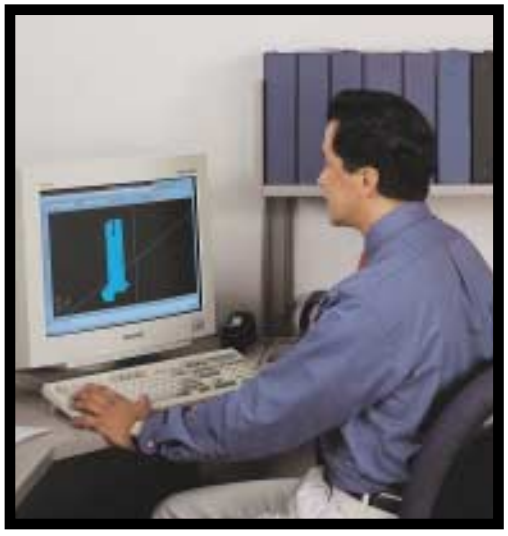
A Management Report on the Correlation Between Workstation Lighting and Computer Vision Syndrome



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Executive Overview

Headaches, eyestrain, difficulty focusing and tense muscles are universal complaints among computer users who put in long hours in front of computer screens. This group of symptoms is called Computer Vision Syndrome (CVS).[1] CVS is not caused by the computer alone, but rather by the effects of too-bright lighting on computer users' eyes. Glare and reflections from light sources interfere with the image on the screen. The user's eyes are constantly trying to adjust and filter out these visual obstructions, resulting in the symptoms of CVS. The more hours a user spends in front of a computer screen, the higher the incidence of these symptoms. Eventually, users look for a way to relieve this condition. Control of workplace lighting is the best way to alleviate environmental causes of this disorder.

Who is at Risk for CVS?

People who use computers intensively, such as:

- CAD designers
- Software developers
- Graphic designers
- Design engineers
- Researchers
- Customer service representatives
- Telemarketers
- MIS professionals

Computer Vision Syndrome: A Universal Complaint Among Computer Users

Computer Vision Syndrome is a growing crisis in the workplace. Statistics compiled by the American Optometric Association verify a substantial increase in the number and frequency of employee complaints about this disorder.[2] Standards organizations, such as ANSI (American National Standards Institute) and the Illuminating Engineering Society of North America (IESNA) have issued formal recommendations for effective lighting for the computer environment.[3]

Employees at greatest risk for CVS use computers intensively on a daily basis. Their productivity and job performance depend on the computer.

Findings on Computer Vision Problems[4]

- Up to 90% of computer users report visual problems and irritation.
- 22% report musculoskeletal fatigue.
- Over 10 million eye exams are performed because of eye problems stemming from computer work.
- 14.25% of all eye exams are conducted because of CVS.
- 40.35% of patients obtained eyewear strictly for use at the computer.

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These people can set their light levels individually – lower to work on computers brighter for paperwork.

Personal Control of Overhead Fluorescent Lighting Eliminates Adverse Workstation Conditions

The real solution for the causes of Computer Vision Syndrome is controllable lighting at the workstation level that:

- maximizes the clarity of the image on the screen so text and graphics are crisp and sharp;
- eliminates interference reflected on the screen that competes with the image forcing the eye to adapt constantly;
- reduces the difference in brightness between the image on the screen and the surrounding surfaces in the workstation.

Individual Lighting Control Puts the Solution in the Employee's Hands

The most effective and practical solution to these lighting environment problems is to allow each individual to adjust his or her lighting, depending on the task being done and personal comfort level. For example, an employee can select very low light when working with a graphic layout or CAD design in order to view colors and illustrations on the computer screen. Later that day, higher light levels may be required for keying a report or working with a spreadsheet. Then the user can choose another lighting level for working on paper tasks at the end of the day.

Essentially what you can't see can hurt you. Inappropriate lighting in the workplace can affect employees physically and mentally on a daily basis. The symptoms of Computer Vision Syndrome go beyond minor annoyance and irritation, affecting employees' job performance, satisfaction and health. Controlling lighting gives employees control of their own environment, with the ability to adjust levels on demand, and checks potential health issues before they become critical.

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Assorted Remedies Offer Short-Term Relief

Various products and new office design techniques promote specific solutions to CVS. Despite the benefits of these partial solutions, experts in various fields — optometrists and medical professionals, computer manufacturers, ergonomic consultants and lighting designers — consider the right lighting at the work-station level to have the greatest overall effect.[10]

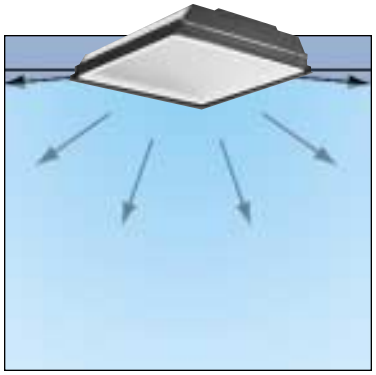
Current Solutions for CVS Symptoms

- Reposition the workstation
- Muted wall colors
- Matte work surfaces
- Ergonomic furniture
- Blinds and shades
- Special eyewear
- Ophthalmic eye drops
- New software programs
- Glare filters

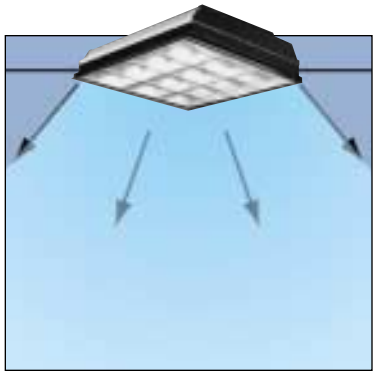
Flexibility Answers the Challenge of Today's Workplace Lighting

Traditional office lighting answers the maximum requirements for handling paper work on flat, horizontal desk surfaces. This lighting, which is very bright and remains at a fixed level throughout the day, is totally inappropriate for computer users. Typically, the lighting in offices is two-to-three times brighter than it should be for people working at computers. Modern workplace lighting must meet the new requirements brought about by the increased use of computers. The challenge is to have lighting that takes into consideration the computer monitor's vertical surface which picks up glare and reflections from overhead lighting, windows, objects and surfaces.

The lighting industry has responded to the challenge with some good alternatives. New indirect lighting techniques and parabolic fixtures have successfully addressed the problem of direct glare and bright spots in the direct line-of-sight. The egg-crate louvers on parabolic fixtures direct light downward over an employee's work area, so a user no longer sees a co-worker's fixture reflected on his or her screen.



Prismatic fixtures disburse light over a wide angle, causing problems for computer users.[11]



Parabolic fixtures concentrate and direct light only over workstations, eliminating most direct glare.[12]

But new parabolic fixtures and lighting techniques address only part of the problem. Screen filters, eye drops, software programs, wall and window coverings, and ergonomic furniture lessen CVS symptoms to some degree. However, none of these techniques or products change the lighting environment, so the number and frequency of CVS cases continue to grow.

Workplace Lighting Correlates to Increased CVS Symptoms

To understand why glare from traditional overhead lighting makes computer users uncomfortable, it is necessary to consider the remaining issues of glare from overhead lighting: Washout, Veiling Reflections and Brightness Ratios.

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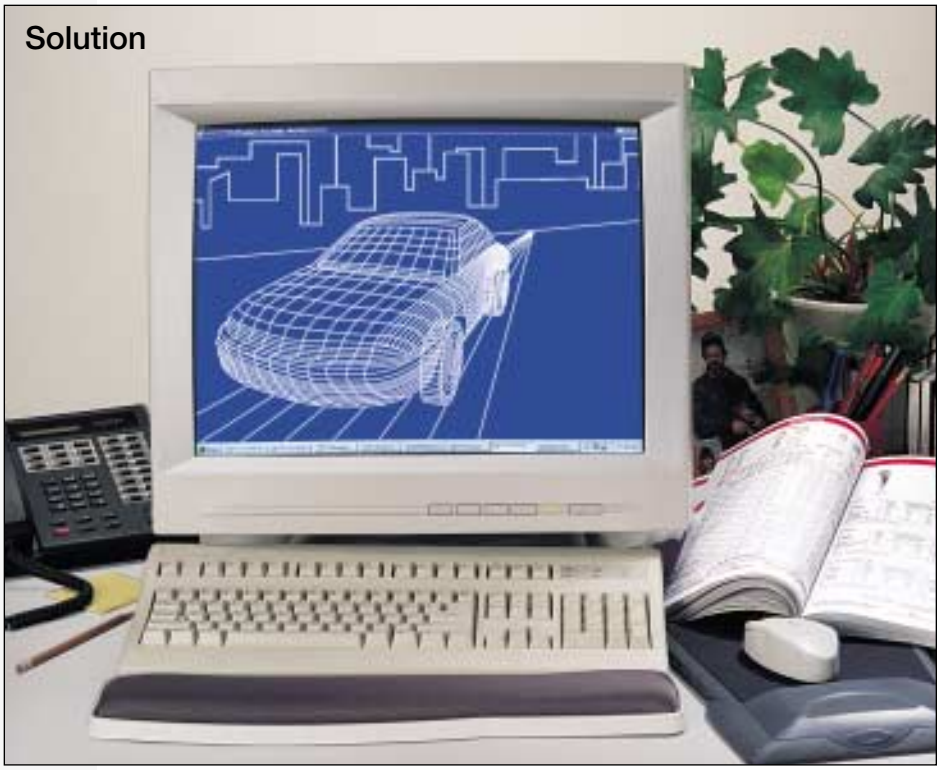
Washout, *or uniform glare is the ambient light that falls across the computer screen. Light washes over the entire screen and lightens it, robbing the image of sharp contrast. For example, black objects or letters become dark gray and closer in color value to the lighter objects or backgrounds on a screen. The eye must work harder to see the characters on the monitor.*[13]

Veiling Reflections *are objects that can be seen on the screen in addition to the screen image. Examples are reflected documents, the user's clothing and silhouette, furniture, objects hanging on the wall, etc. Initially this multiple image is not a problem, but after two or more hours, it becomes very tiring as the eye is always filtering out the reflected image from the screen image.*[14]

Brightness Ratio *is the difference in the overall brightness of the computer screen compared to the brightness of the surrounding surfaces in the workstation. When there are marked differences in brightness, the eye is forced to constantly adapt, causing strain and fatigue.*[15]

High fixed-level overhead lighting causes washout, veiling reflections and high brightness ratios, making computer workers susceptible to CVS.

With controllable overhead lighting, washout, veiling reflections and high brightness ratios are eliminated, providing a comfortable, productive work environment.



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Symptoms of Computer Vision Syndrome Are More Than a Minor Nuisance

Experts are recording and reporting statistics on CVS symptoms. The Journal of the American Optometric Association reported a survey that ranks the symptoms in order of their frequency.[5]

Frequency of Complaints

1. Eyestrain (sore or fatigued eyes)
2. Headache
3. Slowness in changing focusing distance
4. Blurred vision after close-up work
5. Eye irritation (burning, dryness, redness)
6. Contact lens discomfort
7. Neck, back, and shoulder pain due to poor posture

The cumulative effects of CVS symptoms go beyond minor physical irritation. According to the National Institute of Occupational Safety and Health, Computer Vision Syndrome is the number one cause of eyestrain in the workplace.[6] The symptoms are severe enough to cause productivity problems, increased error rates, dissatisfaction with the job, absenteeism, and potential health insurance and disability issues. It is not the first ten minutes in front of a computer screen that create the problem, it is the daily extended period of time that affects the user. In a recent survey of computer executives, 86% report symptoms of CVS after two or more hours of computer use.[7]

Will CVS Take the Same Path as Carpal Tunnel Syndrome (CTS)?

To understand the potential for CVS to develop into a full-scale crisis, consider its similarities to the disorder called Carpal Tunnel Syndrome (CTS). CTS is a subset of the complaint known as Cumulative Trauma Disorder (CTD). CTS affects the musculoskeletal system and is caused by repetitive wrist motion. Results of studies of CTS show that this disability already costs over $8 billion in medical bills and lost work days per year.[8] If CVS-related conditions begin to qualify for medical treatment under guidelines similar to those used for CTS treatment, employee health and disability costs could easily escalate.

The adverse impact of CVS has been documented in examining computer users' visual performance. In the presence of very little visual degradation, such as glare on a monitor, employees show an efficiency decline of 4% to 19% in accomplishing standard tasks. Translating that percentage into dollars, just a 4% improvement in efficiency of an employee earning $30,000 per year would be worth $1,200.[9] Consider the the costs for employees at much higher pay scales.

Lutron's PerSONNA® system controls the light output of one to 20 overhead fluorescent fixtures. Using PerSONNA's handheld remote, you can dim or brighten lights – depending on task and preference.

PerSONNA eliminates the uncomfortable

- glare
- reflection
- brightness ratio

of existing lighting systems on computer screens, so employees can work better.

dimming by LUTRON®

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