Computers and Your Eyes

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We first presented this web article in early 1997, and while all the points made in our original piece remain valid, further studies have since produced new knowledge of how the human eye functions. This, in turn, has given us an even better understanding of optimum lighting conditions for computer users.

Accordingly, for a review of this important topic, we are republishing our original article in its entirety. To this, we are including the following to bring you up-to-date on the latest knowledge on lighting in a computer environment.

It is known now that, in a computer environment, the human eye functions with the least amount of strain and fatigue when the pupil is as small as possible. This may seem contrary to popular understanding, i.e., the brighter the light the larger the pupil. It should figure that the ideal lighting in a computer environment should be very bright, right?

Well, no, not quite. The catch is that over-brightness also creates glare and high contrast. Further studies have also shown that the smaller the pupil improves the visual performance in nearly all people, including those with 20/20 vision. Most people have some optical imperfections in their eyes that allow aberrant rays to reach the retina, causing blurred vision. Decreasing the pupil size results in improved vision.

Recent studies have shown that bluer white light, i.e., light that is high on the kelvin scale, creates a light of this required quality. The visual benefits of this quality of light can be demonstrated by going outside at twilight under a clear sky. You will be surprised at how easily you can see and read under such conditions.

To-date the manmade light that most closely reproduces this is fluorescent lighting, specifically triphosphor fluorescent at 5,000 kelvin. This creates a lighting environment where all colors appear as they would be seen at midday and is therefore neither warm nor cool, and not distorted. Higher kelvin of 7,500 to 10,000 may produce an even better balance of the bright/non-glare ratio, but additional studies and experiments are needed before specific criteria can be established.

Besides seeing your doctor (see excerpt from December 1996 issue of *Clearly Optometry* at end of this article), what lighting issues should you address? There are a number of lighting factors that affect the computer environment:

- Screen reflections and glare
- Good lighting on keyboard and on reading material
- Background lighting differences behind the screen
- General ratio of room lighting to screen brightness

Screen Reflections and Glare

In the selection of a location for the computer monitor, choose an angle that picks up the least amount of reflection and glare on the screen. Once a position is established, any remaining reflections and glare should be eliminated. The reflections on the computer screen from a fluorescent overhead light can be eliminated by installing a parabolic grid to replace the existing lens (see illustration below).

Other types of fixtures that reflect light on the screen may need to be changed or moved as well. Another type of reflection and glare can come from windows in front of the screen. The simplest way to eliminate these reflections is to have a closed blind on the offending window.

Reflected Glare | No Glare
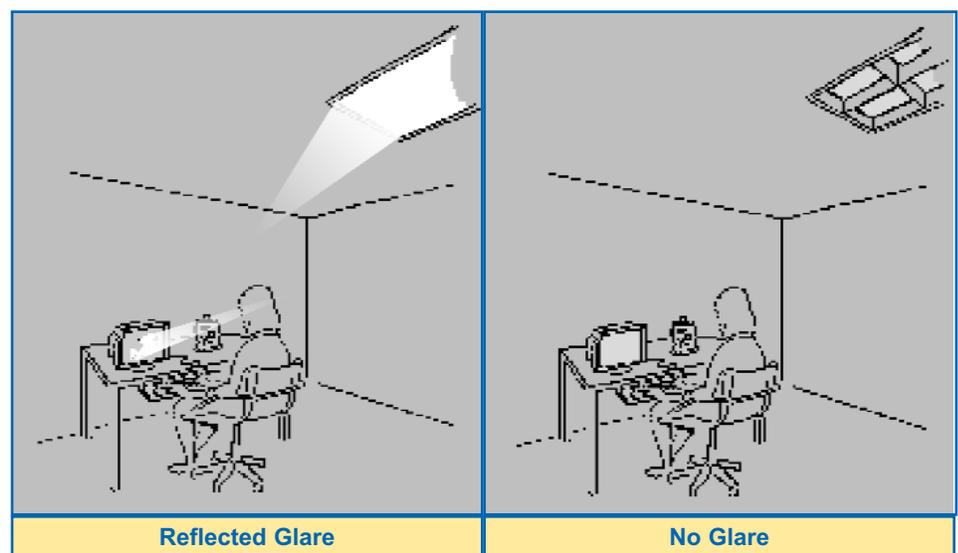
Good Lighting on the Keyboard and on Reading Material

There should be enough light on the keyboard and reading material to allow your eyes to move from screen to keyboard to reading material without a great amount of light contrast. Illumination differences cause the eye to re-adjust, causing increased fatigue and strain.

Background Lighting Differences Behind the Screen

Have you ever been tempted – or – known someone who has attempted – to solve the computer environment problem by working in a dark room ... like in the movie theaters? Did you find this a comfortable work environment? Probably not. The contrast between the darkness in the room and the illumination from the computer screen is too great, and causes enormous strain on the eyes. So the light behind the screen shouldn't be too bright nor too dark. It should be about half as bright as the light directed in the keyboard to avoid eye discomfort and strain.

General Ratio of Room Lighting to Screen Brightness

While less critical than addressing light illumination from behind the screen, it is also important to note general lighting in the room, which affects your peripheral vision. The general lighting should be about one-third as bright as the level of eye comfort.

Summary

A good combination of the above four factors should give you a comfortably lit computer environment.

The other factor that affects not ony eye strain but also is suspected by many experts to be a key factor in carpale tunnel syndrome, is posture. Not only the way you sit and hold your arms and head, but also the type of chair is important. The chair can hamper or facilitate your posture. We will not go into an indepth analysis in this discussion, but we should touch on it. ■

About the Author

Bill Joel received his B.A. from Brown University with creative design courses at the Rhode Island School of Design. He did further studies in interior and lighting design at the New York School of Design and Pratt Institute.

A professional member of AID-ASID from 1963 to 1993, Bill received a Fellowship from ASID in 1978. In 1992, he became one of the first Certified Interior Designers of the Commonwealth of Virginia. His work experience includes residential, commercial and institutional remodeling and new structures, as well as a number of feasibility studies, all with an emphasis on effective, energy-conscious, quality-lit environments. For more details, consult *Marquis Who's Who in America.* Bill has also served as a member of the FIDER Board of Visitors and Accreditation Committee, Foundation for Interior Design Education and Research; set and lighting designer for the Richmond Forum and Barksdale Theatre; and guest speaker on various radio and TV spots. Bill may be reached at Rich@RichArtCo.com.

Excerpt from Dr Kevin J. Green's newsletter, *Clearly Optometry* (December 1996)

Contrary to popular belief, "computer screens do not emit ultraviolet or x-rays. No evidence links computer usage to increasing one's nearsightedness. However, up to 75% of users experience computer vision syndrome. This syndrome consists of temporary nearsightedness, eye fatigue or strain, blurred or double vision, dry or teary eyes, scratchiness, light sensitivity, headaches, and neck or back aches.

The suspected causes of computer vision syndrome are: poor posture in relation to the computer, poor lighting with glare on the screen, reduced blinking, using glasses inappropriate for the position and distance from the screen, and minor visual effects that might have gone unnoticed if not exaggerated by computer usage.