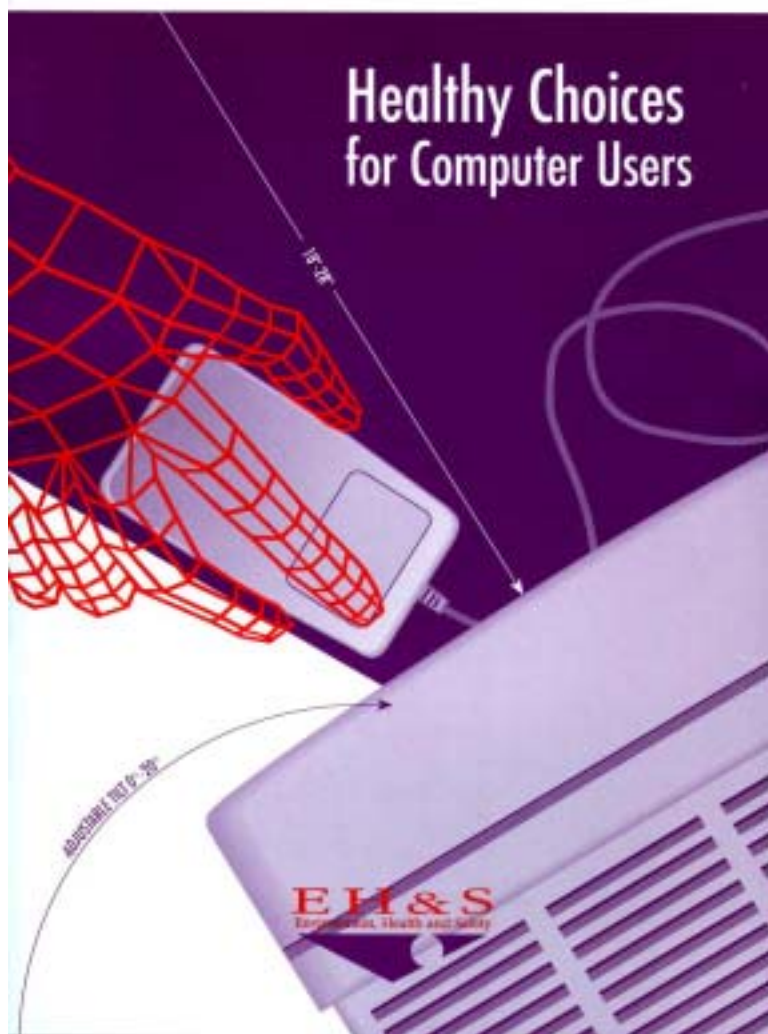


UNIVERSITY OF CALIFORNIA, SAN DIEGO

# Healthy Choices for Computer Users



ADDITIONAL RF-EMF

RF-EMF

**EH&S**  
Engineering, Health and Safety

## Foreward

*Healthy Choices for Computer Users* was created in a joint effort by members of the Cumulative Trauma Prevention Group, an ad hoc committee with representatives from UCSD's Office of Environment, Health & Safety, Employee Rehabilitation, Business Office, Employee Benefits, Hand Rehabilitation and Work Evaluation Centers, as well as Applied Risk Management.

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## Introduction

Personal computers have become indispensable in all aspects of university operations. Computers provide an incredible opportunity for personnel to achieve much greater levels of productivity. They afford speed, versatility and extend unlimited capabilities for their users. In fact, computers have radically changed the very nature of how we perform many of our daily tasks. University personnel now spend a much greater proportion of their professional time actively using their PCs. Unfortunately, many of these individuals are discovering there can be painful and serious health problems resulting from overuse of their computer. In fact, repetitive motion injuries and cumulative stress arising from computer usage constitute the fastest growing category of employee injuries reported in major organizations throughout the country. UCSD is no exception.

*Healthy Choices for Computer Users* was specifically developed to share important information concerning operator injury patterns. Through redesign of your computer workstation and specific job tasks, coupled with greater personal awareness, use of assistive devices, and exercising, many of the problem areas can be successfully eliminated. Studies have shown that a poorly designed computer setup can have a negative impact on the user's comfort and productivity. Recognizing this fact, it becomes important to take a proactive approach to identifying and resolving these problems. Off-work activities involving these same repetitive motions may also be contributing to chronic discomfort.



Solutions to these problems may need to include modifications in these pursuits, as well.

This booklet is designed as a self-help guide to provide the reader with basic ergonomic principles that, when applied, will significantly reduce on-going stress-related problems associated with computer activities. You are strongly encouraged to apply the recommendations presented in each section to your particular workstation. Make whatever adjustments seem reasonable and necessary. You will reap immediate benefits with greater personal comfort and productivity.

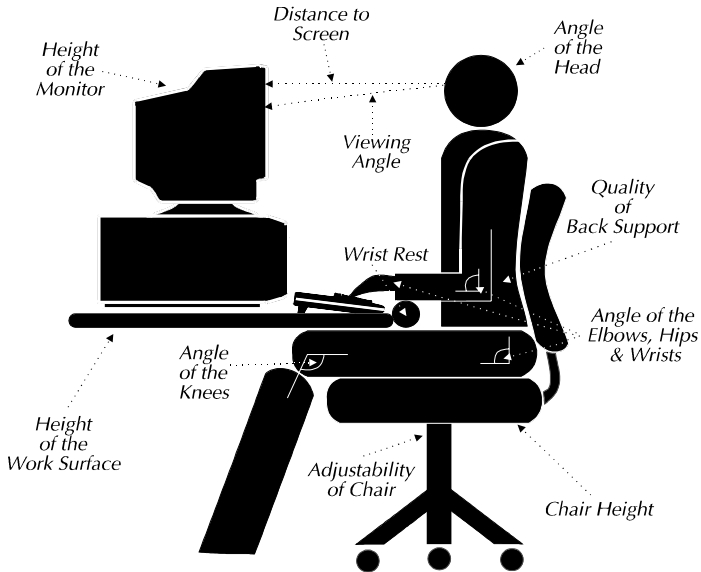
Most workstations at UCSD are inadequately designed with respect to basic user comfort. Part of the problem stems from the use of inappropriate types of desks, chairs, tables, lights, etc., which simply do not provide proper support and proportions. It is not the goal of this publication to encourage computer operators to rush out and purchase new furniture and accessories. Rather, it will focus on low-cost modifications and simple adjustments which will alleviate a great deal of the potential problems.

Hundreds of research studies from around the world have examined every conceivable aspect of computer workstation design. Among the best of these investigations was a ten year study conducted by NIOSH (National Institute of Occupational Safety and Health) which studied thousands of computer users from various industries throughout the United States. The findings of this research serve as the foundation for the information presented in this booklet.



## Workstation Design Factors

An ideal computer workstation, ergonomically speaking, is one that provides the greatest comfort and safety for its operator.



The key to achieving this comfort is making certain your body is always supported in a relaxed, natural position when using your computer. This means ensuring your activities do not force you into awkward, stressful positions. The workstation should be arranged according to your pattern of movement, so working materials are easily accessible.

The following section focuses on reducing stress and fatigue in specific body areas. Eyes, neck, arms, wrists, hands, back and legs are vulnerable areas when using your computer in a poorly designed workstation environment.



## Reducing the Stress in Your... - (Eyes)

Undoubtedly, the single greatest complaint expressed by computer users is chronic eye fatigue. The nature of the close work on the VDT tends to cause general eye strain, dry eyes, tearing, blurred vision and temporary soreness for many of us. Although it may not be possible to completely eliminate all eye discomfort, simple changes in the workstation setup will significantly reduce the symptoms.



A major contributing factor to having dry, itchy eyes results from a reduction in the frequency of your eye's blink rate while viewing the monitor. The human eye cleanses and refreshes itself automatically many times per minute. However, staring and concentrating at the bright monitor causes your eye's blink rate to slow down significantly. The corneal surface dries out resulting in irritated, red, tired eyes.

Another factor contributing to eye fatigue results from simple muscle exhaustion. Small muscles in the eye are responsible for changing the shape of its lens to permit close viewing. Unless there is an effort to consciously relax your eyes, these muscles build up lactic acid, fatigue, and become sore. Take frequent breaks *away* from your computer to allow your eyes to fully relax and refresh themselves.



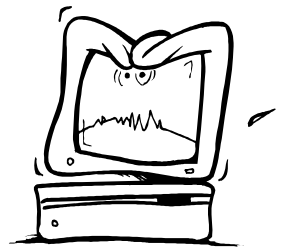
**Use the 20/20/20 rule:** After 20 minutes of computer work, look at a distance 20 feet away for 20 seconds. Periodically gazing across the room or out a window will allow your eye muscles to relax and receive freshly oxygenated blood, thus removing lactic acid. The eyes will usually recover very quickly when allowed to rest.

***Resting your eyes allows freshly oxygenated blood to remove lactic acid....***

Research verifies that many of the visual problems experienced by computer users also arise because their vision may need correction. Eye fatigue may be your body's signal to have your vision checked by your health care provider.

Persons wearing bifocals may experience trouble in comfortably reading text flowing across the screen because of the graduated layers on the lens themselves. Special glasses designed to be worn when using your computer are now available. Their prescriptive formula is specific for the routine distances associated with computer entry.

Computer monitors should have both a contrast and brightness control switch. Maximum contrast and minimum brightness usually produce the least strain on the eyes. Adjust your monitor for maximum personal comfort. If characters on the screen appear to be fuzzy or out of focus, it may not be faltering vision at all. Some monitors lose their character crispness or clarity due to technical



problems. Professional repairs should be sought to correct the problem.

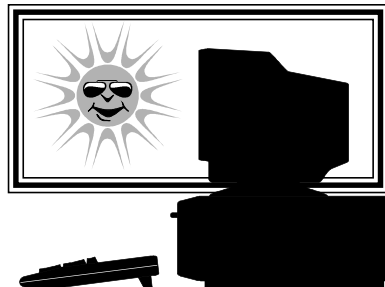


### ***Copy Stand Level With Monitor***

Copy stands should be placed at the same height as your monitor. This allows the eyes to more easily scan back and forth at the same focal distance, rather than looking down on the desk and then readjusting back to the monitor. This simply reduces unnecessary repetitive motion which causes fatigue.

Extraneous light striking the screen and causing excessive glare may come from many sources in your area. Situating your monitor directly in front of a large window may create strong backlighting conditions which can result in squinting, eye strain, and the dreaded "crow's feet" wrinkles. Conversely, computers with large windows directly behind the operator will also tend to have excessive natural glare splashing across the screen. To resolve both problems, place your screen parallel to windows to minimize glare.

### ***Place Monitor Parallel To Windows***



Most monitors come equipped with a pivotal base to allow for tilting up and down and swiveling from side to side. Find the best angle which reduces glare. Many newer monitors are now being designed with a matte finish surface on the screen to minimize reflection of light off walls, bright clothing, etc.

Fluorescent lights tend to be very white and harsh on the eyes. If your workstation has a bright light above it, place a cardboard hood over the monitor to provide shade across the screen surface. Be sure not to block the ventilation openings. Special light diffusers are also commercially available which direct overhead lighting straight downward, rather than sending it across open areas in all directions. This tones down the overall room lighting significantly, but retains full spotlighting on all work areas.

Glare shields made of various materials can provide relief from glare problems. The tinted surface tends to diffuse light striking the screen, rather than reflecting it back. These products are available through the Bookstore, Storehouse and numerous other commercial outlets in San Diego.

**SPECIAL NOTE:** Some glare shields are marketed under the promise of affording safe levels of protection from radiation emissions. Make your product selection based upon how well the glare shield diffuses light, rather than worrying about possible radiation shielding. Refer to the radiation section in this publication for a more complete discussion of this topic.

Vary your activities throughout the day so that computer work is intermittent. Changing activities allows your eyes to rest, thus helping to

reduce chronic strain. Altering activities also allows other muscle groups to relax and stretch. NIOSH recommends a fifteen minute break every two hours of intense computer activity

**Take a 15 minute  
break every  
2 hours...**

## Reducing the Stress in Your...



The average adult's head weighs about twelve pounds. It's about the same size and weight as a bowling ball. When kept balanced directly over your shoulders throughout the work session, strong muscles in the neck easily adjust and support this weight. However, when the head tilts forward or backward too far, muscles become over stretched and/or contracted causing soreness, cramping and fatigue.

Correct monitor height is essential in reducing neck strain. The top of the screen should be level with your eyes. This allows your head to remain in an upright, balanced position. A monitor placed too low (a common problem) forces the head to fall forward as you view the screen. This position puts unnecessary strain on the neck muscles.



Raise your monitor by placing the c.p.u. (central processing unit) under it; using old phone books; or attaching it to a robotic, cantilevered platform which mounts to the side of the desk.



*Exception* - If you wear bifocals, a lower monitor will help accommodate your need to peer through the lower portion of your lens without having to tilt your head backward.

Sitting directly in front of your monitor/keyboard allows greatest relaxation and helps avoid any twisting motion in the neck muscles.

## Reducing the Stress in Your...

*(Hands, Wrists & Arms)*



Research estimates that a person using a computer eight hours a day may make as many as 80,000 separate finger and hand movements during a single work shift! The human body simply does not perform very well when expected to perform like a machine. Muscles, ligaments and tendons become exhausted and irritated and are much more prone to possible injuries. Not surprisingly, the hands and wrists are primary locations for many of the chronic problems reported by university personnel.

Carpal Tunnel Syndrome is one of the family of afflictions collectively known as repetitive-stress disorders. It is a serious problem affecting one or both wrists of many computer users, particularly



those who work full-time on their VDT's. If unchecked, Carpal Tunnel Syndrome can lead to permanent damage resulting in dysfunction and pain in your hand(s).

The carpal tunnel itself is a small opening in the wrist area. The large median nerve, radiating down from the arm, passes through this tunnel on route to the fingers and thumb. When the wrist is relaxed and unstressed, ample space exists for the nerve to easily slide through this narrow passage. However, repetitive movement from keying, coupled with flexed wrist positions commonly associated with working at a poorly designed workstation, can result in exhaustion and swelling of muscles, ligaments and tendons. The carpal tunnel's reaction to this stress is to compress inwardly putting pressure directly on the nerve. This pressure can result in impairment or loss of nervous function in the first three fingers and thumb. Early symptoms of Carpal Tunnel Syndrome include numbness, tingling or burning sensation in the fingers, hands or fore-arms and may progress to a loss of feeling, grip and, finally, some hand function.

The following ergonomic guidelines will help you to identify potential problem areas in the workstation environment which contribute to repetitive stress injuries of the hand and wrist.



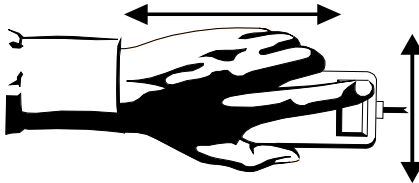


***Maintain a straight line through wrist. Use a wrist rest or small rolled towel. Wrist rests are small foam bars which sit in front of the key board and provide a resting surface for the hands.***

***Avoid any unnecessary flexing in the wrist during keying activities. Fingers should extend straight out from the hand. Strike keys lightly when typing.***



***Move the mouse using the entire hand/wrist fixed in a straight line. The mouse should be located at the same distance and height as your keyboard.***



***Use a wrist rest for support.***

***Detachable keyboard allows for varying height with respect to the monitor. Keyboard should rest on a flat, hard surface.***

***90° - 110° angle through the elbow is best. Hold arms in close to body or resting on chair arms. Keep upper shoulders relaxed.***



## Reducing the Stress in Your...

Of the three positions most of us assume during the day (standing, sitting and lying down), sitting is definitely the most stressful. The human body is simply not designed to hold itself comfortably in a sedentary, seated position for extended periods.



Computers have radically redesigned the way most of us accomplish our daily tasks. We no longer are "required" to move around our work environment nearly as much as was the case with earlier generations. Contemporary computer users are now able to perform all input, retrieval and data storage functions without ever leaving their chairs. This incredible versatility has a price. We literally are being "forced" to remain in this most stressful of all positions far too long. A simple solution to this problem - take frequent breaks away from your workstation. Walk around, stretch, and exercise. This increases your metabolism, starts the blood circulating more quickly and refreshes you mentally. This break in routine is exactly what your body needs to flush away the cumulative stress that plagues so many computer operators.

The following ergonomic guidelines identify potential stressors affecting your back and legs. Individual body size must be considered and will influence the height of your work surface, keyboard, monitor and the design of your chair.



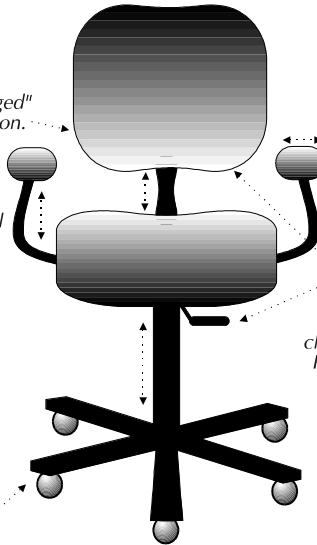
**Avoid any twisted positions which strain muscles and ligaments in lower back and neck area.**



**Sit directly in front of your monitor.**

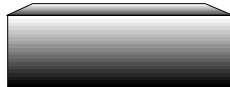
Quality chair offers good lumbar support for the lower back. Sit upright in chair with lower back area "snugged" into curved back cushion.

Small rolled towel placed between the chair and lower back can provide additional support.



Chairs should have adjustable backs, arms, and seat pans to allow change in height and tilt. Pneumatic adjustors are preferable over mechanical systems.

Five legs offer greater stability



Use a foot rest to raise knees level with hips.

**A well-designed chair supports your spine's natural curvature.**



## **Do VDT's Produce HARMFUL LEVELS OF Radiation?**

This question has been asked and researched repeatedly since the early 1960's when personal computers first appeared in the workplace. Many long-term studies have been conducted by NIOSH, as well as many other groups around the world. The investigations have focused on whether VDT's do emit harmful levels of radiation and, if so, what are the possible effects to the user or the pregnant worker's unborn child?

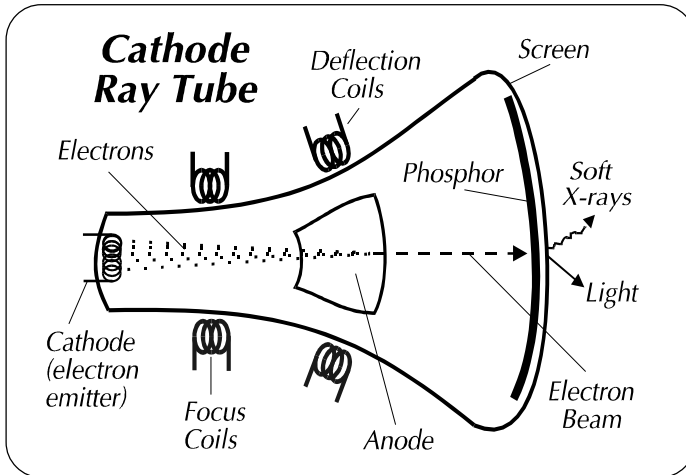
It has been clearly established that computers, as well as televisions and other consumer appliances, do produce minute amounts of radiation as by-products of their technology. This amount is extremely small and falls far below permissible levels established by international radiation safety advisory groups and the federal government. The following discussion describes how the radiation is produced.

Your VDT produces images essentially in the same manner as a television. At the narrow end of the picture tube is an electron gun which fires a constant high-energy beam of electrons onto the back of the screen. As the electrons strike the glass surface and create images, they also produce ionizing radiation in the form of weak x-rays. These "soft x-rays" are essentially contained inside the thick glass tube. The energy of these x-rays is so slight that they travel only a few inches before they dissipate.

Sitting 16-24 inches from the monitor, the operator is so far removed from the screen that



x-rays being produced can't reach them. The conclusion reached by various studies confirm that VDT users are not at risk from harmful levels



of ionizing radiation. The same research verifies that pregnant operators have no greater incidence of miscarriages or other birth related problems than women not involved with computer operations.

Extremely Low Frequency electrical and magnetic fields (ELF-EMF), which are other forms of radiation termed non-ionizing, are also produced by computers. NIOSH research results indicate VDT users are working safely within acceptable established boundaries in these areas, as well. For more in-depth answers concerning radiation questions, contact the EH&S Radiation Safety Division at (858) 534-6138.



## Summary

Computers are here to stay. Every aspect of business and research activity will continue to rely heavily on their technology. It becomes the responsibility of each computer operator to recognize the risks associated with using the appliance, and to take proactive, corrective measures now to reduce potential injuries. The university simply cannot afford to lose your productivity or continue to incur rapidly escalating costs associated with computer injuries.

You are encouraged to closely follow the guidelines outlined in this publication. Compare your work area with the information detailed in each section. Make as many positive changes as possible. The following is a "quick reference" check list which identifies the major points discussed in earlier chapters.

## Check List

- ⊙ Sit directly in front of monitor and keyboard.
- ⊙ Make sure the top of the screen is at eye level.
- ⊙ Check for glare. Close blinds, reposition monitor, place a shade over the screen, install a glare shield or parabolic light diffusers on ceiling.
- ⊙ Maintain approximately 90 degree angle in elbows.
- ⊙ Keep wrists straight and aligned with forearm.



- ⦿ Sit "snugly" in chair to keep lower back well supported.
- ⦿ Keep arms close to body when typing or using mouse.
- ⦿ Move entire hand/wrist area when operating a mouse.
- ⦿ Bring frequently used items close to work area to avoid overreaching and repetitive stretching.
- ⦿ Place feet firmly on the floor or footrest.
- ⦿ Move yourself around the work area using your feet, rather than pulling with your hands.
- ⦿ Allow adequate leg room under workstation for stretching and periodic position changes.

## Resources

UCSD offers several resource groups which can provide you with additional services:

### **Blink's Ergonomics Page at**

Visit the Blink Ergonomic Web page at <http://blink.ucsd.edu/go/ergo> for an abundance of information and resources available to UCSD employees.

