Are computers and electronic devices bad for our vision?

By Prof Jannie Ferreira

This is a question that you may get asked every single day. It is not that simple to answer because it does not refer to one specific problem but may include a whole range of visual problems. Research shows that between 50% and 90% of people who work at a computer screen have at least some symptoms. But most vision experts say we can rest assured, as long as we apply common sense rules then there is really nothing to be concerned about. Herein lays the problem since many people have jobs that require staring at a computer screen for hours at a time. Add to this the introduction of hand held devices such as tablets and smart phones and also 3D screens and common sense flies out of the window.

Since the introduction of concepts such as **Computer vision syndrome (CVS)** and **Visual Fatigue Syndrome (VFS)** in the early 1990's, that warned against eye strain and general visual fatigue, we have seen a dramatic increase on time spend on these devices. Janvier sums it up quite nicely when he states: "Most of us work at least eight hours a day and during this time many of us spend five to six of those hours staring at a computer screen. Now we get home, and what do we do? Check our e-mails, WhatsApp's, pay bills online, shop online, and go to Facebook. Add to that a few more hours at the video games (X-box, Wii, PlayStation, etc.). So now we have been staring at some type of computer or hand-held visual screen for 10-12 hours.

The point here is that we spend a great deal of time on any given day staring at some type of visual screen, whether for work or entertainment. This not only applies to working adults, but also the children: computers at school, smart phones in hand, and hours on the entertainment screen of choice. The large computer screens are bad enough, but now we are also using much smaller visual screens with smaller displays, and not well-formed lettering (fewer pixels). This is placing even greater strain on the eyes and visual system".

Thus the question remains: How does all of this affect our eyes, and is it detrimental to the visual system? **CVS** and **VFS** is considered to be similar to other repetitive motion injuries, such as carpal tunnel syndrome. Working on computers involve continuous focus and refocus as well as tracking and convergence activities. The eyes need to constantly adjust to changing images on the screen to allow the brain to process what you're seeing. All these jobs require a lot of effort

from your eye muscles. And to make things worse, unlike a book or piece of paper, the screen adds contrast, flicker, and glare. Computer work gets even harder as we age and reach presbyopia.

General signs and symptoms associated with the use of handheld devices and computers

- Headaches
- Eye Strain
- Fatigue
- Burning, Itchy, Red and Watery Eyes
- Loss of Focus
- Blurred Vision at near and at distance [NITM]
- Double Vision
- Neck/Shoulder Pain
- Sensitivity to Lights (Photophobia)

Headaches, Eye Strain and Fatigue are mostly associated with squinting and repetitive ocular muscle actions. Burning, Itchy, Red and Watery Eyes results mainly from staring at a screen. The result is a significant reduction in blink rate causing a dry eye. This seems to be the most common symptom reported by patients. Add to this that quite often we work in places that are running air conditioning and the dry eye only gets worse, more so for people wearing contact lenses. Loss of focus and blurred vision at near relates to fatigue in the accommodative system. Blurred vision at distance may be a little bit more complex. The literature suggests that this is the result of a short-term myopic far point shift immediately following a sustained near visual task. This is known as near work-induced transient myopia (NITM). Overall, studies reported myopic shifts, with a mean of approximately 0.40 D and a range from 0.12 to 1.30 D While the precise aetiology remain unclear, I am quite convinced that this "pseudo myopia" can evolve in a more "permanent" myopia and that this is a significant factor in the global increase in myopia.

Double vision relates to a fatigue in the convergence system [more so in people with significant phorias] and because of the near triade [convergence, accommodation and pupil response] often appears with blurred vision and photophobia. Neck and shoulder pain simply results from poor posture. There are also studies that suggest electronic devices give off high-energy, short-wavelength, blue and violet light, which may affect vision and even prematurely age the eyes. Early research shows that overexposure to blue light could contribute to eye strain and discomfort and may lead to serious conditions in later life such as age-related macular degeneration (AMD). There is no real hard evidence yet but "blue light coatings" is becoming common practice.

Guidelines for use of electronic devices

In line with a more holistic approach in dealing with visual problems our emphasis should be to prevent rather than cure [or compensate]. In addition to the risk of computer vision syndrome, visual fatigue syndrome and myopia, we should be aware of the concerns that excessive use of hand-held devices may have on our general everyday life. Several organisations have now reviewed the current scientific literature about this and published a number of guidelines to minimise the effect on the visual system.

1. Try mix of tasks throughout the day. People should take frequent breaks from computer use and take part in a variety of activities that involve postural changes and physical movement. Performing sedentary tasks using electronic media (computer use, watching TV, texting, etc.) should be accompanied with regular breaks. To be safe we should take a 60-second break every 20 minutes and at least 10 minutes after two hours of staring at a screen. Because dry eyes seem to be such a common symptom, people should be encouraged to blink regularly, especially if they wear contact lenses. Tear supplements will also work wonders but the dry, irritated eye actually serves as a good warning sign that it is time for a break.

2. Encourage the use of proper postures when working at a desktop computer. Workstations should be designed to suit the user's size and enable a range of suitable postures. Feet should be able to rest comfortably on the floor; desk height should be at elbow height; document holders should be used to position paper materials near the computer screen. The screen should be below eye level [20 cm] because it is much more comfortable and less strenuous looking down.

3. Encourage a comfortable working distance i.e. Harman's distance for all hand-held devices and at least 50cm for desk top screens. The closer the screen the more strain there will be on the accommodative and convergence systems resulting in double vision and/or blurred vision. If possible increase the font size and adjust the screen resolution and contrast.

4. Ensure that proper lighting is provided. Distant or frontal light can cause a great deal more glare off screens, which makes focusing even more challenging. If possible, use ambient overhead lighting which provides good results. The screen should also be positioned and angled to avoid glare. And remember to clean your screen once in a while!

5. Teach yourself computing skills, including how to touch type with minimum force and how to use keyboard shortcuts to reduce mouse use.

6. Although the use of “computer glasses” is considered to be ineffective and controversial by some researchers, I have no doubt that they work well in reducing several symptoms. I also believe that they prevent NITM and even proper myopia. From my own experience single vision lenses works far better than multifocal or low plus lenses [+0.50]. As a rule of thumb add +1.00 to the distance script to obtain the required power of the lenses.

Computers and handheld devices will dominate our lives for the foreseeable future and dealing with these signs and symptoms effectively will greatly enhance the ocular health of your patients.

References used for this article are available from the author on request.