



**Thomson**  
Software Solutions



**ReadEZ**



# ReadEZ Screening Software



*A better way to read*

Research suggests that up to 20% of the population experience discomfort when viewing certain patterns (including text). This condition is variously referred to as Meares-Irlen syndrome or Visual Stress.

Many of these people can be helped with coloured filters. ReadEZ provides a spectrum of solutions for diagnosing and managing Meares-Irlen syndrome allowing you to provide a valuable new service for your patients.



**The ReadEZ advantage:**

- Elegant screening software helps diagnose the condition and determine the optimum colour.
- Built-in database and report generator.
- Greater range of overlay colours
- Coloured clip-ons provide simple and affordable solution
- Coloured prescription lenses at sensible prices
- Bespoke colour tinting option
- Developed by Prof Thomson in collaboration with Norville optical
- Software already in use in over 500 practices and schools
- Complete spectrum of evidence-based solutions under "one roof"



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Screening Software



Our innovative software quickly and accurately identifies the condition and determines the optimum colour for overlays, spectacles and computer screens.

Overlays

ReadEZ provides a choice of 12 coloured overlays printed on durable acetate



Coloured Reading Guides

ReadEZ Reading Guides use a post box design to provide the reader with their optimum colour plus an aid to track down the page



Coloured Clip-ons

ReadEZ clip-ons provide a choice of 12 colours which are easily worn with existing spectacles



Coloured RX Lenses

ReadEZ Rx lenses are available in 12 colours and to most prescriptions through our partner Norville Optical.



Bespoke Coloured Lenses

Bespoke colours can be selected using the ReadEZ software. The screen colour is then measured using a colorimeter and sent to the lab for precise matching.



Virtual Overlay Software

Our unique Virtual Overlay software allows the user to superimpose a virtual overlay on their computer screen.



For more information, please visit our web site or give us a call  
**Tel: 01707 414700**  
[www.thomson-software-solutions.com](http://www.thomson-software-solutions.com)



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## READEZ

### INTRODUCTION

Some individuals with apparently normal eyesight, experience discomfort when viewing a page of print. Some report that the words appear to move, wobble or flicker while others say that the page appears too bright or the words are too close together.

for the to and you cat is look up my not dog play see come  
see the look dog and not is you come up to my for cat play  
not up play my is dog you come look for see and to the cat  
to not cat for look is my and up come play you see the dog  
my play see to for you is the look up cat not dog come and  
you look see and play to the is cat not come for my up dog  
come see the play look up is cat not my and dog for you to  
come not to play look the and dog see is cat up you for my  
up come look for the not dog cat you to see is and my play  
and is for dog come see the cat up look you play my not to  
look to for my come play the dog see you not cat up and is  
the come to up cat my see dog you not look is play and for  
the cat up dog and is play come you see for not to look my  
dog you cat to and play for not come up the see look my is  
is you dog for not cat my look come and up to play see the  
look up come and is my cat not dog you see for to play the  
play come see cat not look dog is my up the for to and you  
my you is look the dog play see not come and to cat for up  
you for the and not see my play come is look dog cat to up  
dog to you and play cat up is my not come for the look see

This condition is referred to as Meares-Irlen syndrome. Those affected may skip words or lines when reading. Others report eyestrain or headaches after reading.

There is now considerable evidence that, for reasons that are poorly understood, these symptoms are sometimes relieved by changing the background colour to the print. This can be achieved by placing a coloured filter over printed text (coloured overlay) or by wearing spectacles with tinted lenses.

Computer users can be helped in the same way by changing the screen colours. The colour required to achieve optimum relief varies between individuals and may change over time.

Professor Arnold Wilkins from Essex University working with teachers, psychologists and optometrists, was among the first to investigate this phenomenon scientifically and has developed a range of tests and tools for investigating and treating individuals with the condition. A brief review of the history and current understanding of Meares-Irlen syndrome by Prof Wilkins, is included at the end of the manual.

As scientific and anecdotal evidence for the beneficial effects of colour has mounted, an increasing number of teachers, psychologists, optometrists, orthoptists and others have started screening for Meares-Irlen syndrome. The conventional method for screening involves manually presenting a range of coloured overlays/filters and asking the observer to report which colour is optimum in terms of reducing any symptoms. This process is somewhat tedious and prone to a variety of client and examiner biases.

In a bid to improve the efficiency of the process, a team of scientists led by Professor David Thomson, started developing a Windows-based screening program in 1998. After careful evaluation, the *City Coloured Overlay Screener* was launched in 2001. The program simulated the coloured overlay testing protocol developed by Prof Wilkins and provided a reliable indication of the optimum Intuitive Overlay for individuals with Meares Irlen syndrome. The program proved to be very popular and soon hundreds of teachers and eye care professionals were using it.

*ReadEZ* builds on the success of the *City Coloured Overlay Screener* and offers an improved user interface and a range of new features including:

- The ability to print customized overlays using a standard colour printer and appropriate transparencies/ acetates
- The ability to determine the optimum colour for *ReadEZ* tinted spectacles. These can then be supplied in the form of “clip-ons” for patients who wear spectacles or as prescription tinted spectacles
- The ability to determine the optimum screen colours for computer users

## THE READEZ SYSTEM

The *ReadEZ* system provides a simple, efficient and cost-effective way of determining the optimum colour of tinted lenses and providing these as coloured clip-ons for those who already wear spectacles, or as non-prescription and prescription lenses.

The system has been developed by Professor Thomson in collaboration with Norville Optical, a leading supplier of ophthalmic lenses.

The system consists of 13 clip-ons with carefully calibrated tinted lenses and software to determine the potential benefit of colour and the optimum tint.



Having used the software to determine the optimum colour for a tint, a clip-on can be supplied directly from the trial set and the set replenished. Alternatively, lenses to the preferred colour can be glazed into a frame of the patient’s choice, incorporating a prescription if required.

Lenses and clip-ons may be ordered directly from Norville Optical quoting the tint code REZ followed by the letters A-L as determined by the software.

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## ARE 12 COLOURS ENOUGH?

There is some debate about how specific the colour of tinted lenses and overlays must be to produce the optimum benefit. Some have argued that some individuals are very specific in their choice of colour and a small deviation from this optimum colour results in a rapid loss of comfort and reading speed. If this is the case, it would be necessary to tint lenses to a high level of precision. Proprietary systems such as the Intuitive Colorimeter and Precision Tinting are based on this assumption.

Others argue that the evidence to support this high level of colour specificity is weak and have argued that:

- The research literature in this area is at best, inconclusive
- Individuals with such precise colour specificity are likely to require a different tint depending on the lighting (illuminant) that they were working under.
- While such precise colour specificity could perhaps occur in a monochromatic (black and white) world, it is difficult to explain in a “multicoloured” world. The precise wavelengths that enter the eye are a complex interaction between the wavelengths reflected from objects and those absorbed by the tinted lens. This means that the colour appearance and contrast of coloured objects changes in a complex fashion when viewed through tinted lenses. It is difficult to understand how such precise colour specificity could be satisfied by a single tint under such conditions.
- It is difficult to understand why if 9 overlay colours seem to be adequate (or 19 if used in combination), and yet thousands of colours are apparently required for tinted lenses.
- Anecdotal evidence from experienced practitioners suggests that the majority of those with Meares-Irlen syndrome can be satisfied from a much reduced palette of tints.

Why the jury is still out on the precise number of colours required, trials have shown that at least 85% of individuals with Meares-Irlen are “satisfied” with one of the 12 ReadEZ colours.

ReadEZ tints have been designed to be approximately equally distributed in  $u',v'$  colour space under daylight. This means that the perceived difference between the colour of the tints is approximately equal from one tint to the next. Each tint is carefully calibrated during the production process to ensure that the tints are within the prescribed tolerance.

By reducing the number of tints required, the costs are greatly reduced providing a solution for those who show a clear benefit of using colour but cannot afford bespoke tinted lenses. While the majority of those with Meares-Irlen can be satisfied from the choice of 12 ReadEZ tints, it is possible that a few individuals may require a small variation on the colours provided.

## WHO, WHEN AND HOW?

The rather vague nature of the symptoms associated with Meares-Irlen syndrome makes it difficult to assess the prevalence of the condition. In several studies conducted by Prof Wilkins, children in 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.

The most common symptoms associated with Meares-Irlen syndrome are:

- glare from the page
- headaches when reading
- sore eyes when reading
- movement/blurring of print
- The most common signs are:
  - rubbing eyes
  - excessive blinking
  - poor concentration
  - inefficient reading
  - difficulty in keeping place

Before commencing colour sensitivity screening, it is important to confirm that the patient/client has had a recent eye examination by an optometrist. Many optometrists take a special interest in reading difficulties and will be able to perform additional tests to rule out an ocular cause of the problem.

If no ocular cause of the symptoms is found, screening for colour sensitivity should be performed.

*ReadEZ* has been designed to be used by teachers, educational psychologists, optometrists, orthoptists and others with an interest in this area. The program is simple to set up and use and has been shown to produce reliable results.

However, the program must be viewed as a tool, and like all tools it must be used in the correct manner in order to produce accurate results. You are strongly advised to read through this manual carefully before attempting to use the program.

For some, the effects of colour are dramatic, for others they are slight, for others there may be a positive placebo effect and for many there are no benefits. Some will use a coloured

overlay or tinted spectacles throughout their lives while others seem to “grow out” of the need for colour.

While prescribing a coloured overlay or spectacles when there is no clear benefit is unlikely to be inherently detrimental, the patient/client may be disadvantaged if other forms of assessment and management are delayed as a result. Colour sensitivity screening should therefore be viewed as part of the assessment of individuals with reading problems.

## HARDWARE REQUIREMENTS

The *ReadEZ* will run on virtually any PC running Windows XP or later.

### COMPUTER MONITOR

The program will work with most modern display screens. Laptop screens are generally suitable although the colour and contrast of the screen can vary with viewing angle, particularly with older models. If this is the case, the screen angle must be adjusted carefully before attempting to use the program.

### SETTING UP THE TEST ENVIRONMENT

The test should be administered in a quiet room, free from distractions. The room lighting should be subdued and care should be taken to avoid reflections on the screen.

The individual being tested (the subject) should be seated comfortably in front of the screen with the examiner seated to one side. The screen should be viewed from approximately 40cm and the client should wear the spectacles that they normally use for reading (if any).

## INSTALLING THE PROGRAM

Insert the CD and follow the on-screen instructions. The setup program will automatically install all the required files on your computer’s hard disc.

The main program files are located in the program directory. This directory has the following 4 sub-directories:

*Palettes*: contains colour palette files

*Records*: contains the database files

*Report images*: contains any images to be include in reports

*Report settings*: contains the text to be applied in the reports

*Reports:* contains templates for reports

*Resources:* contains files used in resources section of program

*Sounds:* contains mp3 files of the vocal instructions

To run the program, select *ReadEZ* from the *Start* menu or from the icon on the desktop.

ReadEZ is supplied with a Dongle (green USB “stick”). The software may be loaded on multiple computers but will not run unless the Dongle is inserted.

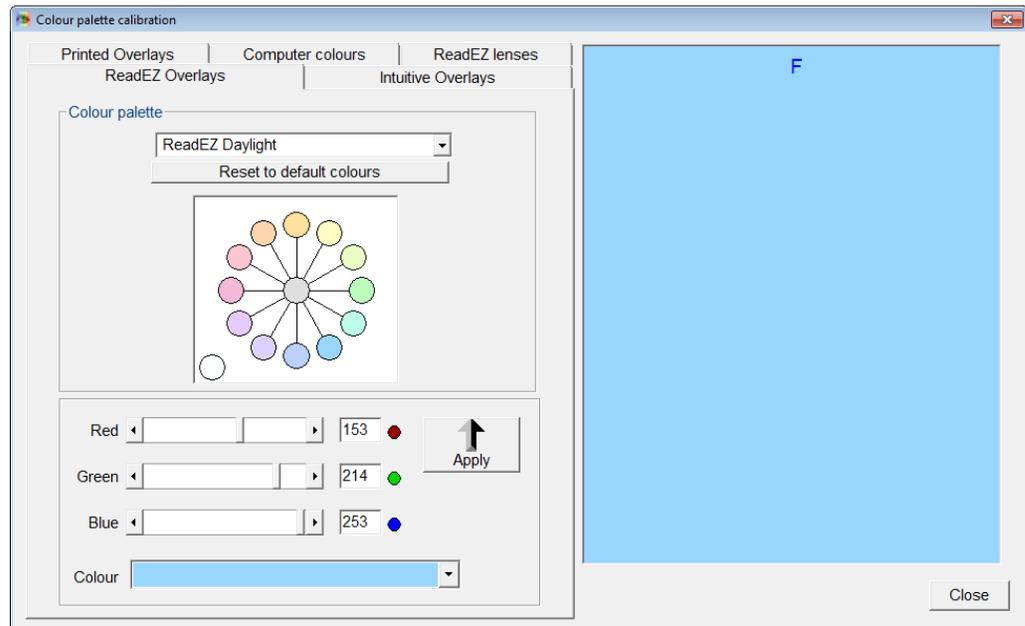
## COLOUR CALIBRATION AND SETUP

*ReadEZ* may be used to determine the optimum colour for:

- ReadEZ Overlays
- Printed overlays (using a colour printer and transparencies/ acetates)
- ReadEZ tinted spectacles and clip-ons
- Computer screens

In each case it is very important that the colours displayed on the screen are well-matched to the overlay/tinted spectacles colours. The program is supplied with a set of default screen palettes. These default colours should be reasonably well-matched to the overlay/tinted spectacles colours for most displays. However, as the colour reproduction of displays can vary quite significantly, it is very important that the screen colours are checked before attempting to use the program.

To calibrate the screen colours, select *Options ... Calibrate colour palette* from the menu of the main screen. This will display the calibration window shown below.



The colour palettes for each testing mode are selected by clicking on the appropriate tab (ReadEZ overlays, Printed overlays, ReadEZ lenses and Computer colours).

The calibration procedure for each mode is described in detail below. However, the general procedure is as follows.

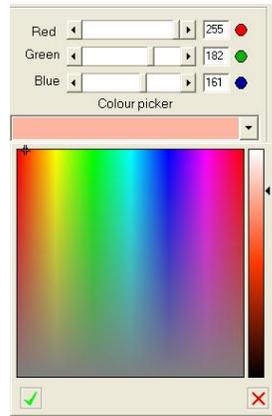
The aim of the calibration procedure is to ensure that each of the colours displayed on the screen is reasonably well-matched to the corresponding overlays / tinted spectacles.

Computer screens consist of a very fine grid of dots known as pixels. Each pixel is further subdivided into a red, a green and a blue dot. The intensity of these dots can be varied individually from dark to light in 256 steps. The dots are too small for the eye to resolve and the eye sees an additive mixture of red, green and blue (RGB). To turn a pixel red, the red dot is turned on while the green and blue dots are turned off. Similarly, to turn a pixel green, the green dot is turned on while the red and blue are turned off. By varying the relative intensity of the red, green and blue dots, the pixel can be made to appear virtually any colour. For example, adding red and green together produces yellow, while blue and red produces purple. Turning all three dots on together produces white.

As the intensity of each dot can be varied in 256 steps, the total number of colours and shades that can be displayed on the screen is  $256 \times 256 \times 256$  which equals 16777216.

Adjusting colours by varying the relative proportions of the red, green and blue primaries can be confusing to begin with. For this reason, the program includes a "Colour Picker" to allow

colours to be selected visually. The exact colour can then be fine-tuned by adjusting the exact red, green and blue mixture using the scroll bars.



To select the “Colour Picker” click on the down arrow on the right of the control. This will then display a window showing a complete gamut of colours as shown below.

Colours are selected by clicking anywhere in the colour area. Moving horizontally across the colour area varies the hue (colour) while the saturation of the colour decreases from the top to the bottom. The value (brightness) is selected by clicking on the bar on the right.

Clicking on a colour in the colour area causes that colour to be displayed in the colour box while the RGB values are shown in the frame above the colour picker.

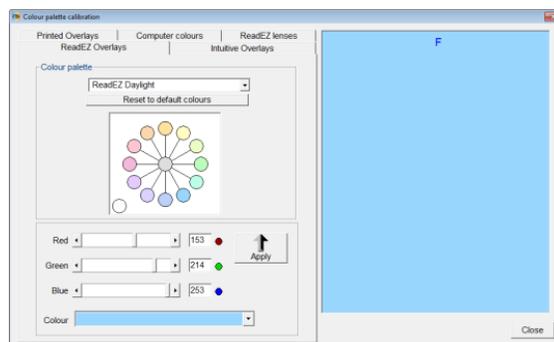
Clicking on the green tick at the bottom of the control will close the colour picker and keep the current colour. Clicking on the red cross will close the control and cancel the colour selection.

## CALIBRATION PROCEDURE FOR READEZ OVERLAYS

The program is designed to be used in conjunction with the *ReadEZ Overlays* supplied by Thomson Software Solutions

**NOTE: A pack of ReadEZ Overlays is included with the software in order to calibrate the computer and for the final stage of the screening process.**

It is very important that the colours displayed on the screen are well-matched to the *ReadEZ Overlay* colours. The program is supplied with a set of default screen colours. These default colours should be reasonably well-matched to the overlay colours for most displays. However, as the colour reproduction of displays can vary quite significantly, it is very important that the screen colours are checked before attempting to use the program.

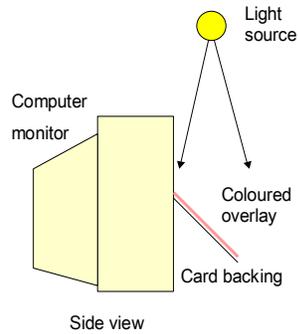


To check the colour calibration, select the *ReadEZ Overlays* tab. This will display the colour calibration window shown below.

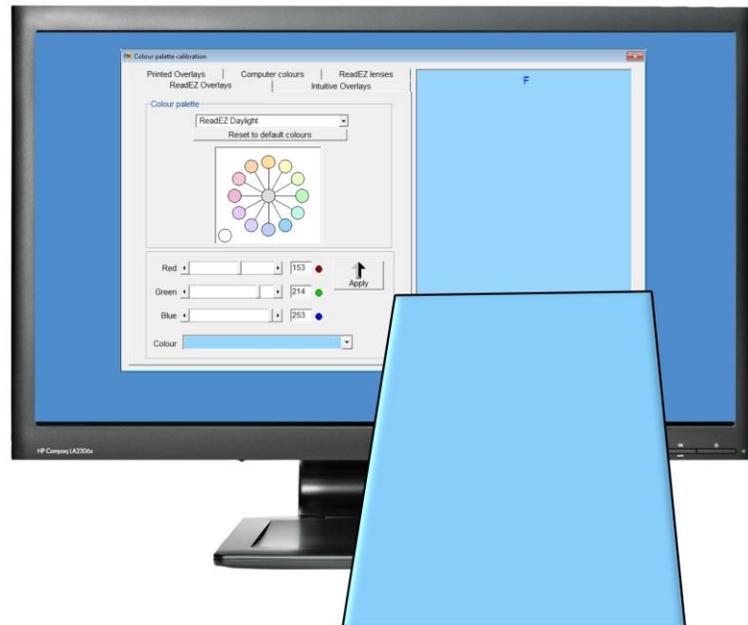
The colour circle represents the twelve overlay colours.

The aim of the calibration procedure is to ensure that each of the colours displayed on the screen are reasonably well-matched to the corresponding overlays.

### MATCHING THE OVERLAY COLOURS



Before starting the calibration procedure, adjust the brightness and contrast of the monitor so that the screen looks clear and sharp. **Do not change these settings after the screen has been calibrated.**



Select the *ReadEZ A* colour by clicking on the sample. The *ReadEZ A* colour will then be displayed in the box on the right of the window and in the colour picker window. The corresponding RGB values will also be displayed.

Select the *ReadEZ A* overlay from your pack and place it on a thick piece of white paper or card. Hold the overlay and the card backing in front of the screen at an angle of approximately 45 degrees as shown in the diagrams.

**NOTE:** The overlay should be illuminated with the same type of light that it will be eventually used under. For example, if the overlay that may be prescribed will be used mainly under daylight, the overlay should be illuminated by daylight and the screen colours matched accordingly.

When you are satisfied that you have achieved a reasonable match, click on *Apply*. The new colour will now be displayed in the colour circle.

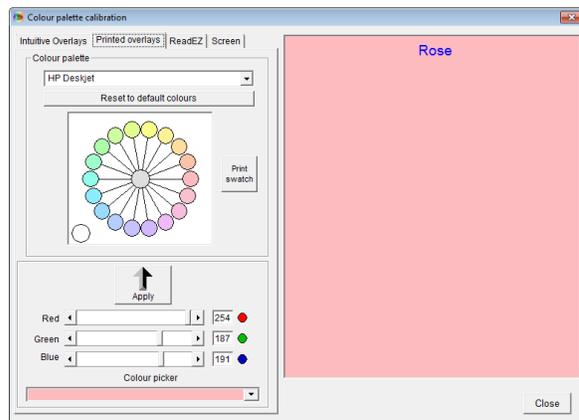
Repeat this procedure for each of the twelve colours.

To reset the colours to the defaults, click on the *Default* button. **NOTE:** this will reset ALL colours in the current palette to their original values.

### CALIBRATION PROCEDURE FOR PRINTED OVERLAYS

*ReadEZ* includes a facility for printing coloured overlays using a standard colour inkjet or laser printer and appropriate transparencies/ acetates. Overlays can be printed in a range of formats and in a very wide range of colours and saturations.

**NOTE:** You will require a colour printer and a pack of suitable acetates in order to complete the calibration.

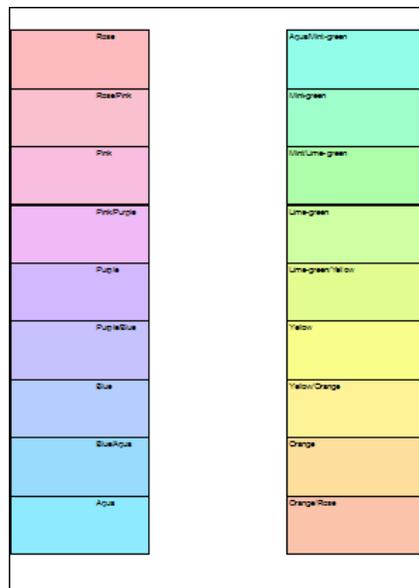


It is very important that the colours displayed on the screen are well-matched to the printed overlay colours. The program is supplied with a set of default screen colours. These default colours should be reasonably well-matched to the printed colours. However, as the colour reproduction of displays and printers can vary quite significantly, it is very important that the screen colours are checked before attempting to use the program.

To check the colour calibration, select the *Printed Overlays* tab. This will display the colour calibration window shown below.

The colour circle represents the eighteen standard printed overlay colours.

Load your colour printer with an appropriate A4 transparency/ acetate and click on *Print swatch*. **Note:** it is very important that you use a transparency/ acetate designed for your type of printer (Inkjet or Laser).

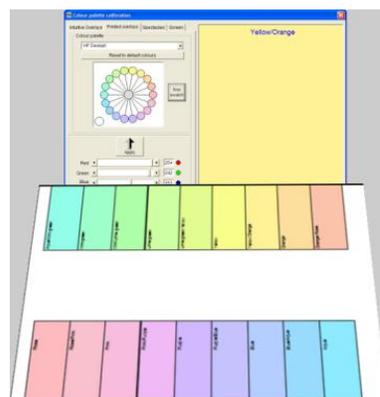


This will print the colour swatch shown to the left.

The aim of the calibration procedure is to ensure that each of the colours displayed on the screen are reasonably well-matched to each of the colours on the swatch.

The procedure is similar to that described for ReadEZ Overlays above.

A variety of colour palettes are available for different display types, printers and illuminants in the pull down list box above the colour circle. Select the palette description that applies to the display type you are using and the type of light that the overlay will be used under.



Select the *Yellow/Orange* colour by clicking on the sample at 1 o'clock in the colour circle. The *Yellow/Orange* colour will then be displayed in the box on the right of the window and in the colour picker window. The corresponding RGB values will also be displayed.

Place the printed acetate on a thick piece of white paper or card and rotate it by 90 degrees as shown in the diagram to the left. Position the *Yellow/Orange* rectangle so that it is next to the screen. Hold the acetate and the card backing in front of the screen at an angle of approximately 45 degrees as shown in the diagram above.

**NOTE:** The overlay should be illuminated with the same type of light that it will be eventually used under. For example, if the overlay that may be prescribed will be used mainly under daylight, the overlay should be illuminated by daylight and the screen colours matched accordingly.

Adjust the screen colours as described above until you have achieved a reasonable match with the printed colour. When you are satisfied that you have achieved a reasonable match, click on *Apply*. The new colour will now be displayed in the colour circle.

Repeat this procedure for each of the eighteen colours in the circle.

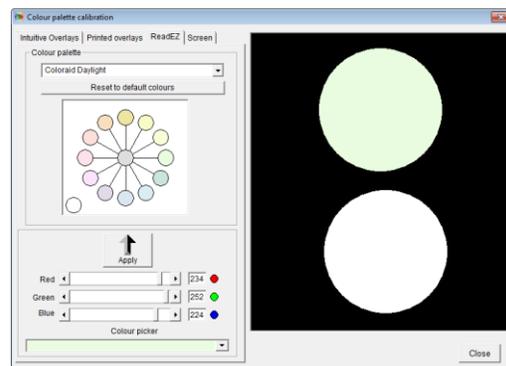
To reset the colours to the defaults, click on the *Default* button. **NOTE:** this will reset **ALL** colours in the current palette to their original values.

### CALIBRATION PROCEDURE FOR READ EZ TINTED LENSES

Coloured overlays are an ideal way of providing colour for reading printed text. However, they are of course not suitable for writing or for viewing text displayed on an overhead projector or computer screen. For these purposes, tinted spectacles can be a good solution.

There are a number of ways of determining the optimum colour for tinted spectacles and there is some evidence that the optimum colour for spectacles differs from that required for overlays.

A number of proprietary systems are available including the Irlen system and the Intuitive Colorimeter / Precision tinting system. While these systems offer a very wide range of colours, both systems require a significant investment in equipment and the spectacles are expensive. This precludes many individuals from benefiting from coloured spectacles.

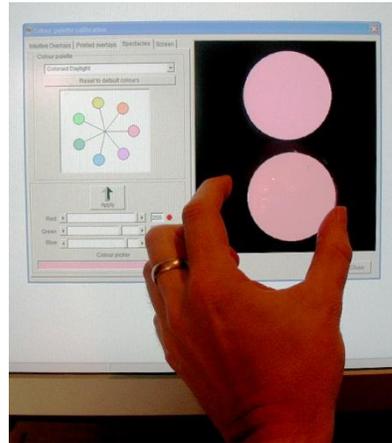


*ReadEZ* uses a set of twelve tinted lenses which are available as “clip-ons” for those who wear spectacles and as non-prescription tinted spectacles for those who do not. While there is some evidence that some individuals are very specific in their choice of colours, research has shown that the majority of individuals with Meares-Irlen can be satisfied with one of these twelve colours.

It is very important that the colours displayed on the screen are well-matched to the *ReadEZ* colours. The program is supplied with a set of default screen colours which should be reasonably well-matched to the lens colours. However, as the colour reproduction of displays can vary quite significantly, it is very important that the screen colours are checked before attempting to use the program.

To check the colour calibration, select the *ReadEZ* tab. This will display the colour calibration window shown to the left. Click on one of the 12 colours shown in the colour circle. The top circle on the right will be set to this colour while the lower circle will be white.

Place the corresponding *ReadEZ* clip-on lens over the white circle as shown in the photograph on the left.



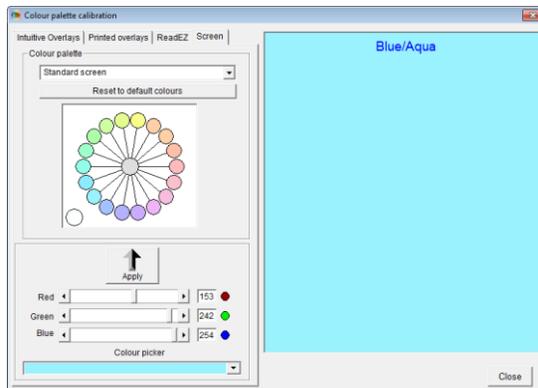
Adjust the screen colours as described above until you have achieved a reasonable match with the *ReadEZ* trial lens. When you are satisfied that you have achieved a reasonable match, click on *Apply*. The new colour will now be displayed in the colour circle.

Repeat this procedure for each of the seven colours in the circle.

To reset the colours to the defaults, click on the *Default* button. **NOTE:** this will reset **ALL** colours in the current palette to their original values.

## CALIBRATION PROCEDURE FOR COMPUTER SCREEN COLOURS

Many people now spend more time reading from computer displays than printed documents. There is now good evidence that a significant proportion of the population can use a computer more efficiently when the screen background colour is other than white.



Screen colours of computers running Windows can be readily changed to any value using the Display Settings. *ReadEZ* includes an efficient algorithm for determining the optimum computer screen colour.

The colours used by this algorithm can be displayed by selecting the *Screen* tab on the *Colour palette calibration* window.

The colours shown in the colour circle should all be approximately the same brightness and should appear to change in approximately equal colour steps.

The default palette is usually adequate but if any of the colours look significantly brighter or dimmer than the others or if the colours do not appear to change in equal colour steps, they may be adjusted in the same way as described for the other testing modes (see above).

## SCREENING – AN OVERVIEW

The aim of the *ReadEZ* screening software is:

- a) to identify those individuals who are likely to benefit from the use of colour and
- b) to determine the optimum colour for ReadEZ overlays, Printed overlays, ReadEZ spectacles and Computer screens.

To achieve this, the program includes the following tests:

### PHASE 1: BASELINE SYMPTOMS WITHOUT COLOUR

The client views a passage of text and is asked a series of questions designed to elicit the characteristic symptoms of Meares-Irlen syndrome

### PHASE 2: BASELINE *RATE OF READING* WITHOUT COLOUR

The *Rate of Reading* test, designed by Prof Wilkins, consists simply of a passage of words that the client is required to read aloud as rapidly and as accurately as possible. The words are all of very high frequency and are therefore familiar to most children, even those whose reading is very poor. The words are arranged in random order to minimise contextual cues. 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* test is initially performed against a white background to establish a baseline for each subject.

### PHASE 3: COLOUR SENSITIVITY SCREENING

During this phase, the client is shown two passages of text. The colour of the background to the text is changed in order to determine which colour(s) are subjectively the most comfortable.

An automated and a manual screening test are provided giving the examiner complete control over the screening procedure.

### PHASE 4: *RATE OF READING* WITH PREFERRED COLOUR

The *Rate of Reading* test is repeated with the colour selected during the screening phase. The difference between the rate of reading with and without a chosen colour has been shown to be a good predictor of whether an overlay will be of sustained benefit.

## PHASE 5: SYMPTOMS WITH PREFERRED COLOUR

The client views a passage of text against a background of their preferred colour, and is asked the same questions as in Phase 1. This provides an assessment of the effects of the colour on symptoms.

Having completed the screening, the program maintains a database of results and is capable of generating a wide variety of reports.

Every effort has been made to keep the program as simple and flexible as possible. The program can be used in many ways, from a regimented screening through to a toolbox of tests that may be selected and used on an *ad hoc* basis.

**USING THE PROGRAM - OVERVIEW**

When the program is run for the first time, you will be prompted to “Add a new organization”

This may be the name of the School or Practice where the software is to be used. You may add other organizations later. Having completed this form select *Save*.

The organization name (in this case test School) will then be shown at the top level of the database (see below).

The next stage is to add the name of the client / patient by clicking on *Add client*. This will display the form shown below:

Having entered the required information, click on *Save*.

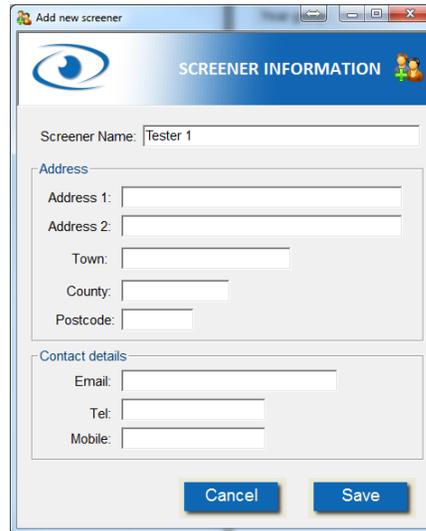
The client's name will then be added to the database as shown below:

These details can be modified at any time by selecting *Edit client*.

You will notice that a range of icons now appear on the toolbar at the top of the screen.

The first stage in the screening process is to determine the baseline for symptoms and rate of reading against a white background. To do this, select the Baseline button in the toolbar.

The first time the program is run, you will be prompted to enter the details of the individual doing the screening (the Screener).

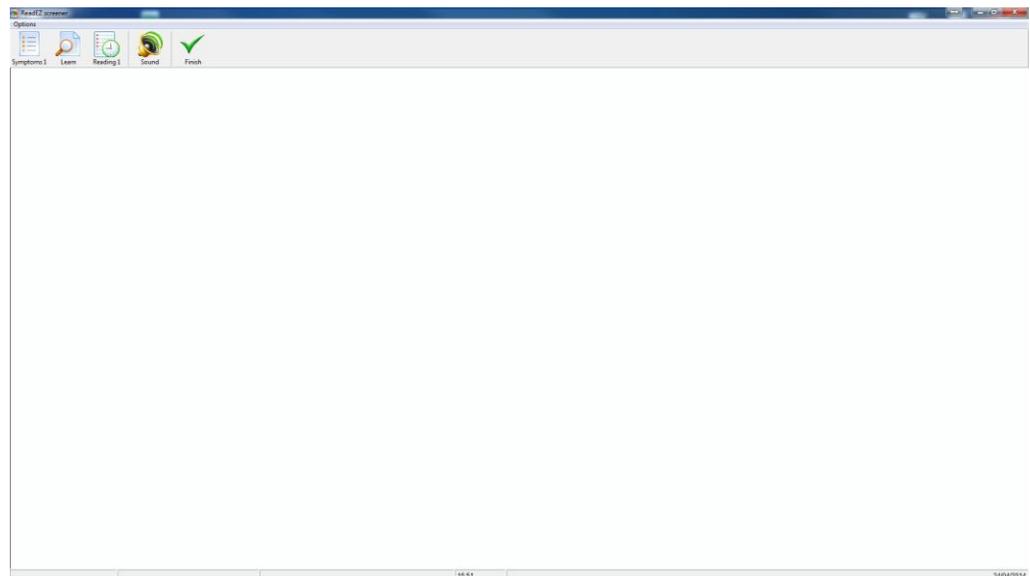


Enter the required information and then click on *Save*.

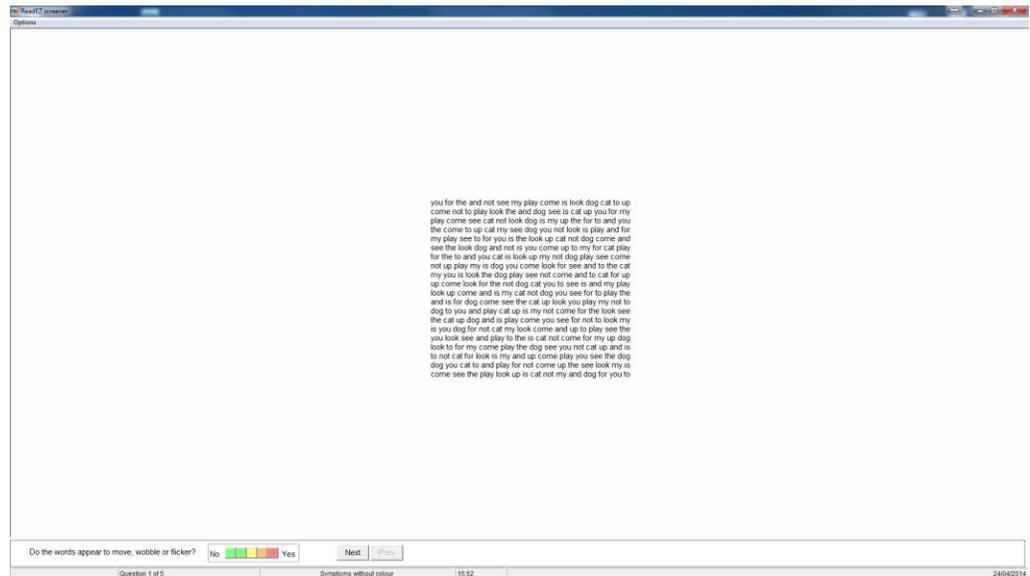
This will display the test screen as shown below:

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## BASELINE SYMPTOMS



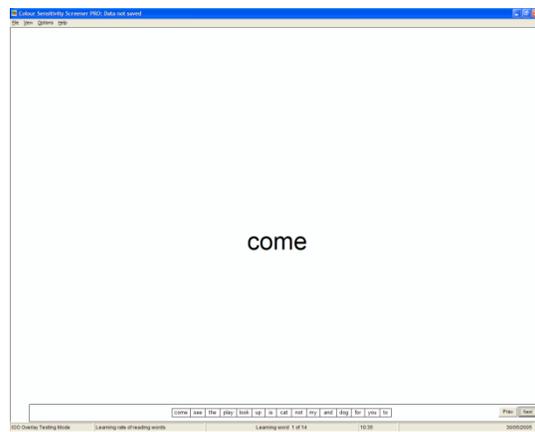
Click on the *Symptoms* button in the toolbar. This will display the screen shown below.



A passage of random words will be displayed in the centre of the screen. The spacing of these words has been chosen to maximize the symptoms of Meares-Irlen syndrome. Instruct the client to look at the words for at least 30 seconds and then ask the questions displayed at the bottom of the screen. For example “Do the words appear to move, wobble or flicker”. Record the client’s response giving some indication of the severity using the coloured squares. For example for a very definite Yes, click on the red button. For a less definite response, click on the yellow button etc. This is very subjective but does give some indication of the severity of the symptom.

Click on *Next* to show the next question and repeat the procedure until all questions have been answered. The screen will then be cleared.

## LEARN RATE OF READING WORDS



In order to perform the *Rate of Reading* test, the client must be able to read the 15 simple words that are used in the test. If the subject’s ability to do this is in doubt, select *Learn Rate of Reading words* from the *View* menu or click on the *Learn* icon on the toolbar.

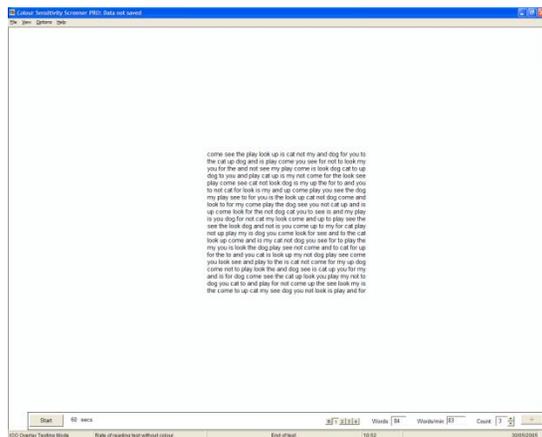
This will display the screen shown. Each of the 15 words can be displayed by clicking on the corresponding words in the response bar or clicking on *Next* or *Prev*.

## BASELINE RATE OF READING

Now select *Reading 1* from the toolbar at the top of the screen. This will display the screen shown below.



The *Rate of Reading* test consists of a passage of words that the client is required to read aloud as rapidly and as accurately as possible. The words are arranged in random order to minimise contextual cues. 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* test is initially performed against a white background to establish a baseline for each subject.

Carefully explain to the client that they will be required to read aloud the words on the screen as quickly and as clearly as they can (or have the computer speak the instructions by clicking on *Sound* on the toolbar).

There is often a practice effect with this test so it is advisable to ask the client to read the text for approximately one minute before recording the baseline result. This also provides an opportunity for the symptoms to “build up”.

To start the clock, click on *Start*. The examiner should listen very carefully and record the number of errors made by surreptitiously clicking on the + key in the response bar or by pressing the Space bar on the keyboard. Care should be taken not to distract the subject. An error should be recorded whenever the client skips a word or line or misreads a word. The total error tally is shown in the response bar (labeled Count) and may be adjusted using the Up and Down arrows at any stage.

The client is usually asked to read for one minute after which the computer will Beep. The examiner should then click on the last word read by the client. The computer will then automatically record the number of words read and calculates the *Rate of Reading* in words/minute. The number of words can be adjusted (to take account of skipped rows for *example*), using the Up and Down arrows.

**NOTE:** If the client has skipped a line, the number of words read will of course be incorrect. To compensate for this, click on the corresponding word on the line above. If two lines have been skipped, click on the same word on two lines above etc.



Research has shown that a reading time of 1 minute is generally optimal for the test. However, the clock may be stopped at any time and the reduced recording time will be taken into account when calculating the rate of reading.

Having completed the Baseline measurements, select *Finish* from the toolbar. This will display the form below:

Select the correct screener name from the pull-down list and enter any additional notes you wish to record. To save the Baseline results, click on *Save*. To return to the main screen without saving the results select *Cancel*.

You will notice that the Baseline results will now be shown on the report form as shown below:

**NOTE:** One set of Baseline results is stored for each client although these tests can be repeated at any time.

SCREENING FOR MEARES-IRLEN SYNDROME – STEP BY STEP

SELECTING A SCREENING MODE

Having assessed Baseline symptoms and Rate of Reading against a white background, the next stage is to assess if the client benefits from colour.

The ReadEZ software is capable of determining the optimum colour for Overlays (ReadEZ and Printed), Tinted lenses and a Computer screen.

The first stage in the screening process is to select a Screening Mode using the toolbar at the top of the screen.



ReadEZ Overlay Screening Mode. Select this mode if you intend to prescribe *ReadEZ* Overlays (available from Thomson Software Solutions)



Printed Overlays Screening Mode. Select this mode if you intend to print your own overlays using a colour printer and appropriate acetates



ReadEZ Spectacles Screening Mode. Select this mode if you intend to prescribe *ReadEZ* tinted lenses or you have facilities for tinting lenses

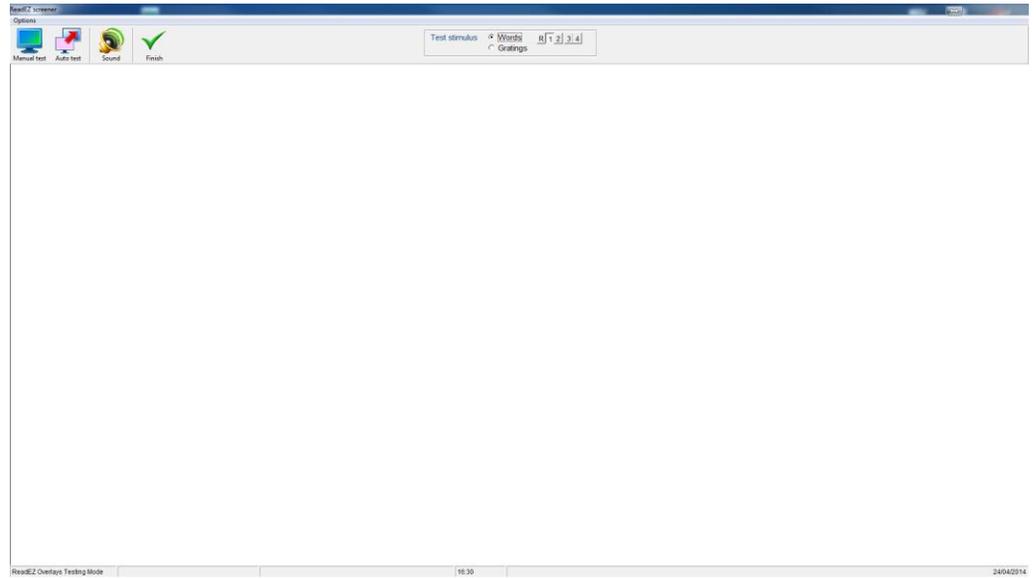


Computer Display Colour Screening Mode. Select this mode to determine the optimum background colour for computer displays

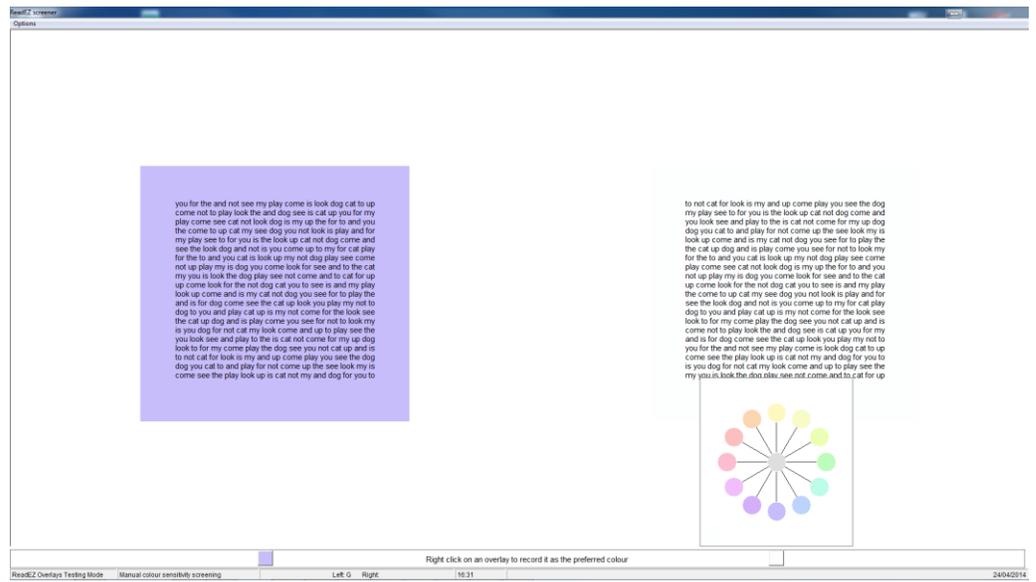
To commence screening, select the corresponding button on the toolbar.

READEZ AND PRINTED OVERLAY MODES

In *ReadEZ* and *Printed Overlay* screening modes, the screen below will be displayed.



To perform a manual test, select *Manual Screening* from the toolbar. This will display the screen shown below:



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## MANUAL OVERLAY SCREENING

In *ReadEZ Overlay* and *Printed Overlay* screening modes, the *Rate of Reading* text is displayed in two blocks on the screen and the examiner can readily change the background colour of each block to an overlay colour, thus simulating placing an overlay filter over text in a book.

The text can be replaced by a horizontal grating by selecting gratings from the toolbar at the top of the screen. The spacing of the bars can then be changed using the slider control. The spacing should be set so that any symptoms are maximized.

A colour is selected by passing the mouse over the two “tiles” placed in the toolbar at the bottom of the screen. This will display the colour atlas showing the colours available in the current mode (12 for ReadEZ Overlay mode and 18 for Printed Overlay mode). A colour is selected by simply clicking on the required colour in the colour atlas.

An overlay colour is selected by simply clicking on the desired colour in the colour circle. The palette will be automatically hidden and the text will now have the chosen background colour.

A grey background may be selected by clicking on the grey circle in the centre and the background may be returned to white by clicking anywhere on the white background.

**Note:** To record the final colour chosen by Manual Screening, Right Click on the preferred overlay.

---

## MANUAL OVERLAY SCREENING ROUTINE

Various algorithms have been proposed for manual screening but the protocol below is recommended:

- Select two different overlay colours for the left and right blocks of text as shown above.
- Ask the client which of the two colours they find more comfortable to look at.
- Keep the colour that is preferred and select another colour for the other side.
- Repeat this procedure until all the colours in the circle have been presented.
- The preferred colour should then be compared to grey to ensure that the subjective preference is based on colour rather than decreased contrast.

**Note 1:** Most examiners develop their own variation on this basic protocol and include some degree of cross checking.

**Note 2:** This “forced choice” procedure will always result in a colour being chosen (even if there is no real improvement). The overlay would only normally be prescribed if there is a significant improvement in the *Rate of Reading*.

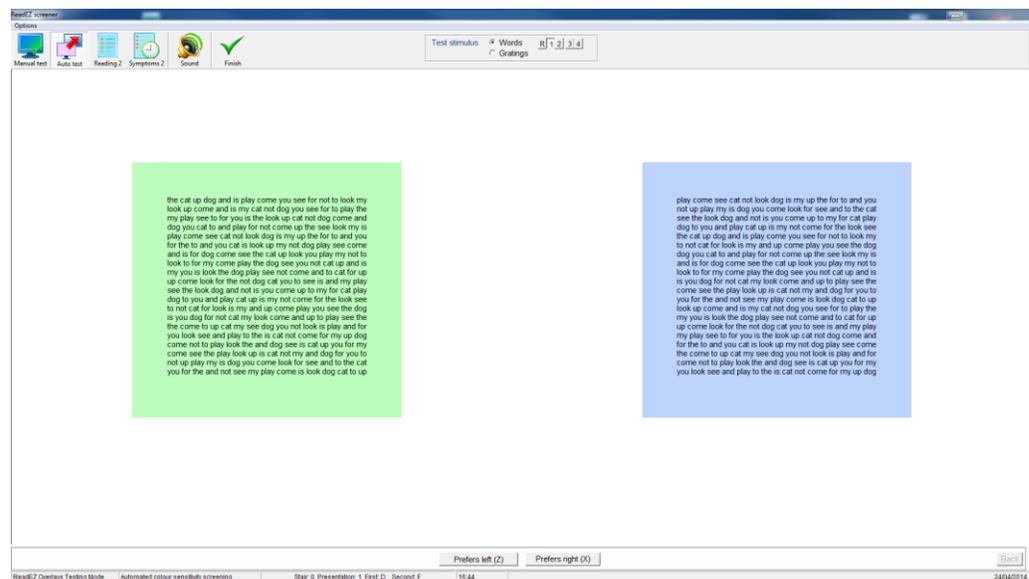
**Note 3:** In some cases, the colour chosen on the screen may be slightly different to the optimum overlay colour (even if the screen colours have been carefully matched to the overlay colours). Research has shown that those with pronounced colour sensitivity usually choose the same colour on the screen and when tested using actual overlays. Those with less pronounced colour sensitivity may choose different colours on the screen although the choice is usually within one overlay colour. There is some evidence that when there is a difference between the colour chosen on the screen and that chosen by conventional overlay screening, the screen colour results in better reading performance. However, it is advisable to confirm the chosen colour using an actual overlay under the same lighting conditions that the overlay will be used.

## AUTOMATED COLOUR SENSITIVITY SCREENING

The automated colour sensitivity screening routine provides a quick and easy method for determining the preferred colour in each screening mode.

The routine is similar to that outlined above for manual screening but the software automatically chooses the colours and analyzes/ records the results. This not only speeds up the screening procedure, but also allows for more rigorous cross checking of responses.

Automated colour sensitivity screening mode is selected by clicking on *Auto test* from the toolbar. This will display the screen shown below:



The routine is similar for all screening modes except that for the *ReadEZ Overlays* and *Printed Overlays* modes, two blocks of text with different coloured background are displayed simultaneously side by side, while in *ReadEZ Spectacles* and *Computer Display Colour* modes,

the two colours are presented successively, one after the other. The presentation duration in these modes can be specified from the *Options* screen.

The examiner records the choice by either clicking on the preferred colour directly or by clicking on the *Prefers left* or *Prefers right* buttons in the response bar (*Prefers first* or *Prefers second* in *RaedEZ Spectacles* and *Computer Display Colour* modes).

The program will then display another pair of colours and the process is repeated until all colours have been shown a number of times and in various combinations.

The program will then compare the preferred colour with grey.

If the subject changes their mind or the examiner clicks on the wrong button, the program can be returned to the previous presentation by clicking on the *Back* button.

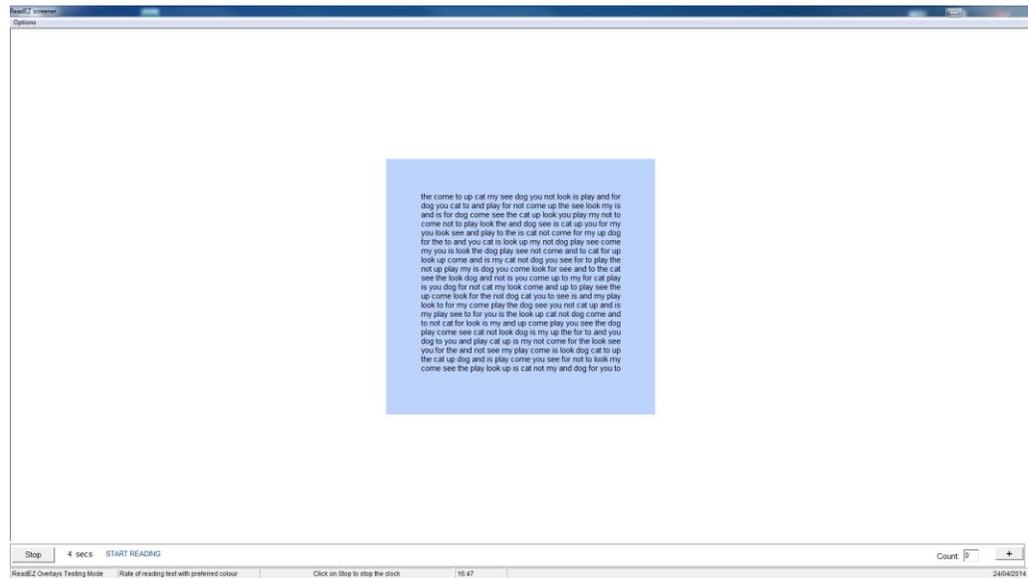
**Note 1:** This “forced choice” procedure will always result in a colour being chosen (even if there is no real improvement). The overlay would only normally be prescribed if there is a significant improvement in the Rate of Reading.

**Note 2:** In some cases, the colour chosen on the screen may be slightly different to the optimum overlay colour (even if the screen colours have been carefully matched to the overlay colours). Research has shown that those with pronounced colour sensitivity usually choose the same colour on the screen and when tested using actual overlays. Those with less pronounced colour sensitivity may choose different colours on the screen although the choice is usually within one overlay colour. There is some evidence that when there is a difference between the colour chosen on the screen and that chosen by conventional overlay screening, the screen colour results in better reading performance. However, it is advisable to confirm the chosen colour using an actual overlay under the same lighting conditions that the overlay will be used.

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#### RATE OF READING TEST WITH COLOUR

The *Rate of Reading* test is repeated using the colour determined by either the manual or automated screening procedure by clicking on *Reading 2* icon on the toolbar. In *ReadEZ Overlays* and *Printed Overlays* screening modes, the screen is as shown below.



In *ReadEZ* and *Computer Display Colour* screening modes, the entire screen is coloured.

By default, the colour will be set to the colour selected by the automated screening procedure (or grey if this has not been done).

The test procedure is exactly the same as that described for the “no overlay” condition (see above).

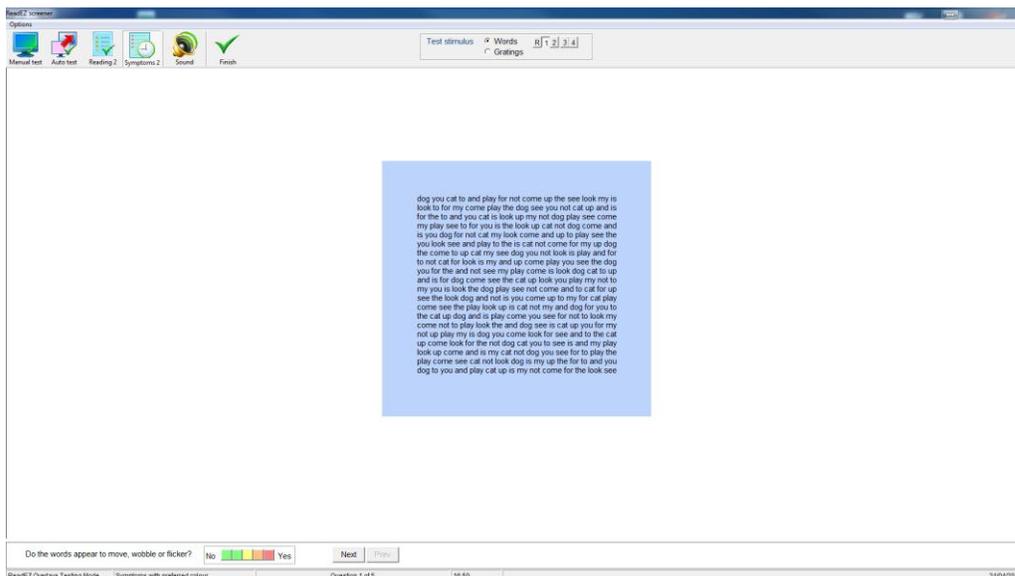
## SYMPTOMS (WITH COLOUR)

The symptoms procedure described above is repeated with the client looking at the same text against a background of their preferred colour by clicking the *Symptoms 2* icon on the toolbar.

If the colour reduces the perceptual distortion, some amelioration of the symptoms would be expected compared to the white background.

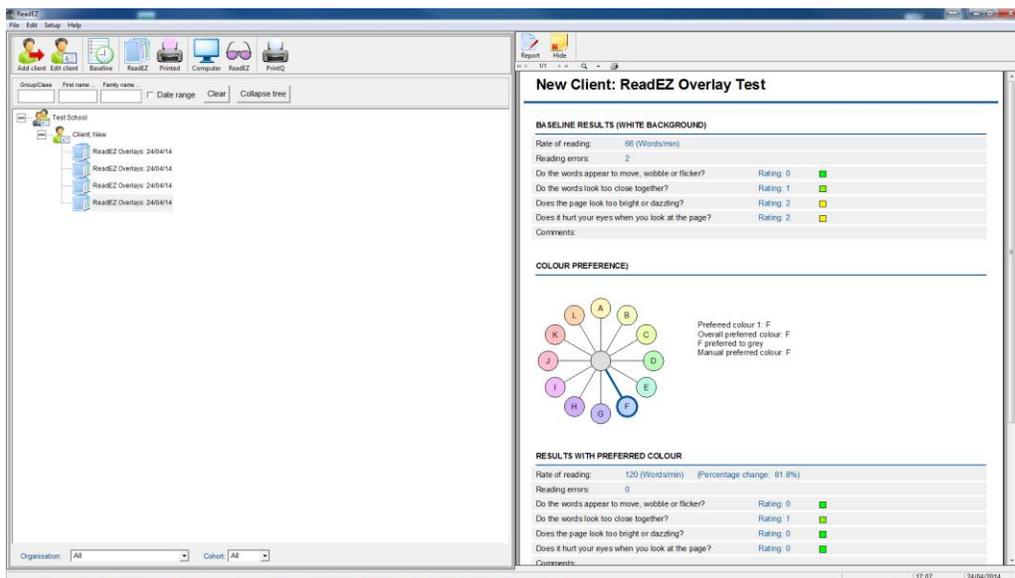
By default, the colour will be set to the colour selected by the automated screening procedure (or grey if this has not been done).

In *ReadEZ* and *Computer Display Colour* screening modes, the entire screen is coloured.



Having completed the screening test, click on *Finish* to record the results.

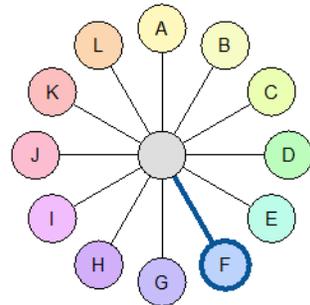
The results will be displayed on the report screen as shown below:



The Baseline results are shown at the top of the report showing the Rate of Reading and Symptoms with a white background.

The *Colour Preference* section gives the results of the colour screening test.

COLOUR PREFERENCE)



Preferred colour 1: F  
 Overall preferred colour: F  
 F preferred to grey  
 Manual preferred colour: F

The colour wheel shows the colours available in the chosen screening mode with the preferred coloured outlined in bold (in this case ReadEZ overlay F). Where a client has been indecisive, a number of shorter “spokes” will be shown on the colour wheel.

The preferred colours for the Auto and Manual screening (if performed) are shown next to the colour wheel along with the results of the control comparison with grey.

The section below this shows the results of the *Symptoms* and *Rate of Reading* tests performed with the preferred colour.

RESULTS WITH PREFERRED COLOUR

Rate of reading:	120 (Words/min)	(Percentage change: 81.8%)
Reading errors:	0	
Do the words appear to move, wobble or flicker?	Rating: 0	■
Do the words look too close together?	Rating: 1	■
Does the page look too bright or dazzling?	Rating: 0	■
Does it hurt your eyes when you look at the page?	Rating: 0	■

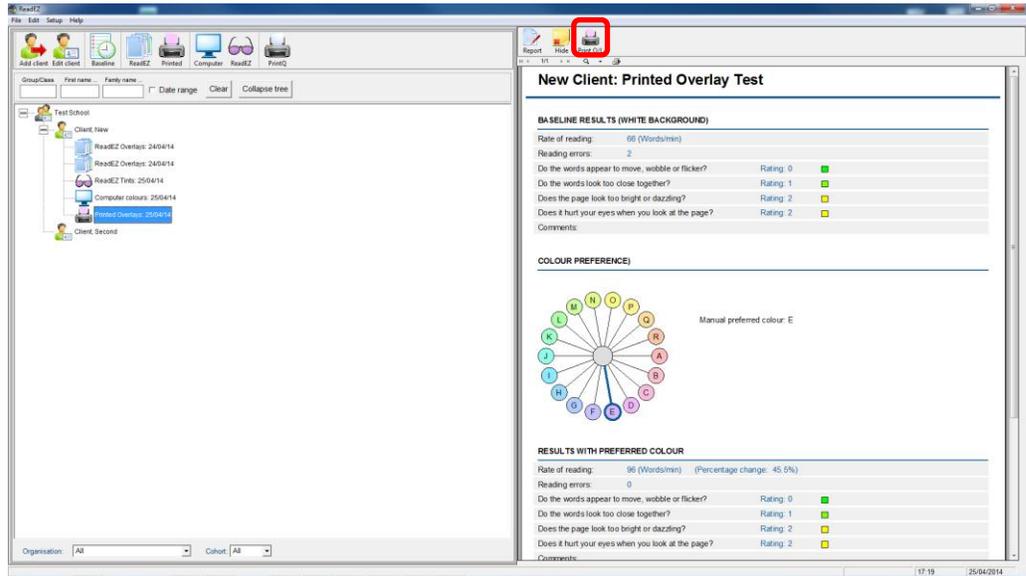
The percentage change in rate of reading relative to the Baseline value is also given.

The format of the report allows a rapid assessment of the symptoms and reading performance against a white background, the preferred colour and any change in symptoms or reading performance with the preferred colour.

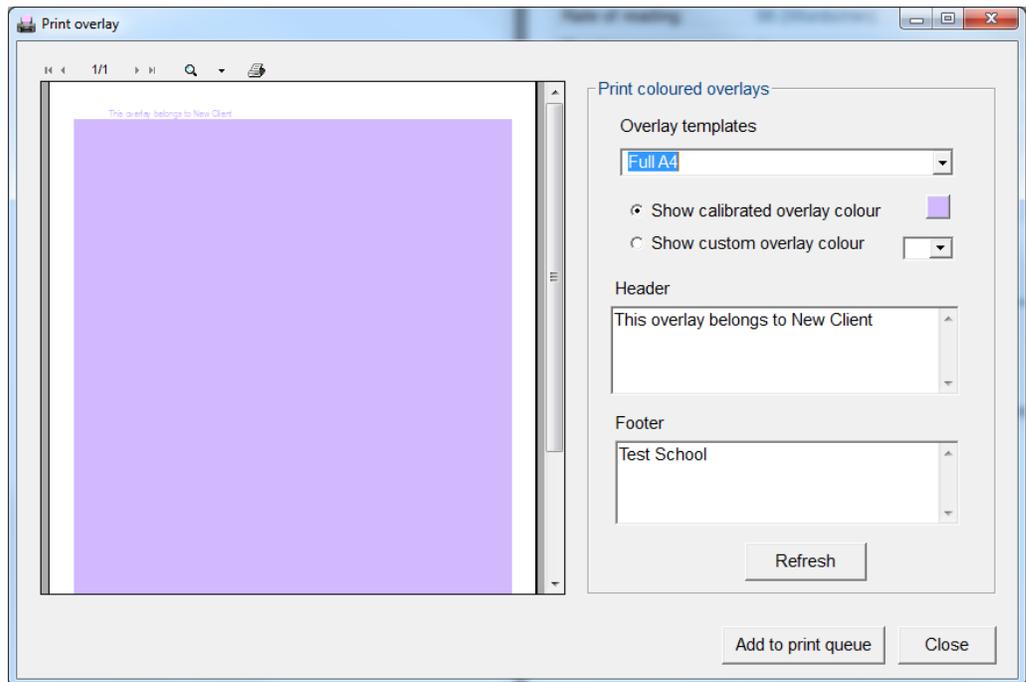
The report may be moved, magnified or printed using the buttons at the top of the page.

PRINTING OVERLAYS

If the *Printed overlays* test has been completed, the toolbar above the report will have an additional button as shown below.



Selecting this button displays the *Print overlay* window as shown below.



This dialog allows overlays to be printed in various formats and in any colour using a standard inkjet or colour laser printer and acetates.

**Note 1:** Ensure that you purchase acetates which are compatible with your printer type (inkjet or Laser).

**Note 2:** Before screening in Printed Overlay mode you should ensure that the screen colours are reasonable well-matched to the printer colour colours by following the calibration instructions described above.

### READEZ SPECTACLES MODE

The *ReadEZ* tints are available as clip-ons to wear over existing spectacles, as plano (zero power) spectacles or made up to a spectacle prescription through our partner organization Norville Optical.



To determine the optimum *ReadEZ* tint for a client, select the *ReadEZ* spectacles icon in the toolbar.

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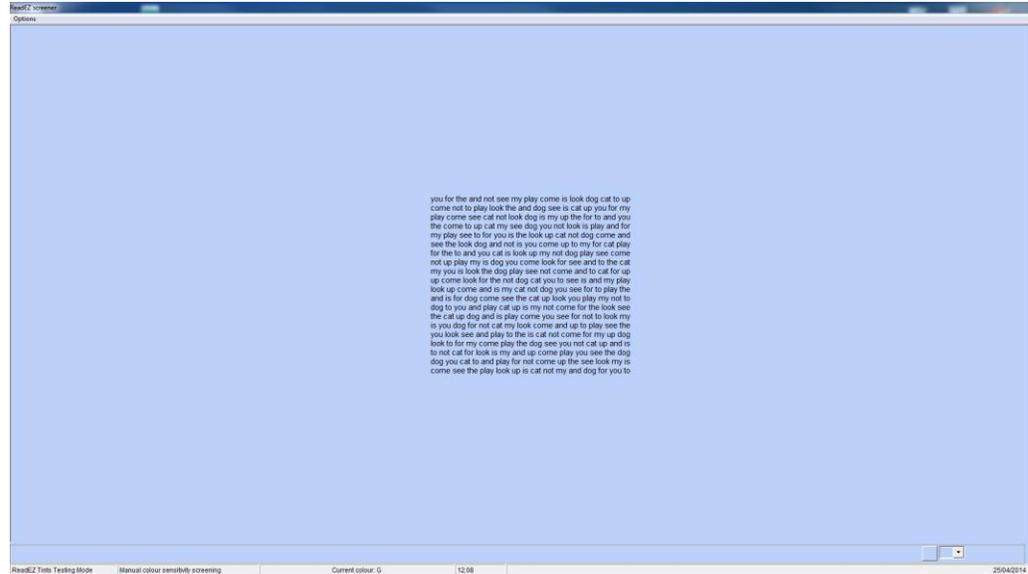
### MANUAL SCREENING ROUTINE FOR READEZ TINTED LENSES

To manually determine the optimum colour for a *ReadEZ* tint, select the *Manual test* icon in the toolbar. In *ReadEZ Spectacles* screening mode, the *Rate of Reading* text is displayed in a single block on the screen and the entire screen is coloured as shown below.

**IMPORTANT:** When wearing tinted spectacles, the entire visual field is coloured. To simulate this, **the test should be performed in a dark room** so that the coloured computer screen is the only object present within the visual field.

The *ReadEZ* palette can be displayed by moving the mouse cursor over the tile on the right of the response bar. The screen colour can be changed to simulate any of the twelve *ReadEZ* tints by simply clicking on the required colour.

To record the current colour as the preferred colour Right Click on the text in the centre of the screen.



It is generally recommended that the automated routine for *ReadEZ* Tinted Lenses is performed first (see below). This will present each of the *ReadEZ* colours in various combinations to determine the optimum colour. This colour can be checked using the following routine:

- Select the colour selected by automated screening and ask the client to look at the screen for at least five seconds.
- Select a second colour and present this for at least five seconds. Ask the client which of the two colours they found the more comfortable to look at. Repeat this process with the same two colours if required.
- Keep the colour that is preferred and select another colour from the circle.
- Repeat this procedure until all the colours in the circle have been presented.
- Having determined the overall preferred colour, compare this to white and confirm that the coloured screen is better.
- The preferred colour should then be compared to grey to ensure that the subjective preference is based on colour rather than decreased contrast.

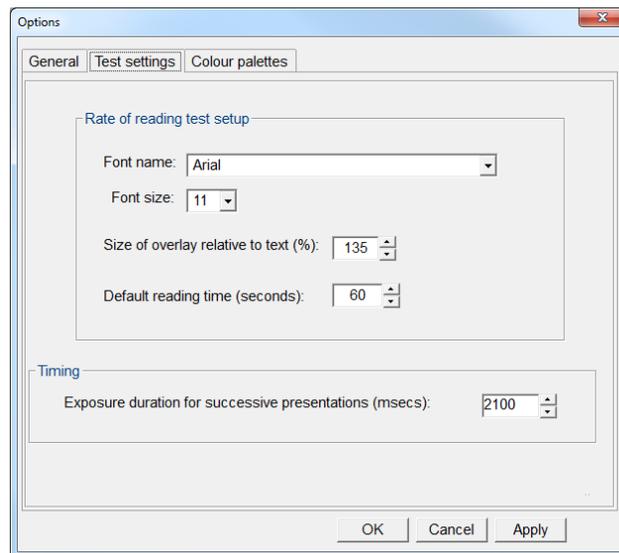
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## AUTOMATED SCREENING ROUTINE FOR READEZ TINTED LENSES

To automatically determine the optimum colour for a *ReadEZ* tint, select the *Auto test* icon in the toolbar. In *ReadEZ Spectacles* screening mode, the *Rate of Reading* text is displayed in a single block on the screen and the entire screen is coloured as shown below.

**IMPORTANT:** When wearing tinted spectacles, the entire visual field is coloured. To simulate this, **the test should be performed in a dark room** so that the coloured computer screen is the only object present within the visual field.

In *Auto test* mode, two *ReadEZ* colours are presented one after the other and the client is asked to report which of the two colours is more “comfortable”. The timing of the presentations can be changed by selecting *Options* at the top of the screen. This will display the window shown below:



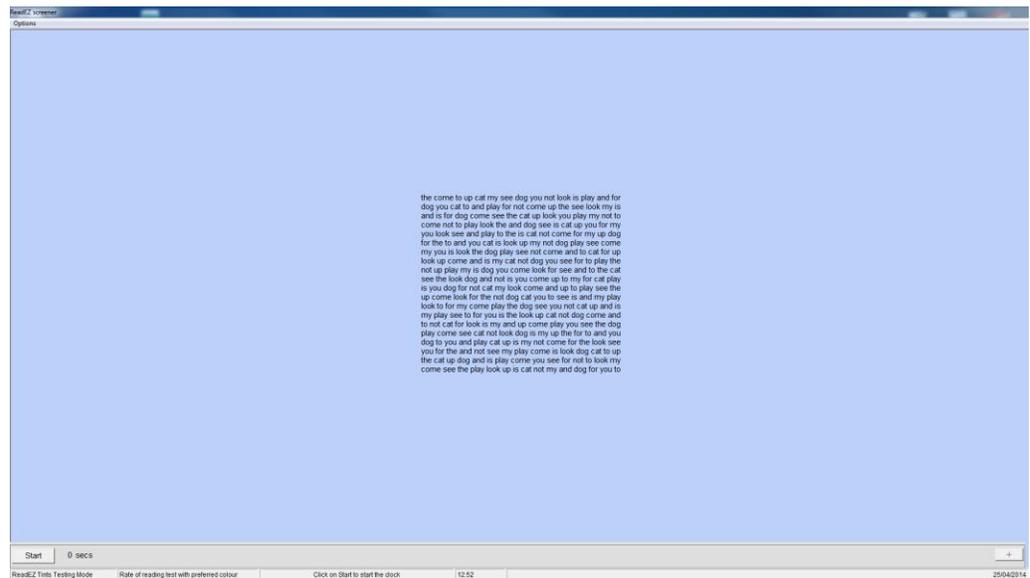
The exposure duration can be changed by selecting the *Test settings* tab and using the up down arrows. The default setting is approximately 2 seconds which generally provides a good compromise between providing adequate time for adaptation and overall test duration. However this may be changed to suit the capability of the client.

The client is asked to report whether the first or second screen was preferred and this response is recorded using the *Prefers first* and *Prefers second* buttons at the bottom of the screen:



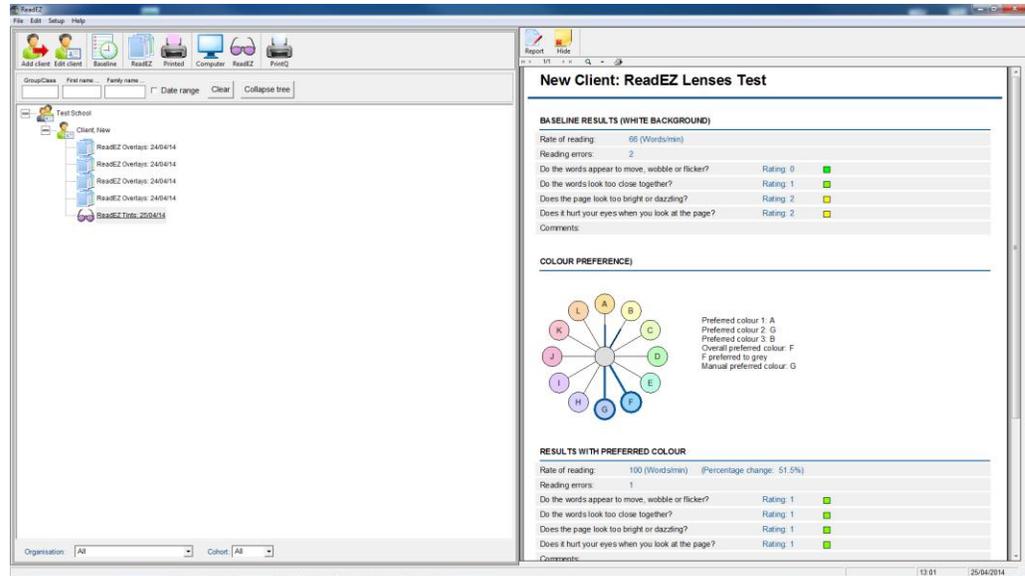
Each colour in the *ReadEZ* palette is compared with every colour in a systematic sequence. This usually involves about 35 presentations in order to determine the overall colour preference.

The *Rate of reading* and *Symptoms* tests are then repeated with the preferred colour (as described above for the overlays), the only difference being that the whole screen is coloured as shown below:



Having completed these tests, click on *Finish* to return to the main screen.

The preferred *ReadEZ* tint colour and reading performance with this colour are shown in a similar format to that described above for the overlays:

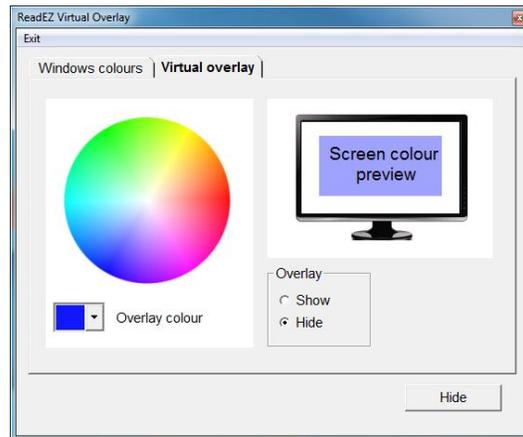


## COMPUTER DISPLAY COLOUR MODE

Many people now spend more time looking at computer displays than paper copy. Those with Meares-Irlen syndrome can “tint” their screen by placing an overlay over the screen (not usually very practical), by viewing the screen through tinted lenses or by changing the actual colours of the screen.

Most computer operating systems allow the user to change the screen background colours although this process can be rather complex.

PC users can download the *ReadEZ virtual overlay* software from [www.thomson-software-solutions.com](http://www.thomson-software-solutions.com). This allows the user to change the screen colours to a colour of their choice at the click of a button.



The *ReadEZ* software can be used to determine the optimum display screen colour. The user can then use this information to change the colour of their own computer screen to the optimum colour.

To determine the optimum computer screen colour select *Computer* from the toolbar. The optimum colour can then be determined using the *Manual test* or the *Auto test*.

## MANUAL SCREENING FOR DETERMINING THE OPTIMUM COMPUTER DISPLAY COLOUR

In *Manual test* mode the screen below is shown:



The colour of the screen can be changed to one of the 18 colours in the colour palette by moving the mouse cursor over the tile at the bottom of the screen and select the required colour from the colour wheel.

It is generally recommended that the client is screened using the automated routine to establish which colour (if any) is of benefit. If a clear benefit is obtained with the standard colours it is worth proceeding to optimize the screen colour.

- Select the colour determined by automated screening and ask the client to look at the screen for at least five seconds.
- Select a second colour and present this for at least five seconds. Ask the client which of the two colours they found the more comfortable to look at. Repeat this process with the same two colours if required.
- Keep the colour that is preferred and select another colour from the circle.
- Repeat this procedure until all the colours in the circle have been presented.
- Having determined the overall preferred colour, compare this to white and confirm that the coloured screen is better.
- The preferred colour should then be compared to grey to ensure that the subjective preference is based on colour rather than decreased contrast.

The screen colour can be further refined using the Colour picker control. This is selected by clicking on the down arrow next to the tile at the bottom of the screen. This displays the screen shown below.



This control provides instant access to the complete gamut of colours available on a computer screen by simply clicking on the spectrum to select colour and saturation and the bar to the right to select “brightness”.

**Having determined the optimum colour, this can be recorded by Right clicking on the text in the centre of the screen.**

## AUTOMATED SCREENING ROUTINE FOR COMPUTER DISPLAY COLOURS

To automatically determine the optimum colour for a computer display, select the *Auto test* icon in the toolbar. In *Computer* screening mode, the *Rate of Reading* text is displayed in a single block on the screen and the entire screen is coloured as shown below.

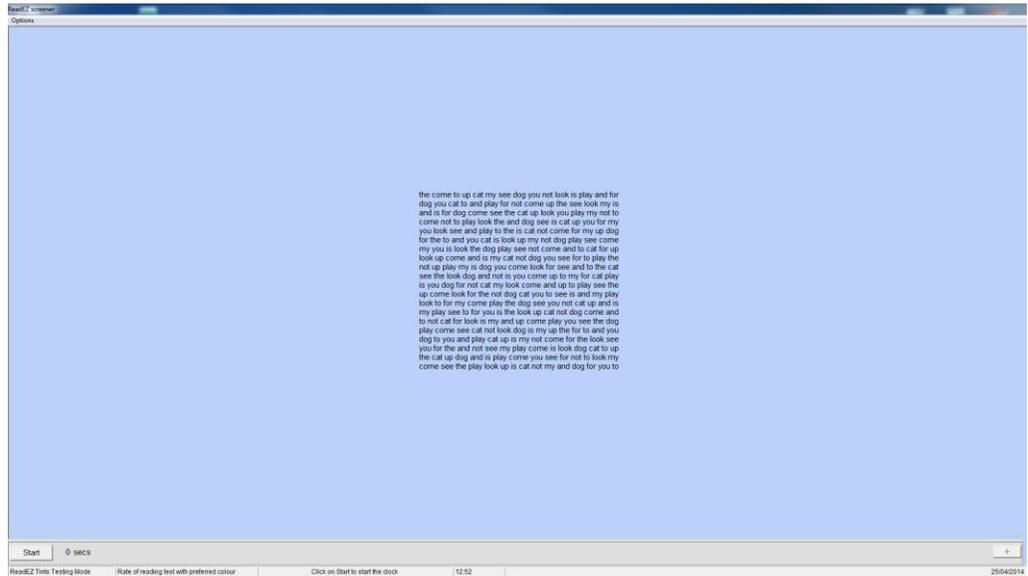
In *Auto test* mode, two colours are presented one after the other and the client is asked to report which of the two colours is more comfortable. The timing of the presentations can be changed by selecting *Options* at the top of the screen (as described earlier).

The client is asked to report whether the first or second screen was preferred and this response is recorded using the *Prefers first* and *Prefers second* buttons at the bottom of the screen:



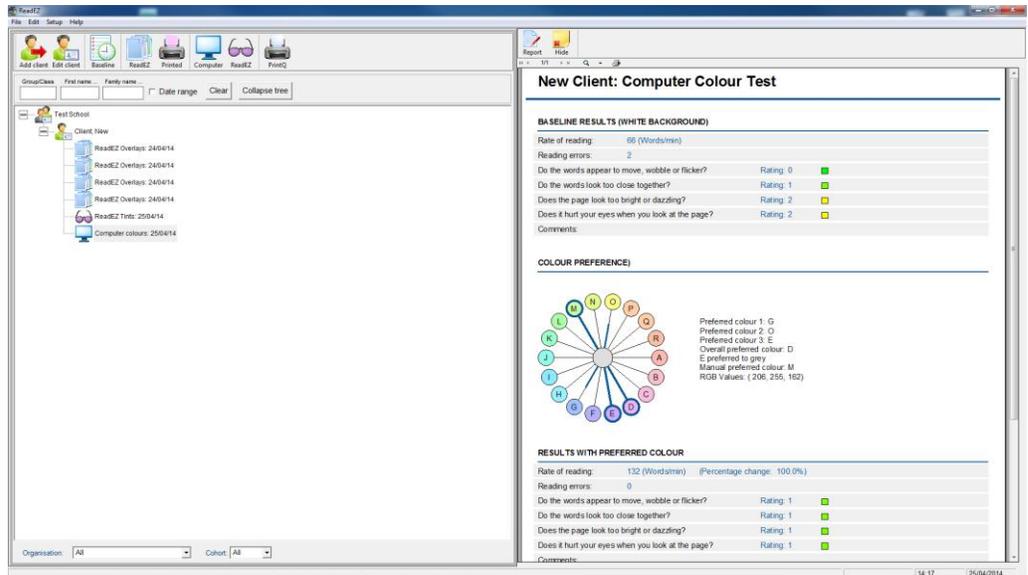
Each colour in the palette is compared with every colour in a systematic sequence. This usually involves about 35 presentations in order to determine the overall colour preference.

The *Rate of reading* and *Symptoms* tests are then repeated with the preferred colour (as described above).



Having completed these tests, click on *Finish* to return to the main screen.

The preferred *Computer* colour and reading performance with this colour are shown in a similar format to that described above for the overlays:



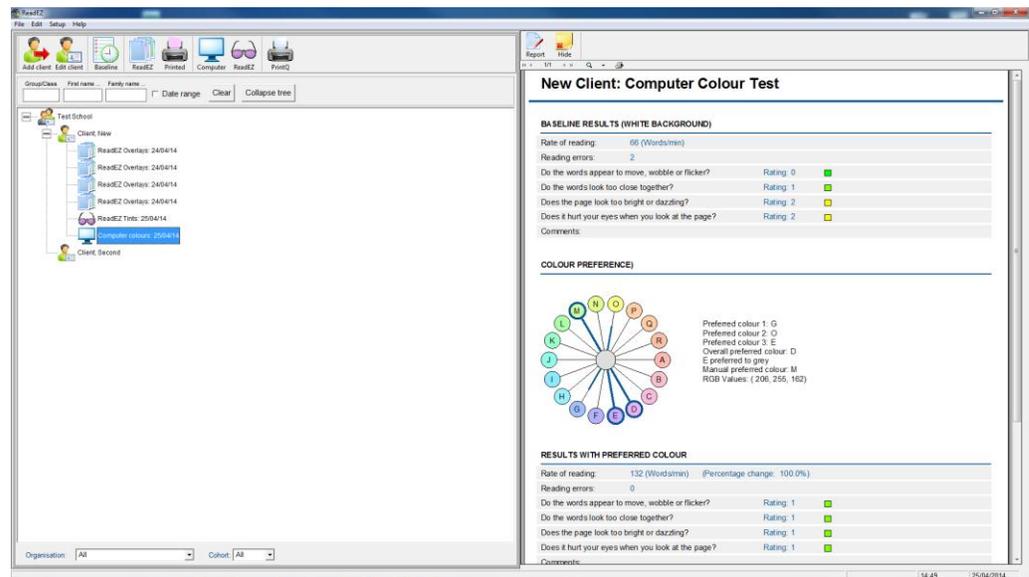
The user may then use the RGB values printed to set up the chosen colour on their PC.

**Note:** Colour reproduction varies between computers and therefore the settings found for the optimum colour on the test computer may be slightly different to those required to produce

the same colour on the subject’s computer. The client should be advised of this possibility and instructed to fine tune the colour selection on their own computer.

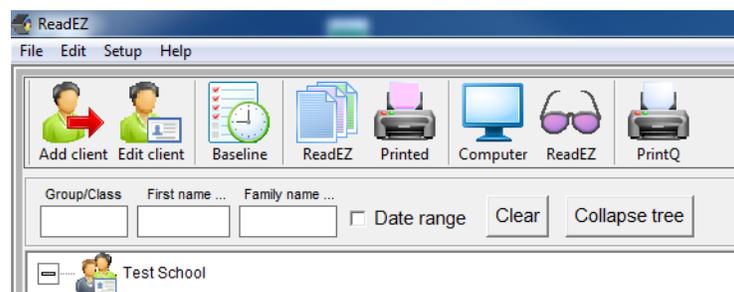
**DATABASE FUNCTIONS**

The *ReadEZ* software includes a powerful relational database to store test results. The database has a three tier structure consisting of Organization .... Client .... Results (as shown below).



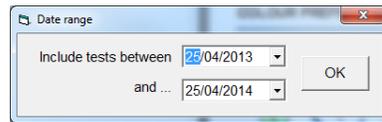
The software allows multiple organizations (for example different schools, classes, opticians), an unlimited number of clients under each organization and an unlimited number of results under each client.

The database is shown in an outline control so that each tier can be expanded or closed by clicking on the + or – symbols. The list can also be filtered by organization (Group/Class), first name, family name or date range using the controls above the database list.



For example entering “d” in *First name* will filter the list to show just those clients with a first name beginning with “d”. Wildcards may also be used – entering “d?v” will show all records beginning with “d” and with a third letter of “v”. The same applies to all filters and the filters are used in combination. For example, entering “d” into *First name* and “t” into *Family name* will show all record where the first name begins with “d” AND the second name begins with “t”.

To show all records within a date range, select the *Date range* check box. This will display the window shown below:



Select the required date range using the calendar control and select *OK*. The list will now be filtered to show just those tests which were performed between these dates.

The filter boxes can be cleared by clicking on the *Clear* button and the database tree can be collapsed using the *Collapse tree* button.

The database list can also be filtered to show specific organizations and a specific cohort of clients using the pull down lists at the bottom of the screen.



To show all organizations and cohorts select “All” in each list. To show one organization only, select this from the list.

Cohort is used to refer to a specific group – for example children in a certain year group. This information is entered when a client is added to the database (as shown below). The database list may be filtered to show just those clients within a specific cohort by selecting the required cohort year from the pull down list.

The screenshot shows the 'Edit record' window with the 'PERSONAL INFORMATION' tab selected. The 'Cohort\*' dropdown menu is highlighted with a red box, indicating it is the focus of the instruction. The form contains the following fields and values:

- Organisation: Test School
- Group/class: 2D
- First name\*: New
- Family name\*: Client
- Gender\*:  Male  Female
- Date of birth\*: 24/04/2005
- Ethnicity: CHNE Chinese
- Ref number: 123123
- Doctor: (empty)
- Contact: (empty)
- Address: (empty)
- Address 1: (empty)
- Address 2: (empty)
- Town: (empty)
- County: (empty)
- Postcode: (empty)
- Contact details:
  - Email: (empty)
  - Tel: (empty)
  - Mobile: (empty)

Buttons for 'Cancel' and 'Save' are located at the bottom right of the window.

A new organization may be added by selecting *Edit ... Add new organization* or details of an existing organization may be changed by selecting *Edit ... Edit current organization*.

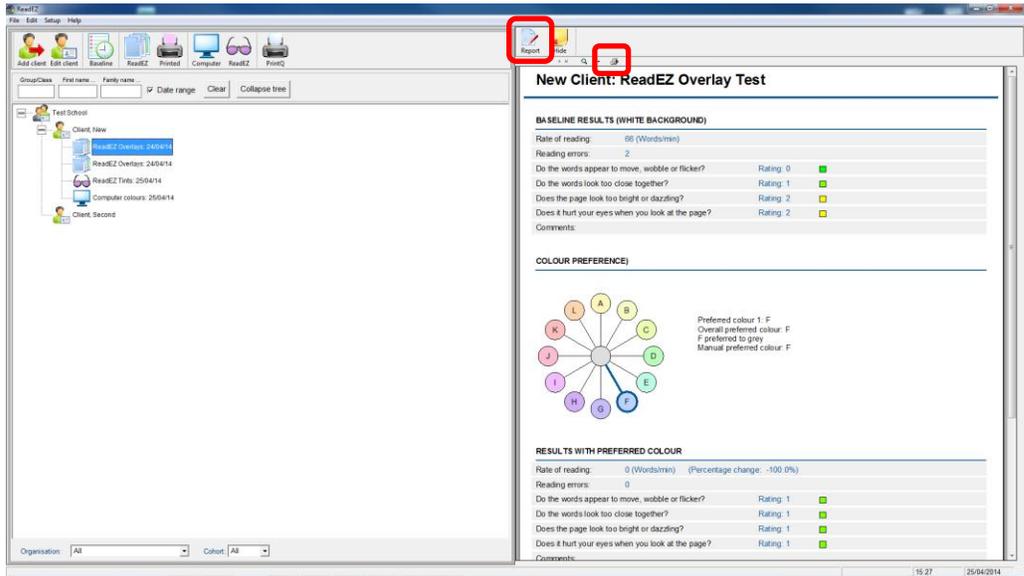
A new client may be added by selecting the *Add client* button on the toolbar. Details for an existing client may be edited by selecting the *Edit client* button on the toolbar.

For security reasons, records cannot be deleted but they can be hidden from the database list by selecting *Edit ... Hide current result*. Similarly, a client can be hidden by selecting *Edit ... Hide current record*. Hidden results and records can be shown by selecting *Edit ... Show hidden records/results*. The records and results can be permanently unhidden by selecting *Edit ... Unhide current record/result*.

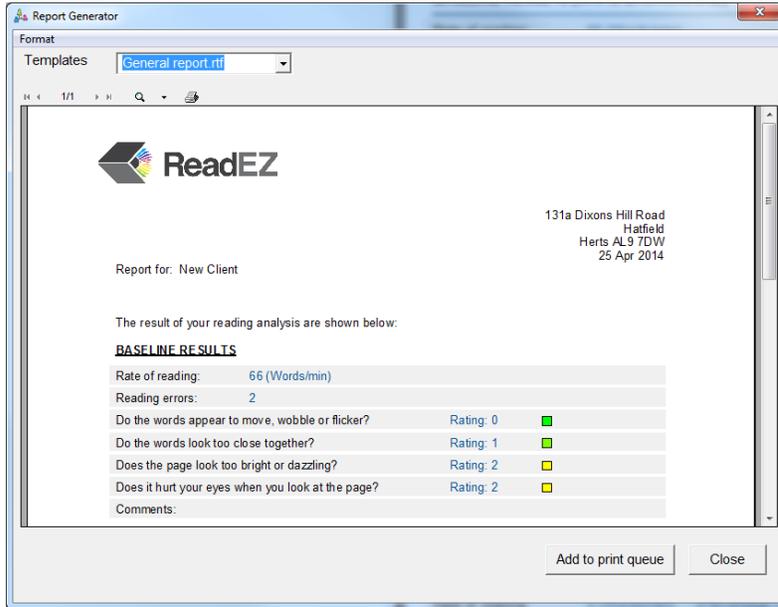
## REPORT GENERATION

The *ReadEZ* software includes a powerful report generator to produce a range of standard and bespoke reports.

A standard report will be shown automatically when a test result is selected in the database list. This report can be printed by clicking on the print icon at the top of the page.



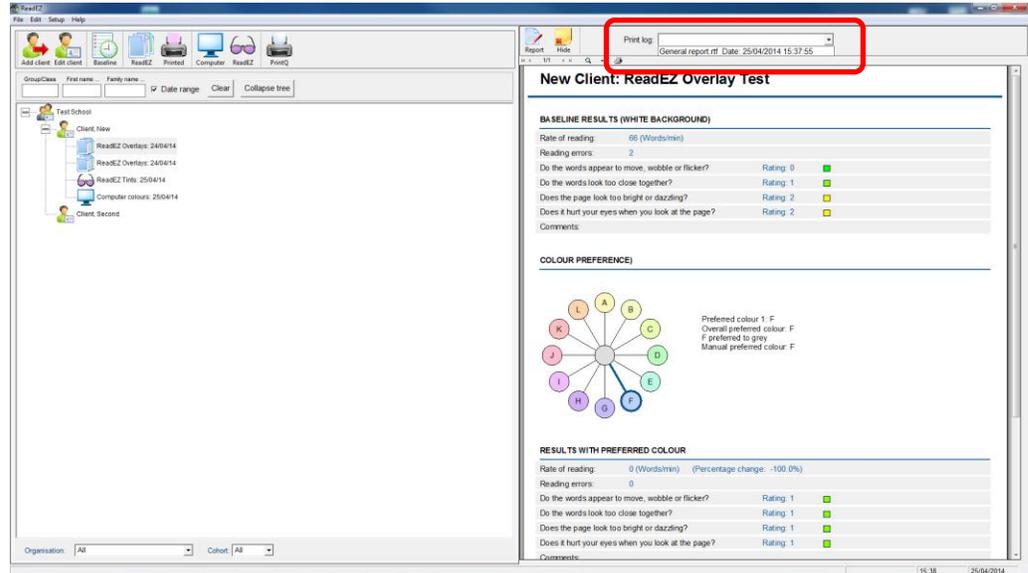
Bespoke reports can be generated by selecting the *Report* icon in the toolbar above this report. This will display the Report generator window shown below.



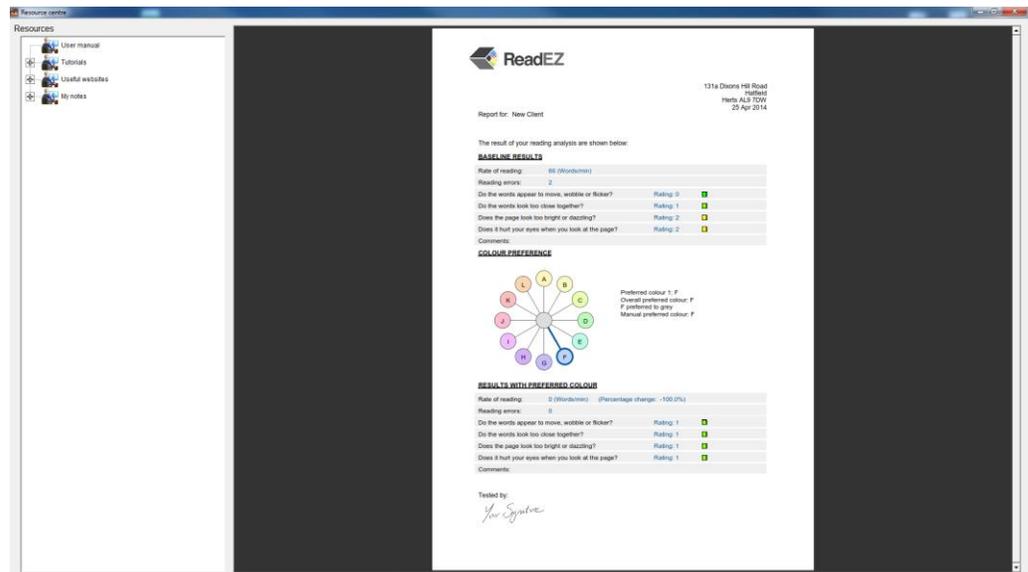
A list of available templates are shown in the pull down list at the top of the screen.

These templates are similar to mail merge documents and can be modified to produce customized reports.

Reports can be printed by clicking on the printer icon at the top of the screen or can be added to the print queue for printing later. Reports added to the print queue are also attached to the record as shown below.

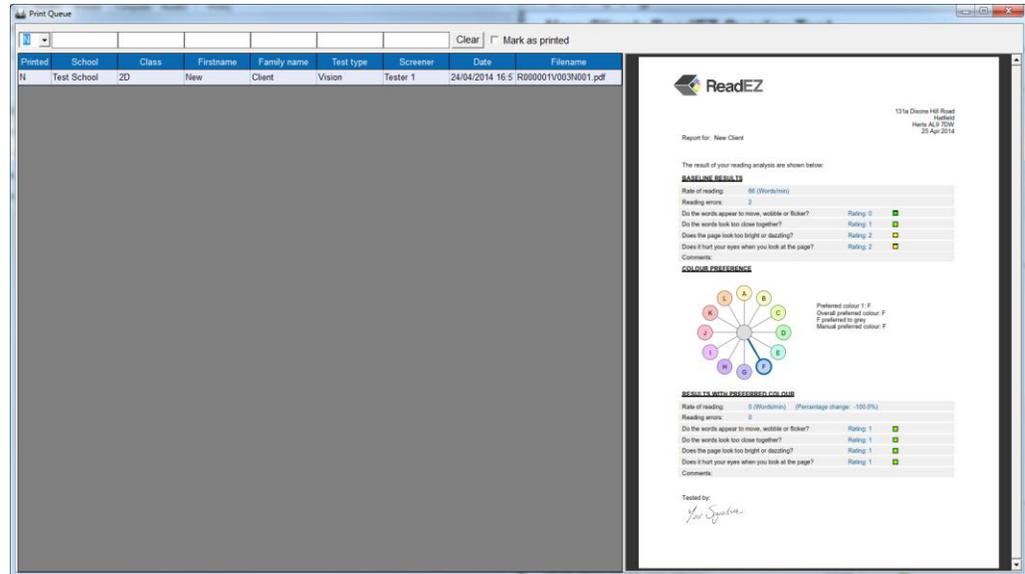


Clicking on a report attached to the record automatically opens the pdf of this report as shown below:



This feature provides a useful way of recording which reports have been created.

To display the reports in the current print queue, select *PrintQ* from the main toolbar. This will display the screen shown below:

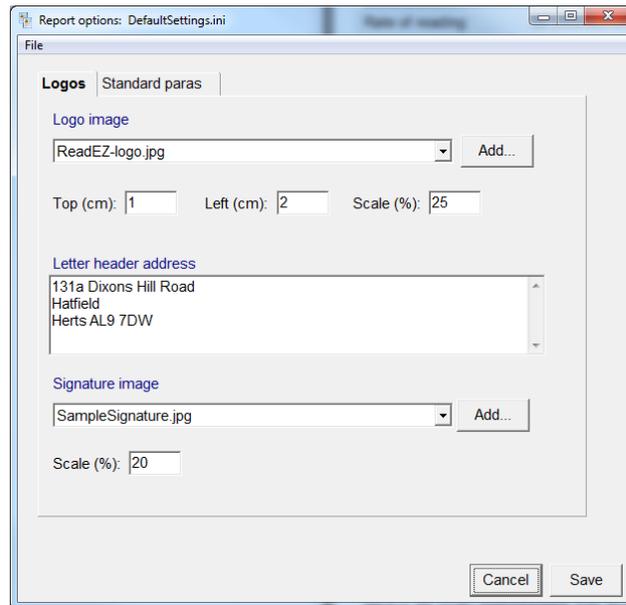


The list of reports will be displayed in the list and the pdf of each report is displayed on the right. The report may be printed or emailed using the corresponding icon. The report can be removed from the print queue by selecting the *Mark as printed* check box at the top of the screen.

To display all the reports that have ever been generated, select *All* in the pull down list above the *Printed* column at the top of the screen. The list can be filtered according to Organization, Group, First name, Family name, Test type or Screener name in the same manner as described for the database list.

## PRODUCING CUSTOM REPORTS

Reports can be customized to some extent by selecting Setup ... Report options. This will display the form shown below:



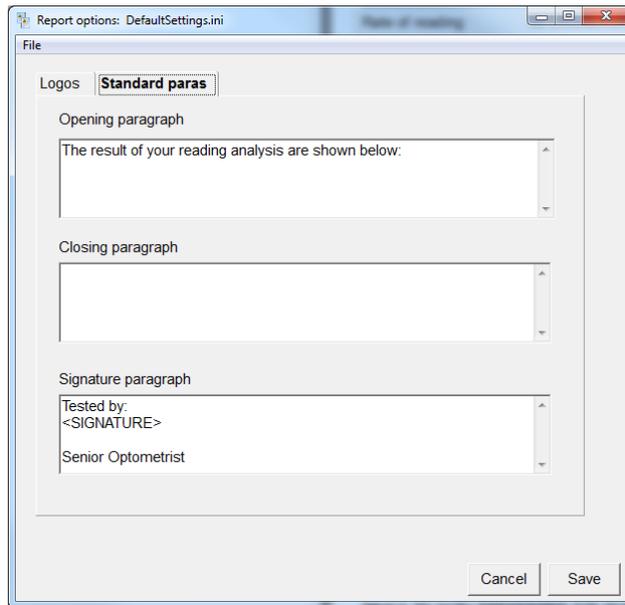
The *Logos* tab allows you to add your own logo, letter header address and signature to the report. The position and scaling of the logo can also be changed.

To add your logo, select Add.. next to the Logo image pull down list and select an image of your logo in (jpg format). This will add your logo to the pull down list.

Follow a similar procedure for adding a copy of your signature (if required).

Selecting the *Standard paras* tab displays the form shown below. This form may be used to add text for an opening, closing and signature paragraph.

To record any changes you have made to these settings, select *Save*.




---

## CREATING AND EDITING REPORT TEMPLATES

The report templates are saved in the *Report templates* subdirectory of the program directory.

The templates are saved in RTF (Rich Text Format) and so may be edited by Wordpad and most word processors.

Fields are inserted into the template in brackets as shown below:

<LOGO>

<HEADER ADDRESS>  
<TODAYS DATE>

Report for: <FIRST NAME> <FAMILY NAME>  
<ADDRESS LINE 1>  
<ADDRESS LINE 2> <POSTCODE>

<OPENING PARAGRAPH>

**<BASELINE RESULTS>**

**<COLOUR PREFERENCE>**

**<COLOUR RESULTS>**

<SIGNATURE>

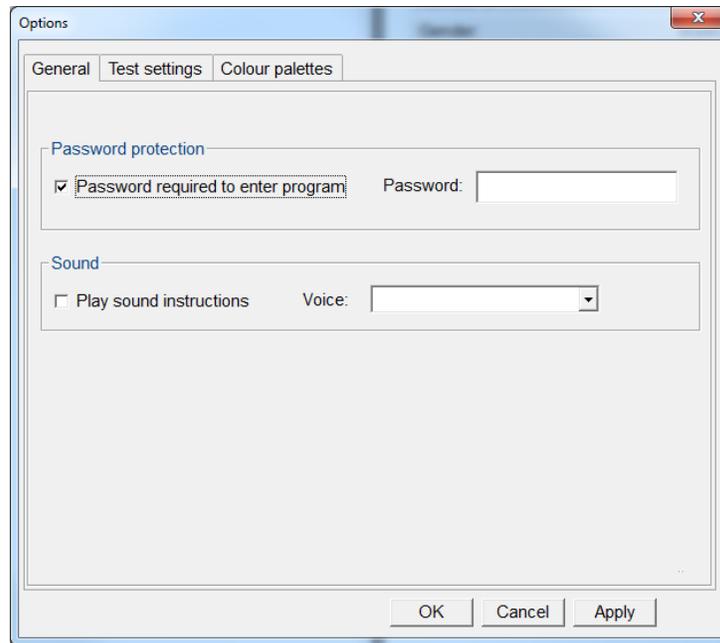
The fields below may be inserted into the template:

<LOGO>	Inserts logo at position defined in report setup
<HEADER ADDRESS>	Inserts header address defined in report setup at current cursor position
<OPENING PARAGRAPH>	Inserts opening paragraph address defined in report setup at current cursor position
"<CLOSING PARAGRAPH>	Inserts closing paragraph defined in report setup at current cursor position
<SIGNATURE>	Inserts signature image defined in report setup at current cursor position
<TODAYS DATE>	Inserts today's date at current cursor position
<DATE OF BIRTH>	Inserts client's date of birth at current cursor position
<NHS NUMBER>	Inserts client's NHS number at current cursor position
<DOCTOR>	Inserts client's doctor's name at current cursor position
<CONTACT NAME>	Inserts client's contact's name at current cursor position
<ADDRESS LINE 1>	Inserts client's address line 1 at current cursor position
<ADDRESS LINE 2>	Inserts client's address line 2 at current cursor position
<TOWN>	Inserts client's town at current cursor position
<COUNTY>	Inserts client's county at current cursor position
<POSTCODE>	Inserts client's postcode at current cursor position
<EMAIL>	Inserts client's email address at current cursor position
<TELEPHONE>	Inserts client's telephone number at current cursor position
<MOBILE>	Inserts client's mobile number at current cursor position
<DATE OF TEST>	Inserts date of test at current cursor position
<BASELINE RESULTS>	Inserts baseline results at current cursor position
<COLOUR RESULTS>	Inserts colour results at current cursor position
<COLOUR PREFERENCE>	Inserts colour preference wheel at current cursor position
<HIM/HER>	Replaces with him or her depending on gender
<HIS/HER>	Replaces with his or her depending on gender
<GENDER>	Replaces with male or female depending on gender
<HE/SHE>	Replaces with he or she depending on gender
<SCREENER NAME>	Replaces with name of screener at current cursor position
<REFERENCE>	Replaces with reference number at current cursor position
<FIRST NAME>	Replaces with client's first name at current cursor position
<FAMILY NAME>	Replaces with client's family name at current cursor position

## PROGRAM OPTIONS

The program may be customized in a number of ways by selecting *Options ... Setup* from the menus at the top of the screen.

This will display the dialog box shown below.



## GENERAL SETTINGS

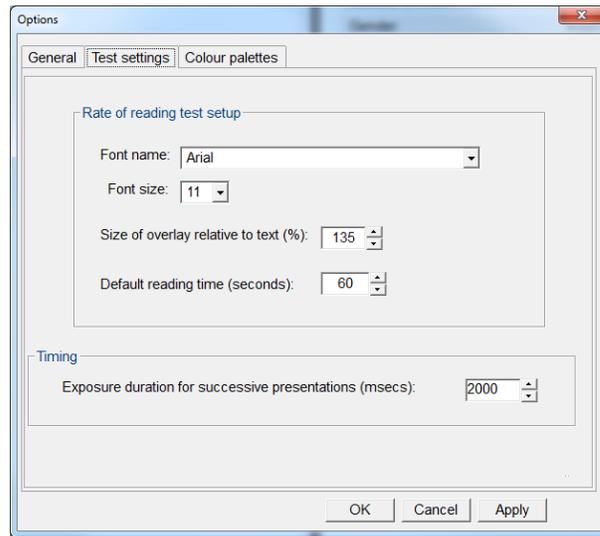
If password protection is required for the program, ensure that the *Password required to enter program* box is checked and enter the Password to be used.

**Please note: This password cannot be recovered so make sure that you remember it!**

The program can play recorded instructions during the screening procedure. To have the sound play be default, select the *Play sound instructions* check box and select the required voice/language in the pull down list.

## RATE OF READING OPTIONS

Research has shown that the 11pt Arial font works well for the *Rate of Reading* test on most monitors. However, this may be changed if required by selecting the required font and size from the corresponding lists.



The size of the “overlay” relative to the block of text can be adjusted if required. Research has shown that a relative size of 135% is optimum on most monitors.

The default reading time for the *Rate of Reading* test is 1 minute. This is generally long enough to produce the symptoms of Meares-Irlen syndrome. However, the default recording time can be changed if required. However, it is important that the reading time is maintained the same for the *without* and *with* overlay conditions.

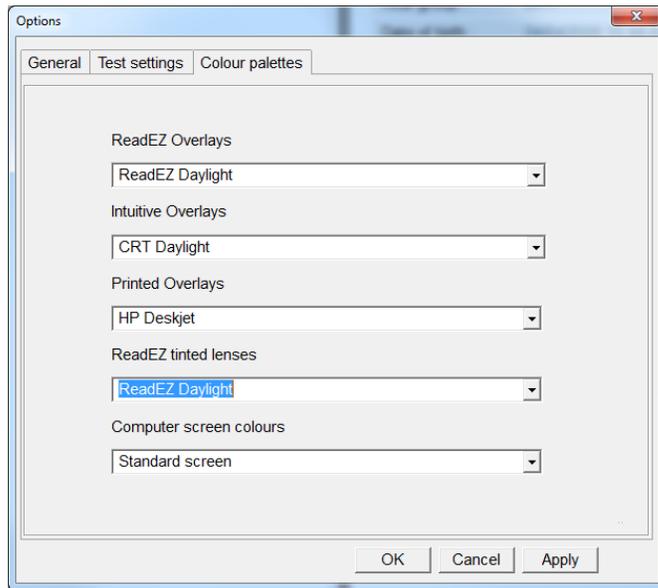
The timing option determines the exposure duration for each colour when in ReadEZ tints and Computer screening modes (described in detail earlier).

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## COLOUR PALETTE OPTIONS

The program provides a number of different colour palettes to compensate for differences in the colour reproduction of different monitors and to allow for the difference in the colour of the overlays under different forms of lighting.

The default palettes for each screening mode may be selected from the drop down lists.



## A BRIEF HISTORY

*Prof Arnold Wilkins*

Until recently there was little convincing evidence that colour could help with reading, but such evidence is emerging and slowly acquiring the scientific respectability it has hitherto lacked. Reading can be helped with coloured overlays and with coloured lenses. You may wish to check my answers to frequently asked questions.

## THE IRLLEN INSTITUTE

Helen Irlen, a psychologist from California, has established Irlen Centres in many western countries. She aims to treat a syndrome that she has variously named "Scotopic Sensitivity Syndrome" or "Irlen syndrome". According to Irlen, this is a syndrome in which reading is hampered by distortions of print. The distortions abate when the text has a particular colour, different for each individual[1]. The Irlen Centres diagnose the required colour and issue individually dyed coloured lenses.

The first detailed description of the syndrome that I have been able to find is by a astute teacher from New Zealand, Olive Meares[2]. She describes the difficulty certain children have with glare from the page and the way in which this glare can be reduced by coloured filters placed over the page.

## PERCEPTUAL DISTORTIONS

It is interesting to listen to children who benefit from coloured filters giving a description of what they see when they look at a page of text. Many describe quite florid distortions which their vocabulary is often inadequate to convey to a sceptical adult. They may, for example, say "the text fizzes" or "the letters jumble" or "fall off the edge of the page", or "the white page comes up and hits my eyes". Sometimes the children suppose that these distortions are normal and do not mention them until prompted by questions such as "Do the letters and words do anything they should not do, after you have been reading for a while."

## SCIENTIFIC KNOWLEDGE

These distortions of spatial perception are poorly understood and there is no scientific rationale for supposing they might be reduced with colour. Indeed there is little scientific rationale for supposing that colour might affect spatial perception in any way. Current

knowledge suggests that the image captured by the eye is processed in modules that keep certain aspects of spatial information at least partially independent of information concerning colour. Not only has the study of colour perception and spatial perception proceeded along separate lines, the notion that there are differences in visual processing between different observers has usually been ignored for the sake of simplicity.

Claims that colour could reduce spatial distortions in text, and that each individual benefited from a different colour are therefore quite free from any basis in established knowledge, and run counter to the little that has been established. Given the absence of any scientific rationale, scepticism was understandable. It was fuelled by Irlen's use of the term "Scotopic Sensitivity Syndrome" because the word scotopic is used to refer to the activity of the rods, receptors that are active at twilight.

The lack of a scientific rationale for a treatment does not, of course, mean that the treatment does not work! Many successful medical treatments are empirical and without a well established scientific rationale. As we will see, Irlen's claims have been borne out in recent scientific investigations, and in recognition of her contribution and that of Meares, it would seem appropriate to give the name "Meares-Irlen syndrome" to the cluster of symptoms of perceptual distortion and visual discomfort with which reading is sometimes associated.

#### RECENT SCIENTIFIC EVIDENCE

We began our investigation of the effects of colour on reading in 1989 by examining 20 clients who had received Irlen's coloured lenses and who found them beneficial. We gave the clients a wide range of tests: those that an optometrist would conventionally use and less conventional tests designed to assess perceptual function and reading. These tests revealed surprisingly little, although the Irlen lenses appeared to reduce perceptual distortion and to improve the speed of visual search by a small amount[3]. Nevertheless the clinical histories the clients gave were convincing and consistent: most reported improvements in reading and a reduction in headaches. 16 of the 20 individuals had migraine in the family. We had earlier studied relationships between migraine and susceptibility to perceptual distortions[4], and so we thought the issue deserved further investigation.

#### INTUITIVE COLORIMETER SYSTEM

To study the effects of colour we needed an instrument that would allow colours to be sampled in a simple way. Clients needed to be able to obtain any subtle shade systematically, so that if indeed there was a colour that reduced distortions, they would be able to find it. We invented a device which has subsequently become known as the Intuitive Colorimeter[5]. It is simply a box with an aperture through which can be seen a page of text lit uniformly with light of a particular colour. One control on the side of the instrument changes the colour (hue), one changes the depth of that colour (saturation), and a third control changes the brightness.

Using this device it was simple to demonstrate that individuals who reported distortions of text were often able to find a colour where those distortions disappeared and the text appeared stable and comfortable to view. The range of colours over which this improvement occurred was often quite small, and the optimum colour varied from one individual to another. Settings made using this instrument have proved to be reliable[6], notwithstanding early claims to the contrary[7].

Many of the children we saw could not afford to obtain Irlen lenses, so we tried to help them by selecting colours from the cosmetic tints then available. The intention was to provide glasses that under conventional lighting would produce the colour the child had selected in the Colorimeter. Sometimes these would be successful, but often a child would say "these are good, but not as good as the colourbox". We tried dyeing our own lenses, dipping CR39 resin lenses into hot dye until the required depth of colour was obtained. This improved matters, but it was clear that the dyes we had available did not sample colours adequately or systematically, particularly greens. At this point we were visited by a firm who manufactured cosmetic dyes. They were interested in the Colorimeter and offered to help produce a range of trial lenses that would sample colours systematically and thoroughly. Before long we had a range of trial lenses that could reproduce any colour very simply, and with a very high degree of precision. It was a simple matter to dye spectacle lenses to match a chosen combination of trial lenses.

## PRELIMINARY OBSERVATIONS AND OPEN TRIALS

In preliminary trials[8] there were remarkable clinical results in a few cases. One patient springs to mind. She could not correctly read the words was and saw. In a list in which these words occurred at random her performance was similarly random. She was unaware of her errors, but reported that the s and w moved around. With a particular yellow hue this illusory movement ceased, and she was then able to read the words quite correctly, even though she was still unaware as to whether or not her performance was correct. Changing the hue slightly resulted in a return to the previous random performance.

Following publicity, we saw 50 individuals, mainly children, who reported perceptual distortions when reading. These volunteers were offered coloured overlays, and, if the overlays were helpful, the volunteers were assessed with the Colorimeter and offered lenses of the selected hue free of charge. We interviewed these individuals after they had been in possession of the lenses for more than 10 months. A surprisingly high proportion (82%) reported they were still using the glasses[9]. This provided the motivation for a double-masked trial.

## DOUBLE-BLIND STUDY

A double-blind or double-masked trial is one in which none of the participants, neither investigators or subjects, knows which is the experimental treatment and which is a sham treatment against which the experimental treatment is being compared. Such trials are invariably used to assess a new drug before it is released on the market. The sham (placebo) must be indistinguishable from the active drug in terms of its appearance. It is only in this way that the effectiveness of a drug can be assessed independently of a person's belief in it. Many people thought it was impossible to undertake a double-masked study of tinted lenses because participants would know which colour they had selected, and this would be the one they believed in. Fortunately, the Colorimeter circumvented this difficulty.

Using the Colorimeter it was possible to determine the colour that subjects found beneficial for perception without them knowing the shade of the lenses that provide that colour under conventional lighting. This was because when subjects observe text in the Colorimeter they adapt to the coloured light and are eventually unaware quite how strong a colour is illuminating the page. When the appropriate lenses are provided they appear far more strongly coloured than expected.

The children who took part in the study selected their optimal colour in the colorimeter. The hue wheel was then turned until the child reported the distortions starting to reappear, and this setting provided a placebo control. Spectacle lenses were made to match each setting, and one pair, active or placebo, selected at random, was glazed into frames and sent to the child. The child kept the glasses for a four-week period during which a headache diary was completed, and then the spectacles were returned.

After a four-week interval while the frames were reglazed (active lenses being replaced by placebo and vice versa), the spectacles were returned for a second period of four weeks during which the headache diary was completed. Two optometrists, Dr Bruce Evans and Jenny Brown helped us conduct the study.

Despite the small sample of children (only 31 completed headache diaries systematically), there was a clear reduction in headaches when the active lenses were worn, as compared with the placebo[10]. In seven of the children the reduction was most unlikely to have occurred by chance. In none of the children was there a significant reduction with the placebo lenses. The likelihood of such a result by chance was less than 0.5%. And this was despite a very small difference in colour between the active and placebo lenses.

The effects on reading were more equivocal. Scores on the Neale Analysis of Reading Ability were better with either lens than with neither, but although the scores with the active lenses were superior to those with the placebo, the difference could well have occurred by chance. As will become clear later, the Neale Analysis is not the most sensitive instrument for investigating the effects of colour on reading.

## EARLIER STUDIES

The double-masked study lends credence to earlier studies. As others have remarked, "many of these studies have been difficult to interpret due to design problems, such as selection bias, sample size, heterogeneity of subjects, subjectivity of results, financial interest of investigators, and failure to consider such factors as placebo effect, controls, and ophthalmic status of subjects." [11] It also helps to explain the failure of several well-controlled studies to reveal any beneficial effects of colour. One such study was by Menacker and colleagues [11]. These authors measured reading errors and used a limited choice of coloured lenses. They failed to show any difference between the coloured lenses and grey (neutral density) lenses. Martin and colleagues [12] also measured reading performance but did so with and without Irlen lenses and failed to show improvements in reading. If the effects of coloured lenses have more to do with symptoms of eye-strain and headache than with reading per se, as the double-masked study suggests, then these findings are to be expected. As will become clear from the studies described below, the effects of colour depend critically on typography. Colour has its greatest benefit with text that is small and closely spaced. With more conventional text the effects on reading speed take time to appear, and do so only when the reader is beginning to tire.

## OVERLAYS

Overlays are sheets of coloured plastic that can be placed upon a page so as to colour the text beneath without interfering with its clarity. There are several studies that have used coloured overlays rather than lenses. Some of these studies have shown improvements in reading, at least in selected clients [13,14]. As Solan [15] has remarked, the studies that have shown beneficial effects have generally been conducted by investigators associated with the Irlen Centres; independent investigators have usually failed to show any effects.

Tyrrell and colleagues [16] measured the speed with which a child read a passage photocopied from a book chosen by the child. On separate days and in random order the reading was undertaken with or without an overlay the child had selected as optimal. About half the children chose a clear overlay, included as a control, and the remainder chose one of the coloured Irlen overlays. The reading continued for 15 minutes, and initially there was no difference in speed between the two conditions. Differences emerged only after the children had been reading for 10 minutes and had begun to tire. The children who had chosen a coloured overlay slowed up when they were reading without it, and reported symptoms of eye-strain; the children who had chosen a clear overlay reported fewer symptoms, did not slow up, and showed no benefit from use of the overlay. The children who took part in the above study were selected from the entry year of a secondary school, and a surprisingly high proportion reported improvements in the appearance of text using an overlay, a greater proportion among the children with reading difficulty than among the good readers.

In two subsequent studies, as yet unpublished, we have examined all the children aged 7-11 in two primary schools, using the Intuitive Overlays[17]. These differ from other overlays on the market in that they sample a wide range of colours systematically and efficiently. As in the study by Tyrrell and colleagues, about 50% of children reported improvements in the perception of text with one of the overlays. These children were given their preferred overlay free of charge to use as and when they wished. After 10 months about half the children were, of their own volition, still using the overlay.

In these recent studies reading speed was assessed using a test we devised called the "Rate of Reading Test". This test consists simply of a passage of words that a client is required to read aloud as rapidly and as accurately as possible. The words are all of very high frequency and are therefore familiar to most children, even those whose reading is very poor. The words are arranged in random order to minimise contextual cues. 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 measured using this test is highly reliable from one examination to the next, but differs considerably from one child to another. The difference in a child's rate of reading with and without a chosen overlay predicts whether the child will continue to use the overlay. Children who will subsequently persist in using their overlay average an increase in speed of 15% when reading with the overlay. In some children the increase can be as great as 50%[18].

The increase in reading speed cannot readily be attributed to motivation because: (1) clear or grey filters usually have little effect; (2) the increase in speed occurs only when the text is visually stressful; (3) as mentioned above, children persist in using the overlay for many months without prompting. The increase occurs in children who have been carefully screened for refractive errors and anomalies of binocular vision[18].

We obviously need to know why such a large proportion of children in British schools seem to be demonstrating a visual component of reading difficulty. What proportion of children receive adequate visual screening, and what proportion of children continue to use their overlay once they have received adequate optometric and orthoptic treatment? These are questions that we are now trying to answer.

## PHYSIOLOGICAL BASIS

The physiological basis for the beneficial effects of colour remains uncertain and contentious. The effects can no longer be dismissed as placebo effects and some physiological explanation is called for. In a recent book Visual Stress[19], I draw attention to the similarities between the physiological mechanisms that induce seizures in patients with photosensitive epilepsy and those responsible for photophobia in migraine. The children who find colour helpful usually have migraine in the family, and migraine is now known to have subtle effects on

vision. The argument is spelled out in detail in the book, with supporting evidence that cannot be given here. In essence, the perceptual distortions are attributed to a hyperexcitability within the visual system, neurones firing inappropriately as a result of a spread of excitation. Coloured spectacles are thought to reduce the excitability by redistributing the excitation within the neural network of the cortex so as to avoid localised areas of hyperexcitability. This is only one viewpoint among several but it brings together a great many very disparate pieces of evidence. Scientific theories are only as good as the predictions they make, and this theory predicts that coloured glasses will prove of benefit in photosensitive epilepsy and certain forms of migraine. There are initial indications that this may indeed be the case.

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## FREQUENTLY ASKED QUESTIONS

### 1. 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.

### 2. 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. Each individual seems to need a different colour, so it is important to assess the effects of a wide range of colours.

### 3. 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.

### 4. 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.

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

### 6. 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.

#### 7. 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.

#### 8. 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 as therapy. Other terms are Irlen syndrome or Scotopic Sensitivity Syndrome (SSS). (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 Meares, but have been listed by Helen Irlen, as follows.

#### 9. What are the symptoms of Meares-Irlen Syndrome?

Some of the main symptoms are:

- glare from the page
- 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).

#### 10. 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

11. Which texts show a benefit from colour?

Overlays 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. If the text is closely spaced, the benefit is more immediate.

12. 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.

13. Does visual perceptual distortion relate directly to learning difficulties, 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.

14. 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.

15. 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 client of investigation.

16. 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 handwritten work.

17. 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 distortions less distracting.

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

19. 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.

20. 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, since visual perceptual distortions can sometimes be caused solely by binocular vision problems, it is often sensible to have these corrected first. If the distortions remain then coloured filters need to be tried.

21. 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.

22. Are coloured glasses necessary?

Children who persist in using their overlay usually find coloured glasses more convenient to use. Glasses 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 overlays. Perhaps for this reason glasses often give better results.

23. Are glasses the same colour as overlays?

It is essential to realise that the appropriate colour for use in glasses may not be the same as that in overlays. For example, a child may choose a yellow overlay and benefit from blue lenses.

24. Why are glasses a different colour from overlays?

When you wear glasses everything you see is coloured, but you are often unaware of the colouration because you adapt to it and make allowances for it (for 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.

25. 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!

26. 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.

27. Do children change their preferred colour?

Children sometimes seem to change their preferred colour. The precise reason for this is not known.

28. 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.

29. 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.

30. 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.

31. How can I find an optometrist who has specialised in reading difficulties?

Optometrists (previously called ophthalmic opticians) can be found in most town centres. 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.

32. What tests should I expect the optometrist 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.

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

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

## UPDATES

If your computer is attached to the internet, software updates can be downloaded automatically by selecting *Help ... Check for updates*.

## OBTAINING HELP

Registered users are entitled to ongoing email and telephone support. Please read this manual carefully before calling and have details of your user name and serial number available.

We are always looking for ways of improving our programs and value your feedback.

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