

Vision for Learning (Part II)¹ : A tool for educators to assist in the detection and treatment of vision difficulties

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“visual impairment may go far beyond educational implications, impacting on ... social factors including overall health, self-perception and job choices”

The Australasian College of Behavioural Optometrists (ACBO) (2013c, para. 2) recognises that vision is a key sense in the classroom – playing a major role in a vast array of skills, particularly literacy skills such as reading, spelling and writing. The *Children's Vision Information Network* [CVIN] (2013d, para. 2) reports that around 20% of school-aged children struggle to read. When considering vision as a possible cause of difficulty it is useful to note that the *Australasian College of Behavioural Optometrists* (2013c, para. 3) warns that “many students’ visual skills are not able to meet the demands of typical classroom learning situations. However, it must be recognised that not all children with learning problems will have visual difficulties, and that not all children who are identified as having vision difficulties will experience educational delays” (ACBO, 2013c, para. 3). While “in some instances visual problems may be the primary cause of the reading or learning difficulty, more frequently they are contributory” (ACBO, 2013c, para. 3).

Current research does suggest that individuals with reading difficulties often have co-existing visual and language processing deficits; explaining why vision difficulties often co-exist with dyslexia (ACBO, 2013c, para. 18; Peachy, 2013, para. 2). With regard to dyslexia, it is also important to note that at times the signs and symptoms of these vision problems mimic those suffered by individuals with dyslexia (ACBO, 2013f, para. 15). Thus, before

a diagnosis of dyslexia is made comprehensive assessments in a variety of areas should be made, including assessments of vision skills.

Regardless of the cause of vision problems, “prompt professional treatment is required, as any delay in vision care will dramatically reduce a child’s achievement levels at school, and may cause them to begin to adapt behaviours to compensate or overcome the difficulty they are experiencing” (ACBO, 2013d, para. 24). Vision difficulties may cause children to adapt their behaviour in ways that result in poor concentration and overall behaviour (ACBO, 2013g, para. 3). As a result the effects of visual impairment may go far beyond educational implications, impacting on a number of other social factors including overall health, self-perception and job choices (Davidson & Quinn, 2011, p. 334).

Binocularity & Alignment (Eye Teaming Skills)

An important requirement of vision is that both eyes function together as a team – performing as one. However, this teaming is not guaranteed by design. Therefore, difficulties in the teaming skills of binocularity (binocular vision) and alignment may exist (ACBO, 2013d, para. 11). *Binocularity* is the ability to use both eyes at the same time. This process involves simultaneously blending the images from both eyes to create one mental picture (ACBO, 2013b, para. 23). Alignment requires

¹ Vision problems, behavioural optometry, orthoptic treatment, behavioural and perceptual vision therapy and good vision habits were addressed in Part I.

that both eyes work together as a synchronised team to focus on images (Handler & Fierson, 2011, p. 832). It is important to note that true *orthophoria* (perfectly straight eyes) occurs rarely; therefore, most individuals demonstrate a small asymptomatic *phoria* (deviation) that should be considered a normal variant – a latent deviation, usually *esophoria* (inward deviation) or *exophoria* (outward deviation) (Handler & Fierson, 2011, p. 832). While visible signs of eye turn are a clear indicator of vision problems it is important to realise that “Subtle eye alignment problems ... that may not produce a visible eye turn ... still can be the cause of eye strain and eye fatigue when reading” (Heiting, 2013, para. 25).

The *Children’s Vision Information Network* (2013d, para. 8) reports that about 10% of school aged children have eye teaming problems. Eye teaming skills are vital in determining the level of function of the *vergence system*, which works to maintain fusion – maintaining eye alignment on a visual target (Handler & Fierson, 2011, p. 832). *Convergence* is a skill which involves conducting and maintaining inward turn of the eyes, and is required for conducting close-up visual tasks (Handler & Fierson, 2011, p. 832). *Convergence insufficiency* or *convergence excess* may be characterised by “discomfort, eye strain, blurry vision, diplopia (double vision), and headaches, which can contribute to limited fluency by interfering with the child’s ability to concentrate on print for prolonged periods of time” (Handler & Fierson, 2011, p. 834). It is important to note that while children who have *acquired* convergence insufficiency problems (via injury or illness) tend to have more symptoms, “those who have never refined their ability to maintain eye convergence generally have few visual symptoms” (ACBO, 2013a, para. 4). “These children do tend, however, to have reduced fine *eye-hand* and *visual-motor* skills, and will tend to avoid near centred tasks due to the difficulty they experience in attending to these” (ACBO, 2013a, para. 3).

In addition, “problems in this area of visual performance will manifest in general clumsiness in the classroom and playground” (McKee, 2013, para. 1). One reason for this is that the *disparity* (difference) between the two retinal images of the same object provides important information about its size, distance and movement relative to other visible objects (McKee, 2013, para. 1). Squinting, blinking and poor posture may also be evident (ACBO, 2013d, para. 12). The *Children’s Vision Information Network* (2013d) provides an animation depicting how a page of text might appear to an individual with eye teaming difficulties.

Strabismus (Crossed or Wandering Eyes)

Strabismus is a vision problem that exists in a reciprocal relationship with eye teaming skills, effecting 2-4% of the population (Davidson & Quinn, 2011, p. 337). Strabismus occurs when one or both eyes turn in or out due to the brain’s inability to coordinate both eyes simultaneously (CVIN, 2013b, para. 1). The most common type of strabismus involves horizontal misalignment (Davidson & Quinn, 2011, p. 337). “Strabismus in which the misaligned eye turns in or out is divided into two categories: *esotropia* (crossed eye), which means one eye turns in towards the nose; and *exotropia* (wandering eye), which means one eye turns out away from the nose” (CVIN, 2013b, para. 2).

As a result of strabismus, an individual is only able to see through one eye at a time. Therefore, they experience loss in *depth perception*, which is the ability to judge distance (CVIN, 2013b, paras. 3, 4). Strabismus usually develops before a child is two, but may also occur as late as six, and even later as the result of injury or disease (CVIN, 2013b, paras. 1, 5). Children do not outgrow strabismus, and the condition may worsen over time, even resulting in additional complications with amblyopia, which is explored next. Therefore, it is important that the condition of strabismus receive prompt treatment (CVIN, 2013b, para. 1)

“Subtle eye alignment problems ... that may not produce a visible eye turn ... still can cause of eye strain and eye fatigue when reading”



Figure 1: Esotropia (top) and Exotropia (bottom) of the right eye

Source: Biology Forums - Strabismus, right exotropia <http://biology-forums.com/index.php?action=gallery%3Bsa=view%3Bid=6118>

Amblyopia (Lazy Eye)

The *Australasian College of Behavioural Optometrists* (ACBO, 2013e, para. 3) reports that *amblyopia* (lazy eye) is “quite common in young children, with about 5% of children requiring treatment for this problem”. According to the *Children’s Vision Information Network* (2013a, paras. 1, 2, 4), amblyopia is the result of one eye failing to develop normally as the result of the brain suppressing its use in favour of the other eye, and thereby failing to develop *binocularity*. Because the brain suppresses the *lazy eye*, *acuity* (normal sharpness of vision) is unable to develop, resulting in blurred vision even with the best glasses or contacts that an optometrist can prescribe (CVIN, 2013a, paras. 2, 4, 5). “The amblyopic eye/visual system becomes susceptible to the crowding phenomenon – a difficulty with distinguishing letters in close proximity to one another” (Handler & Fierion, 2011, p. 830). *Figure 3* provides an example of how a scene may look to an individual with normal vision, compared to how it may look to an individual with amblyopia – even with corrective lenses.

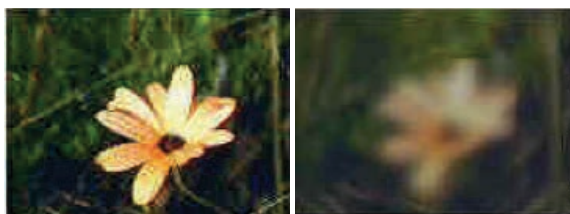


Figure 2. The above pictures depict clear vision out of an eye with normal sight (left picture), and blurry vision out of a lazy eye, even with glasses (right picture) (CVIN, 2013a)

Amblyopia is caused by various conditions, and is usually associated with *strabismus* or other eye teaming problems and/or *anisometropia* (refractive errors between an individual’s eyes); however, there is usually no visible structural abnormality (Davidson & Quinn, 2011, p. 336; Heiting, 2013, p. 23). A common misconception is that the lazy eye is primarily the result of a muscle problem. The problem is in fact usually due to the manner in which the eye muscles are controlled by the brain (ACBO, 2013e, para. 9). Prompt treatment to encourage the lazy eye to again switch on is important (ACBO, 2013e, para. 3).

Oculomotility (Eye Tracking Skills)

An additional ability that is important for reading is *oculomotility* – the ability of the eyes to control movements (CVIN, 2013d, paras. 15, 18). For example, catching a ball requires the eyes to follow the movement of the ball smoothly and accurately,

while reading requires the eyes to be able to control this fine movement at close range in order to follow a line of print. Children with tracking difficulties will often lose their place, skip or transpose words, have difficulty comprehending, read slowly, and will often be forced to use their fingers to follow the line because their eyes are unable to (Ciuffreda, et al., 2008, p. 18; CVIN, 2013d, para. 15). The *Children’s Vision Information Network* (2013d) website contains an animation that is useful in understanding how a page of text might appear to an individual with eye tracking difficulties (see www.childrensvision.com/reading).

What is important to understand is that when we read our eyes don’t move smoothly across the line; instead they make a series of saccades (jumps) and fixations (pauses to aim) as we read (CVIN, 2013d, para. 16). The length of saccades and duration of fixations is determined by factors such as the difficulty of the text being read, the ability to recognise letters, and the length of words (Handler & Fierion, 2011, p. 831). Research also indicates that *memory* aids in visual movement control, and therefore the more an individual reads the better control they will have over eye movements (Cheng, Grosbois, Smirl, Heath & Binsted, 2011, p. 1).

“The precise coordination of *saccades* and *fixations* is controlled by the *central* and *peripheral visual systems*. The central vision processes what is seen, while the peripheral vision processes where an individual is looking” (CVIN, 2013d, paras. 16, 17). Current research also provides some indication that individuals can shift attention to an object without moving our eyes (McPeck, 2013, para. 4). “In reading, central vision processes the word, while peripheral vision locates the following word and also tells the eyes where to aim next (CVIN, 2013d, para. 17). If there is not continuous, fluid simultaneous integration between these two systems tracking difficulties will result” (CVIN, 2013d, para. 17). Despite difficulties, it is possible for children with tracking disorders to learn to read fluently (Handler & Fierion, 2011, p. 831).

Accommodation (Focusing)

Accommodation (focusing) is the *optical* part of vision that allows an individual to see clearly by maintaining a clear, sharp image for an extended period of time, and also to quickly shift focus when looking from near to far (Damari, Taub & Duman, 2011, p. 17). Accommodation is an important ability required when reading up close and also when looking from the desk to the board (Damari, Taub & Duman, 2011, p. 17.). The *Children’s Vision Information Network* (2013d) website contains an animation that is useful in understanding how a

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page of text might appear to an individual with focusing difficulties (see www.childrensvision.com/reading).

Accommodative difficulties may be indicated by the following: decreased visual acuity at near; accommodative lag; either *esophoria* or *exophoria*; and uncomfortable, blurry or moving vision (Handler & Fiererson, 2011, p. 831). Sometimes children with focusing difficulties will hold their books very closely or lay their heads down, and may commonly experience headaches (CVIN, 2013d, para. 19). Accommodation has been shown in several studies to be the major cause of *binocular vision dysfunctions* (Damari, Taub & Duman, 2011, p. 17).

A major reason for accommodative difficulties is that our eyes are actually better suited for “distance vision, so when we look at something up close the natural lens in our eye has to change shape in order to redirect light rays on the retina” (Handler & Fiererson, 2011, p. 834). “Occasionally, a child can fail to establish adequate focussing stamina during the early years of development; however, in the vast majority of cases focussing dysfunction results from fatigue arising during sustained near visual tasks such as reading, writing and computer work. Therefore, in a sense this problem is an acquired one rather than being an innate problem with the visual system” (ACBO, 2013a, para. 2). “Also, accommodative amplitudes are maximal at childhood and decrease naturally with age” (Handler & Fiererson, 2011, p. 831). In addition, accommodative difficulties may be the result of the following: uncorrected high hyperopia (far sightedness); nonspecific viral illness; local ocular trauma; many medications; and various functional problems (Handler & Fiererson, 2011, p. 831).

Visual Perceptual Processing

Visual perceptual processing is a set of skills used to gather visual information from the environment and integrate them with our other senses, in order to create *schemes* (representations); the ability to interpret, analyse, and give meaning to what is seen (CVIN, 2013d, paras. 21-29). Examining visual perceptual processing is akin to ‘opening a can of worms’. However, it is important for educators to have at least a basic understanding of how visual processing deficits might impact their students. “Processing of visual input is a higher *cortical function*. Decoding and interpretation of retinal images occurs in the brain after visual signals are transmitted from the eyes. Although vision is necessary for reading, it is the brain that must perform the complex function of interpreting the incoming visual images” (Handler & Fiererson, 2011,

p. 832). *Visual perceptual processing* can be broken into three components: *visual spatial skills*; *visual analysis (discrimination) skills*; and *visual integration skills* (McMains, 2008, para. 3).

Visual Spatial Skills

“Visual spatial skills require observing an object then accurately reporting its relationship in space relative to your own self with regard to *laterality* (left and right) and *directionality*”, and also includes the ability to be able to *bilaterally integrate* by effectively using both sides of the body simultaneously (McMains, 2008, paras. 7, 24). Problems in this area may be indicated by a number of signs including: difficulty in learning left and right; letter reversals; and lack of coordination and balance (McMains, 2008, para. 8). Currently research into visual perception is an important area of neuroscience, with one of the central questions being *how the brain represents an object in space* (Kasamatsu, 2013, para. 1).

Visual Analysis Skills

Visual analysis skills are those skills that are utilised in order to “identify, sort, organise, store and recall visually presented information; the ability to take in visual information, remember it, and apply it at a later time” (McMains, 2008, para. 29). *Sub-skills of visual analysis include* the following: *figure ground*, which is the ability to distinguish an object from its surroundings; *visual form recognition/discrimination and constancy*, which involves discriminating differences in forms, including differences in size, shape, colour and orientation; *visual closure*, which allows an individual to visually complete a picture or form that is not in full view; *visual spatial memory*, which is the ability to recall the spatial location of an object or stimuli; *visual sequential memory*, which is the ability remember and recall forms in the correct order; *visualisation*, which is the ability to recall a previously viewed image or object and mentally manipulate the image from various aspects; *visual speed and span perception*, which relates to the rate and amount of information being handled in visual processing; and *automaticity*, the ability, once all of these skills have been developed, to be performed automatically so that less brain power is used, and efficient learning may take place (McMains, 2008, paras. 30-49). Signs and symptoms of problems with visual analysis skills may include: difficulty learning the alphabet; difficulty remembering how to read and write letters and numbers; difficulty recognising words; having poor concentration and attention span; having difficulty understanding instructions; and exhibiting hyper- or hypo-activity (McMains, 2008, para. 31).

“Visual perceptual processing is ... to gather visual information from the environment and integrate them with our other senses, in order to create schemes”

Visual Integration Skills

Visual integration skills allow an individual to integrate visual information with other visual information (*visual-visual integration*), and with other senses such as the auditory system (*visual-auditory integration*) and the motor system (*visual-motor integration*) (McMains, 2006, para. 1).

Visual-visual Integration (VVI)

Visual-visual integration is the result of several visual skills integrating together (McMains, 2008, para. 3). For example, such as when you look at a word and then match it to an image in your mind; looking at the word 'Siamese' and then picturing that type of cat in your mind (McMains, 2008, paras. 4, 5). In this case you would be integrating visual input with visualisation. Children with deficiency in this area will demonstrate poor visualisation skills.

Visual-auditory Integration (VAI)

"Visual-auditory integration requires linking together visual information with information that is heard, and includes abilities such as seeing a word and saying it aloud, or hearing a word and writing it down" (McMains, 2008, para. 15). Research indicates that organisation of visual-auditory integration is important in processing peripheral space and motion (McMains, 2008, para. 16). Signs and symptoms of visual-auditory integration problems include: "the consistent need to have directions repeated; poor spelling ability; difficulty learning to read phonetically; and difficulty relating symbols to their relevant sounds" (McMains, 2008, para. 20).

Visual-motor Integration (VMI)

Visual-motor integration, which includes gross motor eye-body and fine motor eye-hand-body coordination, is a critical component of vision (CVIN, 2013d, para. 30). In fact, "20% of raw visual data from the retina does not go back to the visual cortex for imaging, but rather breaks away and travels up to the brain's motor centres to assist with balance, coordination and movement" (CVIN, 2013d, para. 30). "*Gross motor eye-body coordination* requires efficient visual input regarding the body's relationship with its surrounding space. Children with poor *eye-body* skills may have difficulty in such areas as sports, leaning to ride a bicycle, or general clumsiness" (CVIN, 2013d, para. 31). "*Fine motor eye-hand coordination* requires efficient visual input into the body's fine motor systems. Children with poor *hand-eye* coordination may have poor handwriting and take longer to complete written assignments", and are also likely

to often become frustrated and lose concentration during sustained tasks (CVIN, 2013d, para. 32; ACBO, 2013d, para. 15).

Related Difficulties: Behavioural Disorders, Stress & Anxiety

More than 100 years ago White (1903, p. 14) clearly articulated the importance of the harmonious development of the whole person. While on the surface, behavioural disorders might seem to have little to do with optometry, "the fact is that vision occurs in the brain and not in the eyes, and co-mingles extensively with social and emotional pathways in the brain" (Hong & Press, 2009, para. 2). Therefore, we are compelled to look more closely at the role of vision in disorders such as attention deficit (A-D/HD), oppositional defiance (ODD), bi-polar disorder, and depression. In the subsequent pages, this document examines the association between vision and the following: *Attention Deficit Disorder (ADD) / Attention Deficit Hyperactivity Disorder (ADHD); Autism Spectrum Disorders (ASD); and stress and anxiety, in disorders such as Streff Syndrome.*

Attention Deficit Disorder (ADD) / Attention Deficit Hyperactivity Disorder (ADHD)

A recent research study into "the connection between eye teaming problems and attention deficit disorders found that children diagnosed with ADHD were three times as likely to have a *convergence insufficiency* as children in the general population" (Granet, Gomi, Ventura & Miller-Scholte, 2005, p. 163). Children with vision-based learning problems experience discomfort which causes them to exhibit a number of characteristics in common with those of ADD, including: being highly distractible; having short attention spans; making careless errors; failing to complete assignments; and often being fidgety and off task (CVIN, 2013c, para. 3). Unfortunately, educators and even some professionals are often not aware of this fact, and as a result these children are often misdiagnosed (CVIN, 2013c, para. 3). The *Children's Vision Information Network* (2013c, para. 6) recommends that prior to a diagnosis of ADD being made, vision tests should first be undertaken; objective clinical measures and tests for vision should be place before subjective checklists used to diagnose ADD.

Autism Spectrum Disorders (ASD)

Another example of the interplay between vision and behaviour is the relationship between vision and *autism spectrum disorders* (ASD). Recent studies comparing saccadic eye movements in autistic and non-autistic individuals suggests that some of the

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social impairments associated with autism may be attributed to abnormal attentional processing (Mazer, 2011, p. 1150). For example, Klin, Jones, Schultz, Volkmar and Cohen (2002, p. 809) found that autistic individuals viewing a movie tended to focus on the mouth, body and other objects, whereas non-autistic individuals tended to focus on the eyelids of subjects, and were therefore better able to read related social cues. Thus, while “*attentional biases* often result in positive outcomes, such as enhanced perceptual representations of visual stimuli containing an attended feature”, they may also be *maladaptive* and thereby facilitate certain human *psychopathologies* (Bridwell & Srinivasan, 2012, p. 1151).

Stress & Anxiety: Streff Syndrome

Streff Syndrome is a condition of visual stress, which although it is associated with physical, psychological and/or emotional stress, can only be diagnosed by optometric testing (Godtland & Scott, n.d., para. 1). Due to the role that patient anxiety is now recognised as playing, anxiety rating scales are now being developed for clinical and research purposes (Hong & Press, 2009, para. 2). Optometrists can treat the visual stress – usually with low plus lenses – and if no improvement is seen, psychotherapy can be recommended (Godtland & Scott, n.d., para. 2). While *Streff Syndrome* is caused by stress and anxiety, it is important to note that mild head trauma or concussion may be a trigger for stress that leads patients down the path to *Streff Syndrome* (Godtland & Scott, n.d., para. 2).

Streff Syndrome It is most often seen in patients between the ages of 6-12, with a slight female predilection (Godtland & Scott, n.d., para. 1). In addition, this condition is frequently seen in children with above average intelligence who are having reading, writing, learning and/or behavioural problems (*Vision Link Behavioural Optometrists* [VLBO], 2013, para. 4). *Streff Syndrome* is classically characterised by a loss of *depth perception* and a decrease in *visual acuity* that is worse at near than it is at distance (Godtland & Scott, n.d., para. 1). There may also be *colour vision* abnormalities that do not follow the colour confusion lines, as well as reduced *visual fields* (Godtland & Scott, n.d., para. 9). If sufferers are observed carefully, it becomes clear that it is not for lack of trying that they struggle (VLBO, 2013, para. 3). In fact, the harder they try to be obedient to the requirements to do their near work, the worse vision becomes (VLBO, 2013, para. 3). Also, it is common for children suffering from this problem to be accused of *malinger*ing (not telling the truth),

because the optometrist does not understand the problem (VLBO, 2013, para. 6).

Vision Resource & Checklist

The new visual demands placed on children as they enter school are likely to highlight existing problems in the visual system. However, children rarely report vision problems because their vision is normal to them, and therefore they think that everyone sees the way that they do (CVIN, 2013b, para. 8). For this reason it is essential for educators to be aware of the signs and possible causes of visual difficulties. In fact, the *Australasian College of Behavioural Optometrists* (2013d, para. 5) **considers teachers to be the best screeners for vision problems, through simply observing children functioning in the classroom.**

To resource teachers, three appendices follow. Appendix A is a list of web based resources; Appendix B addresses colour vision deficit assessment. Finally Appendix C contains a checklist designed to assist educators to identify students who may be experiencing vision problems which is an adaptation of the *Checklist for Common Symptoms* provided by the *Children's Vision Information Network* (2013d). Please note that proper diagnosis and treatment can only be performed by a qualified behavioural optometrist; however, this checklist provides a useful starting point.

Appendix A: Web Sourced Vision Resources

Brain Gym International
<http://www.braingym.org/>

Children's Vision Resources for Teachers
<http://www.optometrists.asn.au/EyesVision/ChildrensVision/ForTeachers/ChildrensVisionresourcesforteachers/tabid/861/language/en-AU/Default.aspx>

Clues to Good Vision: Teachers Resource Kit (Primary)
<http://www.optometrists.asn.au/LinkClick.aspx?fileticket=ra9vomlW%2bok%3d&tabid=861&language=en-AU>

Good Vision Guide – Multilingual
<http://www.optometrists.asn.au/LinkClick.aspx?fileticket=GGHCSKIONKo%3d&tabid=861&language=en-AU>

Good Vision Teacher Information Card
<http://www.optometrists.asn.au/LinkClick.aspx?fileticket=sCT5VdUdn9k%3d&tabid=861&language=en-AU>

“The Australasian College of Behavioural Optometrists considers teachers to be the best screeners for vision problems, through simply observing children functioning in the classroom”

National Eye Institute: Eye Health Information
<https://www.nei.nih.gov/health/>

Parent's Guide to Vision
<http://www.optometrists.asn.au/LinkClick.aspx?fileticket=%2fmqj0K%2fc04k%3d&tabid=845&language=en-AU>

Appendix B: Colour Vision Deficiency (CVD)

Colour Vision Deficiency (CVD), commonly referred to as *colour blindness*, is a disorder in which sufferers are unable to see all colours, but are still able to see things as clearly (Better Health Channel, 2013, paras. 2, 8). “Colour blindness is most commonly a genetic condition; some colour blindness is genetically inherited while other colour blindness arises as a result of a genetic change (mutation during development) or trauma to the brain or retina” (Better Health Channel, 2013, para. 2). “Very few people who are colour blind are blind to all colours” (Better Health Channel, 2013, para. 7). The usual colours that individuals have difficulties with are greens, yellows, oranges and reds, and less commonly, blues (Better Health Channel, 2013, paras. 3, 8). There are varying degrees of colour vision deficiency, with the degree and intensity of the light and nearness of the object also playing a role in colour vision ability (Better Health Channel, 2013, para. 13). Many tasks at school require children to be able to accurately see in colours. Signs that a child may have colour blindness include: difficulty recognising and identifying different colours beyond the age of around four years; and the inability to categorise things according to colour” (Better Health Channel, 2013, para. 5). “There is generally no treatment to cure colour blindness. However, certain types of tinted filters and contact lenses may help a person to distinguish different colours better” (Better Health Channel, 2013, para. 22).

“There is generally no treatment to cure colour blindness. However, certain types of tinted filters and contact lenses may help a person to distinguish different colours better”

It may be useful for educators to complete diagnostic tests to ascertain if any of their students might have *Colour Vision Deficiency*. These can be completed on an individual or whole class basis. Please note that the validity and reliability of these tests is impacted by the colours that are displayed on the screen being used to display them; different screens will produce variations in colour.

Colour Vision Deficiency Assessment Links

1. This on-line colour vision test consists of 8 plates taken from the Pseudoisochromatic Plate Ishihara Compatible (PIPIC) Colour Vision Test 24 Plate Edition, and is suitable for children who are able to identify numbers. (<http://colorvisiontesting.com/ishihara.htm#first%20test%20plate%20answer>)
2. This online-colour vision test is a simple non-medical test for red-green colour blindness. The animal shapes make this a suitable test for young children who may not yet be able to identify numbers. (<http://freepages.rootsweb.ancestry.com/~hellmers/test/>)
3. This online colour vision test is available in video format on YouTube. The first section consists of paediatric test plates which cater for younger children, while the latter section caters for older children and adults who are capable of reading numbers. (<http://www.youtube.com/watch?v=yEIM4jmK1F0>). **TEACH**

References

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Peanuts by Charles M. Schulz



Source: Schultz (1968, p. 13)

Appendix C: Checklist of common symptoms*

Name: _____ Date: _____

Place a tick (✓) in the column that best describes how often your student/child experiences the following symptoms:

	How frequently does this happen?	Never	A Little	Sometimes	A Lot	Always
1.	Headaches with reading or writing					
2.	Words slide together or get blurry when reading					
3.	Reads below grade level					
4.	Loses place while reading					
5.	Head tilt or closes an eye when reading					
6.	Hard to copy from the board					
7.	Doesn't like reading or writing					
8.	Leaves out small words when reading					
9.	Hard to write in a straight line					
10.	Burning, itching or watery eyes					
11.	Hard to understand what he/she has read					
12.	Holds book very close					
13.	Hard to pay attention when reading					
14.	Hard to finish assignments on time					
15.	Gives up easily (says "I can't" before trying)					
16.	Bumps into things, knocks things over					
17.	Homework takes too long					
18.	Daydreams					
19.	In trouble for being off task at school					
Total score in each column:						
Multiply column totals by:		x0	x1	x2	x3	x4
Score for each column:						
Total score for all columns:						

If your student/child's total score is more than 20, they have a greater than 80% chance of having a vision problem that is interfering with their learning.

* Adapted from the Children's Vision Information Network (Children's Vision Information Network, 2013), this checklist has reportedly been found to be an excellent tool in identifying at-risk children.

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