A SURVIVAL GUIDE TO COMPUTER WORKSTATIONS

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INTRODUCTION

Since the early 1980's computer workstations have become an integral part of America's work force. Millions of units are now in use and the numbers will continue to increase. The computer is comprised of a central processing unit, display monitor, keyboard and mouse. Components of the computer workstation may include the chair, desk, anti-glare screen, document holder, printer and any other equipment essential to working with computers.

An increased number of computer workstations in the work place has resulted in health concerns related to vision and body aches and pains. Problems associated with computer workstations are generally temporary and can often be solved using simple corrective measures. This guide briefly discusses these concerns and addresses administrative controls (i.e., proper computer set up, monitor positioning, rest breaks and project assignment) and engineering or ergonomic controls (i.e., furniture design, lighting, glare control, computer workstation configuration and layout).

EYES AND VISION

There are a number of symptoms that may be experienced by computer operators. These symptoms include: visual fatigue, blurred or double vision, burning and tearing eyes, headaches and frequent changes in eyeglass prescription. There is no scientific evidence that computer work causes permanent eye damage, but the temporary discomfort that may occur can reduce productivity, cause lost work time and reduce job satisfaction. Eye complaints are usually the result of glare (direct, specular or diffuse) or visual fatigue.

GLARE

Direct glare is caused by bright windows or strong light sources that are in the visual field of the computer operator (i.e., a strong light shining in your face as you look at the monitor)
Specular glare is reflection that appears on the glass surface of the display screen similar to a mirror like image
Diffuse glare is patches of the screen that are washed out and have lost contrast due to light bouncing off the inner phosphor layer of the monitor surface, similar to washout that occurs to a television image from bright sunlight
Controls To Avoid Glare
Keep the monitor at an angle that prevents the light source from shining on the screen and washing out characters
Use blinds, drapes or shades to block glare from windows
Avoid light colored clothing
Use a micromesh antiglare filter on the screen to scatter and absorb light or use a neutral density filter to scatter and diffuse light
Visual Fatigue
Extended periods of computer use can put physical strain on the eyes in a number of ways. The following are common causes of visual fatigue:
Staring at the screen without varying eye position or focus
Dry eyes caused by infrequent blinking or low humidity (below 40%)
Maintaining a viewing angle that is above the horizon (higher than if one were looking straight ahead)

Poor image quality due to lack of contrast, a screen that is too bright or dim, flickering of the screen image, inadequate screen resolution or clarity
Intense display colors
Incorrect eyeglass prescription

Controls To Avoid Visual Fatigue

Exercise the eyes by periodically focusing on objects at varying distances
Keep the screen and document holder at the same distance from the eyes
Practice blinking regularly
Add moisture to the air with a steam humidifier, open pans of water or plants
Adjust the screen height so that when seated the top line of the monitor is no higher than your eyes
Adjust the brightness control for comfort
Keep the screen clean
Adjust the contrast control to make the characters distinct from the background
Service or repair monitors that flicker or have inadequate clarity
Consult an optometrist regarding special lenses or the use of bifocals, have regular eye examinations and indicate the distance from your eyes to the monitor

MUSCULOSKELETAL

Musculoskeletal problems occurring with computer use may range from simple muscle fatigue or neck and back ache to cumulative trauma disorders. Cumulative trauma disorders are associated with tasks that require repetitive motions occurring over long periods of time. The two that may be experienced by keyboard users include Tenosynovitis and Carpal Tunnel Syndrome (CTS).
Tenosynovitis is an inflammation of the sheaths through which the tendons of the fingers pass. It is caused by rapid flexing of the fingers and wrists. Symptoms are pain in the wrist and back of the hand. Tendonitis, an inflammation of the tendon itself, may also be a problem for computer users.
Carpal Tunnel Syndrome is a condition caused by compression or squeezing of the median nerve which passes through the carpal tunnel of the wrist bones. Pressure on the nerve causes numbness, tingling, burning or pain in the palms, fingers or wrists. The problem can intensify over time, spreading up the arm and weakening the muscles, so that one may drop objects being carried or fail to sense hot or cold. CTS can be aggravated by swelling of the tendon sheaths such as in tenosynovitis.

MUSCULOSKELETAL PROBLEMS

Musculoskeletal complaints involving muscular fatigue or cumulative trauma disorders are usually the result of the following conditions:

Maintaining an unnatural or unhealthy posture while using the computer
Inadequate lower back support
Static load placed on the body by sitting in the same position for an extended period of time (i.e., turning head to the side to view poorly placed document)
An ergonomically poor workstation design

CONTROL OF MUSCULOSKELETAL PROBLEMS
The control of musculoskeletal problems can be accomplished by utilizing the ergonomic potential of your work station. Furniture, unit design and proper technique often go hand-in-hand. The following are descriptions of desirable features for furnishings and equipment, their setup, and the proper technique to be used with each item.

The Monitor
Should swivel, tilt and elevate (use an adjustable stand, books or blocks to elevate monitors that are not adjustable)
Should be located so the top line of the monitor is no higher than the user's eyes or no lower than 20° below the horizon of the user's eyes or field of vision
Should be at the same level and beside the document holder
Should be between 18 to 24 inches away from the user's face

The Keyboard
Should be detachable and adjustable (legs to adjust angle)
Should be placed to allow the forearm to be parallel to the floor without raising the elbows
Should allow the wrist to be in line with the forearm so the wrist is not flexed up or down
Should include 2 inches of space to rest the wrist or should be provided with a padded detachable wrist rest
Should be placed directly in front of the monitor and at the same elevation as the mouse, track ball or touch pad

The Chair
Should support the back
Should have a vertically adjustable independent back rest that returns to its original position and has tilt adjustment to support the lower back
Should have a pneumatic height adjustment, so that the chair height can be adjusted while the user is in a seated position
Should be adjusted so the back crease of the knee is slightly higher than the pan of the chair (use a footrest or a stack of books to elevate the feet if the chair is too high and not adjustable)
Should be supported by a five prong caster base
Should have removable armrests that are adjustable in all three dimensions
Should have a contoured seat with breathable fabric and rounded edges to distribute the weight and should be adjustable to allow the seat pan to tilt forward or back

The Table/Desk
Should provide sufficient leg room
Should allow for adjustable height
Should have enough surface area (about 8 square feet) to support the computer equipment and space for documents
Should provide at least 30 inches in depth
Should have rounded corners and edges

The Wrist Rest
Should be a minimum depth of two inches
Should be the same length as the keyboard
Should be the same height as the front edge of the keyboard
Should be constructed of firm supportive foam or gel material
Should have a flat top with rounded edges
Should be attachable to the work surface

The Keyboard Tray
Should have adjustable height options
Should have a forward and back tilt feature
Should be large enough for the keyboard and mouse
Should be retractable for storage
Should clamp under the work surface and have a position lock

The Keyboard Tray
Should be able to rotate 360 degrees

The Footrest
Should be tilted 10 to 20 degrees from front to back
Should be tall enough to accommodate the person who's feet do not touch the floor
Should be at least 12 inches deep and 20 inches wide
Should be movable, but heavy enough to stay in place
Should have a non-slip surface

The Document Holder
Should be adjustable to fit monitors from 8.5 to 17 inches wide
Should be fully adjustable to permit left or right, up or down, forward or backward, and tilted movement
Should be sturdy enough to support stacks of papers and heavy documents
Should have a wide lip to hold books and manuals open
Should have an adjustable line guide for data entry
Should have a non-reflective material to minimize glare
Should be stable and able to be attached to either side of the monitor

HELPFUL TIPS

The following tips may also help prevent musculoskeletal problems:
Provide a 15 minute break for every two hours of continuous computer use
Alternate work tasks
Use a stretching routine to relax the body
Keep the mouse at keyboard level
Do not grip the mouse tightly
Hold the mouse lightly with all fingers
Click gently

FACTS ON IONIZING AND NON-IONIZING RADIATION

X-Ray Radiation-ionizing radiation
Low energy x-rays are produced by the cathode ray tube and electronic circuitry when the lighted letters and graphics are created on the screen. Almost all of the x-rays are absorbed inside the cathode ray tube or are blocked by the glass. Only an insignificant amount is detectable outside of the unit. It should be noted that low energy x-rays can not penetrate paper.

Ultraviolet (UV) and Infrared Radiation (IR) non-ionizing radiation
UV and IR radiation are produced by the monitor, but at levels well below established health and safety standards. Although non-ionizing radiation is associated with cataracts, the low levels from computers are of no concern. There is no scientific link between cataracts and computer use.

Radio Frequency and Microwave Radiation
These non-ionizing forms of radiation are produced by the high voltage electrical components in the computer. The emissions of radio waves are weaker than actual broadcast signals and the computer is not capable of generating significant microwave radiation.

Electromagnetic Fields (EMF's)
EMF's are produced by the electrical circuits of the computer. Levels are lower than those produced by hair dryers or other household appliances and there is no scientific data linking EMF's to harmful biological effects to humans.

Static Electricity
Static electricity, generated on the screen of the monitor, can attract dust. Grounded screens and antistatic accessories can be used to minimize dust accumulation. Relative humidity between 40% and 60% can also minimize static electricity. If humidity is low, a simple pan of water in the room can provide enough moisture.

Pregnancy and Computers
Users of computers have expressed concerns as to whether low energy x-rays and EMF's have any effects on pregnant women or their unborn child. Scientific research indicates there is no adverse effect on mother or child.

SUMMARY
The computer workstation is obviously an essential tool in today's work force. Although visual or musculoskeletal problems can occur, it should be noted that with the proper equipment, unit design, technique and work practices these problems can be controlled. Take a few minutes to look at your work station and use the information provided in this survival guide. The effort will minimize the risk of visual and musculoskeletal problems, and put you in control of your computer work environment.

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http://www.engin.umich.edu/dept/ioe/C4E/
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