**REPORT OF EYE EXAMINATION OF:**

Clinical results (see Appendix for description of tests)

**Symptoms and history**

**Visual acuities and refractive error**

Vision: R. 6/ L. 6/

Near Vision (Snellen equivalent): R. 6/ L. 6/

Refraction: R.

 L.

**Ocular health**

Ophthalmoscopy: all observations were within normal limits

Pupil reactions: normal

Visual fields (Henson Pro, 30°): threshold 33; all points seen by each eye

**Ocular motor function**

Cover test: D

 N

Dissociation test: D

 N

Aligning prism (association test): D

 N

Ocular Motility: full and smooth

Near point of convergence:

Foveal suppression (Mallett):

Stereo-acuity: D (Rodenstock): 30' (=test ceiling)

 N (Randot): Global: 250 secs arc Local: 20 secs arc

Fusional reserves (VPS): Convergent: Divergent:

Amplitude of accommodation: R. D L. D

Accommodative lag (MEM):

AC/A ratio (gradient): Δ/D

**Other tests**

Colour vision (Ishihara):

Perception of crowded text:

Effect of occlusion:

Effect of coloured overlays:

Summary and Management

Xx was co-operative throughout my examination and demonstrated a quick understanding of my tests and of the tasks that were required of him. Many of the tests double-check each other and these showed Xx to be consistent.

Xx has normal visual acuities (ability to read a letter chart) and the ocular health and visual fields are normal. Most children are a little long-sighted and can usually compensate for this with ease. Xx has the usual degree of long-sightedness and my tests suggest that he is overcoming this without it causing any strain.

Many people with specific learning difficulties have a subtle form of binocular inco-ordination: this is a weakness in the co-ordination of the two eyes. I carried out about 12 tests to assess Xx’s binocular co-ordination and the results were consistent and within normal limits. Similarly, the ability to focus close to was within normal limits. Hence, Xx would not be likely to benefit from any eye exercises, patching, or spectacles.

Some people find reading easier when using coloured filters. In particular, coloured filters can help people who experience visual perceptual distortions and/or headaches and eyestrain when reading. I tested Xx with a range of coloured overlays and the response was consistent. I have issued him with a coloured sheet of his preferred colour to use on a trial basis for up to one school term. If Xx finds the sheet to be of sustained benefit then it is likely that he would benefit more from coloured glasses and he should return to me for further testing with a new instrument, the Intuitive Colorimeter.

Professor Bruce JW Evans BSc PhD FCOptom DipCLP DipOrth FAAO FBCLA 10 November, 2014

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Appendix: Description of clinical tests

Below is a description of the tests that are routinely carried out on people with specific learning difficulties (SpLD) and photosensitive migraine. This examination procedure has been developed over a number of years based on published research findings, both by Professor Evans and by other researchers. The tests that are required will vary from one patient to another, depending on the symptoms, on the co-operation during the examination, and on the findings of other tests. Many of the tests double-check each other. It is not always possible to carry out all of these tests (especially with younger children) and we often carry out additional tests in addition to those listed.

There are a number of possible outcomes from an eye examination. Many patients receive the "all clear" when no problems are detected. Other outcomes can be: eye exercises, coloured overlays or glasses, normal glasses, or occlusion (patching).

**Symptoms and history**: This is the starting point of the eye examination and it is very important to determine what problems a person is having. To this end, we have developed a detailed questionnaire, which is sent to patients before their appointment, or which is completed at the appointment. The questionnaire is very comprehensive and usually takes about 30 minutes to complete. When we see the patient we ask them further questions and encourage them to mention any other factors that they think are important.

**Visual acuity**: As well as the standard letter charts for use at distance and near, we also have charts comprising pictures and shapes for those with severe literacy difficulties.

**Retinoscopy**: This is a technique that is used to determine the degree of any long-sightedness, short-sightedness or astigmatism that may be present. The optometrist uses reflected light from the retina so that this technique is fully objective. In other words, a reliable estimate of the refractive error can be obtained without the patient's co-operation. This is particularly useful with unco-operative children and in all cases to check the child's response. The retinoscopy result is not usually recorded in reports, unless it is significantly different from the subjective refraction, or unless a reliable subjective refraction cannot be obtained (see below).

**Subjective refraction**: The patient is asked a series of deductive questions to confirm the retinoscopic findings and to determine the precise refractive error. The subjective refraction is checked in a number of ways, and the visual acuity is re-measured with any appropriate lenses to see if the vision can be improved. Although most people with specific learning difficulties or migraine do not require glasses, this technique is still important because the refractive error can influence how well someone can focus close to or how well the two eyes work together.

**Ophthalmoscopy**: Optometrists have a statutory responsibility to ensure that their patients' eyes are healthy. Although, thankfully, eye diseases are very rare in young people, we always carefully check to ensure that no diseases are present. Ophthalmoscopy is a technique when we look inside a person's eyes with an instrument that allows us to examine the lenses in the eye and the retina, blood vessels, and optic nerve head at the back of the eye. In the unlikely event that any abnormalities are detected we carry out further investigations (e.g., visual fields) and refer as appropriate.

**Visual fields**: Most “eye tests” assess the central visual function, that is how well a person can resolve fine detail seen in their central vision. Some eye or brain diseases can cause a loss of peripheral vision and people with a loss of peripheral vision are often unaware of this. Visual fields are checked in people who are old enough to co-operate with this testing to confirm that the peripheral vision is normal.

**Cover test**: This is the fundamental test to assess the binocular co-ordination. The binocular co-ordination describes how well the two eyes are co-ordinated together. This is an area where people with a specific learning difficulty sometimes have problems. The cover test is carried out at distance and near and detects any tendency for the eyes to deviate inwards or outwards.

**Dissociation test**: This quantifies any tendency for the eyes to deviate inwards or outwards.

**Aligning prism (association test or fixation disparity test using the Mallett Unit)**: This test has been shown in research to be very good at detecting whether any binocular inco-ordination is causing symptoms, and hence whether it needs to be treated. Research has shown that the test can be used to carry our a modified version of the **Dunlop Test**. An advantage over the original Dunlop Test is that the Mallett Unit is much less artificial and more closely represents the situation when a child is reading. However, the Dunlop Test, which has been claimed to detect "binocular instability", is controversial and some researchers have found it to be unreliable. Therefore, we carry out several tests to detect binocular instability, rather than just relying on one test.

**Ocular motility**: In this test the eye movements are observed to see whether there are any weak ("lazy") muscles. If so, we have a computerised technique for assessing any weak muscles in more detail. During ocular motility testing, we also assess whether the "tracking" eye movements are “smooth” and regular.

**Near point of convergence**: This test assesses how well the eyes converge (turn inwards) when looking at objects close to. Sometimes, we repeat this test several times to see if this deteriorates when a person becomes tired.

**Foveal suppression**: Some people with binocular inco-ordination suppress (or switch off) the image from one eye during reading. We use a polarised acuity test to detect this.

**Stereopsis (depth perception)**: We use a sensitive test (that measures to 20" of arc) to assess the stereo-acuity.

**Fusional reserves**: This is a measurement of the ability of the eyes to converge (turn inwards) and diverge (turn outwards), and reflects the "power in reserve" that can be used to overcome any tendency for the eyes to deviate. Professor Evans’ research, and that of others, shows this to be one variable that is often poor in those with a specific learning difficulty.

**Amplitude of accommodation**: This describes how well the eyes can focus close to. This is measured for each eye individually and can be repeated to see how easily the eyes become fatigued.

**Accommodative error or lag**: Usually, when we are reading our focussing is slightly "lazy" and lags just a little behind the plane of the page. This lag, if small, will not cause problems. However, for some people this lag can be excessive and we check this, using an objective method.

**Intuitive overlays**: Some children with specific learning difficulties can benefit from the use of coloured filters. Professor Evans have been involved in collaborative research with Professor Arnold Wilkins which has shown that, in some cases, coloured filters help for reasons other than a placebo. Therefore, we screen children who have a specific learning difficulty with coloured overlays. Initially, any perceptual distortions or discomfort on viewing crowded text are recorded, as is the effect of occluding one eye. We then use a range of overlays (Intuitive Overlays) that has been developed by Professor Arnold Wilkins to scientifically and systematically sample the range of colours that we can perceive. If someone shows a sustained benefit from coloured overlays then we issue them with their preferred colour to try out, with written instructions.

**Intuitive colorimeter**: This is another invention of Professor Arnold Wilkins. It is an instrument which, together with a new range of "precision tints", allows coloured glasses to be prescribed very precisely. If a child shows a significant benefit from a coloured overlay then they can return for intuitive colorimetry, if they would like tinted glasses. This is not a "cure for dyslexia" and only a fairly small proportion of our patients end up wearing tinted glasses. However, those who do need them report a benefit in terms of a reduction in eyestrain, headaches, and an improved perception of text.