

Blue Light and Screen Time Guide for Schools and Educators



A GUIDE FOR EDUCATORS

eyesafe®



Children Are More Susceptible to Screen Time and Blue Light

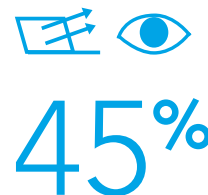
The effects of digital light are beginning to come to the forefront of our professional and personal lives. According to Nielsen data,¹ we spend over 11 hours of our day on smartphones, tablets, or computer displays and are exposed to the effects of digital light, which in turn impacts our task productivity and cognitive performance. We are just beginning to understand the potential health risks of screen time and blue light exposure.



BECAUSE CHILDREN HOLD DEVICES CLOSER TO THE FACE, BLUE LIGHT INTENSITY INCREASES UP TO 4X²



TIME SPENT PER DAY LOOKING AT SCREENS THAT EMIT DIGITAL LIGHT¹



MORE LIGHT TO THE BACK OF THE EYE OF A CHILD'S DEVELOPING EYE³

1. The Nielsen Total Audience Report: Q3 2018, <https://www.nielsen.com/us/en/insights/report/2019/q3-2018-total-audience-report/>

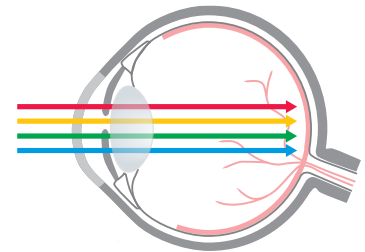
2. 20/20 blue light refocused – separating science from speculation, by Gary Morgan, OD, Jobson Medical Information LLC

3. Blue light impact in children, Infant & Children's Vision Resources supported by The American Optometric Association and Optometry Cares – The AOA Foundation

Cumulative Exposure to High-Energy Blue Light is Especially Intense for Human Health

Blue light is a part of the visible light spectrum that has been shown to contribute to digital eye strain. High-energy blue light from device screens combined with the amount of time we use devices may cause overexposure, and affect our eye health.

The light intensity of mobile devices peaks in the middle of the blue light spectrum. This intense portion of the light spectrum goes straight to the back of the retina. In young children, more blue light is transmitted to the retina due to their developing eye lens.

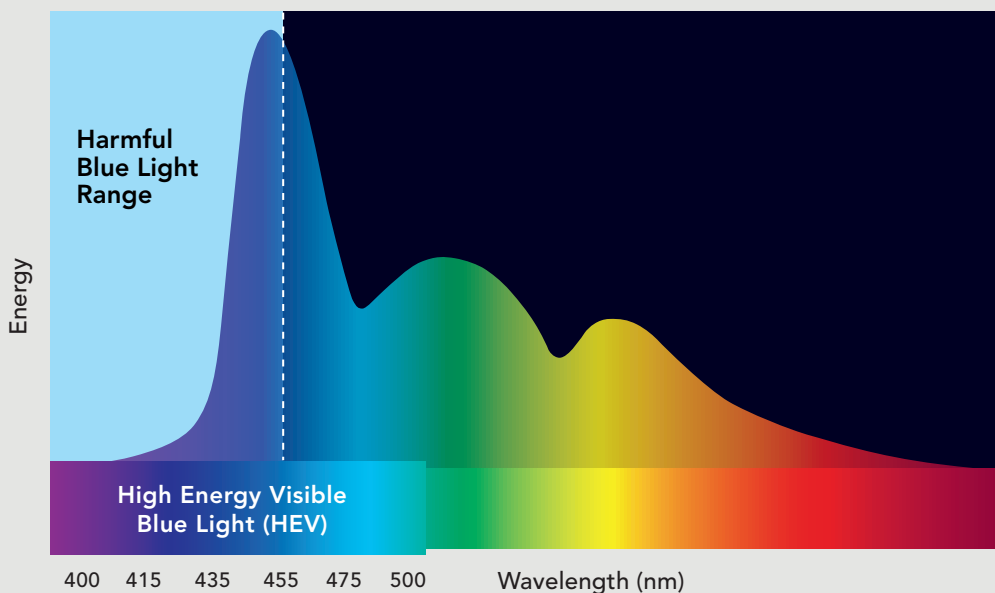


Visible light is transmitted to the retina from natural and artificial light sources, between the range of 400-700 nm.

Chronic exposure to high-energy blue light from devices has been connected with:

- Digital Eye Strain
- Circadian Rhythm Disruption and Melatonin Suppression
- Potential long-term retinal damage, AMD (Macular Degeneration) and other physiologic impacts

Find a summary of impacts and recent research at eyesafe.com/research.



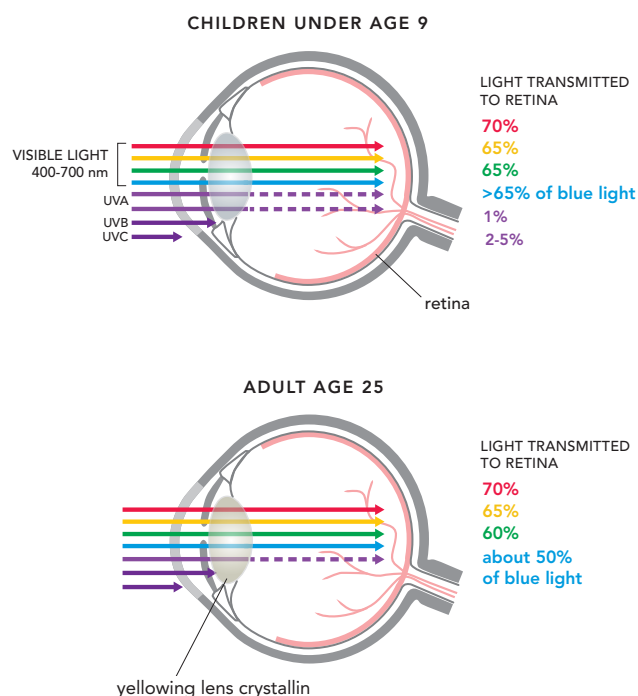
Typical Industry Displays Emit High Amounts of Blue Light

High-energy visible (HEV) blue light ranges from 380 to 500 nm. The blue light rays that border UV (at 380 nm) have the highest energy.

Common Devices Today Emit Most Energy in the Range Where Children's Eyes are Most Vulnerable

“The absorption spectrum of the lens changes with age. In young children, more than 65% of blue light is transmitted to the retina. At around 25 years, only 20% of the light between 400 and 460 nm and 50% of wavelengths between 400 and 500 nm are transmitted.”¹

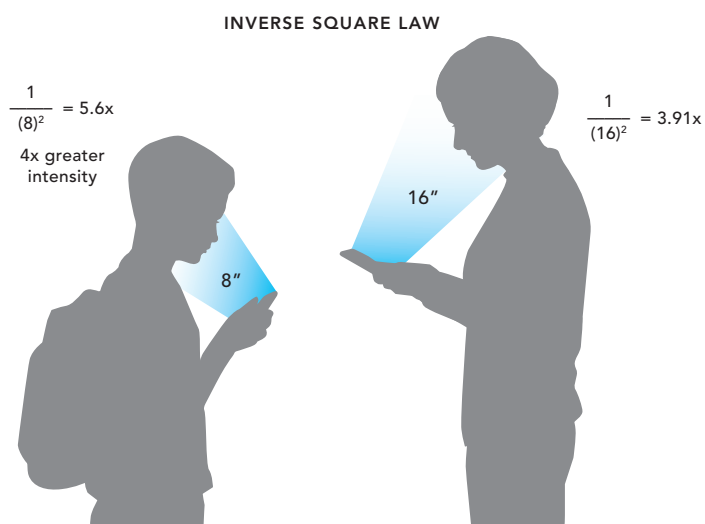
“Children may be at higher risk for blue light retinal damage than adults. The juvenile lens absorbs less short-wavelength light than the adult lens, allowing more blue light to reach a child's retina.”²



Children Hold Devices Closer to Their Face, Increasing Blue Light Exposure

Light intensity changes by the inverse square of the distance. A child with shorter arms holding a tablet or phone will receive a greater intensity of light than an adult, four times the intensity depending on body size.

Children can be more exposed to display intensity. Holding a display twice as close quadruples the intensity.



1. Blue light impact in children, Infant & Children's Vision Resources supported by The American Optometric Association and Optometry Cares – The AOA Foundation
2. Light-emitting diodes (LED) for domestic lighting: Any risks for the eye? Progress in Retinal and Eye Research 2011; 30, 239-257 F. Behar-Cohen et al.

Key Research Identifies the Risks for Children's Developing Eyes

CHILDREN UNDER 18

"ANSES, the French Agency for Food, Environmental and Occupational Health & Safety*, recommends that consumer information about health risks related to the use of LED lighting systems be made available immediately pending the implementation of an appropriate regulatory framework.

ANSES recommends:

- 1) To avoid the use of light sources emitting cold-white light (light with a strong blue component) in places frequented by children or in the objects they use (toys, electronic display panels, etc);
- 2) To ensure that manufacturers and integrators of LEDs carry out quality controls and qualify their products with regard to different risk groups;
- 3) To set up a clear, easy to understand labeling system for consumers, with a mandatory indication of the photobiological safety Risk Group on the packaging for all types of lighting."¹

"Children under 18 are at higher risk for retinal damage from blue light since their young crystalline lenses are clear and do not impede the passage of blue light."²

"Recent research found that filtering blue light from LED screens before bed of teenagers significantly weakened the LED-induced melatonin suppression and decreased alertness brought on by blue light before bedtime."³

"Higher levels of total time spent outdoors, rather than sport per se, were associated with less myopia and a more hyperopic mean refraction, after adjusting for near work, parental myopia, and ethnicity."⁴

KEY POINTS:

Avoid cold-white light

Children under 18 are at higher risk for retinal damage

Reduce blue light exposure before bedtime

1. *Light-emitting diodes (LED) for domestic lighting: Any risks for the eye?* Progress in Retinal and Eye Research 2011; F. Behar-Cohen et al.

2. *Balancing the Blues*, 20/20 Magazine

3. *Blue blocker glasses as a countermeasure for alerting affects of evening light-emitting diode screen exposure in male teenagers*, The Journal of Adolescent Health

4. *Outdoor activity reduces the prevalence of myopia in children*, Ophthalmology

*ANSES, Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail. www.anses.fr

LEADING EYE DOCTORS ARE CONCERNED:

"Given that eyes are still developing through the teenage years, blue light protection is important for children's eyes."

Sheri Rowen, MD, world-recognized ophthalmologist and member Vision Health Advisory Board



Screen Time Now Exceeds Sleeping Hours, Leading to Numerous Health Issues

Average daily screen time is growing, and as many as 4 in 5 adults complain of digital eye strain – a direct result of extended computer and smartphone usage and prolonged exposure to the high energy blue light emitted from typical displays.

Health Impacts of Digital Eye Strain and Over-Exposure to Blue Light can lead to:

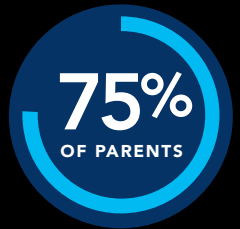
- Dry, irritated eyes
- Trouble sleeping
- Blurred vision
- Reduced attention span
- Irritability and difficulty concentrating



AVERAGE DAILY
SCREEN TIME



REPORT SYMPTOMS
OF DIGITAL EYE STRAIN



CONCERNED ABOUT
DIGITAL DEVICES AND
DEVELOPING EYES



WORLD LEADING HEALTH ORGANIZATIONS ARE TAKING POSITIONS ON IMPACTS OF SCREEN TIME ON HUMAN HEALTH



The American Medical Association adopts guidance to reduce harm from high intensity high-energy visible blue emitting LED street lights. "Discomfort and disability from intense, blue-rich LED lighting can decrease visual acuity and safety, resulting in concerns and creating a road hazard. In addition to its impact on drivers, blue-rich LED streetlights operate at a wavelength that most adversely suppresses melatonin during night. It is estimated that white **LED lamps have five times greater impact** on circadian sleep rhythms than conventional street lamps. Recent large surveys found that brighter residential nighttime lighting is associated with reduced sleep times, dissatisfaction with sleep quality, excessive sleepiness, impaired daytime functioning and obesity.



The American Academy of Pediatrics recently published screen time guidance for children and families, citing blue light: the recommendations cite a study in regard to blue light's impact on children. For industry, AAP recommends to "Develop systems embedded in devices that can help parents monitor and limit media use."

Because of the below AAP recommends:

For children younger than 18 months: avoid screen use

For children 2-5 years: 1 hour per day

For children 6 and older: set reasonable limits



American Optometric Association published "Blue Light Impact in Children" which identifies that children may be at higher risk for blue light retinal damage than adults. The juvenile lens absorbs less short-wavelength light than the adult lens, allowing more blue light to reach a child's retina. Also that exposure "is able to stimulate blue-light-sensitive ganglion cell photoreceptors that regulate circadian rhythms. As a result, cellular telephone, tablet and personal computer use before bedtime can delay sleep onset, degrade sleep quality and impair alertness the following day. Extended use of these devices has also been shown to cause symptoms **of dry eyes, blurred vision and headaches.**"



Prevent Blindness has identified that "Almost all visible blue light passes through the cornea and lens and reaches the retina. This light may affect vision and could prematurely age the eyes. Early research shows that too much exposure to blue light could lead to: **Digital eyestrain:** Blue light from computer screens and digital devices can decrease contrast leading to digital eyestrain. Fatigue, dry eyes, bad lighting, or how you sit in front of the computer can cause eyestrain. Symptoms of eyestrain include sore or irritated eyes and difficulty focusing. Retina damage: studies suggest that continued exposure to blue light over time could lead to damaged retinal cells. This can cause **vision problems like AMD.**"



The Vision Council states: "With an increase in digital technology, there has been an increase in blue light exposure. In turn, many individuals suffer from the physical eye discomfort after screen use for longer than two hours at a time, also known as digital eye strain." While **78.3 percent** of parents are somewhat or very concerned about the impact of digital devices on their child(ren), only **29.1 percent** report taking their child(ren) for an annual eye exam as part of back-to-school preparation."

New Requirements are Providing Guidance for Employers and Health Payers for Blue Light Health and Safety

REQUIREMENTS & STANDARDS

In collaboration with leaders in the eye and healthcare community, Eyesafe® Display adheres to Requirements established with leaders in the eye and healthcare community, the latest research, and recognizing industry standards.

eyesafe®
DISPLAY

THIS PRODUCT MEETS
EYESAFE® REQUIREMENTS FOR
REDUCED BLUE LIGHT EMISSIONS
AND COLOR INTEGRITY

Look for Eyesafe®

Products achieving Eyesafe®
Requirements include the
Eyesafe® mark.

HIGH-ENERGY BLUE LIGHT



- ✓ Blue Light Toxicity Scaling requirement based on ICNIRP
- ✓ Blue light toxicity factor [Blue light toxicity ($\mu\text{W}/\text{cm}^2$)] vs. total lux must be less than 0.085
- ✓ The ratio of light in the range from 415-455nm compared to 400-500nm must be less than 50%

SAFETY STANDARDS



- ✓ Photobiological Safety
- ✓ The product must meet exempt group limits as outlined in IEC/EN 62471

COLOR PERFORMANCE

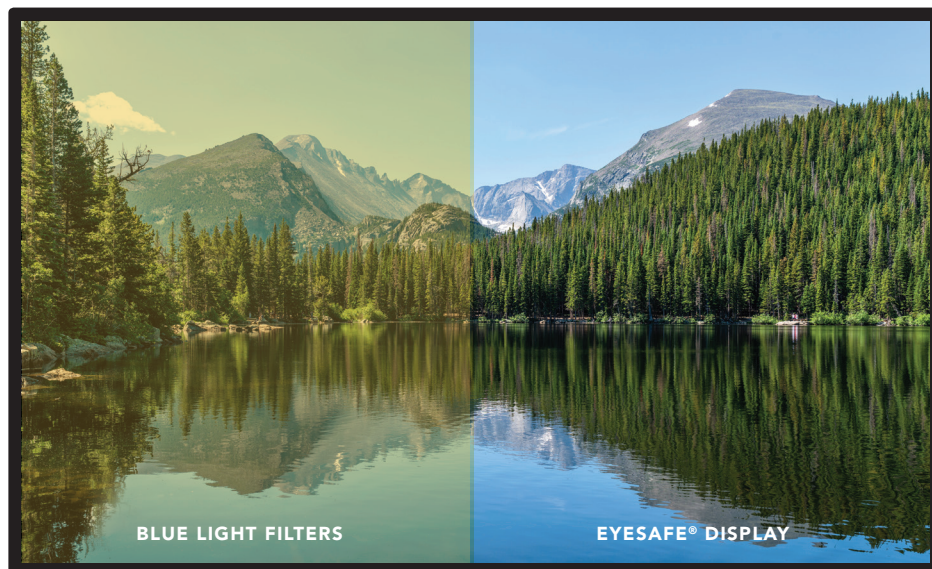


- ✓ Color Gamut %
- ✓ Gamut must be 72% of NTSC⁽ⁱ⁾ or greater
- ✓ The CCT shall be within in the range of 5500K to 7000K

Promote a Healthier Digital Environment for Students and Classrooms

What can educators do to promote the healthy use of digital devices?

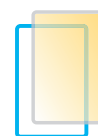
- **Apply protective overlay screens** certified to reduce blue light on smartphones and tablets.
- **Utilize filtering software** such as 'night shift' if available to help reduce blue light in all displays and handheld devices
- Promote **healthier screen habits** to reduce use of devices before sleep/bedtime
- **Talk about the harmful effects** of too much exposure to blue light
- **Look for products that are certified** to meet Low Blue Light Requirements



Solutions for reducing blue light include software that shifts color to warmer hues

Eyesafe® Display Color Requirements are designed to maintain color integrity

Ways to reduce harmful blue light from digital devices:



Overlay screen



Filter app/
blue light
reduction
mode



Computer
glasses



Look for
products
with Eyesafe
certification

Want more information?
Go to eyesafe.com for
Eyesafe® Display products
or contact us.

Research Has Found Cognitive Health Benefits of Eyesafe vs. Baseline LED Display

STUDY FROM PEC UNIVERSITY FINDS COGNITIVE HEALTH BENEFITS OF EYESAFE VERSUS BASELINE LED SCREEN

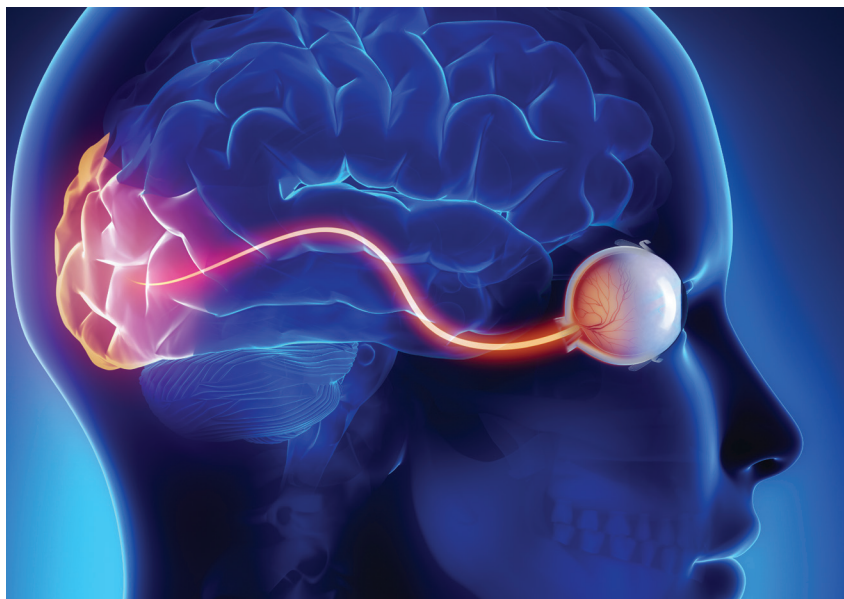
PEC University of Technology in India has completed a comprehensive study on the effects of blue light exposure on human cognitive performance. Specifically, study participants were exposed to LED screen with Eyesafe RPF30 compared to baseline LED screen.

The results of this study may be found here and are highlighted below. Prolonged exposure to blue light from LED was found responsible for:

- unpleasant mood
- inducing sleep disorders
- increased inability to hold information i.e. it affects memory
- decrease in the reaction time during certain tasks given

Use of Eyesafe RPF30 was shown to reduce the above effects. These results are positive and open up additional areas of future study.

"Results have shown that there was a significant difference in EEG delta theta activity, mood, sustained attention (action time task), short term memory (verbal memory task), and active memory (visual memory task) for two types of screen interfaces. Continuous exposure to LED screen has led to decrease in frontal region delta theta activity and increased alertness. Exposure to (Eyesafe RPF30) blue light filter has elevated memory performance and mood in participants. Thus continuous exposure to blue light, emitted by LED screens was found harmful for mood, memory performance, attention and sleep."



1. Effects of Blue Light on Cognitive Performance International Research Journal of Engineering and Technology (IRJET) 2017, 04(06). N. Bansal et al.
<https://eyesafe.com/report-on-health-impacts-of-cumulative-blue-light-exposure-from-digital-devices-on-cognitive-performance/>

Eyesafe Developed with World Leaders in Eye Care

The Eyesafe Vision Health Advisory Board are comprised of leading eye care professionals across ophthalmology and optometry focused on public health advocacy, industry research and standards development. This group of internationally recognized eye doctors are actively involved in product and standards development. For more information: eyesafe.com/vhab

The Vision Health Advisory mark may be used in association with Eyesafe® products.



RALPH CHU, MD



H. BURKHARD DICK, MD, PHD



CHAD DOCKTER, OD



DAVID FRIESS, OD



MITCHELL JACKSON, MD



PAUL KARPECKI, OD



RICHARD LINDSTROM, MD



SHERI ROWEN, MD



VANCE THOMPSON, MD



WILLIAM TRATTLER, MD



ROBERT WEINSTOCK, MD



WILLIAM WILEY, MD

How Does Blue Light From Electronic Devices Affect Our Health?

