



**HINDSIGHT IS  
20/20/20:**

Protect Your Eyes  
from Digital Devices

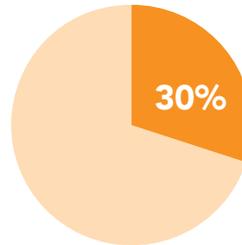
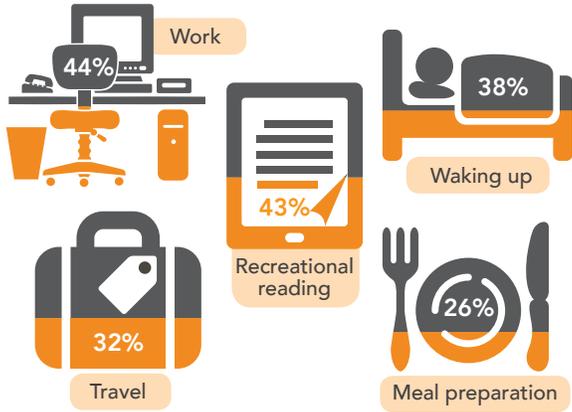
2015 DIGITAL EYE STRAIN REPORT



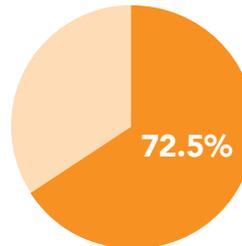
THE **VISION**COUNCIL

# Digital eye strain is the physical eye discomfort felt by many individuals after two or more hours in front of a digital screen

## Activities Associated with Digital Device Use:

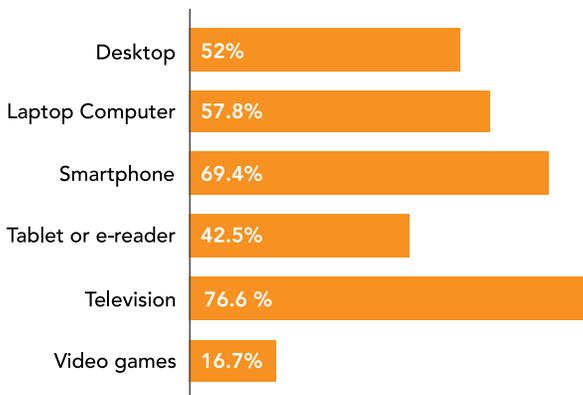


Nearly one-third of adults (30%) spend more than half their waking hours (9+) using a digital device.



72.5% of adults are unaware of the potential dangers of blue light to eyes.

## Digital Devices Most Commonly Used:



## Symptoms Commonly Associated with Overexposure to Digital Devices:

- Eye strain, 32.8%
- Neck/shoulder/back pain, 32.6%
- Headache, 24%
- Blurred vision, 23.3%
- Dry eyes, 22.8%

30.6%

More than 30% of parents who say they are very concerned about the impact of digital devices on children's eyes allow more than 3 hours of screen time daily

31.9%

31.9% of adults do not take any action to reduce symptoms of digital eye strain

### Kids (Born 1997-2014)



**23.6%** Nearly one in 4 kids spend more than 3 hours a day using digital devices

**22%** of parents say they are very concerned about the potential harmful impact of digital devices on developing eyes

### Millennials (Born 1981-1996)



**37.4%** Nearly four in 10 millennials spend at least nine hours on digital devices each day

**68%** Nearly seven in 10 report symptoms of digital eye strain

**84%** Most millennials own smartphones

**57%** Nearly six in 10 millennials take their smartphones to bed and use them as alarm clocks

### Gen X (Born 1965-1980)



**32%** Nearly one-third of Gen X spends at least nine hours on digital devices each day

**63%** Six in 10 Gen

Xers report symptoms of digital eye strain

**48%** Gen Xers own more tablets or e-readers compared to other age groups

More likely than the other two groups to use digital devices for work and recreational reading

### Boomers (Born 1946-1964)



**26%** One in four boomers spend at least nine hours on digital devices each day

**57%** Experience fewer symptoms of digital eye strain than millennials and Gen Xers do

**81%** of Boomers are more likely to own a TV compared to other age groups

Source: 2014 Vision Watch data

## Executive Summary

Digital devices permeate every aspect of the American life. According to The Vision Council's annual survey of digital device use, 69 percent of American adults use a smartphone on a daily basis — compared with 45 percent three years ago. And 42.5 percent use a tablet or e-reader, compared with 26 percent in 2012.<sup>i</sup>

From the moment people get up until the time they go to bed again — including when they are eating, exercising and reading — they are using their smartphones, tablets, computers, laptops and other electronic devices. The use of such technology has increased each year since The Vision Council first conducted a survey on the topic in 2012. **According to the 2014 Vision Watch survey results, nearly three in 10 adults (29.8 percent) are high users, spending more than nine hours each day using digital devices.**

Digital devices allow people to live in the present — connecting with others, sharing information and capturing memories. Yet many users fail to notice how the hours spent with this technology can affect vision health, both immediately and over a lifetime.

Eyes are one of the most vital organs and a window into the bigger picture of what is going on inside the bodies. Even so, many people neglect to care for their eyes when it comes to digital devices, which can have unintended health consequences.

More than 90 percent of adults report using digital devices more than two hours a day, putting them at risk for digital eye strain. Our options are limitless, often including more than one device at a time from televisions, smartphones, computers, tablets or e-readers and video game consoles. When face-to-face with computers, screens sit about two feet from our eyes and people tend to stare at them for prolonged periods, which decreases blinking. Blinking is important to prevent dryness or irritation in eyes. In addition, many of workspaces are not “eye-gonomically” designed to prevent digital eye strain. For smaller digital devices, they tend to be held 8 to 12 inches from the eyes, even further fostering conditions for digital eye strain, which is characterized by dry, irritated eyes; blurred vision; eye fatigue; and head, neck and back pain.

While adults with computer-oriented jobs seem to be the prime targets of over-exposure to digital devices, **one in four children use these devices more than three hours a day.** This exposure, which occurs both at school and at play, poses a risk to children's developing eyes. Accelerated myopia, or nearsightedness, is just one potentially troubling byproduct of too much screen time.<sup>ii</sup>



*“For better or for worse, digital devices have changed the way we receive and process information. This digital age has come to put a greater stress on our eyes as we adapt to this use. The vision industry as a whole has identified this as a challenge for eye comfort and health. Over the past several years, we’ve seen a tremendous amount of innovation to help reduce the strain to eyes that many experience from digital devices. These tools and technologies are doing more than protecting eyes from the harsh impact of increased use of digital devices. They are improving the acuity and precision of our vision.”*

– Mike Daley  
Chief Executive Officer  
of The Vision Council

Additionally, the optical industry is paying close attention to the issue of blue light exposure, also referred to as high-energy visible, or HEV, light exposure. Because blue light can reach deeper into the eye than ultraviolet light, it may damage the retina.<sup>iii</sup> Although the issue is nascent, emerging research points to a possible link between exposure to blue light and long-term vision issues such as age-related macular degeneration (AMD) and cataracts.

As more people from all age groups spend added time in front of digital screens, new lens technologies are enhancing the experience while preventing eye strain. During a comprehensive annual eye exam, an eye care provider can evaluate any symptoms of digital eye strain, as well as discuss lens options or lifestyle changes for alleviating and protecting against future discomfort.

To raise awareness of the issue of digital eye strain and what is available to alleviate its symptoms, The Vision Council commissioned its third annual survey to examine the increasing usage of digital devices and consumer knowledge about the impact on vision. Nationwide, 9,749 adults participated in this survey, which was conducted in October 2014.

## What Is Digital Eye Strain?

On average, more than nine in 10 adults (93.3 percent) spend more than two hours each day using a digital device, with more than six in 10 adults (60.8 percent) spending five or more hours on digital devices each day. Whether it's for work or play, using computers, smartphones, tablets and e-readers, TV or video games, all that time can take a toll on the eyes and lead to digital eye strain.

Digital eye strain is the physical discomfort felt after two or more hours in front of a digital screen and is associated with the close to mid-range distance of digital screens, including desktop and laptop computers, tablets, e-readers and cell phones. On average, a person going through his or her daily routine blinks about 18 times per minute. However, spending significant amounts of time staring at a screen causes blink rates to reduce, resulting in dry, itchy or burning eyes.<sup>iv</sup>

Adults with computer-oriented jobs feel the strain most acutely. A recent study found that office workers who spend significant time in front of computer screens and experience eye strain undergo changes in tear fluid similar to people with dry eye disease,<sup>v</sup> creating a physiological change.



### Children (Born 1997-2014):

- Nearly one in four kids spend more than three hours a day using digital devices (23.6 percent) and more than 15 percent of parents don't limit their children's screen time at all
- More than one in five (22 percent) parents say they are very concerned about the potentially harmful impact of digital devices on developing eyes, one in three (30 percent) report not being concerned at all about this issue
- Nearly one in three (30.6 percent) parents who say they are very concerned about the impact of digital devices on children's eyes do not limit or allow more than three hours of screen time daily



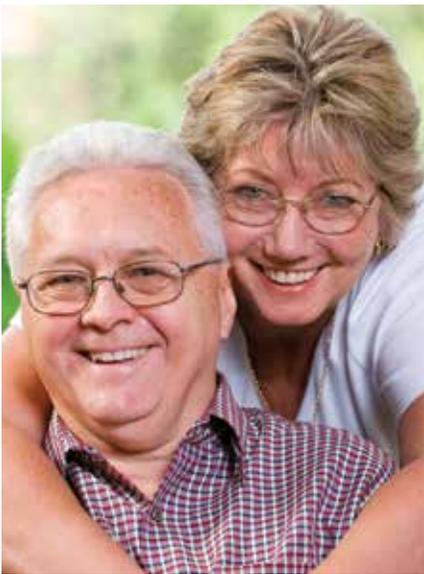
### Millennials (Born 1981-1996):

- Nearly four in 10 millennials spend at least nine hours on digital devices each day (37.4 percent)
- Nearly seven in 10 (68 percent) report symptoms of digital eye strain
- Most millennials own a smartphone (84 percent)
- Less likely than other generations to own a television (68 percent)
- Nearly six in 10 (57 percent) take their smartphones to bed and use them as alarm clocks



### Gen Xers (Born 1965-1980):

- Nearly one-third of Gen X spends at least nine hours on digital devices each day (32 percent)
- Six in 10 Gen Xers (63 percent) report symptoms of digital eye strain
- Nearly three in four (74 percent) report not knowing that digital devices emit blue light, at wavelengths that can irritate or even harm vision
- Gen Xers are more likely to own a tablets or e-readers compared to other age groups (48 percent)
- More likely than other age groups to use digital devices for work and recreational reading



### Boomers (Born 1946-1964):

- One in four boomers (26 percent) spend at least nine hours on digital devices each day
- 40 percent say they would wear computer eyewear if an eye care provider informed them of the potential danger of blue light emitted from digital devices
- Experience symptoms of digital eye strain to a lesser degree than the other two groups, possibly due to less time spent in front of a screen at work (57 percent)
- Boomers are more likely to own a TV compared to other age groups (81 percent)

Tools are available to help technology users alleviate the discomfort of digital eye strain, maintain vision health and prevent further eye discomfort. When used in tandem with practical “eye-gonomic” health tips, lenses tailored for digital screen use (computer eyewear) can reduce or even prevent digital eye strain.

## What is Blue Light?

As we now live in the digital era, the issue of high-energy visible (HEV) light wavelengths emitted from backlit displays is of concern to eye care providers, specifically the impact of overexposure to blue light on long-term vision health.

Light that appears white can have a large blue light component, exposing the eye to hidden spikes in intensity at wavelengths within the blue portion of the spectrum. These wavelengths range from 380 to 500 nanometers (nm). The band of blue-violet light considered potentially most harmful to retinal cells ranges from 415 to 455 nm. Some of the most favored digital devices and modern lighting — such as light-emitting diode (LED) lights and compact fluorescent lamps (CFLs) that have replaced most incandescent lights — can emit a high level of blue light, typically in the wavelength starting at 400 nm.

Over time, eyes are exposed to various sources of blue light. Emerging research suggests that this cumulative and constant exposure to blue light can damage retinal cells.<sup>vi</sup> This slow degradation could lead to long-term vision problems such as age-related macular degeneration (AMD) and cataracts.

The retina, which is responsible for processing intensity of light and color, cannot regenerate or be replaced if damaged. Once damage has occurred, the eyes are left increasingly exposed to blue light and other harmful environment factors, increasing the risk for long-term visual impairment.

While high levels of blue light might be detrimental to eye comfort, it is also has benefits, including helping to establish the natural circadian rhythms in the human body and aiding cognitive functions such as alertness, memory and emotion regulation. While blue light is unavoidable, it is important to understand how it impacts eyes and bodies and to know tools and tips for limiting exposure when necessary.

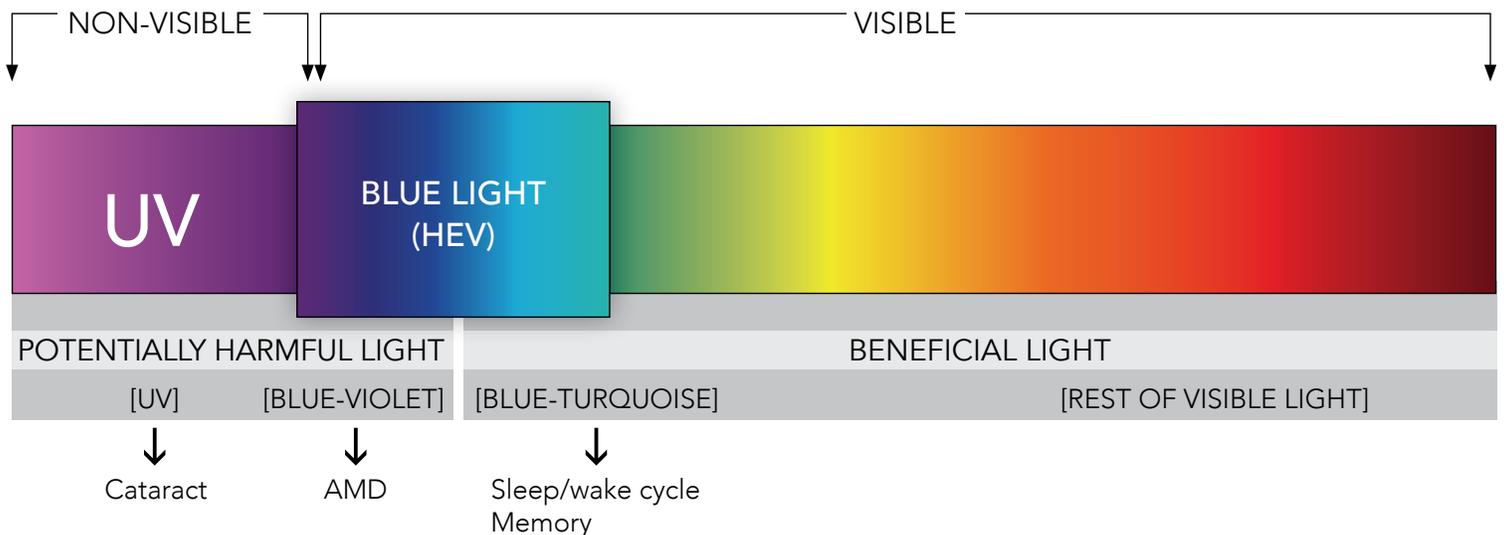


FIGURE 3: The band of blue-violet light that is most harmful to retinal cells ranges between 415 and 455 nm.

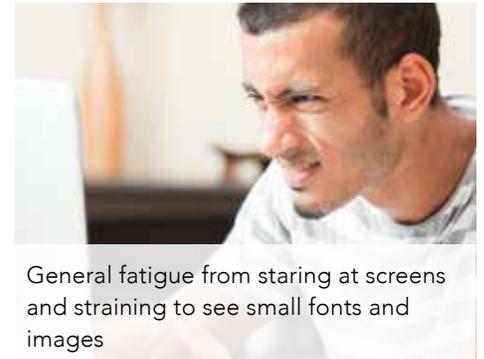
## Symptoms of Digital Eye Strain



Redness, irritation or dry eyes from staring at the bright backlight of screens for long periods; also, reduced blinking



Blurred vision due to screen glare



General fatigue from staring at screens and straining to see small fonts and images



Back and neck pain due to poor body posture when a screen is not positioned properly



Headaches from repeated eye strain

## What to Consider When Protecting Your Eyes from Blue Light

Blue light-blocking lens materials such as blue attenuating anti-reflective lenses, or specialty filters, absorb specific wavelengths of high-energy blue light and limit penetration into the retina. If selecting blue light-blocking lenses, be aware that most varieties will distort color perception.

Early research suggests that blue light-blocking lenses can also help sleep patterns by wearing these lenses in the evening hours while still awake.<sup>vii</sup> Blue light is known to impact circadian rhythms by suppressing the natural release of melatonin.<sup>viii</sup> Wearing blue light-blocking lens material when using digital devices in the evening can help prevent the body's responses to blue light and encourage better sleep patterns.



FIGURE 2: Nearly three in four adults (72 percent) don't know that digital devices emit blue light.

## What Can Cause Digital Eye Strain?

While no one culprit is solely responsible for causing digital eye strain, several environmental factors can contribute to it, including posture, personal device use habits and the blue light emitted from screens, lighting and even sunlight.

However, many people do not understand the effects of constant viewing of digital devices or know that there are ways to reduce digital eye strain.

Digital eye strain can be identified by an eye care provider through a comprehensive eye exam and conversations about lifestyle and digital device use. For people experiencing symptoms of digital eye strain, it is important to have their vision and eyes evaluated by an eye care provider. Eye exams are an important part of maintaining health. Adults should have their eyes tested to keep their prescriptions current and to check for early signs of eye disease. For children, eye exams can play an important role in normal development.

Consumers should pay close attention and protect their vision health if they encounter the following:



*"I get headaches from squinting to read the print on my screen."*

### → The culprit: Text on Digital Devices

Newspapers and books displayed on digital devices often have small, hard-to-read type. To see it better, people tend to hold them closer to their eyes. This can cause the muscle inside the eye to contract and refocus, leading to fatigue and eye strain. Try increasing the text size and adjusting the contrast on the device to make the text easier to read at a comfortable distance.



*"My eyes feel dry and tired after spending all day staring at my computer and phone."*

### → The culprit: Time Spent Staring at Screens

Six in 10 adults (60.8 percent) report spending five or more hours every day using digital devices. Such sustained usage can wear eyes out, creating discomfort and affecting productivity. Remember the "20-20-20 rule:" look away from the screen every 20 minutes for at least 20 seconds at something 20 feet away. This helps refocus and recharge the eyes during long periods of use and helps blinking return to a normal rate.



*"When at work, the lighting and my desk setup make my eyes feel uncomfortable."*

### → The culprit: Workstation Distance and Setup

Shorter working distances for computers, laptops, smartphones and tablets dominate how digital devices are viewed in the workplace. Many office dwellers spend their days in cramped cubicles, which can significantly strain their vision. Adjust the computer screen so that it is one arm's length in front of your face.

*“I find myself straining when using my glasses with digital devices for sustained periods of time.”*

→ **The culprit: Existing Vision Issues**

While individuals of all ages and backgrounds are susceptible to digital eye strain based on their use of technology, people with vision issues such as myopia, hyperopia, astigmatism and presbyopia may be at increased risk. The combination of too much screen time and existing vision issues can put extra strain on the eye. Fatigue can set in as the eyes strain to correct for abnormal vision issues while focusing on complex digital content. Lenses designed to correct vision issues might not be appropriate for the mid-distance range of a computer. People with vision issues should consult an eye care provider to tailor their eyewear for their activities, including use of digital devices.

*“My eyes get irritated from the light on the screen.”*

→ **The culprit: Glare and Blue Light**

Glare from surroundings, including walls and the reflection from of the screen, can foster digital eye strain. Emerging research indicates that blue light emitted from screens or even the fluorescent or LED lighting in an office can have both short-term and long-term effects on the eye. To reduce glare, try an anti-reflective coating on the front and back of lenses or anti-glare protective screens for monitors. If possible, also try adjusting the lighting in the workspace, using desk lamps or other portable lighting.



Blue light emanates from indoor lighting, computer screens, mobile devices and even the sun, leaving eyes exposed over time to potential deterioration and gradual oxidation of the macula. While it may seem like there is no escaping the harmful effects of high-energy blue light, protection is available.

In my Alexandria, Virginia, practice, patients of every age – from their early teens through their 40s – come in with symptoms of eye strain. Whether they are teens with visual complaints of fluctuating vision from constantly looking up from smartphones or office workers feeling the strain likely from the effect of blue light on eyes – they assume these symptoms are something they need to live with as the cost of using digital devices.

Office workers especially experience a high frequency of these symptoms. Faced with hours at the computer, coupled with harsh LED or fluorescent lighting that emit blue light, as well as the popularity of large and dual-monitor computer screen set-ups, office environments are increasingly becoming hot spots for digital eye strain. It has been estimated that as many as 70 to 75 percent of computer workers experience eye discomfort from high screen use.

As an industry, we need to educate the public that you don't have to live in discomfort, or even pain, when using technology. Adjustments to viewing, along with custom eyewear can alleviate or prevent these symptoms. Blue light-blocking lenses are available for people with or without prescription glasses to provide relief from short-term symptoms and protection from long-term damage.

Dora Adamopoulous, OD  
Medical Advisor, The Vision Council

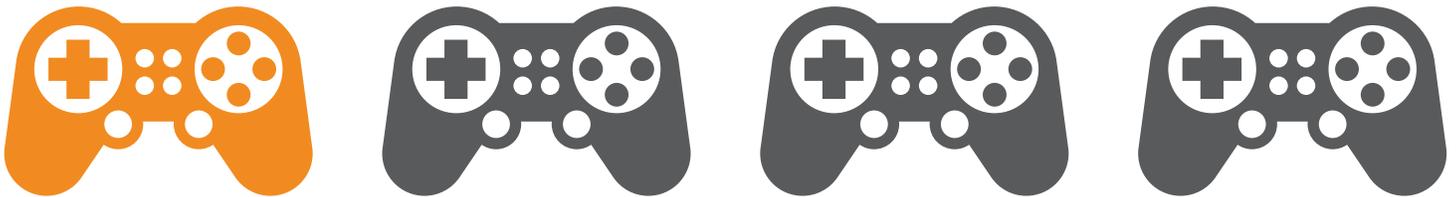
## How Do Digital Devices Impact Children?

Children today have grown up with technology always at their fingertips. It seems as if kids learn how to use a smartphone or tablet before they learn to walk. Whether it's playing the latest game or doing homework, technology permeates a child's life and does so at a young age.

Because this is a new phenomenon, not much is known about the long-term impact of computers or other digital gadgets on pediatric eyes. However, eye care providers have reported seeing an increase in cases of myopia, or nearsightedness. According to the National Eye Institute, more than 34 million Americans suffer with myopia, a number that is projected to rise to nearly 40 million by 2030.<sup>x</sup>

Although there is no one specific cause for the increase, scientists point to a mix of genetic and environmental factors, including increasing near-range activities such as the use of digital devices, and decreasing exposure to natural light through outdoor activities.<sup>x</sup> Digital eye strain can also affect children and teens, whose eyes may fatigue after long periods of use. Computers and smartphones are often tied to every facet of a young person's life—from school to socializing, there is little respite from the constant use of technology.

To ensure children's eyes are developing normally, parents should ensure their child receives comprehensive annual eye exams. An eye care provider can evaluate any symptoms or physical discomfort stemming from use of digital devices, and may suggest tools and tips to help children protect their eyes.



One in four kids use digital devices more than three hours a day

Many parents aren't heeding the warnings from medical professionals on the need to monitor digital device use among kids. One in four children uses digital devices for more than three hours a day. In fact, 15 percent of survey respondents report they don't limit their children's screen time at all.<sup>xi</sup>

And while 22 percent of parents say they are very concerned about the potentially harmful impact of digital devices on developing eyes, 30 percent report not being concerned at all about this issue.

Digital devices are an easy — and often welcome — way for parents to distract their children, but it's important for adults to limit overexposure. Although limiting screen time is the best way to reduce or prevent digital eye strain, parents can also follow these tips to help their children develop good habits while using digital devices:

- Consider investing in computer eyewear for your child to prevent digital eye strain and to block blue light exposure.
- Encourage children to take breaks when using digital devices.
- Make sure children don't put the screen too close to their eyes, especially for long periods of time.
- If a child is doing schoolwork on a computer, set up the workspace properly. This includes having a chair that encourages correct posture, with both feet flat on the floor.

## What Can You Do to Prevent Digital Eye Strain?

Many people experience the symptoms of digital eye strain but don't know that products and changes in how they use their devices can help stave off the often annoying and even painful effects of the condition in the short term and potentially protect long-term vision health.

### Computer Eyewear and Advances in Lens Technology

Just like people need different pairs of shoes for different occasions, there is also a need for different, specialized lenses to cater to varied vision needs. To accommodate how much lives have changed in the decade with digital devices, the optical industry has developed lens treatments that limit the amount of blue light penetrating eyes while also preventing vision fatigue caused by prolonged use of technology.

Computer eyewear is specially designed for optimizing vision when viewing content on screens and can be provided with or without a prescription. This eyewear can utilize different filters, lenses and materials tailored to lifestyle needs. Users experience more relaxation, sharper focus and reduced blurriness and pixilation, which can cause discomfort unless corrected. The lens designs allow adults and children's eyes to relax, adjusting to intermediate-distance objects and reducing glare during prolonged use of digital devices.

One of the most popular lens options is the anti-reflective, or AR, lens, which decreases reflection from overhead lighting to improve acuity and contrast. These specialized lenses can be combined with blue light-blocking capabilities. Blue light-blocking lenses selectively absorb harmful blue light, keeping it from entering through the cornea and reaching the back of the eye. These lenses are either infused with melanin or made to filter a specific range of blue light.

When examining the best options, consumers should take into consideration the amount of time spent in front of their computer, ambient lighting conditions, distance from their computer and the type of computer work being done. Consider if there are short bursts of computer work interspersed with meetings or other activities away from the desk. This will help determine between the need for lenses that offer a very wide, but shallow field of view (ideal for sustained computer work) and one that offers good computer vision but also lets you see clearly wherever you are inside the workplace.

### Lens Options

- **Single Vision Lenses** – function at an individual's computer working distance
- **High Fitting Bifocals** – provide a large diameter bifocal section at the bottom and middle of the lens specifically for the face-to-computer distance; above the bifocal section, the lens is built to view objects that are far away
- **Occupational Lenses** – offer appropriate computer screen viewing assistance at the top of the lens; the bottom of the lens is for reading
- **Progressive Lenses** – developed as a solution for everyday vision needs, near, intermediate and far; prescribed for adults with limited computer use
- **Computer Progressive Lenses** – designed to provide large, distortion-free viewing areas for computer distance and up-close objects; recommended for computer use, reading and limited distance viewing

## Lens Treatments and Filters

- **Anti-Reflective Lenses** – reduces reflection and glare from indoor and outdoor lighting sources
- **Amber/Yellow Filters** – absorb glare and filter out harmful blue and violet light that is emitted by many digital devices

Computer eyewear is available through eye care provider practices as well as at selected retailers. It is recommended to consult an eye care provider when considering the best options for your lifestyle and vision needs.

## Use Devices Responsibly

- When using handheld devices, make sure to keep them at a safe distance, just below eye level.
- Take a 20-20-20 break: Every 20 minutes, take a 20-second break and look at something 20 feet away.
- Remind yourself to blink more often. Staring at a digital screen can affect the number of times you blink, causing eyes to dry.
- Frequently dust and wipe digital screens to help reduce glare.
- Increase text size to better define the content on the screen. Use the settings control to make adjustments that feel comfortable to your eyes.

## Adjust Your Workstation

### Lighting

- Lessen the amount of overhead and surrounding light that is competing with the device's screen.
- Adjust the brightness of the device. Consider changing the background color from bright white to cool gray.
- Attach a glare reduction filter to your computer screen.

### Setup

- Create a comfortable distance for viewing. When using a computer, first sit in your chair and extend your arm. Your palm should rest comfortably on the monitor (as if you're high-fiving the screen), ideally 20 to 28 inches from your eyes.
- Adjust the screen so that it is directly in front of your face and slightly below eye level. Do not tilt a computer monitor.

## In Conclusion

Digital devices are here to stay, yet it is still unknown how all the exposure will impact eyes in the long term. However, even temporary issues such as digital eye strain are taking a toll on technology users, which can have real effects on productivity while causing unnecessary discomfort.

It is important for consumers to be proactive about their vision health and to monitor if constant exposure to digital devices is impacting their eyes. While many individuals may be experiencing symptoms, they may not know there are products such as computer eyewear that can ease digital eye strain.

Through this report, The Vision Council aims to elevate the issue of digital eye strain and highlight recommendations from the optical industry and eye care providers about this preventable health issue.

Practicing good eye health and proper eye care are key to preserving your vision. Having a comprehensive annual eye exam is the most important thing you can do to prevent or treat symptoms of digital eye strain. During an exam, an eye care provider can take a closer look at the health of your eyes and vision and determine a plan to address personal vision needs based on your lifestyle and digital device use.

Regular eye exams are a part of healthy vision maintenance and should be considered for both adults and children. Preventative eye care can help preserve vision and can help identify vision and other health issues early on in disease progression ensuring lifelong vision health.

If you have digital eye strain, your eye care provider has technology designed to help you alleviate and prevent it in the future. By taking action, individuals can enhance their vision in everyday life when using digital devices.

For more information about digital eye strain, visit [www.thevisioncouncil.org](http://www.thevisioncouncil.org).

## Methodology

This report is based on VisionWatch, a large-scale consumer survey designed for the eye care industry. The questionnaire took place in October 2014. VisionWatch is an ongoing study of a statistically balanced sample of 110,000 U.S. residents designed to be representative of the U.S. population 18 years of age and older. The structure of the sample is controlled to produce an unweighted composition that is as close as possible to the desired final mix. Both demographic weights and psychographic weights are applied to assure that the final sample is statistically stable and representative.

A list of 11 questions regarding use of digital media devices and any related effects on vision from extended use was appended to the October 2014 VisionWatch questionnaire.

Results and tabulations contained in this report are based on a total sample of 9,749 American adults.

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225 Reinekers Lane  
Suite 700  
Alexandria, VA 22314

703.548.4560  
703.548.4580 (fax)

[thevisioncouncil.org](http://thevisioncouncil.org)

**About The Vision Council:** *Serving as the global voice for vision care products and services, The Vision Council represents the manufacturers and suppliers of the optical industry through education, advocacy and consumer outreach. By sharing the latest in eyewear trends, advances in technology and advice from eyewear experts, The Vision Council serves as a resource to the public looking to learn more about options in eyeglasses and sunglasses.*