



Zap!

How your
computer
can hurt
you—and
what you
can do
about it

by Don Sellers

Edited by Stephen F. Roth



PEACHPIT PRESS



AN OPEN HOUSE BOOK



ZAP! How your computer can hurt you—and what you can do about it
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Preface

A Handbook for Safer Computing

“What’s wrong?”

“My wrists are killing me. They’ve hurt off and on for years, but not bad enough to see my doctor. A few months ago I had a big project with a really killer deadline. My wrists began aching, but I kept going, figuring it would pass. They haven’t stopped hurting since.”

“Can’t the doctor do anything?”

“He told me to wear these splints and take aspirin when it hurt too much. He suggested surgery, but I’m not sure I want that.”

“Can’t you see another doctor?”

“Who?”

“Isn’t there another way to treat this?”

My friend was completely transformed from when I had seen her only a few months earlier. Suffering chronic pain, she could only put in a few hours a day at her freelance job. Gardening, which she loved, proved impossible. With her livelihood threatened, she was near despair.

How did she get into this mess? Was her desk the wrong height? Were her work habits wrong? Did she get too little exercise? Or too much? Had this problem been creeping up on her for years, without her knowing? Was her problem preventable? How many others were at risk? Could it happen to me?

The Cost of Computer Injury

My friend was not alone—the number of people suffering computer-related injuries has risen dramatically with the popularity of desktop computers. The Bureau of Labor Statistics (BLS) surveys show that in 1981, when the desktop computer was just being introduced, cumulative trauma disorders (CTDs) affected 23,000 workers, accounting for 18 percent of all workplace injuries in the United States (this includes all industries, like meatpacking and



Many computer-related injuries are preventable.

■■■
Use
common
sense.
■■■

working in a supermarket). By 1991, when there were over 45 million desktop computers in use, the number had risen to 223,600, or 61 percent.

While the BLS percentages may accurately reflect the accelerated injury rate, the actual numbers of those considered injured by the BLS are commonly held to be significantly understated. Recently, a *CTDNews* survey concluded that 4.4 million people in the United States suffer from computer-related CTDs alone.

No one knows how much this costs businesses, but most rough estimates place it in the tens of billions of dollars. The National Council on Compensation Insurance figures that treating a single case of back pain costs business about \$24,000; treating a single case of carpal tunnel syndrome costs \$29,000. Not all those suffering from computer-related CTDs have sought treatment; if they did, the cost to business could reach upwards of \$100 billion dollars a year. Better surveys must be made before the real figures are known.

Zap! Fights Back

I wrote *Zap!* because I knew this near-epidemic could be reversed—with education and effort. *Zap!* acts as a handbook that sifts the fact from the fancy of computer health issues by providing answers to the most commonly asked questions about computer health.

Can you get injured by working on a computer? Yes.

Are you likely to? Probably not, depending on your job type, equipment, schedule, body, and stress level.

Do computer injuries debilitate people? Yes, a small minority.

Can injury be prevented? In many cases, yes.

Most computer users don't know what can injure them. And people often work on computers until their body is so injured that a return to good health proves difficult or impossible. *Zap!* explains the steps to take to minimize the chances that your computer will hurt you. *Zap!*'s mission is simple: reduce the number of people who are ever injured by a computer to a minimum.

How To Read This Book

Steve Roth, my editor, has a sign above his desk that reads "Eschew Obfuscation," and we tried to carry that simple philosophy to *Zap!*: most chapters describe problems, then supply ways you can prevent and fix them. For you to get the most out of this book, think of it as one of the tools at your disposal: *Zap!* supplies the information, but you must add your own intelligence and common sense. *Zap!* can

guide you, but it cannot necessarily tell you exactly what you should do in any particular situation. You may need to go beyond *Zap!*, seeking the advice of a professional, for example, in order to use a computer safely. Here's how to work with *Zap!*.

Don't Let It Replace a Doctor

To make *Zap!* useful for the largest number of people, I have included more information than most people need—so much, in fact, that you may have to steer clear of some. For example, I've included exercises and stretches in *Zap!*. Should everyone do them? Absolutely not (for example, you may not be healthy enough to engage in vigorous exercise). *Zap!* also relates how certain medical conditions are typically handled. Should you handle them that way? Perhaps. Only a health-care professional, and ultimately a physician, can tell you what is best for your body. Although I interviewed dozens of physicians, scientists, ergonomists, and other experts in the fields related to computer health, no book is capable of acting as a health-care professional.

■■■
Worry is
counter-
productive.
■■■

Be a Low-Stress Reader

Zap!'s tone expresses a reasoned concern about computer-health issues—far from the hysteria often found in the general and computer press. There's a good reason for this choice: Psychological stress exacerbates most of the physical problems associated with computer use. Worry is counterproductive. Read *Zap!* with a positive attitude, figure out what you need to do, and then take action.

Keep Informed of Current Events

The computer health field excites scientists because it is changing so rapidly. While most of the information in *Zap!* will be accurate for quite some time, it's impossible to predict what will change, and how. Keep yourself current on the subject through newspapers and computer magazines. And I'll bring out revised editions when necessary.

Acknowledgments

The thinness of *Zap!* belies the great number of people who contributed to its content. I thank them all for helping to create a handbook for safer computing.

Kate Rauch

Kate Rauch contributed her broad expertise as a health journalist to write several chapters of *Zap!*. Her knowledge and judgment contributed greatly to the success of this book. I am fortunate to have had her help.

Computer Health Experts

Creating *Zap!* required the insights of scores of computer health experts. Their selfless generosity with their time and knowledge is a testament to their dedication both to this subject and to their particular fields and organizations. The following people were interviewed to ensure the content of *Zap!* is factual, comprehensive, and up to date.

Bruce Bernard, MD, MPH, National Institute of Occupational Safety and Health (NIOSH); Robert Bettendorf, Institute for Office Ergonomics; Mark Caitlin, WASHCOSH; Richard Cheu, Vision Aerobics; Elizabeth Collumb, Voyager Company; Paul Cornell, PhD, Steelcase, Inc.; Andrea Devaux, American Academy of Ophthalmology; Janet Gold, Labor Occupational Health Center; Fred Freitag, B.O., Diamond Headache Clinic; Michelle Hartzell, NoRad Corporation; Rob Henning, PhD, University of Connecticut; Pamela Henwood, Visionary Software; Peter Jeff, Steelcase, Inc.; Marilyn Joyce, The Joyce Institute; Jim Kinsella, *CTDNews*; Rani Lueder, Humanics; Shirley Lunde, Kinesis Corporation; Steve Marshall, The Ergonomics Lab; Bob Matthews, Sonera Technologies; Dennis McIntosh, Center for Office Technology; Stephen C. Miller, OD, American Optometric Association; Lori Parent, Curtis Manufacturing; Vern Putz-Anderson, PhD, NIOSH; Ward Raap, National EMF Testing Association; David Rempel, M.D., University of California at San Francisco; Caroline Rose, RSI Network; Hector Serber, American Ergonomics Corporation; Michael Silva, Enertech Consultants; Michael J. Smith, PhD., Department of Industrial Engineering, University of Wisconsin at Madison; Laura Stock, Labor Occupational Health Program; Suzanne Stefanac; Naomi Swanson, PhD., NIOSH; Susan Thomas, Signa Corporation; Beverley Tillery, Office Technology Education Project; Ignacio Valdes, LifeTime Software; Thomas van Overbeek, Cornerstone Technology; Tim Warner, *Macworld* Magazine; Jim Young, NYCOSH.

And a special thanks to Ruth Lowengart, MD, Alpha Bates Occupational Health Clinic; Dr. James Sheedy, VDT Eye Clinic, University of California; and Louis Slesin, *VDT NEWS*.

Bookmakers

All books require the expertise of the behind-the-scenes experts in editorial and publishing to take a sprawling, meandering text and shape it into a cogent and tidy whole. I thank my experts for their contributions that molded *Zap!*

Steve Roth, master of the art of editing, gave his perspicacity and advocacy; Ted Nace, Peachpit's ardent publisher, tirelessly husbanded this project through many incarnations; Olav Martin

Kvern, guru-to-the-mavens, created the exquisite design and supplied continual support; Sandy Haight, talented artist (and old friend), produced the perfect illustrations; Glenn Fleishman, jack-of-all-trades, excelled as editor, fact checker, production manager, illustration coordinator, and reality touchstone; David Blatner, alternate reality touchstone, contributed his wisdom and insight.

The Others

I can never adequately thank my family for the long hours I spent away from them while I was researching and writing *Zap!*. Finally, I want to thank the many sufferers of computer injuries who so willingly shared their knowledge and lives with me. I hope this book helps.

Don Sellers

The Perfect Workstation

Positioning Yourself for Safer Computing



Choose products based on what works the best, not what's cheapest.



The right equipment, adjusted correctly, provides one of the cornerstones of safer computing.



Related chapters:

- The Chair
- The Desk
- Keyboards and Mice
- Lighting

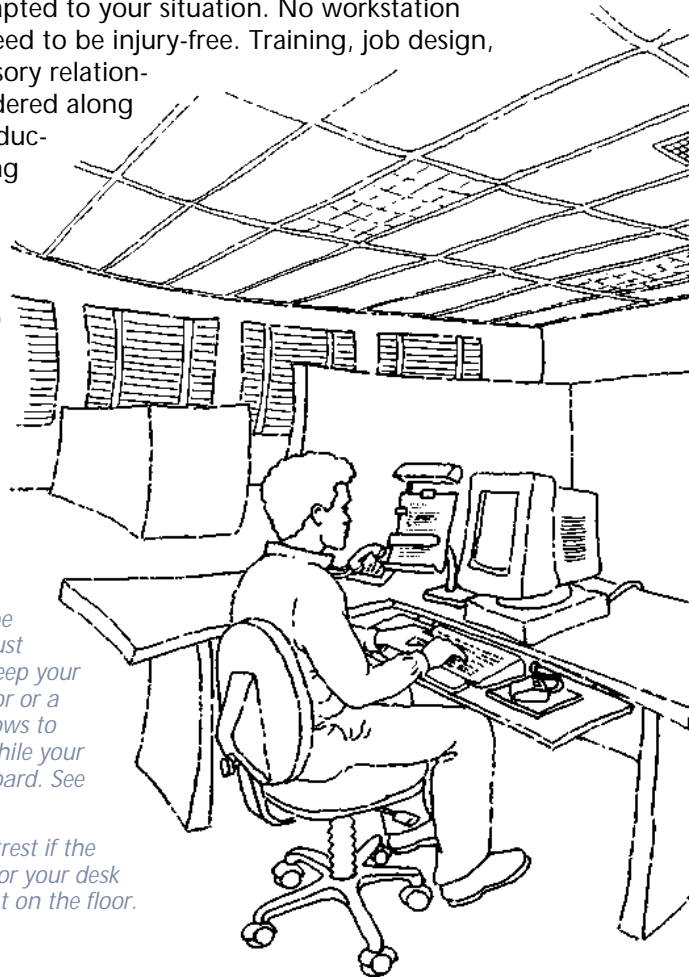
Your workstation should be designed and adjusted for your body and job to minimize physical stress, force, and repetition. Consider this chapter's contents as guidelines rather than hard and fast rules: they must be adapted to your situation. No workstation design can be guaranteed to be injury-free. Training, job design, schedules, and supervisory relationships need to be considered along with equipment in producing a healthy computing environment.

Task lighting. *Use task lighting only if necessary. Make sure it's not too bright and doesn't spill light into your eyes.*

Keyboard height. *Your elbows should be bent approximately 90 degrees and your wrists should be in a flat, "neutral" position. See **Keyboards and Mice**.*

Chair. *Your chair should be well made, and should adjust easily. The height should keep your feet comfortably on the floor or a footrest, and allow the elbows to bend around 90 degrees while your hands are flat on the keyboard. See **The Chair**.*

Footrest. *You need a footrest if the chair height that's proper for your desk doesn't let your feet rest flat on the floor.*



Bright lights. *Keep bright lights out of the field of vision. Orient your workstation to exclude light sources that can't be modified. See **Lighting**.*

Ambient light. *Indirect lighting is preferred; it shouldn't overpower the brightness of the screen. See **Lighting**.*

Reflections. *Control screen reflections by lowering or masking lights, repositioning the screen, or attaching a glare shield. See **Monitors**.*

Room surfaces. *Use matte finishes and neutral tones to reduce brightness.*

Noise. *Music and office noise should not be loud enough to annoy or distract.*

Air. *Maintain a comfortable temperature, with adequate fresh air. See **Office Air**.*

Adjacent monitors. *If electromagnetic radiation concerns you, stay at least four feet away from the backs or sides of adjacent monitors (unless they meet MPRIL guidelines). See **Radiation**.*

Space. *You should have enough space to adopt various comfortable positions. Your space should provide some privacy while allowing you to easily shift your focus to a distant object.*

Work surface. *Make necessary materials easily accessible. See **The Desk**.*

Monitor. *Ensure adequate resolution, keep it well maintained, and clean the surface regularly. See **Monitors**.*

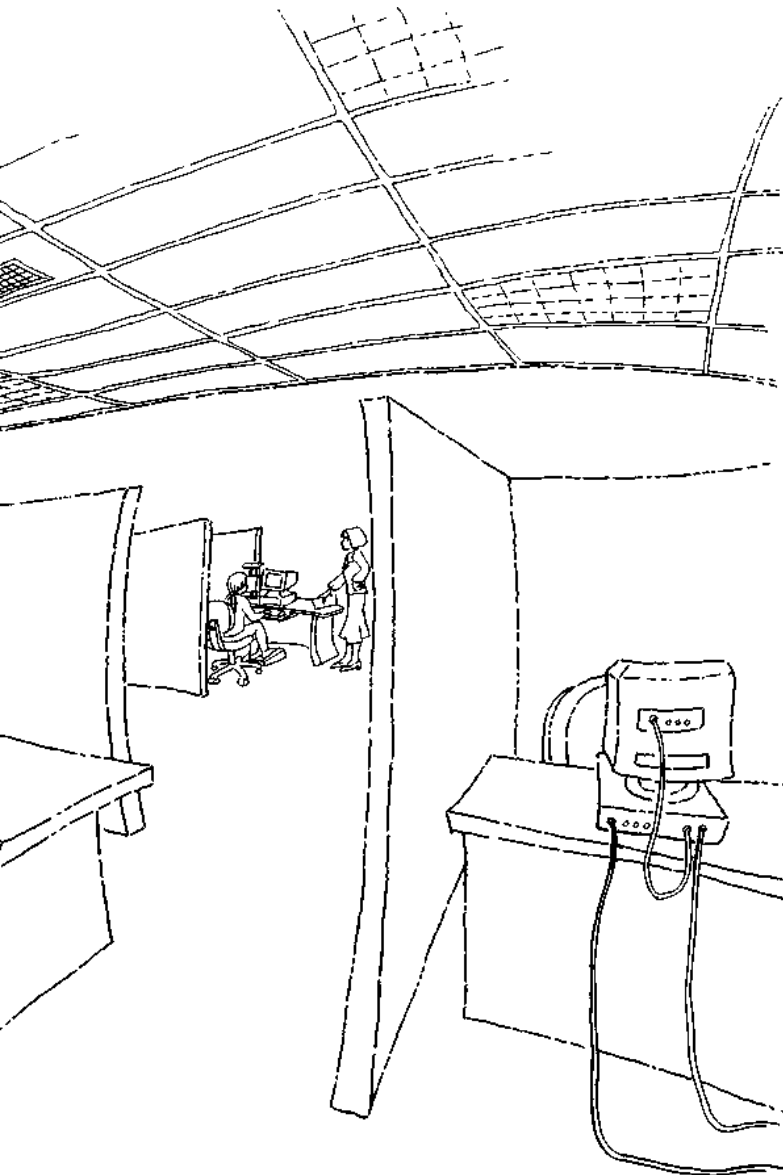
Monitor position. *The top of screen should be at eye height or slightly below, and about 18 to 24 inches or 45 to 60 cm from the eyes (30 inches or 75 cm if you are concerned with electromagnetic radiation and your monitor is unshielded). The monitor should swivel to help reduce reflections. See **Lighting and Radiation**.*

Type size. *The type displayed on your screen should neither be so small that it's hard to see, nor so large that it slows down your reading. See **Monitors**.*

Keyboard. *The keyboard should be slim, detached, and provide solid key-press feedback. See **Keyboards and Mice**.*

Documents. *If you refer to them often, keep documents on a copy stand adjacent to the screen.*

Wrist rests. *Some people find wrist rests helpful to maintain a neutral wrist position.*



Keep Moving

Prevent injuries that are caused by holding a static position for long periods. See **Schedules**.

- Shift your seated position frequently to remain comfortable. Adjust your chair and workstation to accommodate.
- Take breaks and alternate tasks. Get up and move away from your workstation.

Psychosocial Factors

In addition to the physical factors that affect your work, you should also consider your supervisor, your job, and you.

Your supervisor. Managers should be rewarded for keeping groups free of injuries.

Your job. Too much force and repetition should not be required by your job. The schedule and the other requirements of your job should not create undue psychological stress.

You. You need sufficient training (and inclination) to adhere to safety principles. Talk to your supervisor about problems and see your health-care provider if they persist. Take proper breaks and consider stretching. See **Schedules** and **Stretching and Exercise**.

Stretching and Exercise

Improving Health and Preventing Injury

19



Sitting too long can injure you.

The human body didn't evolve to sit; it functions best when it stands or walks. Sitting can slow circulation, produce muscle aches, and contribute to back and neck stiffness. And years of sitting day after day can lead to much more dangerous conditions, such as heart disease and spinal problems. To perform well, the body needs to regularly move through its natural range of motion—keeping joints lubricated and muscles toned.

Exercise is not a panacea—a National Institute of Occupational Safety and Health (NIOSH) office study showed that passive breaks improved mood and comfort as much as breaks incorporating exercise. And exercise breaks should not be seen as a complete solution to office health; they are only one aspect of the office ecosystem. But there is no question that exercise can improve health and mood. Although office work may seem designed to keep you from moving your body, with a little effort your workday can become part of an overall fitness program.



Never stretch to the point of pain or discomfort.



Integrated Exercise

Aerobic exercise can be incorporated into your workday. Try to develop an attitude that seeks ways to exercise muscles in different ways. Here are a few tips.

Use the stairs. Stairs are a great way to improve cardiovascular performance and stamina.

Park about a five-minute walk away from the office. Or, if you live less than a few miles from work, consider walking. Brisk walking is a great way to start your day and loosen up on the way home.

Run errands at lunch. Maybe not run, but walk quickly. See how much you can accomplish in a limited period, but don't get stressed out!

Related chapters:

- Health Basics
- Stress
- Software



Integrate
exercise
throughout
your workday.



Exercise other muscles during time off. A few parts of your body can get more than enough exercise at work. Use leisure activities to exercise your neglected muscles, instead of straining those that are overworked. Swimming and jogging are generally good alternatives for a computer user.

References

See **Where Else To Turn** for a complete list of companies, products, associations, and other helpful resources.

“A review of physical exercises recommended for VDT operators,” ***Applied Ergonomics***, Vol. 23, No. 6, December 1992. NIOSH review of the usefulness and safety of 127 office exercises.

Sitting on the Job: How To Survive the Stresses of Sitting Down to Work, Scott Donkin (Boston: Houghton Mifflin Company, 1989).

Stretching, Bob Anderson (New York: Random House, 1980).

Before You Begin

Exercise isn't for every body.

Think. Start slowly. Not doing any exercise is safer than overdoing it when you are out of shape. Listen to your body; never stretch to the point of pain or discomfort. Use your common sense as to what you can do safely.

Think twice. Stretches or exercise can worsen some cumulative trauma disorders, even incipient problems you are unaware of. To be safe, check with a doctor to ensure that stretching or exercise is right for you.

Think thrice. Many doctors recommend checkups before beginning an exercise program, especially if you've had recent surgery or haven't exercised regularly for some time.

Work Warm-Ups

Stretching before work can prevent muscle strains by preparing your body for the demands of sitting and working the keyboard. You can also warm up as you change tasks throughout the day.

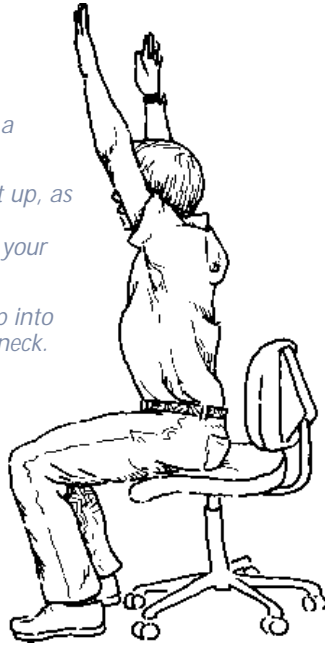
Posture Stretch

Sit straight, maintaining a lumbar curve.

Reach both arms straight up, as high as you can, while imagining a rope pulling your head straight up.

Allow arms to slowly drop into your lap, and relax your neck.

Repeat five times.



Back Stretch

Stand straight, and clasp your hands together, placing them in the small of your back.

Push your hips and hands forward, arching your body.

Immediately come back to the upright position.

Repeat five times.



Eye Roll

Stare straight ahead.

Without moving head, slowly move eyes in a circular pattern for one complete circuit.

Make a circuit in the opposite direction.

Repeat three times.



Finger Stretch

Hold your arms straight out in front of you, palms down.

Spread the fingers apart until you feel resistance.

Hold for five seconds, then relax.

Repeat five times.



Desk Stretches

You might include these stretches as part of your daily tasks—but be sure to also regularly get out of your chair. Each stretch can be performed in sets of up to five repetitions, depending on comfort and time.



Eyes

Focus on the most distant object available for two seconds.

Refocus on an object at about the distance of your screen for two seconds.

Refocus on your finger held about nine inches from your nose for two seconds.



Hands and Wrists

Hold left hand in front of you with palm facing up.

Place palm of right hand onto the fingers of left.

Using your right hand to provide resistance, try to press the fingers of left hand up.

Switch hand positions and repeat.

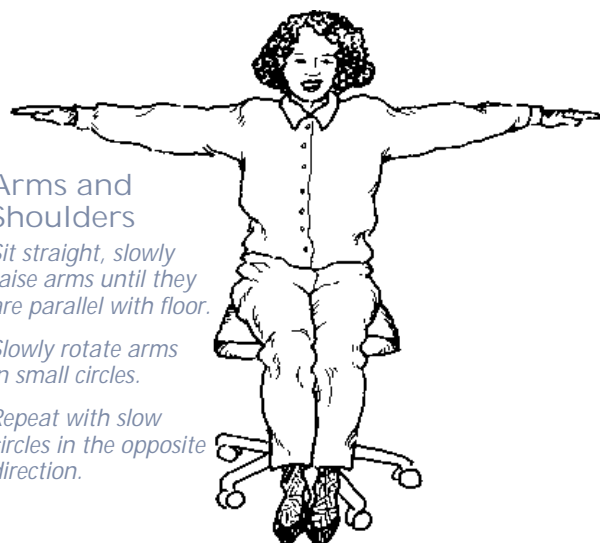


Neck

Sit straight, eyes looking straight ahead.

Pull head back, creating a double chin.

Hold for a few seconds.

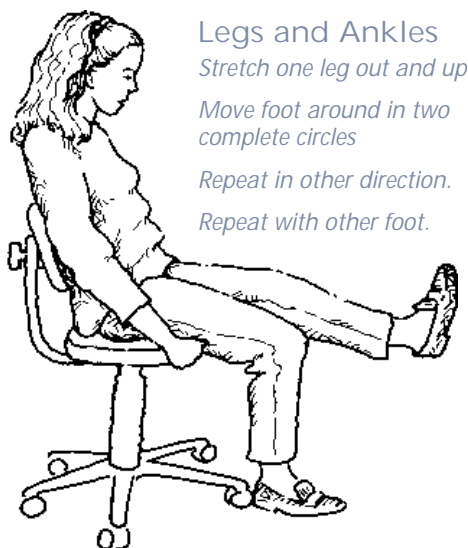


Arms and Shoulders

Sit straight, slowly raise arms until they are parallel with floor.

Slowly rotate arms in small circles.

Repeat with slow circles in the opposite direction.



Legs and Ankles

Stretch one leg out and up

Move foot around in two complete circles

Repeat in other direction.

Repeat with other foot.

Software

Safe Computing Assistance

22



Computer sorcery: Being transformed into a mindless servile drudge by the instant gratification provided by your computer. Characterized by transfixed vision, static posture, and long periods without breaks, it results in anxiety, eyestrain, repetitive strain injuries, and other complaints.

Sound familiar? A proper computer work schedule, exercise program, and a health-conscious attitude are sometimes not enough; you may need to shatter your computer's spell before you can exercise your eyes, stretch, or get up and take a break.

A few software packages are available that automatically display exercise programs and, at appropriate intervals, suggest healthy alternatives to sitting in front of your mesmerizing screen. Most of these packages are integrated programs to reduce eye, musculoskeletal, and psychological stress; others have more specific roles. Additionally, a number of utility programs can be drafted to help you compute safely. Keep in mind that research has not yet proven many benefits from exercising at the keyboard (see **Stretching and Exercise**). However, taking frequent breaks improves productivity and decreases the risk of injury (see **Schedules**).

Spectrum of Healthy Software

Many of the health-related software packages share similar features, including exercise programs, advice on workstation setup and posture, and various safety checklists. Vision Aerobics is the only computer-safety package designed specifically for the eyes.

LifeGuard

LifeGuard—a full-featured package available for Mac, DOS, and Windows—includes exercises for eyes and major muscle groups pertinent to computing. LifeGuard also provides basic workstation setup and posture diagrams. Its reminders are customizable—and can include voice on the Mac. You determine what alternate

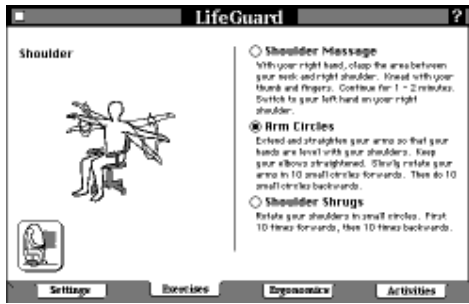
Software functions as part of an overall safe-computing plan.

■ ■ ■
Break your computer's spell.

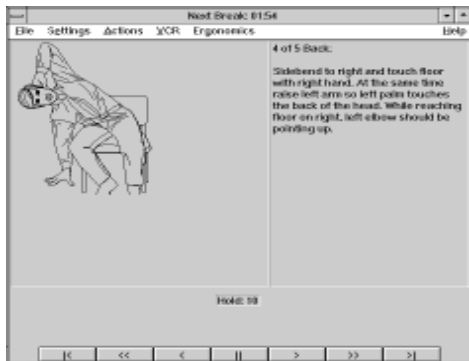
■ ■ ■

Related chapters:

- Stretching and Exercise
- Schedules
- Eyestrain
- Stress



LifeGuard



Exercise Break



Eyercise

activities LifeGuard suggests during its break prompts. LifeGuard signals you when you've exceeded your time limit of uninterrupted keyboard work—a valuable feature—but it does not flag excess keystroke intensity. \$59.95 from Visionary Software. (503) 246-6200.

Exercise Break

Exercise Break—an inexpensive package available for Mac, DOS, and Windows—contains a series of 10 exercises for the major areas of the body affected by computer use, except the eyes. Its unique Type-Watch feature records and graphically displays keyboard activity, and can switch you into Exercise Break when you exceed your predetermined keystroke intensity while in another application. Exercise Break can also be triggered by timed interval. The package includes a basic workstation chart and repetitive strain injury checklist. You can customize sets of exercises. \$29.95 from Hopkins Technology. (612) 931-9376.

Eyercise

Eyercise for Windows and OS/2 includes 19 stretches and four eye exercises. It is triggered manually or by time or interval. A triggering option beeps at you when the program is ready to run, then the exercises begin only if you stop typing for 10 seconds. Eyercise allows you to easily and extensively configure the number and duration of exercises displayed. The Eyercise package (which includes a copy of the book *Computers and Visual Stress*) is available from RAN Enterprises for \$69.95. (800) 451-4487.

User-Friendly Exercises

This solid, integrated program—available for DOS, Windows, and Mac—allows the user to choose between various exercise series, principally for the hand, wrist, back, and eye. User-Friendly Exercises' animation uses photographs, so are easy to accurately follow. The program also contains ergonomic hints and allows you to construct customized exercise series. It is triggered by timed interval. \$59.95. Technically Innovative Computer Accessories distributes it through PM Ware. (800) 845-4843.

Vision Aerobics

Vision Aerobics—available for Windows only—focuses just on the eyes. This sophisticated package contains three parts that work together as an eye-strain-reduction regimen. An arcade-style game strengthens and tones eye-movement muscles. Following geometric figures as they separate (while you wear the supplied 3-D glasses) improves depth perception. A relaxation exercise reduces overall stress. The developer claims that following the program relieves eyestrain and significantly improves visual performance. \$99.00 from Vision Aerobics. (800) 445-7899.

Take Five

Take Five, available on CD-ROM for the Mac only, takes a visual approach to computer health by providing QuickTime movies to help the user stretch and relax. Take Five also includes imagery and music intended to aid the viewer in solving problems at work. The most visually sophisticated of the computer health software packages, Take Five is user-triggered only. A Windows version was due in late 1993. \$49.95 from The Voyager Company. (310) 451-1383.



User-Friendly Exercises



Vision Aerobics



Take Five

Software Sense

Be satisfied with your selection and use of computer-health software.

Choose it. Evaluate different program strengths in the light of your needs. Take the program for a test drive, and don't be afraid to return it if it doesn't satisfy you.

Use it. All of these packages allow you to override their prompts; they'd drive you crazy if they didn't. But ignoring them can quickly become a habit. Don't let it.

Don't abuse it. Software is at best only part of the solution. To be effective, it must be part of an overall safe-computing strategy.

Do It Yourself

You can knock together some less sophisticated aid with inexpensive utility programs, one of which you may already have.

Typing Shortcuts

Many applications (WordPerfect is just one example) have programmable macros for commonly used groups of words. Or utilities like Magic Typist, QuicKeys, WordWriter, and ProKey will enter a text string when you type a triggering keystroke combination. If you find yourself repeatedly typing the same long passages, consider checking out one of these programs to keep your keystroke count down.

Alarms

Many macro and scheduling programs can be set up to trigger visual or aural alarms on a recurring basis. You can use different alarms to remind you to refocus, stretch, or take a break.