction of symptoms were evident with the two systems. In contrast to symptoms, rate of reading appears to be relatively little affected by demand characteristics: motivational instructions and placebo overlays have been shown to have little effect on reading rate (Jeanes et al., 1997; Wilkins & Lewis, 1999; Wilkins et al., 2001). The absence of any differences in symptoms with the two types of overlay, and the absence of any consistent preference for one overlay system over the other, make it difficult to attribute the differences in reading speed to demand characteristics.

The *Intuitive Overlays* increased reading speed and the *Reading Rulers* did not do so. The failure of the *Reading Rulers* to increase reading performance is difficult to attribute to their small size, and the necessity of moving them down the page, because when the *Intuitive Overlays* were reduced in size to resemble the *Reading Rulers*, there was no difference in reading speed. Waldie and Wilkins (2004) have already shown that an overlay does not need to cover the entire page to be beneficial and it now appears that there can be some benefit from overlay use even when part of the text remains uncovered.

Instead, the difference in reading performance between the two overlay systems may possibly be attributable to the choice of 27 shades of colour available with the *Intuitive Overlays* as compared with the 5 shades of colour available with the *Reading Rulers*. This is because there was a slightly larger difference in reading speed with the two overlays for children who chose a colour with the *Intuitive Overlays* that differed from the colour they chose with the *Reading Rulers*. The difference does not appear to be attributable simply to the larger increments generally observed in children who show test–retest consistency (Wilkins et al., 2001). Instead, it suggests that the 5 shades of colour available with the *Reading Rulers* may be insufficient to benefit all children. If this analysis is correct, then it is perfectly possible in individual cases for the *Reading Rulers* to provide for a greater reading speed increment than the *Intuitive Overlays*; it depends on whether the colour they offer is appropriate for the individual.

If 5 shades of colour are indeed insufficient for a general benefit, the question arises as to whether the 27 shades of colour provided by the *Intuitive Overlays* are also insufficient,

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if maximum possible benefit is required. Wilkins Sihra and Myers (2005) measured the reading speed of five individuals who used coloured glasses. Without their glasses, they read passages of text under coloured light, and the colour of the light was changed randomly from trial to trial. The chromaticities under which reading was the quickest differed from one individual to another, but the reading speed decreased in much the same way for all individuals as the colour departed from the individual optimum.

Figure 3 shows how reading speed was affected for the group as a whole. The *y*-axis shows reading speed expressed as a factor of the reading speed under white light. The *x*-axis shows the separation in chromaticity on the CIE 1976 UCS diagram. Under the simple hypothesis that each individual needs their own precise optimum chromaticity, the worst-case scenario occurs when an individual has an optimum that lies mid-way between the available colours. Wilkins (2003; Figure 7) has demonstrated that the average separation of the chromaticities of the *Intuitive Overlays* is <0.05 under daylighting (CIE Standard Illuminant D65). A separation of half of this, 0.025, is the maximum departure from optimal chromaticity under the worse-case scenario. This corresponds in Figure 3 to a reading speed increment of 1.7, about 75% of the maximum. The worst-case analysis therefore suggests that the *Intuitive Overlays* provide for a reading speed increment that is no worse than about 75% of the best available, at least in daylight. Although a larger number of available shades would in principle improve reading speed still further, the variation in shade with different lighting is likely to render such an increase in complexity and cost unjustifiable.

The analysis suggests that the 5 colours of the *Reading Rulers* may in principle be insufficient to ensure a reading speed increment because they are separated by a maximum of about 0.10 in the CIE UCS diagram and would give an increment corresponding to a separation of 0.05, i.e. no worse than about 35% of the maximum possible. Although the rulers could be combined to produce more colours, the resulting

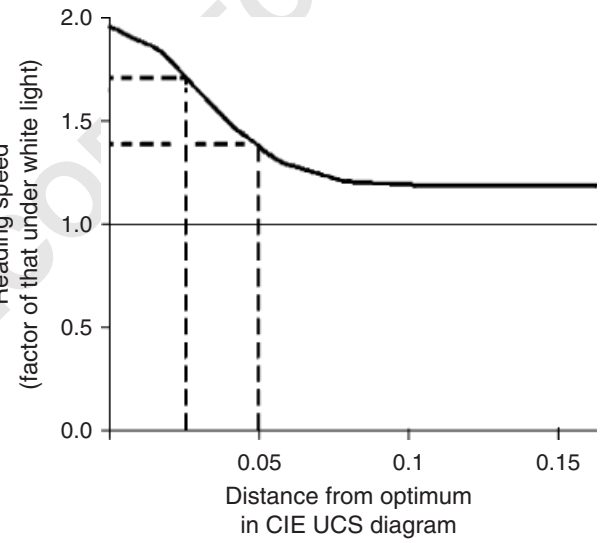

Figure 3. Variation in reading speed with departures from optimal colour. The optimal colour is represented by the origin of the *x*-axis. Adapted from Wilkins et al. (2005). The broken lines show the reading speed when the distance is 0.025 and 0.05.

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chromaticities would not be evenly distributed in the CIE UCS diagram, and the combinations would be rather dark because of the greater saturation of the filters.

Of course, the above analysis must be treated with caution: our study is small in scale and confined to one age group. Our analysis takes no account of the lower luminance associated with stronger colours, nor does it take account of the colour adaptation that occurs under coloured lighting, but only to a much lesser extent with surface colours such as overlays. As has already been shown by Lightstone, Lightstone and Wilkins (1999), the colours optimal for overlays differ from those optimal with lenses. Colour adaptation occurs with lenses. The present results may, of course, help to explain the differences in the optimal colour for overlays and lenses, given that the lenses used by Lightstone et al. provided for more than 6,000 possible shades.

About half the pupils preferred the *Reading Rulers*, many finding the presence of a reading guide helpful. It would be a simple matter to add such a guide at the centre of an *Intuitive Overlay*, although the overlay would then need to be reduced in size so as to be moved down the page with convenience.

The present paper seeks to answer a practical rather than theoretical issue. However, the benefit that coloured filters offer has been attributed by some (Chase, Ashourzadeh, Kelly, Monfette & Kinsey, 2003; Ray, Fowler & Stein, 2005) to the deficits in magnocellular function with which reading difficulties are sometimes associated. It has been argued that such deficits can be treated using 'yellow' and 'blue' filters because the filters alter the balance between magno- and parvocellular function. Filters of these colours were included among the *Crossbow Reading Rulers*. The present results therefore suggest that overlays of 'yellow' and 'blue' are insufficient to benefit all children, at least as regards reading speed.

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Declaration of interest: The second author was responsible for the design of the *Intuitive Overlays* when he was employed as a Medical Research Council scientist. He receives an Award to Inventors from the MRC based on a proportion of the sales of the *Intuitive Overlays*. The first author was responsible for collecting the data and has no financial interest, direct or indirect.

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