Blue Blockers may adversely affect light sensitive individuals

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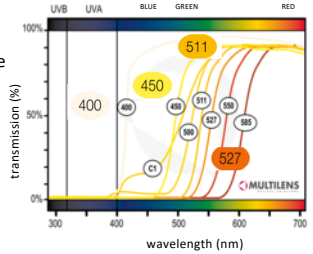
Amber lenses (blue blockers) are the most commonly recommended tints, but may not be the best. We hypothesize that blue blockers preferentially transmit wavelengths that increase discomfort, particularly for those with light sensitivity. Studies were conducted with normal and light sensitive patients suffering from dry eye syndrome (DES), using a LuxIQ™ system (Jasper Ridge Inc.) over a Colenbrander mixed contrast eye chart.

Blue Blockers are generally prescribed to increase perceived contrast
For example, they reduce glare from bright blue sky
Some practitioners are motivated by concern about blue light exposure

Characteristics:
- Amber or yellow tinted lenses
- Block blue, sometimes green
- Transmit red light



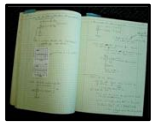
Method
Preferred intensity in lux vs. color was measured using a LuxIQ™ with a Colenbrander mixed contrast chart. N=17.

The exam system presented four colors:
- White (6,500°K color temperature)
- Blue (470 nm)
- Red (625 nm)
- Simulation of an FL-41 lens (blue blocker transmitting pink hue)

Subjects were asked to increase intensity for each color to their maximum comfort level, and those levels were recorded.

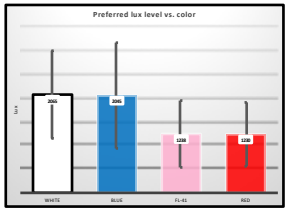
Greens and blues are common in the natural environment; reds are not
The human visual system evolved in a blue-green environment

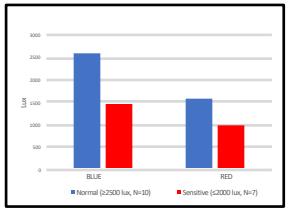
Green backgrounds reduce eye strain
Accountants and engineers use green paper for fine work



VisionEdge® Light

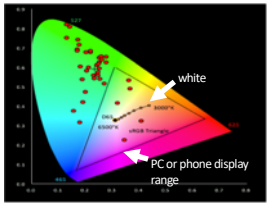
Results
Subjects tolerated blue and white about equally, and 60% more than FL-41 and red (left graph).
Colored light tolerance is independent of light sensitivity (right graph).





Light Sensitivity and Color
When presented with a choice, most people prefer green-blue backgrounds
Most perceive a red background as irritating. (See figure at right.)

Original aim of the study in this poster:
When measuring light sensitivity using the LuxIQ exam system, will a more irritating color like red produce a better result than white?



40 subjects
Ref: G. L. Goodrich et. Al. Envision 2016

Conclusion:
Blue blockers
- Block the "comfortable" colors – blues and greens
- Transmit the "irritating" colors – reds

Many find blue and green lenses
- More comfortable and
- Tolerate higher intensity when wearing them

Paradigm shift:
Can we help light sensitive patients by blocking the red and letting in the blue?

Recommending amber lenses (blue blockers) is a trade-off, and a light sensitive patient might benefit from a blue or green tinted lens.

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Novel Light Sensitivity Device for Quantitative Dry Eye Syndrome Evaluation

"The LuxIQ™ is to Dry Eyes what Visual Field is to Glaucoma"

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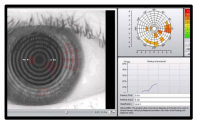
Purpose

Goal is to evaluate the effectiveness of a novel device that quantifies light sensitivity in patients reporting Dry Eye Syndrome (DES) symptoms, and **whether light sensitivity measurement is an effective indicator of DES.**

Methods

MD recruited patients (n=15) reporting DES symptoms during their regularly scheduled visit to a Dry Eye clinic. A routine screening exam was conducted, including Non-Invasive Tear Break-up Time (NIBUT), Schirmer, and Osmolarity. In addition, each patient was asked to adjust a light sensitivity device (LuxIQ™ by Jasper Ridge Inc.) to their preferred illuminance and white light color temperature on a 40-cm near vision chart (Colenbrander Mixed Contrast). The illuminance range was 0-5000 lux and color temperature range was 2,700 to 6,500°K. Measurement was bilateral (both eyes open). Patients were not told the purpose of this measurement. Control subjects without DES symptoms (n=8), were measured for illuminance and color temperature preference.



NIBUT (5 min exam time)

LuxIQ™ (2 mins)

Schirmer (10 mins)

Osmolarity (5 mins)

Results

DES patients were more light sensitive. The average illuminance preferred by DES patients was significantly lower: 1750 ± 753 lux for DES vs. 2643 ± 1435 lux for controls (fig 1). DES patients' light sensitivity peaked between 1000 and 2000 lux, and was significantly greater than the control (p=.21). Subjects showed no significant difference in their preference for color temperature. Interestingly, the NIBUT, Schirmer and Osmolarity tests showed no correlation to one another. The sole correlation between methods ($r^2 = 0.91$) was seen between the LuxIQ and the NIBUT, for those patients with NIBUT time in both eyes <5 sec and LuxIQ illuminance <3000 lux.

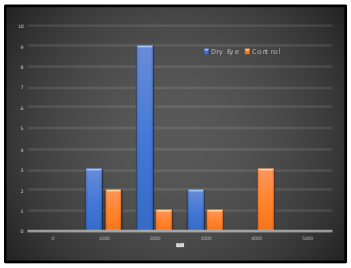


Fig 1: Frequency distribution for preferred lux for Dry Eye Syndrome and control subjects.

Fig 2: LuxIQ/2™ tint and light system over standard reading chart.

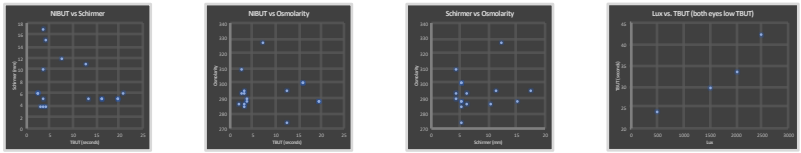


Fig 3: Low correlation between conventional tests (NIBUT, Shirmer, Osmolarity). High correlation between NIBUT (<5 sec, both eyes) and new test, LuxIQ light sensitivity system (<3000 lux).

Conclusion

This study found strong evidence of a consistent, tight relationship between light sensitivity measurement and DES symptoms. Of the four diagnostic tests used in this study, preferred illuminance using the LuxIQ to measure light sensitivity was the most consistent. In addition, the LuxIQ is the quickest, simplest, and least invasive test for DES.

Just as the visual field instrument is an objective measurement of an inherently subjective response to light intensity and correlates with visual function, the LuxIQ is an objective measurement of inherently subjective response to light sensitivity and correlates with dry eye disease.

The LuxIQ device is an objective measure of an inherently subjective response to light intensity and correlates with dry eye disease.

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