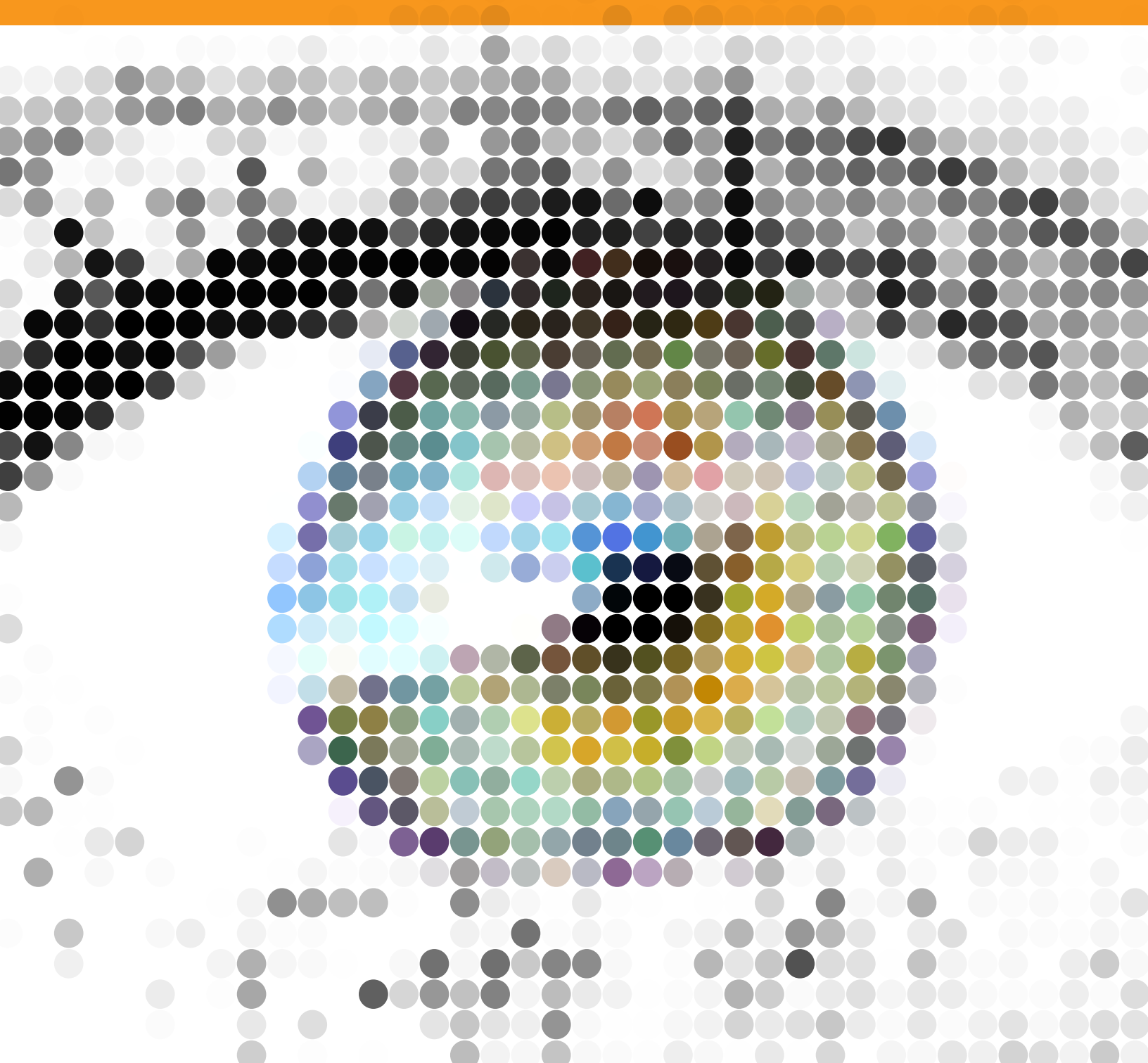
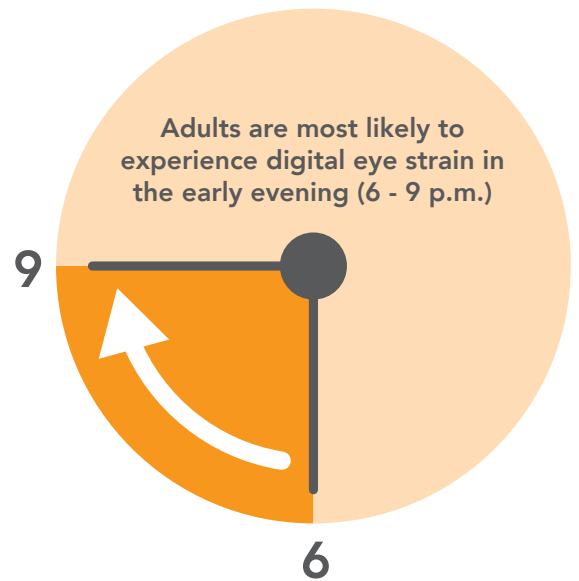
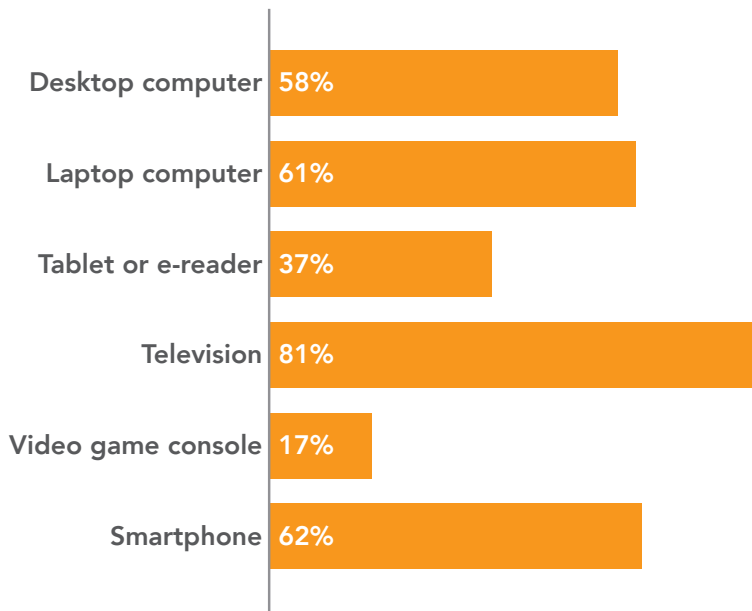


# DIGITEYZED: THE DAILY IMPACT OF DIGITAL SCREENS ON THE EYE HEALTH OF AMERICANS

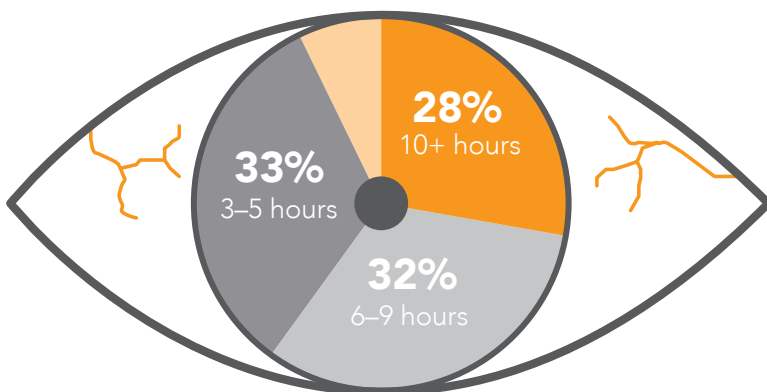


## Nearly 70% of American adults experience some form of digital eye strain due to prolonged use of electronic devices

### Daily device use:



### Time spent in front of digital devices:



### Issues commonly associated with over-exposure to digital devices:

- eye strain
- dry eyes
- blurred vision
- headache
- neck/shoulder/back pain

**63%** of adults do not know that electronics emit high-energy visible or blue light

**41%** of adults have never tried – or don't know how – to reduce their digital eye strain

SOURCE: The Vision Council reports on digital eye strain, 2012 & 2013

An estimated 2.35 billion personal computers, tablets and mobile phones were shipped around the world in 2013.<sup>i</sup> With new products hitting shelves every day, the market for digital devices continues to grow. This means more time spent looking at electronic screens and digital content. Many Americans average 6 to 9 hours a day in front of digital devices — and the percentage of adults spending 10 or more hours in front of screens rose 4 percent in the last year.

The world's reliance on electronics has proven to be beneficial in many ways but poses a problem for the eyes. Nearly 70 percent of U.S. adults experience digital eye strain as a result of the growing use of these devices. Adults aged 18 to 34 report feeling eye strain at a higher rate (45%) than their older counterparts.

New research also suggests that overexposure to blue light, also referred to as high-energy visible or HEV light, may contribute to vision problems such as cataracts and age-related macular degeneration (AMD). Long-term implications are just now being studied, but the short-term impact of digital eye strain affects individuals on a daily basis.

Eye care providers are noting a steady rise in the number of patients with screen-related eye strain, whose complaints include dry, irritated eyes; blurred vision; and head, neck and back pain. To preserve eye health and help adults adapt to digital life, the optical industry is investing in new lens technologies to enhance the digital experience while minimizing eye strain as an increasing number of people from all age groups spend more time in front of screens.

To better understand digital eye strain and empower individuals to prevent or mitigate device-related vision problems, The Vision Council fielded two consumer surveys (2012 and 2013). This report is based on findings from the second of those surveys, which was conducted in October 2013. More than 7,000 adults nationwide participated.

Most importantly, this report includes recommendations from The Vision Council's medical advisory board to help prevent or lessen digital eye strain. These tips include:

- **Wear computer eyeglasses to help focus while in front of a digital screen**
- **Every 20 minutes, take a 20-second break from the screen and look at something 20 feet away**
- **Build an "eye-gonomic" workspace to mitigate outside stressors**
- **Program your devices for optimal distance viewing**

*\*A full list of solutions can be found on page 11*



*"It is an exciting time to be a part of the lens manufacturing community. New ideas and developments have gotten us to the point where we are seeing with more accuracy and precision than ever before, and with light weight, innovative technologies. People all over the world are now able to find customized glasses in sleek and fashionable frames. Whether for improved sporting, safer driving, multi-vision, or even simple single-vision lenses, new lens technologies are able to keep up with the most diverse trends and lifestyles."*

– Raanan Naftalovich  
Chairman of the Board  
of Directors for  
The Vision Council

## The Issue: Digital Eye Strain

Digital eye strain is the physical discomfort felt by many individuals after two or more hours in front of a digital screen. Symptoms are different for each person, but digital eye strain typically manifests itself as dry, red or irritated eyes; blurred vision; fatigued eyes; back, neck or shoulder pain; or headaches. For some, the effects of digital eye strain can be painful and, in extreme cases, debilitating.

Digital eye strain is not a permanent condition, but it can have a strong and lasting effect on individuals who rely on electronics for education, social interaction and, most commonly, work. For adults with computer-oriented jobs, digital eye strain can result in painful distractions that lessen productivity. In fact, digital eye strain is now the most common computer-related repetitive strain injury among workers, surpassing carpal tunnel syndrome and tendinitis.<sup>ii</sup>

To combat strain, eye care providers recommend glasses designed specifically for digital screens. When used in combination with good “eye-gonomics,” computer glasses can reduce or even prevent digital eye strain symptoms. For more information on this type of lens technology, view page 10.

### Symptoms of Digital Eye Strain

- Eye redness or irritation from staring at the bright backlight of screens for long periods
- Dry eyes due to reduced blinking
- Blurred vision due to screen glare
- General fatigue from staring at screens and straining to see small fonts and images
- Back pain due to poor body posture when a screen is not positioned properly
- Neck pain caused by poor screen and monitor positioning
- Headaches from repeated eye strain



FIGURE 1: 43% of adults work in a job that requires prolonged use of a computer or tablet.



*“Our eyes are not ideally equipped to look at digital screens for extended periods of time. Pixels are hard targets for our eyes to accurately focus on, which fatigues the focusing system faster. There are many things that we can do to minimize digital eye strain and eye doctors are the best equipped to help. I always tell my patients that despite the fact that digital eye strain is common, it does not mean you have to suffer.”*

-Dr. Justin Bazan, Optometrist and Medical Advisor

## Contributing Factors

Several factors can signal the onset of digital eye strain. Some can be easily remedied; others may require additional help or guidance from an eye doctor. The following section includes a brief overview of the most common factors, with tips on ways to resolve them.

Shockingly, more than 40 percent of adults have never tried — or do not know how — to reduce digital eye discomfort.

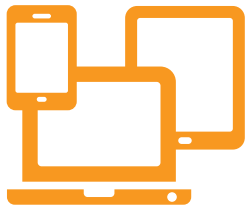
### EXISTING VISION PROBLEMS



Individuals with existing vision problems such as astigmatism, farsightedness and presbyopia have a greater likelihood of developing digital eye strain. This is because eyes are forced to deal with abnormal vision issues while at the same time focusing on the complexity of digital content.

The corrective glasses and contact lenses prescribed for these vision issues can contribute to digital eye strain. Lenses designed to bring near or far objects into focus are not built for the mid-distance range of a computer. For relief during computer use, work with an eye care provider to obtain lenses designed specifically for the eye-to-computer viewing range. The lenses should also have an antireflective coating to reduce glare.

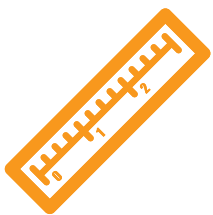
### DIGITAL DEVICES



Different digital devices cause different degrees of vision discomfort. The crispness of high-definition displays on television screens, tablets and laptops, for instance, can feel easier on the eyes than an older, less defined screen. In its 2013 consumer survey, The Vision Council found that desktop computers are the device most likely to cause digital eye strain, followed closely by laptops.

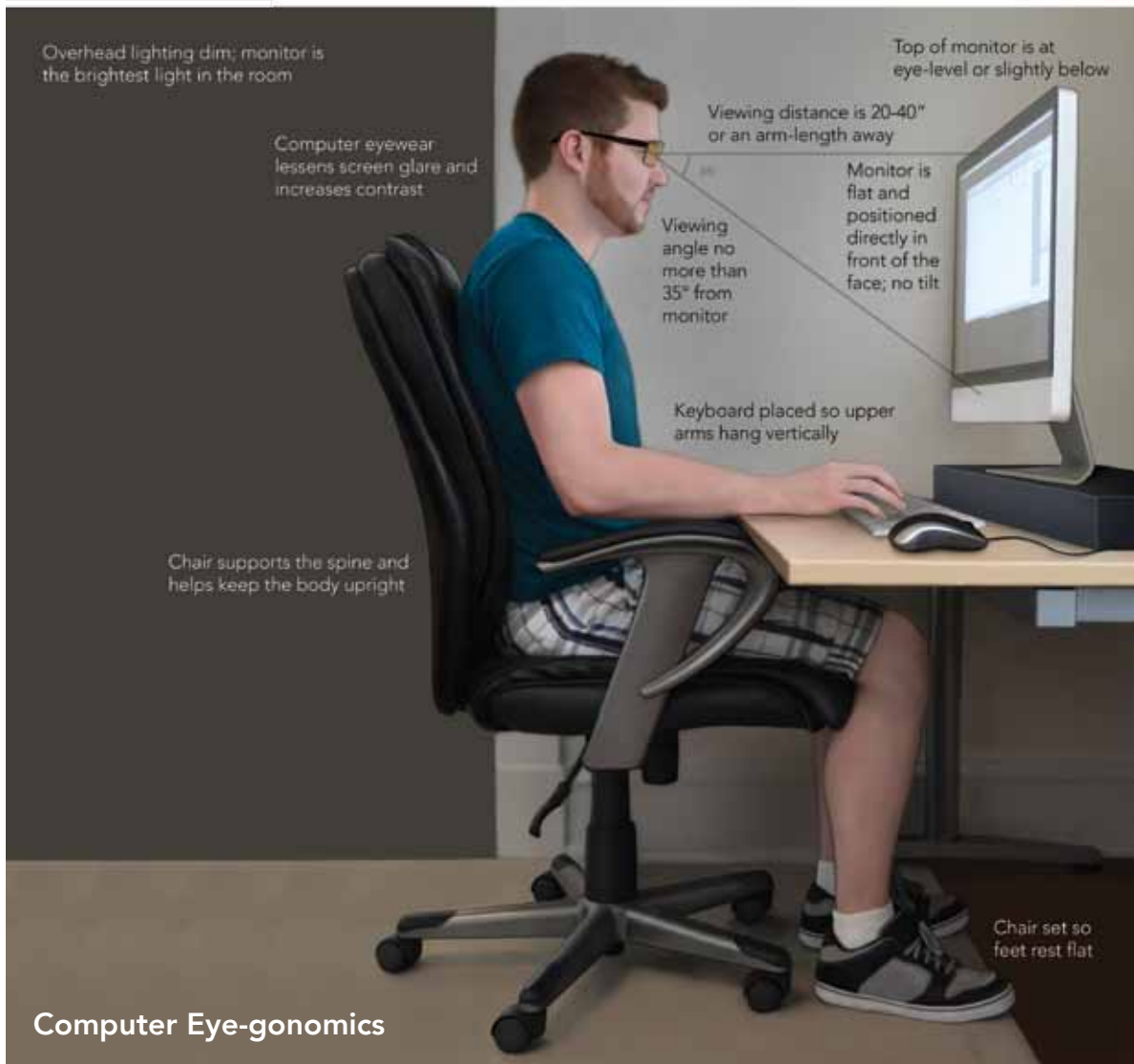
As more people use smartphones to read news articles, play games and respond to emails, small screens are compounding the problem. Nearly 10 percent of adults reported that the smartphone is the device most likely to give them eye strain.

### VIEWING DISTANCE

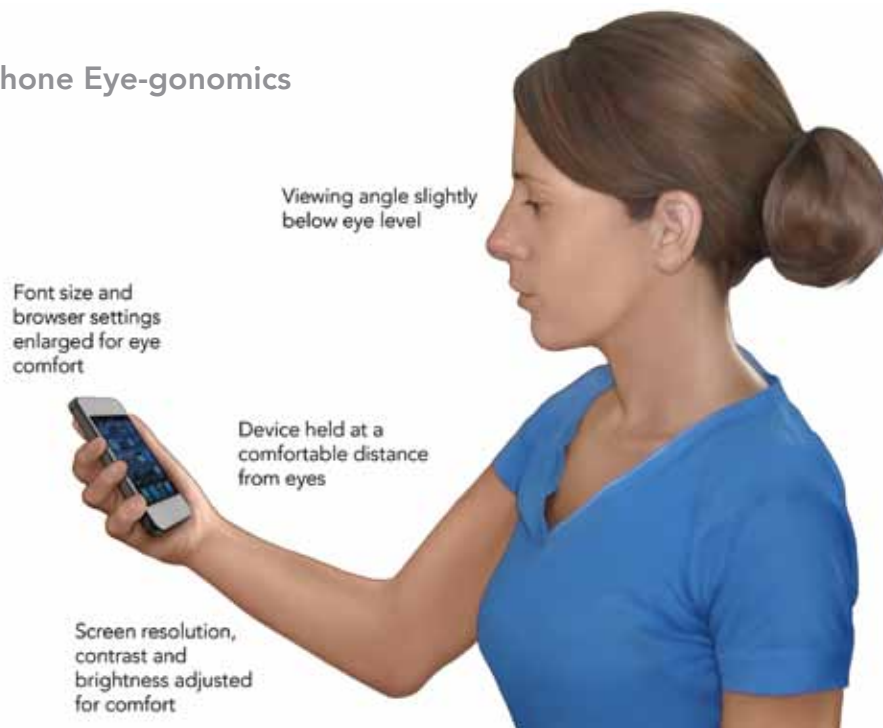


Strain is often caused by the distance between the eyes and a digital screen. Our eyes aren't designed to focus on words and images at a mid-point distance, which is exactly where laptop and desktop screens sit.

For optimal viewing, set your computer about an arm's length away from your face. When sitting straight, you should be able to extend your arm and high-five the computer screen. Mobile phones and hand-held devices should be kept at a comfortable distance from your eyes and at an angle just slightly below eye level.



### Smartphone Eye-gonomics



## DIGITAL CONTENT



Digital content is created by thousands of tiny dots of light called pixels. Unlike ink on paper, pixels lack uniform density and defined borders, making them harder to bring into focus.

Even on high-definition displays, text characters and images formed with pixels can be less distinct than those on a printed page. This is especially true when holding a handheld device closer to the eyes than recommended.

## TIME SPENT IN FRONT OF DIGITAL SCREENS



Spending just two consecutive hours on a digital device can cause eye strain and fatigue. The eye exerts a lot of energy to focus on the mid-distance range of a screen, and after some time the muscles become tired and stressed. All of this strain can extend to the head, neck and shoulders. Repetitive staring can also disrupt the natural blinking process, resulting in dry eyes.

## AGE



Age can also impact the likelihood and frequency of digital eye strain. Many vision problems occur as a normal part of the aging process and can contribute to computer-related strain. According to The Vision Council's survey, digital eye strain is most common among adults aged 18 to 34, but it is still highly prevalent among those aged 35 to 54. Digital eye strain typically decreases after age 55, likely because of reduced computer use.

Children, often the leading force behind consumer electronic purchases, also are at risk for eye strain. Unfortunately, many children don't realize that blurred vision or discomfort is unnatural and wait too long to alert their parents, teachers or caregivers.

## TIME OF DAY



The majority of adults experience digital eye strain between 3 and 9 p.m. During this time, the eyes are already fatigued from hours of screen viewing and must work extra hard to focus on new stimuli. To relieve eyes in the afternoon, take multiple breaks from the computer screen. And, if sitting near a window or under harsh lights, dim surrounding lights so that the screen is the brightest surface in the room.



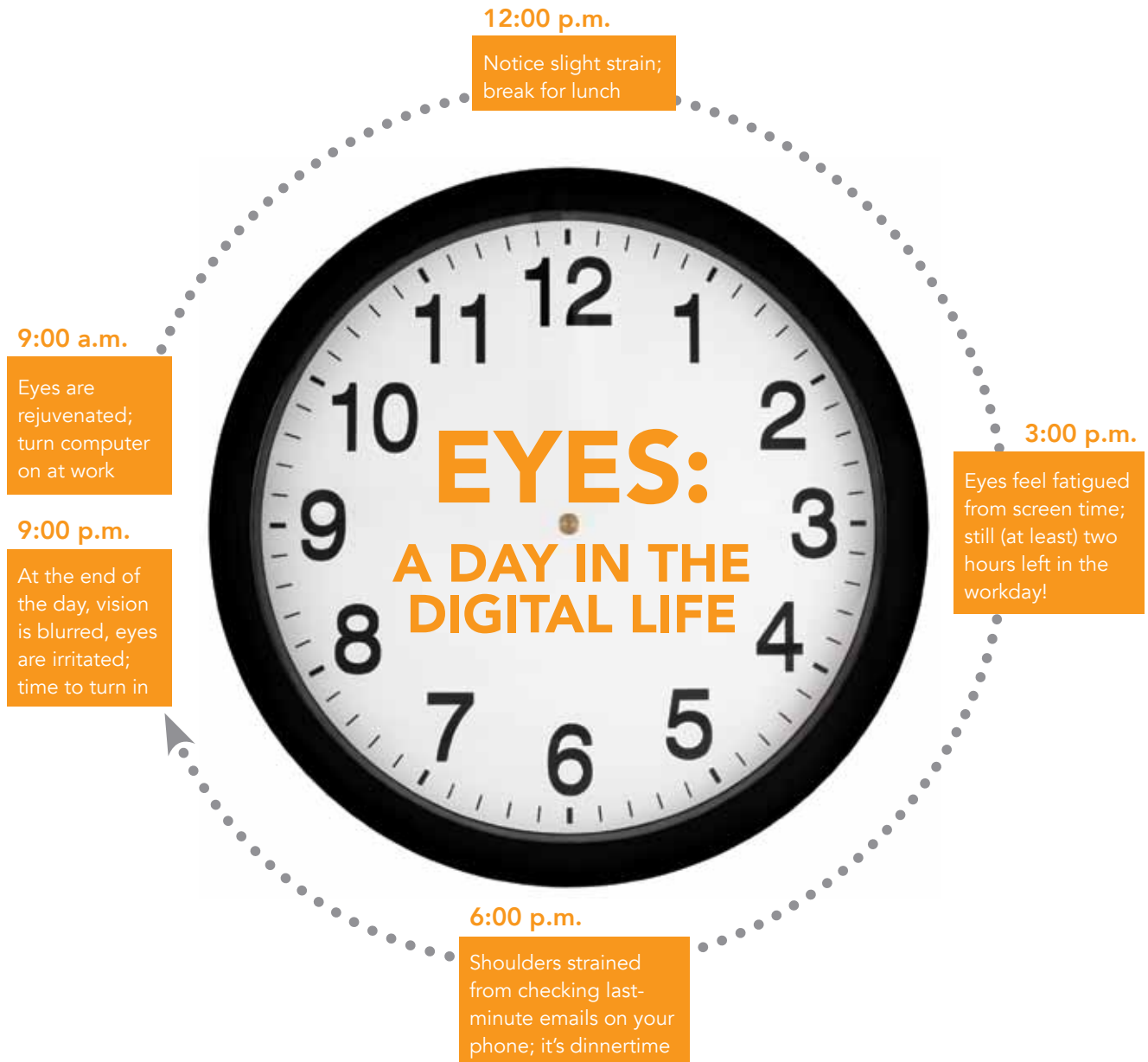


FIGURE 2: Eyes: A Day in the Digital Life

A variety of other medical factors can cause digital eye strain. The Vision Council recommends talking with your eye care provider about your digital device habits and any eye strain or fatigue you are experiencing. Your eye doctor can build a personalized plan to reduce your digital eye strain and recommend the best computer glass lenses for your specific viewing range. Eye doctors can also perform simple tests to determine if you are at risk of dry eyes, which can exacerbate vision problems when looking at device screens.



## The Blue Light Situation

A recent topic of debate among eye care specialists has been the effect of blue light on eyesight. Blue light, another name for high-energy visible (HEV) light in the blue and violet part of the light spectrum, is a particularly intense light wave emitted by many modern electronics — including computers, tablets and smartphones — and even compact fluorescent light bulbs. The 2013 Vision Council survey found that only 37 percent of adults know that electronics radiate blue light.

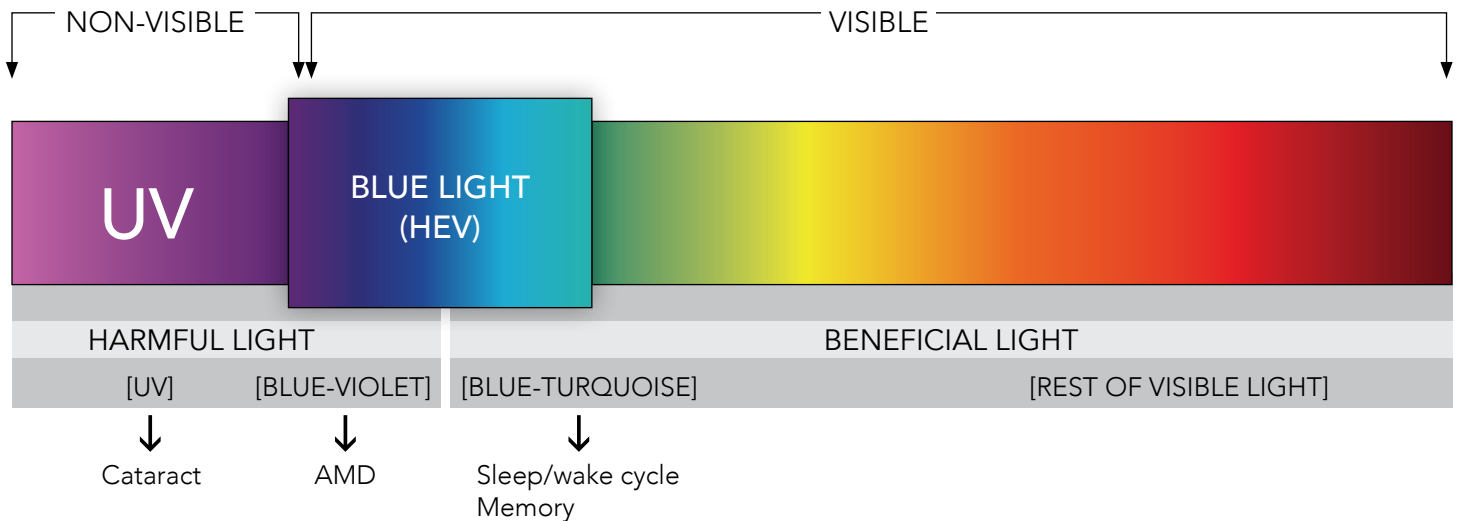


FIGURE 3: The band of blue-violet light that is most harmful to retinal cells ranges between 415 and 455 nm.

Studies suggest that overexposure to HEV light can damage the retina, the part of the eye that brings objects into focus. This occurs when blue light penetrates the macular pigment of the eye and causes a breakdown of that protective shield. This leaves the eye more susceptible to blue light exposure and cell degeneration.

Over time, accumulated damage can increase the likelihood and severity of eye disorders such as age-related macular degeneration and cataracts.<sup>iii</sup>

Certain bands of blue light can be beneficial. Blue-turquoise light is essential for color perception, clarity and vision sharpness. It aids circadian rhythms (related to healthy sleep patterns), cognitive performance and pupillary constriction reflex. The average American can easily get a healthy amount of beneficial blue light due to regular exposure to the sun's UV rays—with sunglasses, of course!



FIGURE 4: Only 7 percent of U.S. adults have tried computer glasses to reduce digital eye strain.

## Computer Glasses and Advances in Lens Technology

To address all of these factors, lens manufacturers have developed a line of new products tailored to the digital device user.

Advances in lens technology have made computer glasses possible. They come in all shapes and sizes and can be made with or without a prescription. Computer glasses look like regular glasses but the lens is unique.

*Age-related macular degeneration is the leading cause of severe vision loss in people 60 and over.<sup>iv</sup>*

Computer glasses help the eye adjust to intermediate-distance objects such as computer screens. A modified lens power relaxes the eye while providing a large field of view. And an antireflective coating helps combat eye strain by softening the glare of harsh indoor and outdoor lighting, while also improving the contrast of digital content. There are even lenses that selectively absorb harmful blue light, keeping it from entering through the cornea. These lenses are either infused with melanin or use a blue-light filtering coating.

### Lens Options

- **Single Vision Lenses** – A prescription lens that is optimized for individuals' computer screen working distance. This is the least flexible lens option as the extent of vision (depth of field) is very limited.
- **Progressive Lenses** – A solution for your everyday visual needs that addresses far, intermediate and near vision. These lenses are a good solution for those with limited computer use. Due to a limited intermediate vision width of field, they should not be worn for prolonged computer time.
- **Computer Lenses** – A work station solution for those that are on a computer for more than two hours a day. With a wide intermediate and near area, these lenses have limited room-length viewing distance.

### Lens Treatments and Tints

- **Anti-Reflective Coating** – Reduces reflection and glare from indoor and outdoor lighting sources in addition to ghost reflections from light sources that can contribute to visual noise and potential visual distractions.
- **HEV Coatings** – Reduces reflection while blocking out potentially harmful HEV light. Some fluorescent light and backlit LED devices produce a lot of light at the blue end of the spectrum.
- **Color Filters** – May filter out harmful blue and violet light that is emitted by many digital devices. These filters may also be prescribed to reduce harsh office lighting and balance colors.

Left to right:

single vision lenses,  
progressive lenses,  
blue light filtering lenses,  
anti-reflective coating



The common thread is that computer lenses provide improved protection and reduced fatigue and strain for the eyes. They bring digital device screens into sharp focus and correct the blurriness and pixilation that can otherwise persist and cause irritation. Not only does this allow users to see more clearly, but it also relaxes eye muscles so that blinking rates are normal and the eye stays lubricated.

Computer glasses are available at most eye care retailers. It is always a good idea to schedule a comprehensive eye exam to determine whether a new or updated prescription is needed. Before arriving at your eye doctor's office, be sure to measure your personal eye-to-computer-screen distance to ensure that you receive the most effective lens for your preferred viewing position.

## Tips to Prevent and Lessen Digital Eye Strain

Lens technology is advancing to meet the concerns of a digital world. Computer glasses are a great solution to reduce or eliminate digital eye strain. Other "eye-gonomic" actions can also help lessen the incidence of fatigue. The Vision Council's medical advisory board offers these tips for safer screen viewing:

- Adjust the brightness of your device. Consider changing your background color from bright white to cool gray. Attach a glare reduction filter to your computer screen.
- Frequently dust and wipe digital screens to help reduce glare.
- Adjust your screen so that it is directly in front of your face and slightly below eye level. Do not tilt a computer monitor.
- Position yourself or your device so there is sufficient distance between your eyes and the screen.
- Lessen the amount of overhead and surrounding light that is competing with your device's screen.
- 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).
- Keep handheld devices a safe distance from your eyes and just below eye level.
- Increase text size to better define the content on your screen. Use the settings control to make adjustments that feel comfortable to your eyes.
- Remind yourself to blink more often. Staring at a digital screen can affect the number of times you blink, causing eyes to dry.
- Take a 20-20-20 break: Every 20 minutes, take a 20-second break and look at something 20 feet away.
- Parents should limit the amount of screen time for children, and reduce their screen time in front of children so as to set healthy standards in the home.
- Blink. Breathe. Break.

## In Conclusion

No one knows precisely how digital technology will evolve in coming years. But it seems likely that tablets will get even smaller, phones will have even more apps, new devices will be invented and our eyes will spend more and more time staring at screens for work, school and play. We need to learn how to interact safely with this technology. Above all, we need to develop healthy eye habits.

The Vision Council is working with eye care providers and the optical industry to educate individuals about digital eye strain. And with new research emerging on the potential effects of blue light, it is increasingly important to understand digital devices users' risks.

Digital eye strain may also be caused by eye disease. Comprehensive eye exams can determine whether a sight-threatening disease is present. With proper treatment, individuals can be more confident of a comfortable and productive digital and visual future.

The Vision Council reminds users to be mindful when using digital devices. Take frequent breaks, move away from the screen and wear computer glasses while on a device for two or more hours. Taking control of vision protection will allow for many more years in the digital age.

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

## Methodology

This report is based on an October 2013 survey from VisionWatch, a large scale consumer survey designed for the eyecare industry. VisionWatch is an ongoing study of a statistically balanced sample of 110,000 US 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 12 questions regarding use of digital media devices and any related effects on vision from extended use was appended to the October 2013 VisionWatch questionnaire.

Results and tabulations contained in this report are based on a total sample of 7,160 American adults.

## Endnotes

<sup>i</sup>Gartner, Inc. Gartner Says Worldwide PC, Tablet and Mobile Phone Shipments to Grow 5.9 Percent in 2013 as Anytime-Anywhere-Computing Drives Buyer Behavior. June 2013 press release. <http://www.gartner.com/newsroom/id/2525515>

<sup>ii</sup>Cathy Wong on About.com. Natural Approach to Computer Vision Syndrome and Eyestrain. January 2008. <http://altmedicine.about.com/cs/backpain/a/Computer.htm>

<sup>iii</sup>American Macular Degeneration Foundation. Ultra-Violet and Blue Light. Retrieved in November 2013 from <http://www.macular.org/bluelite.html>

<sup>iv</sup>Patient Education Institute. X-Plain Macular Degeneration. April 2007. <http://www.nlm.nih.gov/medlineplus/tutorials/maculardegeneration/ot059103.pdf>



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