

## Use of Performance-Tinted Contact Lenses in Patients with Photosensitivity

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Photosensitivity, also referred to as photophobia, is commonly associated with migraine headaches, concussion, traumatic brain injury, keratitis, iritis, and other systemic and ocular conditions. A recent review by Burstein, Nosedá, and Fulton delineates four specific types of symptoms of photophobia that can be experienced by individuals with specific conditions:<sup>1</sup>

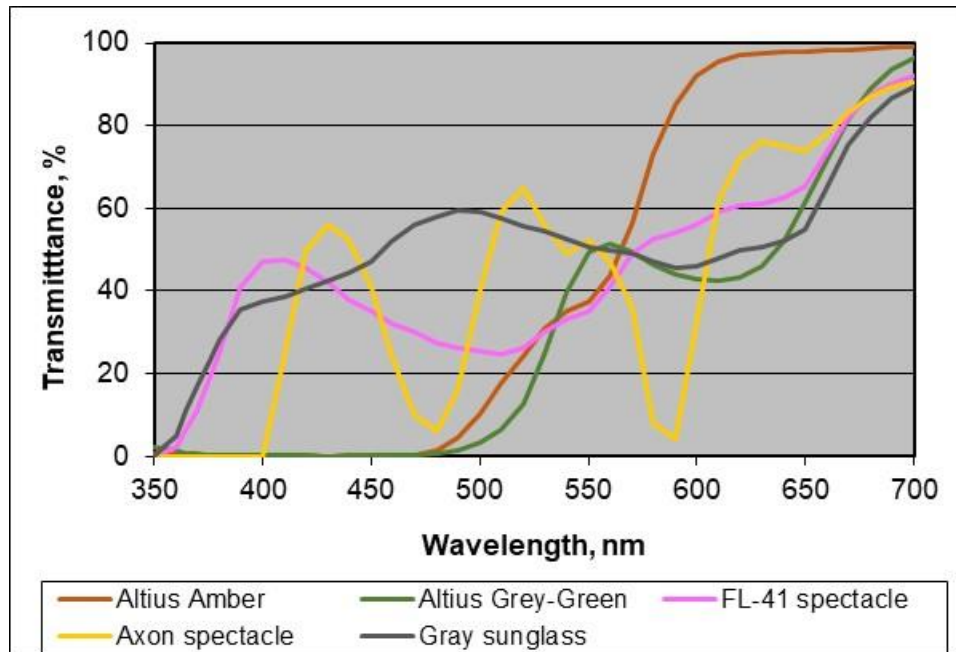
1. abnormal sensitivity to light;
2. ocular discomfort;
3. exacerbation of headache by light; and
4. general aversion to light.

The authors propose various neurological pathways and mechanisms in affected individuals by which light – not only by intensity but also by color – can trigger either a direct photophobia response or negative emotions.<sup>1</sup> The primary component appears to be the recently-discovered third type of photoreceptor, the intrinsically photosensitive retinal ganglion cell (IPRGC). IPRGCs are believed to regulate circadian rhythm and the pupillary light reflex, with peak sensitivity to wavelengths in the blue region of the spectrum at about 480 nm.<sup>2</sup> Previous research demonstrated that exposure to blue light could exacerbate migraine symptoms even in blind individuals.<sup>3</sup> While Burstein et al. show that all colors actually can trigger negative responses in most migraine sufferers, green light actually can trigger positive emotional responses in some.<sup>1</sup>

Previous research also has demonstrated that photophobia symptoms can be relieved by blue-blocking lenses,<sup>4-7</sup> including lenses with FL-41 or similar tint.<sup>2</sup> However, unless the spectacle frame is sufficiently contoured to the wearer's face and head, light leakage around the frame and reflection from the back surfaces of the lenses are possible and may not provide the relief sought, even with dark gray or strongly colored lenses. Also, if the lenses have a steep base curve, they may induce significant prism if they are not compensated for use in a frame with high faceform tilt.

A new performance-tinted single-use soft contact lens (CL), ALTIUS® (ocufilcon D), has recently been introduced commercially. Range of available powers is Plano to -6.00 DS with base curve of 8.7 mm and overall diameter of 14.2 mm. Two solid tints are available: amber, with 50% total light transmittance; and grey-green, with 38% total light transmittance. The tints are designed to enhance vision during sports and recreational activities under a wide range of outdoor light conditions. Both tints block 100% of ultraviolet and have negligible transmittance below about 500 nm, thus blocking all violet and most blue light. By comparison, typical FL-41 and similar tints block only a portion of light at the peak of the action spectrum of IPRGCs and less at other nearby wavelengths, while typical gray sunglass tints offer little if any selective filtering of light (see Figure 1).

Figure 1. Transmittance spectra of ALTIUS® Amber and Grey-Green CLs, typical FL-41 and gray sunglass spectacle lenses (adapted from Ref. 1), and Axon light sensitivity spectacle lens (adapted from Ref. 8).



Since the CL more than covers the entire cornea, it will eliminate all light leakage and lens reflection as well as any unintended prism. While the primary purpose of the ALTIUS® CL is for sports and recreational use, they can also potentially help individuals with photosensitivity complaints. We report here on three such patients.

Patient 1: female, 22, history of migraine headaches, frequently experiences nausea in bright indoor lighting at work. Previous use of polarized sunglasses and/or medications provided only marginal relief. The ALTIUS® grey-green tint completely eliminates her symptoms and allows her to function normally throughout the day.

Patient 2: male, 35, combat veteran who has experienced several bomb blasts at close proximity, diagnosed with post-concussion syndrome. Frequency of photosensitivity symptoms has been decreasing, but both ALTIUS® tints improve visual comfort more than other tinted eyewear for various tasks under different light conditions.

Patient 3: male, 23, collegiate baseball catcher, suffered a concussion 3 months prior to examination with subsequent photosensitivity, frequent headache, and cognitive/behavioral changes. The ALTIUS® grey-green tint significantly improves visual comfort and reduces symptom awareness.

The ALTIUS® CL provides a uniform solid tint to the wearer. Both ALTIUS® tints eliminate nearly all blue light, and the grey-green selectively transmits green light. The reduction of symptoms in these patients is consistent with the mechanisms reported by Burstein et al.<sup>1</sup> Unlike spectacles, ALTIUS® CL reduces or eliminates light leakage, surface reflections, and unintended prism. The ALTIUS® CL is a viable alternative for patients with photosensitivity complaints.

## References

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