

**Advice  
for those teaching and caring for  
children with a  
colour vision deficiency  
(colour blindness)**

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## Contents

	Page
<b>Introduction</b>	<b>3</b>
<b>What Is Colour Blindness (colour vision deficiency – CVD)?</b>	<b>3</b>
<b>Why Does Colour Blindness Matter At School?</b>	<b>4</b>
<b>What Causes Colour Blindness?</b>	<b>4</b>
<b>Types of Colour Vision Deficiency</b>	<b>4</b>
<b>Diagnosis</b>	<b>5</b>
<b>Colour Blindness and Education</b>	<b>6</b>
<b>Overview</b>	<b>6</b>
<b>What Can Teachers Do?</b>	<b>7</b>
<b>Nursery/Pre-School/Key Stage 1</b>	<b>7</b>
<b>How To Identify a Young Child With CVD</b>	<b>8</b>
<b>Key Stage 2 Onwards</b>	<b>9</b>
<b>What if <u>you</u> are a colour blind teacher?</b>	<b>11</b>
<b>Special Educational Needs</b>	<b>12</b>
<b>Alternative and Augmentative Communication (AAC)</b>	<b>12</b>
<b>How To Identify CVD In a Non-Verbal Child</b>	<b>13</b>
<b>If You Suspect CVD In a Non-Verbal Child, What Next?</b>	<b>13</b>
<b>Where to Find Resources</b>	<b>14</b>
<b>How to Obtain Further Help</b>	<b>14</b>
<b>Want to know more?</b>	<b>14</b>

## Introduction

In the UK alone there are almost 3 million people colour blind people. The condition affects

- 1 in 12 (8%) males and 1 in 200 (0.5%) females
- approximately 400,000 school children
- the ability to identify many different colours, not just reds and greens

25% of colour blind people have a severe form, so around 100,000 school children are severely colour blind - the vast majority are boys.

Statistically speaking there will be a colour blind child in every classroom.



**Normal colour vision**



**Severe red/green colour blindness**

Modern teaching methods heavily rely upon the use of colour to teach, highlight, warn and explain, but what if the colours we describe are not the same for the children we are teaching?

The purpose of this document is to provide teachers, parents and carers with hints and tips about how to identify and support the colour blind children in their care. For those working with children using AAC there is a special section under [Colour Blindness and Education](#).

## What Is Colour Blindness (colour vision deficiency – CVD)?

Colour blindness (colour vision deficiency- CVD) is usually an inherited condition which affects the way a person is able to perceive most colours. The image on the right above shows how a person with a severe red/green CVD will 'see' the image on the left. People with CVD can see clearly and in focus but are often unable to perceive objects of a 'problem' colour if they are on top of or adjacent to another 'problem' colour. For example, a colour blind person would find it difficult or impossible to see a ripe, red, strawberry against green strawberry leaves as both red and green are 'problem' colours.

## Why Does Colour Blindness Matter At School?

There is a common misconception that colour blind people mix up red and green only, in fact people with a colour vision deficiency cannot distinguish accurately between all shades of reds, greens, oranges and browns. They also confuse blues with purples, pinks with greys and yellow with some greens and oranges. Most colours can be confused, therefore CVD is a major disadvantage in an educational setting.

Consider how children are instructed in early years' settings. We ask children to pick up the red brick. We encourage their ability to sequence in advance of reading by asking them to form colourful patterns with beads or other visual materials. We use colour in our descriptions of virtually everything, from the big brown dog, to the pretty pink flower and the green door that marks the entrance to the loo. We ask them to fill in colouring sheets in specific colours and sing songs about the colours of the rainbow.

If children are not 'getting' a percentage of what we are saying, they are not learning to full capacity and this is a problem that can not only undermine their confidence at an extremely impressionable age but provide a faulty foundation for future learning.

As CVD children move up primary school, on to secondary school and into further education the problems they encounter become more complicated, so an understanding of their needs is crucial to ensure these children are given the opportunity to realise their full potential.

## What Causes Colour Blindness?

Colour blindness or CVD (colour vision deficiency) is largely a genetic disorder associated with the X chromosome, hence it affects males more than females. As a genetic disorder it does not improve or deteriorate through normal life and currently there is no cure. The most up-to-date research suggests that it is caused by faulty photo-receptors in the retina of the eyes.

For more detailed information refer to [www.colourblindawareness.org](http://www.colourblindawareness.org)

## Types of Colour Vision Deficiency

There are 3 main types of genetic CVD conditions which can vary from mild to severe forms;

- Protanopia/protanomaly relates to a red deficiency,
- Deuteranopia/deuteranomaly relates to a green deficiency and
- Tritanopia/tritanomaly relates to a blue deficiency.

In all deficiencies, however mild or severe, accurate perception of more than just one or two colours is affected.

People with red or green deficiencies will see the world in a similar way to each other because red and green are very close together on the light spectrum. Most people think red/green colour blind people confuse just red and green. This is not the case at all - red/green colour blind people have problems with colours right across the spectrum.

Although red/green colour blind people can see blue, blues and purples can be confused because of the red tones in purple. Someone with a red vision deficiency will find it difficult to distinguish dark colours and can readily confuse a deep red with black.

Red/green deficiencies are very common but blue deficiency and total colour blindness (where everything is seen in shades of grey) are extremely rare.



**Normal colour vision**



**A form of severe red/green CVD  
(Deuteranopia)**



**Tritanopia (severe loss of blue  
vision)**

Colour blindness can sometimes be acquired as a result of other conditions such as diabetes and multiple sclerosis.

Children with other visual impairments e.g. glaucoma and retinitis pigmentosa, are also more likely to have colour vision defects which may not present in the same way as genetic red/green colour blindness – i.e. different colours may be affected.

## Diagnosis

Although LEA colour vision screening in schools has largely been phased out, all opticians can test for the 2 main types of CVD (although not all have the additional test system that covers all deficiencies). Colour deficiency testing is not a statutory part of the NHS eye examination. As a result Colour Blind Awareness surveys show that even if a child has had an eye test with an optician there is only about a 20% chance that their colour vision will also have been tested. However, the test is available from opticians if requested and should be undertaken free of charge.

The standard test is the Ishihara Plate test where numbers formed from coloured dots are set within a circle formed from dots of a different colour. Depending upon which numbers can be seen the optician can advise whether someone is colour blind or not.

What if the child in your care is unable tell you which numbers they can see? A special test is being constructed at the moment which will use eye gaze to determine responses, but this will not be available for some time. A genetic screening test is available in the US but has yet to be approved for use in the UK. In the meantime follow our tips on how to spot possible signs of colour blindness in the sections '[How to Identify a Young Child With CVD](#)' and '[How to Identify CVD in a Non-Verbal Child](#)'.

## Colour Blindness and Education

This section is aimed specifically at teachers and covers the following:-

- a general overview of the main issues
- information to enable teachers to understand where colour blind students might have difficulties
- hints and tips in how to identify and support a colour blind child at different stages in their school career. See [Nursery/ Pre-School/Key Stage 1](#) and [Key Stage 2 Onwards](#)
- Special Needs including those using [Alternative and Augmentative Communication](#)

## Overview

For the average student, colour is a useful tool. For colour-blind students, who do not see many of the colours in question, it can be a nightmare – undermining confidence, encouraging basic errors and causing frustration and even anger.

Some children may have a mild form of CVD whilst for others (25%) their condition will be severe. It is not possible to find out exactly which colours someone with a less severe condition will be able to see, therefore best practice is to assume (i) you will have at least one CVD child in each class and (ii) all CVD children have a severe form of colour blindness.

Some important points to note:-

- Colour blindness is not considered to be a Special Educational Need despite placing children at a significant disadvantage in most elements of their education, so there is little or no provision to help children who simply cannot operate effectively using colour. On the whole teachers have had no training in how to identify and support colour blind children.
- While colour-blind children can learn to identify some colours through their hue and saturation – and experience – they cannot actually see most of them so colour-blindness will affect performance and understanding in many subjects.
- Many children feel embarrassed about not being able to choose the appropriate crayon or colour of paint, or to accurately describe things around them. They may be slower to follow instructions, because those relating to colour may make very little sense. Indeed, they may seem 'slow' or 'hesitant' in many situations, because they can and will be perplexed by the need to make choices based on something they simply cannot see.
- When colour-blind students are faced with a variety of different options based on colour, they will not only struggle to distinguish between them, but they will make basic errors that will compromise their work – and their ability to learn. When they are taught using colour, they will spend precious time trying to work out what is being explained or highlighted and fail to absorb the information either efficiently or correctly.
- Textbooks highlighting 'familiar' key words and sounds are largely useless to colour-blind children, as are those that use colour-on-colour printing, which are almost impossible for many colour-blind students to read e.g. some sections of maths textbooks.
- In secondary school students are encouraged to colour maps and graphs; colour is used to highlight material and as keys in instructions; it is used in the science lab, the art room, in maths, food technology, ICT and history; teachers use it on whiteboards and often use different colours for marking.

## What Can Teachers Do?

### Nursery/ Pre-School/Key Stage 1

First of all, consider screening children as they enter your centre. A local optician may be able to arrange this, as can the visual impairment team in your local authority. Alternatively, visit [www.colourblindawareness.org](http://www.colourblindawareness.org) for more information. Knowing which children are colour-blind (and chances are that there will be at least one in every year group), can help you to make appropriate provision for their education.



Normal colour vision



Red/green colour blindness

- Think about the lighting in your classroom. Good lighting can make it easier for children to recognise colour. Colour-blind children should be seated in good natural light, but avoid bright sunlight and artificial light as these can distort a CVD child's perception of colour
- Take time to group and label things like coloured pencils, paints, beads, bricks and colouring material according to colour. Think about how you colour-code boxes of toys, art materials and books. Little ones will obviously find it difficult to read labels using words, but you could find a creative alternative. For example, the red beads could be labelled with a photograph of a fire engine; the green ones with leaves. Some products are available at [www.colourblindawareness.org](http://www.colourblindawareness.org)
- Most young children learn the colours of things, even if they do not know what they are, and can confidently tell you that the grass is green, even if they cannot see it. Therefore, giving them clues can help them to make the correct associations and learn to use and choose colours appropriately.
- Avoid using colour-on-colour books and other support materials. Black on white will be most appropriate for colour-blind children.
- In sports and games (including board games), ensure that children can see who is on his or her 'team', and that they can see the ball or the 'men' on the board.
- Checking computer settings, web pages and computer-based teaching aids to ensure that the child can pick out the relevant information. Colour-blind children may struggle with coloured 'keys' that provide instructions and information.
- Use strong contrast on white or chalkboards; red, green or pastel colours should not be used to highlight teaching points.

- Encourage children to help each other choose colours when drawing, painting or colouring, and to reinforce their use by using the correct name. Many colour-blind children will eventually memorise their colours through repeated experience of their use.
- If you are teaching reading, use symbols rather than 'colours' for different levels of books, or clearly explain to children which box is theirs.
- Talk to parents about how they can support their children at home, and direct them to the Colour Blind Awareness website [www.colourblindawareness.org](http://www.colourblindawareness.org) for help.

### How to Identify a Young Child with CVD

Once a colour blind child realises that he finds colours more difficult to recognise than his peers, he will try to hide his condition. This makes a colour blind child difficult to spot in a group.

Look out for:-

- inappropriate use of colours when colouring in e.g. green faces, purple sky, pink elephant, brown Father Christmas, red dog etc
- a young child insisting upon naming a toy using an incorrect colour e.g. a green teddy bear might be named 'blue' or 'grey' bear
- reluctance to help sorting toys when tidying up if the boxes are colour coded boxes (for fear of making a mistake)
- disruptive behavior/unwillingness/inability to play board games, matching games, some memory games, beads, following patterns
- copying other children in colour situations e.g. Art/science, the child might borrow a colour from a friend routinely after the friend has used it, then copy exactly where that colour went



- food
  - refusal to eat some foods (i) because they look particularly unappealing e.g. green vegetables appear brown; or (ii) because the child has made a mistake previously e.g. eaten a green banana
  - taking overly long to choose some foods or confusion over condiments e.g. ketchup/ brown sauce/vinegar sachets; chocolate/strawberry sauces, especially if the child can't read

If a child is demonstrating several of these signs consider whether he/she might be colour blind and ask the parents to have the child tested by an optician as soon as possible.



## Key Stage 2 onwards

Older children will be less likely to make mistakes in choosing colours for themselves as they have had more time to learn the very subtle differences in shading which help them to identify different colours. They will also have had more time to hone coping techniques such as copying other children in colour situations. However, the older the child becomes the more they will be exposed to situations where they will be expected to interpret colour accurately, especially in school.

Try to remember that whilst colour is very important to people with normal colour vision, to colour blind people it is of little consequence.

Look out for:-

- inability to interpret some sections of computer games/homework software programmes/websites
- holding back in sports and team games where team colours may confuse e.g. red team and green team
- holding back in peer group work
- uninspiring presentation, lacking in colour and formatting. especially in ICT
- reluctance to speak in discussions where colour is a main element (maps in Geography, colour propaganda in History, Art discussions, coloured pie/bar/line graphs in Maths and Science etc)
- inability to read litmus paper, universal indicator and colour changes in chemistry
- 'silly' mistakes in geography, science, maths, history etc which could be caused by poor colour choices used in textbooks

Where you suspect a student might have problems with colour ask the parents to refer to an optician for a formal diagnosis.

Follow the tips for younger children but also try to:-

- 'Audit' your classroom, including computer-based interactive white board/homework software packages, to ensure important messages for the students are not given in 'difficult colours', especially red and green
- Try to ensure all pencils, crayons, paints, felt-tipped pens and so on are all labelled with the name of their colour – you can buy ready-made stickers from specialist suppliers or visit [www.colourblindawareness.org](http://www.colourblindawareness.org)
- Use strong contrast on the board and on computer screens. Try not to use red, green, orange or pastel colours to highlight different teaching points; rather underline the words you wish to emphasise.
- Assign a classmate to help the student where coloured diagrams or pictures are being used or in peer group work, especially science experiments
- Consult with diagnosed colour blind students to identify where they might have problems and encourage them to let you know whenever they think problems with colour might occur
- Check worksheets for colour issues and where possible use patterns or secondary indicators e.g. labels, patterns and shading to differentiate rather than, or in addition to, colour. Photocopy worksheets into black and white if this is not possible
- Check wall posters for potential issues – languages posters are often problematic for those learning colours in a new language



- Avoid using a 'traffic light' system for the student to indicate how well he has understood a task - most colour blind people can't be relied upon to know the difference between red, green and orange
- In games/PE check the student is able to identify his teammates and if necessary use blue and yellow bibs to distinguish between teams (red/green colour blind people can see blue and yellow). Remember to check whether coloured training cones can be seen against grass, that the pupil can actually see the ball (e.g. red cricket balls and orange hockey balls are difficult to see against grass, particularly in poor light) and so on
- In art organize a colour palette for the student to memorise colour placement and focus on mediums other than colour e.g. charcoal, textiles, clay
- Be aware that at present textbook manufacturers do not take account of the needs of colour blind children.

**For diagnosed CVD students ensure your SENCO and all teaching colleagues are aware of potential problems and ensure an Individual Education Plan is put in place for the student at the earliest opportunity.**

For further information on Best Practice and Accreditation for your school visit the Colour Blind Awareness website <http://www.colourblindawareness.org/teachers/services-for-schools/>.



## What If You Are a Colour Blind Teacher?

Note that you may not always be aware of the strategies you use to cope with your own condition – these will probably be different to the strategies adopted by a colour blind student. Sometimes you may not be able to notice information which will be readily apparent to your colour normal students. You may have a mild condition or a different type of condition to your colour blind pupil and so will not necessarily be able to appreciate the needs of your colour blind students as they may not match your own. If you have any doubts always seek confirmation from colour normal peers/pupils and your colour blind students before using colour to make a teaching point.

Refer to [www.colourblindawareness.org](http://www.colourblindawareness.org) for further information.

## Special Educational Needs

Colour vision deficiencies are likely to affect the results of any tests to indicate other Special Educational Needs which include colours as part of the assessment.

An example is the Rapid Colour Naming subtest of the CTOPP (Comprehensive Test of Phonological Processing) test which is used to indicate phonological processing and help identify dyslexia. Likewise the online Dyslexia Screener has a coloured shapes section which may also cause problems. Before using any such screening tests check them for potential colour issues and refer to the producers if you are unsure.

**Be aware that even though a software package might have been put together by a specialist in Special Educational Needs this does not necessarily mean the software takes account of colour vision issues because at present CVD is not considered to be a SEN.**

As mentioned in the [Types of Colour Vision Deficiency](#) section, children with some other visual impairments such as glaucoma and retinitis pigmentosa, are also more likely to have colour vision defects which may not present in the same way as genetic red/green colour blindness – i.e. different colours may be affected.

Without a Visual Impairment Statement it will be difficult or impossible to get access to Visual Impairment services for a child with CVD. Hence if you suspect a child is showing signs of possible CVD it is extremely important to arrange for a child to be tested and diagnosed with a Statement to ensure you can fully access support.

Children in specialist SEN schools with colour vision problems are far more vulnerable than CVD children in mainstream school environments not only because they may not be able to verbalise their inability to distinguish some colours but also because colour is an inherent part of educational tools for early years' teaching and for children with special needs.

Therefore it is extremely important for teachers and carers to be able to identify whether or not a non-verbal child might have colour vision problems so that they can specifically tailor teaching aids to the needs of the individual child.

## Alternative and Augmentative Communication (AAC)

Teachers, parents and carers of children using AAC must ensure they find out whether or not the child has problems distinguishing colours as colour is a fundamental component of AAC teaching methods. Often the child will be unable to explain colour problem, especially if they are non-verbal.

There is some evidence to suggest a higher prevalence of CVD in those with cerebral palsy than in the rest of the population, not only because of complications arising from other visual impairments, but also due to increased defects in genetic code.

Where colour vision deficiencies are present in a non-verbal child which have been acquired from non-genetic causes e.g. retinitis pigmentosa, the colours a child has problems with may be different to those which cause problems for someone with genetic CVD (common red/green colour blindness).

At present it is not possible to simulate or fully appreciate what such a child might be able to see, so the only way to understand is to try the [Colour Blind Awareness Indicative Test for CVD in Non-Verbal Children](#) cards, work out the potential problems colours for the individual child concerned and avoid those colours when teaching that child in the future. Cases of acquired CVD are relatively rare in children – around 5% of cases of CVD. The following advice therefore refers to genetic red/green colour blindness only. Contact [info@colourblindawareness.org](mailto:info@colourblindawareness.org) for more information.

## How to Identify CVD in a Non-Verbal Child

As mentioned previously, although under development, at present there are no formal tests available in the UK to diagnose CVD in non-verbal children. Contact the Colour Blind Awareness Organisation at [info@colourblindawareness.org](mailto:info@colourblindawareness.org) for further details of indicative tests which can help to identify colour vision deficiencies in non-verbal children (*Colour Blind Awareness Indicative Test for CVD in Non-Verbal Children*) communicating by eye gaze, or for activities suitable for children using hand-grabbing techniques to communicate. You can also register for further details on progress of availability of the formal tests.

Colour Blind Awareness can arrange for a representative to visit and undertake indicative testing at your centre and/or provide training for your staff.

NOTE: A child will not be suitable for indicative testing for CVD unless they are able to indicate differentiation between 'same' and 'different'.

## If You Suspect CVD in a Non- Verbal Child, What Next?

Update the child's communication passport - note possible problem colours and ensure the symbol book is colour blind compliant too. In future try to avoid all combinations of colours the child has found it difficult to tell apart in the test. Remember to include colour blindness as part of the Early Years Moving Up booklet.

Consider all the methods you are using to communicate with the child including communication books, encoding, keyboards, and software packages. **Be aware that even though a software package might have been put together by a specialist in cerebral palsy this does not necessarily mean the software takes account of colour vision issues.**

For more detailed information check the **cp toolkit** section of the Scope website <http://www.scope.org.uk/help-and-information/education/cerebral-palsy-toolkit> . The **cp toolkit** is currently under construction so if you are unable to find what you need please refer to [info@colourblindawareness.org](mailto:info@colourblindawareness.org) . Scope commissioned Colour Blind Awareness to write the advice sheets for the **cp toolkit** relating to red/green colour blindness and AAC teaching methods and is therefore able to provide advice in the interim.

## Where to find resources

Visit [www.colourblindawareness.org](http://www.colourblindawareness.org) for

- colouring pencils, felt-tipped pens, crayons etc marked with the name of their colour
- stickers printed with the names of colours for paint pots, crayons, storage boxes etc for both home and classroom use
- Indicative CVD Testing Kit for Non-Verbal Children or very young children

OR

- to arrange visits for staff training/INSET talks/mass colour vision screening/Indicative Testing for non-verbal students etc. –email [info@colourblindawareness.org](mailto:info@colourblindawareness.org)

## How to obtain further help

Refer the child to the Specialist Teaching Services/Visual Impairment team at your Local Education Authority who should be able to advise you about how to support the child's specific type of colour vision deficiency.

## Want to know more?

Refer to the Colour Blind Awareness Organisation's website [www.colourblindawareness.org](http://www.colourblindawareness.org) for more detailed information including how to support CVD children at home. You will find a huge range of visual images to clearly demonstrate the issues faced by CVD sufferers together with tips to manage things day to day.