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Appendices

Editors' Poll:
Have You Ever Suffered From a Repetitive Stress Injury? If Yes, What Did You Do?

JH: Only once, and it was after playing a Nintendo Gameboy for way too long.... The cure was simple, of course. No more Gameboy.

MEC: No. I have this annoying (to my coworkers) habit of getting up and walking about every 20 minutes or so, and it may have saved me from RSI.

ML: I occasionally get tendonitis in the thumb of my right hand from extensive mousercize. I take ibuprofen. When it's really bad, I make a fist with my hand and put a sock over it—exactly what my doctor suggested to keep it immobile. Rest usually takes care of it within a day or so.

TL: No. Well, not exactly. The main symptom I get is incredible eye strain, which develops into pounding headaches and has resulted in a deterioration of my vision.

I ignored the eye strain, took coffee and apsin for the headache, and got stronger eye-glasses for the vision problem. My wife said that I should simply not stare at the computer so much. I haven't yet tried her solution—it's too rash!

JC: I sometimes suffer from tendonitis. I've uncovered a number of ways to relieve the pain as well as prevent the problem from recurring. First, go see a doctor and get the opinion of a professional, don't just take the advice of some Mac-goobers. Most doctors will prescribe a combination of physical therapy, stretching exercises, and a pain killer if necessary. Personally, I've found working on my PowerBook instead of my desktop Mac helps alleviate the pain and helps prevent the problem. For flareups, ibuprofen is a good pain killer.

BF: About two years ago I had mild carpal tunnel caused by overuse of my fingers and wrist in my right hand. The solution was a rigid brace to wear during the night to prevent hyper-extension of my wrist, and spandex partial gloves to wear when typing. These gloves keep your wrist warm and improve circulation when you are typing (your hands are elevated when you type and circulation is impaired). They also provided a small measure of support as well as a constant reminder to take it easy.

KT: Yes. My orthopedist called it "Mac elbow." I brought on the acute form by typing about 300 pages of manuscript because I thought I could use the money myself instead of paying a typist, as is my usual practice. (Never again, by the way.)

My orthopedist gave me phenylbutazone—the stuff they give horses!—and huge doses of ibuprofen instead of exercises, and after a week the acute pain went away.

I've learned to use both hands when possible (or menus) just to avoid bad pivoting. I move the position of the keyboard and mouse up and down to avoid doing the same things in the same way. And I have tried using a trackball instead of a mouse (hated it) and tried one of those "ergonomic" keyboards, which I also hated.

A Staying Healthy at the Mac

As you spend more and more of your time in front of computers, keeping an eye on health issues can save you time, money, and aggravation. The computer revolution is producing its own genre of health-related problems which were previously experienced only by a small percentage of workers exposed to repetitive work environments. From eye problems to a myriad of spinal complaints, there is a serious need for computer users to become familiar with these potential problems.

Most of the interventions for keeping healthy while working with your computer remain relatively simple, and yes, even economical. In this appendix, we'll discuss preventative measures you can take to avoid the kinds of health problems associated with spending long hours at the computer.

Contributors

Bart Farkas (BF) is the chapter editor.

Don Sellers (DS) is a Seattle-based computer writer, editor, educator, documentary filmmaker, and author of the book *Zap! How your Computer Can Hurt You—And What You Can Do About It* (Peachpit Press).

John Kadyk (JK) remembers proofreading the two-page plan for the first *Macintosh Bible* at Won Thai restaurant in Berkeley in June 1986. He likes playing music and riding bikes when he's not writing, editing, or consulting about Macs.

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Eye Problems and Headaches

Eyestrain and headaches are two of the most common medical complaints of computer users. Rarely is computer use the entire cause of the problem, but it is certainly a significant contributing factor.

The Symptoms

(DS)

Eyestrain results from forcing our eye muscles to work too hard. Like any other muscle, if they are overworked they stop functioning properly until they are allowed to rest. Because most of us take our eyesight for granted, we often work through spells of eyestrain, simply accepting them as a part of life, until the strain becomes unbearable and a headache ensues. Signs of eyestrain include the inability to focus, double vision, headaches, and color confusion. The causes of eyestrain are basically anything that causes the eye muscles to work harder than they normally would. Be mindful of factors that cause your eyes to have to refocus more than usual: glare, reflections, dust on the screen, bright lights, dimly lit reading materials, or frequent distance changes.

Headaches are still somewhat of a mystery. They are caused by such a vast array of factors that preventing them is still an inexact science. On any given day, your headache may be caused by diet, air quality, weather, stress, eyestrain, a combination of any or all of these, or something entirely different. Obviously the frequency, intensity, and quality of your computer use can impact your chances for a headache. The best defense is vigilance; if you notice that your headaches coincide with your computer use, there may be more than just a casual connection.

Unfortunately, working heavily on a computer demands a lot of our eyes and it may be impossible to avoid overexerting them, but there are a number of things you can do to minimize the discomfort and avoid more serious problems.

Taking Preventative Action

(DS)

You can avoid and reduce eyestrain in many ways, from changing work habits to changing hardware.

Monitors matter. If you have the freedom to select your own monitor, there are a number of features you should look for.

Resolution directly impacts the amount of work your eyes have to do to focus on small images. When picking out a monitor, reduce the text down to about 5-point and decide if it's legible. If you can read the text, you can be fairly sure the monitor will

display 12-point type quite well. Also inquire about the *dot pitch* of a monitor. Dot pitch is the distance between pixels on your screen and the smaller the dot pitch, the more precise the image (.28 mm or less is considered very sharp).

Brightness, contrast, and sharpness can all cause problems if they are not properly set. Because light levels vary significantly from workplace to workplace (and from computer store to workplace) make sure that all controls, especially brightness, are easily and widely adjustable.

There should be no flicker on your screen as it causes the eye to constantly readjust. Ask about the *refresh rate* on any monitor you will be using (70 Hz is fine for most people, but some are more sensitive than others) and remember that the larger the monitor, the faster the necessary refresh rates. Most of all, stare at the screen carefully to look for flicker; if you see it, the refresh rate is not correct.

Avoid reflections on the screen. Reflections on your screen are the result of strong light sources or reflections off items facing your monitor. Make every effort to minimize these reflections as your eyes will work harder to see through the glare. You can accomplish this through a combination of monitor position, light control, and screen colors. The easiest way to avoid glare is to change the position of lights in your work area. If you cannot change them, monitor positioning is your next best tactic. Finally, the background color of your monitor can affect reflections. Use a white background whenever possible as it reduces the effect of glare.

You may also want to consider using a glare filter, but you should choose it carefully as many can actually cause worse problems than glare. Every type of filter involves a trade-off of one or more elements (i.e., brightness) in exchange for reduced glare, so try many different types of filters and be sure you can return them if you don't like them. Your safest guide may be right on the package; the American Association of Ophthalmologists evaluates and approves glare screens. Their seal is one indicator of a filter's quality and effectiveness.

Use readable type. Obviously, the smaller the image, the more your eyes have to work to focus on it. Position your monitor about 18 inches away from your eyes and experiment with type sizes and document magnifications that reduce eyestrain. Don't get carried away with colors.

Get your eyes checked. Computer work is particularly demanding on the eyes, so it may lead you to discover eye problems that wouldn't otherwise bother you. If you already wear glasses or contacts, consider getting your eyes rechecked—many forms of eyesight correction can cause rather than correct problems at the computer. You may need custom eyesight correction for the times you're at work.

Dry Eyes: Annoying, but Treatable

(BF)

Dry eyes (when your eyes feel gritty, itchy, or generally irritated) is a fairly common condition where the natural lubricating mechanisms of your eyes are not functioning up to snuff, or cannot rise to the challenge of environmental factors. Some people even experience some transient blurring of vision, but this usually clears with blinking.

Computer users are more likely than most to suffer from dry eyes for a couple of reasons. First, staring at *anything* (a book, a computer screen, a TV) for extended periods of time dramatically reduces the natural rate of blinking, which, in turn, lowers the amount of natural tears bathing the surface of the eye. Second, computers have an addictive quality compelling some people to stare unblinkingly at them for long periods of time, compounding an untreated problem.

The above factors substantially reduce the eye's natural ability to properly lubricate its surface. The result is a dry corneal surface. This causes the "gritty" and dry feeling that many of us have experienced from time to time. Add in the fact that many work environments have a low humidity, and you've got some irritated eyes. This is a very easily treated condition. Ask your pharmacist for a good eye lubricant. These are nonmedicinal lubricants that can be used liberally without fear of damaging your eyes. Don't confuse the eye-clearing medications for the lubricants. Getting the red out is not going to do you any good for this problem.

Take breaks and exercise. The National Institute of Occupational Safety and Health recommends getting away from the screen for 15 minutes every one or two hours of intense work at the computer. If that's not realistic for you, take breaks as often as you can. Spend the interval doing noncomputer work, or—as one doctor recommends—put your feet up, your head back, and close your eyes and relax (general stress increases the strain on your eyes, too). Exercise your eyes every ten minutes or so by focusing on as distant an object as possible for five or ten seconds.

Neck and Back Pain

(DS)

Neck and back pain can be particularly debilitating for anyone who works with computers. Because most if not all of us work with our computers while in a sitting position, we are particularly prone to neck and back injury.

The Symptoms

Humans are not designed to sit for long periods of time; even perfect posture can't eliminate the 30 percent increase in pressure on your lumbar vertebrae caused by being seated. That, along with the massive demand sitting puts on tendons, muscles,

and nerves, makes sitting a terribly strenuous activity which can lead to an array of back and neck ailments, and other problems as well.

Muscle fatigue, lower back pain caused by poor posture, upper back and neck pain from slouching or twisting, spinal irritation or nerve compression, nerve pinches, stiffness, muscle spasm, and radiating pain can all affect anyone who sits in front of their computer for any period of time.

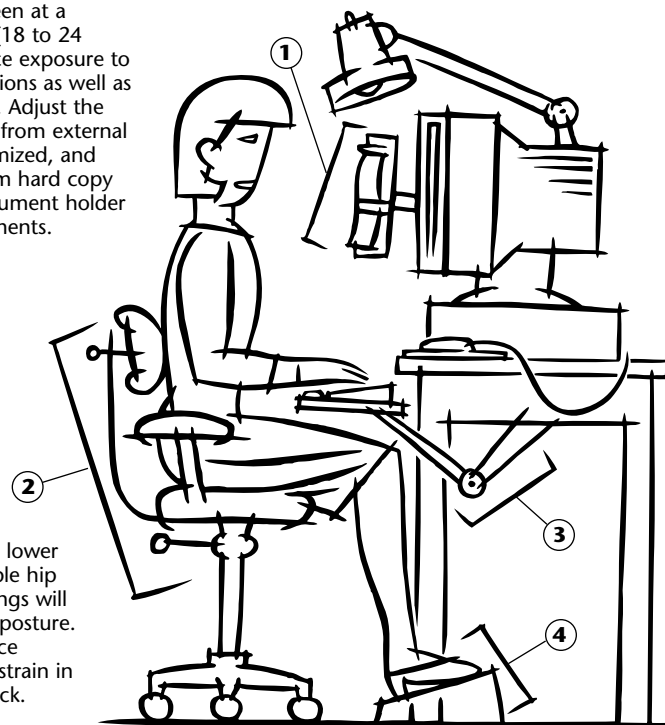
Taking Preventative Action

Good posture. Good seating posture is not necessarily sitting bolt upright on a hard-back chair. Above all you should be comfortable and use the support your chair offers; if the chair doesn't do it, your muscles have to. There are, however, some specific guidelines that should be followed.

Always keep your feet flat on the ground or on an elevated footrest. Don't slump your shoulders (Mom was right) and keep your chin slightly tucked in. Maintain your lumbar curve; most office chairs provide some support for this natural curve but you should

1. Positioning the screen at a comfortable distance (18 to 24 inches) will help reduce exposure to electromagnetic emissions as well as avoid excess eyestrain. Adjust the monitor so reflections from external light sources are minimized, and when transcribing from hard copy documents, use a document holder to reduce neck movements.

2. A quality chair with lower back support, adjustable hip angle and height settings will help encourage good posture. This, in turn, will reduce muscular tension and strain in your shoulders and neck.



3. An adjustable keyboard/mouse table brings everything within easy reach

4. Your feet should remain flat on the floor, or better yet, a footrest is a great idea.

An ergonomic work space can save you time, money, and aggravation.

Selecting a Chair

(DS/JK)

The point of an adjustable chair isn't to let you find the one perfect position you can sit in all day without budging: A good chair should make you comfortable in a number of different postures. Get one with a backrest that adjusts up or down and whose tilt you can change (it should also be tall enough to support your upper back when you lean against it). The seat should also be adjustable to tilt forward or backward. Because the positions of the seat and backrest are related, you should be able to adjust both at once *while you're sitting*, by just moving around until you find a comfortable position and then setting it with a lever.

You should also be able to adjust the seat height so that when you sit with your hands on the keyboard, your feet are flat on either the floor or a footrest, and your elbows are level with your wrists and hands. Arm rests are often recommended, but it's unclear whether it helps to use them while typing.

Not all chairs—even those that appear to be on the forefront of design—are based on modern ergonomic principles, and there's no perfect chair for everyone; you need to try some out to find one that's right for you.

Kneeling chairs have forward-tilting seats and support for the knees, which bear a lot of body weight. These chairs have their advantages, but they put a lot of stress on the knees, tire the back, and are difficult to get in and out of. Many experts in ergonomics feel these flaws outweigh the advantages of kneeling chairs.

be prepared to supplement it if your chair is insufficient. Don't overwork your neck muscles by twisting, jerking, or repeatedly bending it. Fidget often (Mom didn't know everything); small changes in your position help to distribute the muscular work load.

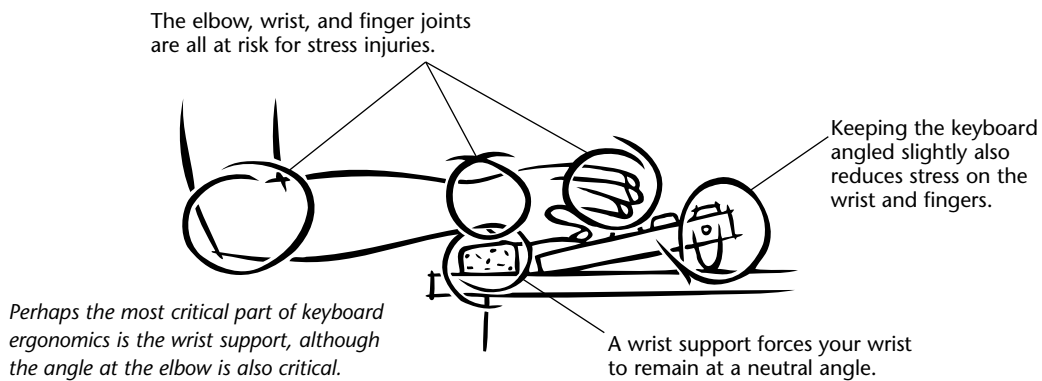
Beyond posture, there are other things you can do to keep your back and neck fresh. Stand up as much as possible and take every opportunity to walk. It also helps to take active breaks; only sit when you absolutely have to.

Adjust your workstation. In addition to altering the position of your body, you can reduce neck and back problems by altering your work area to cause the least possible stress. Keep your monitor and reading material directly in front of you at eye level or below. If you answer the phone a lot, keep it within easy reach and do not cradle it between your cheek and shoulder. Adjust your chair to allow you to sit comfortably and with good posture.

Wrist and Arm Problems

(DS)

The dangers and likelihood of wrist and arm injuries have been exaggerated by the extensive publicity they have gotten. They are, however, far from harmless, and pain in the wrists and arms should be carefully monitored.



The Symptoms

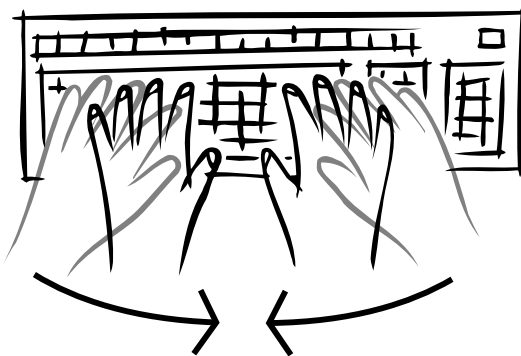
Cumulative Trauma Disorders (CTDs) are caused by the repeated infliction of small traumas which, in time, accumulate to become large and potentially debilitating injuries. The most commonly talked about disorder in relation to computer use is *Carpal Tunnel Syndrome* (CTS), which affects the median nerve that runs through the wrist. CTS and other CTDs are caused by a number of factors including awkward posture, constant hand flexing, working in cold temperatures, and typing with twisted or cocked wrists. There is a wide variety of symptoms which point to a CTD: burning pain when away from the computer, local pain, dull aches, radiating pain, numbness, or loss of muscle coordination. If any of these symptoms occur or become chronic or persistent, seek medical attention.

Taking Preventative Action

Minor CTDs can be self-treated with hot or cold treatment or over-the-counter anti-inflammatory medications. Persistent or acute problems, however, should only be treated by a professional, preferably with a CTD background.

The best treatment, however, is prevention. Wrist rests can be helpful in reducing stress. Make sure they are flat (curved ones are as bad as a desk edge), well-cushioned, and level with or just slightly above the level of the keyboard. You can also prevent CTDs by exercising good keyboard form: Forearms should be parallel to the

floor, hands should be flat and even with the forearms, wrists should float or rest on a cushion (a folded hand towel does nicely) but should never rest on a hard desk edge, and arms and hands should be relaxed.



Your hands naturally want to point slightly inward. Conventional keyboards force you to constantly fight this natural position. Adjustable “split” keyboards help to alleviate this stress.

Many CTDs do not result from keyboard use but from a less talked

An ergonomic “split” keyboard can dramatically reduce wrist problems by keeping your hands at a natural angle.

about source: the mouse. The same rules of keyboard form apply to mouse form with a few extras: Don’t grip the mouse too tightly, don’t hold onto it when you are not using it, and keep it as close to your keyboard as possible. If you still have problems with your mouse, try one with a *drag lock* feature, try switching hands, use keystrokes instead, or try out a trackball ([see Chapter 6](#) for more on trackballs).

Radiation

Computer monitors radiate electromagnetic radiation in two forms known as *ELF* (extremely low frequency) and *VLF* (very low frequency). Although it is not known for certain whether or not these emissions pose any danger, you can take minimal precautions if you are concerned. The most important thing to do is carefully scrutinize any claims made about computer monitor radiation and judge the risks soberly and with a healthy skepticism.

The Symptoms

Studies in recent years have called into question the assumption that the radiation produced by computer monitors is totally harmless. A number of theories have been advanced, but none has definitively proven any ill effects unique to computers. To a certain extent, computers are no more or less harmful than any other electrical equipment. Unlike other electrical equipment, however, computers produce both electrical *and* magnetic fields; some believe that it may be the *magnetic* fields that merit study. Whatever the answer, there are things you can do to minimize any potential risk without giving in to hysteria.

Taking Preventative Action

First, be suspicious of anyone who claims to protect you by making you part with your money. Be sensible and do some research to decide if a product is really of any use.

Second, make sure your monitor conforms to MPR II guidelines; you will find their approvals in your monitor's specifications sheet.

Lastly, limit your exposure to *electromagnetic fields* (EMFs). Turn off your monitor when you are not using it. Stay about an arm's length away from the screen. Arrange other EMF emitting devices (i.e., laser printers, copiers) so you are not bombarded while at your computer.

General Advice

(DS)

Don't Wait Until You're Suffering

People constantly adjust to awkward or constrained positions, chairs of the wrong height, or bosses who put them in lousy moods. The body and mind compensate for these problems, minimizing the immediate results. But the worse the computer-related injuries get, the harder they are to fix. So listen to your body, and when something hurts, do something about it. If you don't take the time to be healthy now, you may have to use it to be sick later.

Make Sure Products Are Really Ergonomic

Don't believe labels, be a smart consumer. Consult the American National Standards Institute (ANSI) and the U.S. Occupational Safety and Health Administration (OSHA) for recommendations, but remember that they are only *recommendations* and neither organization actually certifies products. Most of all, pick products that work for you.

Other Resources

The material in this appendix under Don Sellers' name is adapted from his book, *Zap! How Your Computer Can Hurt You—And What You Can Do About It* (Peachpit Press), which gives much more thorough coverage of computer-related health threats than we have space for here. It also provides a huge list of related resources, including other books, periodicals, and organizations, plus sources of ergonomic hardware, software, and furniture.

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