



Pattern Glare, Photosensitivity^a and Tinted lenses

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It is common optometric and ophthalmologic practice to prescribe tinted lenses for many patients who complain of light sensitivity (photophobia), as well as for general protection against visible and ultraviolet light exposure. Tint selection is commonly based on symptoms, visual demands and subjective patient colour and density preference.

However, people with the specific condition known as “**pattern glare**” are abnormally photophobic, as well as being extremely sensitive when viewing particular types of repetitive striped patterns^{1 2 3}. Printed reading material can sometimes have the same effect due to the spatial effect of rows of words and spacing⁴; as a result people with pattern glare possibly can have issues with reading of text due to the high contrast spatial frequency of reading material.

People with pattern glare issues commonly complain of significant eyestrain, headaches, and even words moving when reading, as well as increased light sensitivity, particularly to certain types of fluorescent lighting, flickering light or reflections.

Specifically selected tinted lenses have been found to be significantly beneficial for some people in reducing symptoms of eyestrain and headaches and reading difficulty due to pattern glare (see below).

^a Abnormal sensitivity to light



Pattern glare can occur without other health issues, but can also be associated with a number of conditions. Researchers have found the following evidence of benefits of appropriately selected tinted lenses for various conditions as follows:

Acquired brain injury. Photophobia, headaches and reading difficulties are quite common after traumatic brain injury or stroke^{5 6 7 8 9 10}. Researchers have found a significant association of pattern glare with stroke in a study of 20 subjects, and they recommend further investigation of this possible association¹¹. It has been suggested that the brain injury or neurological condition can cause neurological disinhibition, increasing sensitivity to movement and light, resulting in visual cortex hyperexcitability¹².

Concussion. Many people who suffer concussion or whiplash experience significantly increased sensitivity to light and sound (photophobia and phonophobia)^{13 14}.

Photosensitive epilepsy. People who experience seizures which can be provoked by flashing lights, have been found in many cases to have improved visual symptoms from having spectacle lenses prescribed with a tint, most commonly rose or purple. They experienced reduced dizziness caused by exposure to fluorescent lighting or computer screens^{15 16}. **However, this does not suggest a reduction in seizures for anybody with this condition.**

Migraine. Researchers have found visual factors, particularly pattern glare issues, in some people can contribute to migraine^{17 18 19}. Huang et al have shown that the visual stimulus which causes pattern glare is sensory rather than physical in origin, and that in people with certain types of migraine, specifically chosen tints can reduce the cortical hyperactivation^{20 21}.

Visual snow (VS). Visual snow is described by Lauschke et al as a “persistent visual experience of flickering fine achromatic dots or static in the whole visual field of both



eyes likened to “static analogue television noise”^{22 23}. The symptoms can often be associated with other symptoms such as photophobia, pattern glare and palinopsia, tinnitus and migraine²⁴. Similarly, Unal-Cevik and Yildiz have reported on one patient with “visual snow , migraine with aura, and cortical hyperexcitability”, with the latter detected electrophysiologically.

Lauschke et al stated: “When (colourimetry was) offered to VS patients we identified a pattern of symptoms relief from these coloured filters, particularly those in the yellow-blue spectrum”. While intuitive colourimetry for VS has also been investigated by the National Hospital for Neurology, this application of tinted lenses would benefit from further research.

Blepharospasm. Herz and Yen twelve years ago reported in a study of 24 benign essential blepharospasm (BEB) patients compare with 10 normal controls, that “the symptoms of photophobia in blepharospasm patients can be reduced significantly with” chromatic lenses²⁵. Adams et al found their subjects with BEB had similar heightened light discomfort thresholds to people with photosensitive migraine, with improved comfort with Zeiss FL41 or gray-tinted spectacles²⁶. Blackburn et al in a study of subjects with BEB that FL41 and gray-tinted lenses “provided superior improvement in ...reading, fluorescent light sensitivity, overall light sensitivity, blepharospasm frequency and blepharospasm severity”. **It should be noted that tinted lenses may improve visual comfort and function in people with benign essential blepharospasm, but have not been shown to specifically treat blepharospasm²⁷.**

Autism. Increased sensitivity to light is a common symptom in people with autism spectrum disorder (ASD)²⁸, with 50% possibly having “severe sensitivity to fluorescent lighting”²⁹, with one group suggesting this is due to fluorescent light “coherence and phase shift”³⁰. In one study it was found that “repetitive behaviours for ASD children increased ..in a room... (with) fluorescent light”³¹. As well, “judgements of emotional



intensity (in faces) improved significantly with the addition of the preferred colored tint (selected as improving the clarity of text) in (an) ASD group but not in controls, a result consistent with a link between visual stress and impairments in processing facial expressions in individuals with ASD”³²

Reading problems and dyslexia. The use of tinted lenses and coloured overlays for treatment of reading problems continues to be controversial, and is complicated by generalisations confusing different groups of people and problems, encompassing people who experience pattern glare when reading, people with severe learning problems which may be language - based, and people diagnosed with dyslexia . The majority of people with reading issues do not report pattern glare, but many people have claimed tinted lenses as a panacea for reading issues, which adds to the confusion^{33 34 35 36}.

In addition, Scheiman and others have conclusively shown that many people who report an improvement in reading performance with tinted lenses or overlays, have significant vision problems including accommodation (focusing) and convergence issues, which when appropriately treated with lenses and vision therapy, result in tinted lenses making minimal or no difference subjectively^{37 38}.

Pattern glare symptoms in relation to reading have been labelled in a number of ways, including the Meares – Irlen syndrome³⁹ as well as the Scotopic Sensitivity Syndrome. Meares first described the use of colour for people with reading issues in 1980. Psychologist Helen Irlen popularised the terms Irlen syndrome and Scotopic Sensitivity Syndrome in the late 1980s, and franchised Irlen clinics to many people who offered testing, which was very subjective and unscientific , and prescription of coloured lenses for children and adults with significant reading problems. This was sensationalised by the media in Australia and the US, but the number of Irlen clinics has reduced significantly over the years, at least in Australia^{40 41}.



Recently Barrett et al have published a paper described as a systematic review of the literature regarding the use of coloured overlays or lenses for reading problems. They conclude that any benefits reported by patients are due to placebo or practice effects, rather than true benefits.

Not unexpectedly proponents of the use of lenses for scotopic sensitivity syndrome have criticised the review as selective and potentially biased.

Interestingly Chouinard et al published a functional neuroimaging study of one case of Meares-Irlen syndrome ⁴².

As a result, the controversy continues regarding the science and clinical benefits of using tinted lenses or overlays specifically for reading issues.

Wilkins published a comprehensive text in 1995 using the phrase “visual stress” to describe visual symptoms in specific conditions such as migraine, and there have been numerous publications since, concerning migraine as well as reading problems, by Wilkins and other researchers such as Evans.

Wilkins also developed an instrument termed the Intuitive Colorimeter, which is said to provide a more scientific assessment of potential benefits of coloured lenses for pattern glare than the Irlen approach of trial and error of different coloured lenses with very subjective questions and answers. In the United Kingdom it is estimated there are now over 500 hospital and university clinics and optometry practices using the instrument for testing and possible treatment with tints of various conditions.

Anecdotally, optometrists who use the Intuitive Colorimeter for testing of people with reading problems report the test results frequently show there is no specific tint which changes reading performance for people whose primary concern is reading issues. As such, it is useful in avoiding unnecessary prescription of tints in many people.



At the same time, the instrument is a more scientific method (than subjective trial) of determining whether a tint improves pattern glare symptoms for people with various conditions, and which particular tint is optimal.

Summary

Optometrists may prescribe tints where clinically indicated for specific conditions in which pattern glare may occur, including migraine, photosensitive epilepsy, stroke, traumatic brain injury, and concussion and whiplash. There is strong scientific evidence base for the increased presence of pattern glare in these conditions, suggestions for a cortical mechanism, and evidence supporting the benefits of specifically selected coloured lenses in treating the symptoms.

The use of coloured lenses or overlays for reading problems is still controversial, and made more complex by issues of the presence or absence of pattern glare, language-based reading issues, definitions of dyslexia, and strong opinions on both sides of the discussion.

It should be emphasised that optometrists prescribe tinted lenses for the physical conditions listed above, where indicated by patient symptoms and clinical assessment, and only prescribe tinted lenses in relation to reading problems when there are significant visual symptoms which respond to tint application, and clinical evidence of pattern glare interfering with reading legibility.



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