

Make Yourself Comfortable: an Ergonomics Guide

ERGOA/UM1

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Contents

Ergonomics -- what does it mean?	1-1
What will you learn from this manual?	1-2
Computer Positioning and Usage	2-1
Monitor	2-2
Keyboard and Mouse	2-4
Copy holder	2-6
Laptop Computers	2-7
Make it fit	3-1
Chair	3-2
Desk	3-4
Work in comfort	4-1
Vary your activities	4-4
Stress	4-5
Relaxation	4-6
Exercise	4-8
Workstation stretches	4-8
Repetitive Strain Injury (RSI)	5-1
Other RSI factors	5-4
Take care away from work	5-5
Listen to your body	5-6
Get help	5-6
Summary	5-7

Ergonomics -- what does it mean?

The term ergonomics comes from the Greek words *ergon* (meaning “work”) and *nomos* (meaning “laws”). Therefore, we can define ergonomics as “the laws of work.”

People come in different shapes and sizes. Some of us are small, some large, some in-between. We have short legs, long legs, perfect vision, or corrected vision. Our arms and trunks come in different lengths. Attention span varies in humans as does tolerance and motivation. Our work areas need to take all of these differences into account and fit each individual as much as possible for optimum productivity and comfort.

By ergonomically adapting our workstations, equipment, and our thinking, we become happier, healthier, more productive employees. *User-friendly workstations* conform to your personal needs and comfort.

What will you learn from this manual?

In the following chapters, you will learn how to:

- correctly place your computer components
- maintain good posture and body alignment to reduce muscle strain
- avoid eye fatigue
- tailor your workstation to your individual body size and to the tasks you perform daily
- exercise to reduce stress and injuries and maintain good health
- recognize Repetitive Strain Injury (RSI)

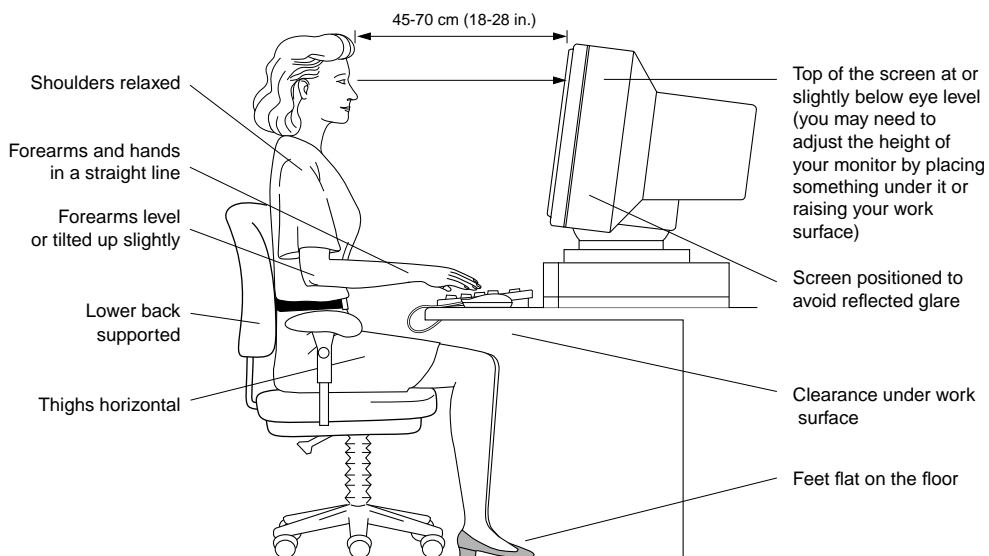
Because of the sedentary nature of computer work, you no longer move around as much as you did when the typewriter was the dominant office tool. Using a manual typewriter meant inserting paper, returning the carriage at the end of each typed line, and erasing your mistakes. With the computer, your hands stay basically in the same position -- in front of the monitor, keyboard, and mouse.

Computer Positioning and Usage

Computers simplify many of your tasks. However, strain on your body may increase if you *fail to*:

- change your body positions occasionally throughout the day
- adjust your chair properly
- place computer components at appropriate heights

Poor positioning of the keyboard, mouse, screen, or document sometimes forces you to sit in constrained, non-neutral or stressful postures.



Monitor

Position the center of your computer monitor screen approximately 15 - 20 degrees below eyeball level.

- Maintain a comfortable eye/ monitor distance, generally at arm's length -- between 18 -28 inches (45 - 70 cm).

If you have trouble seeing the print from the recommended distance, use a good pair of reading glasses or increase the size of the font.

- Adjust your chair up or down to put you at the most comfortable viewing position.

If the position of your monitor is still too high, reposition the monitor *next* to your computer on the desk surface, rather than having the monitor sit atop the computer.

If the monitor is too low, use a suitable support to bring the monitor up to the correct viewing level

- Tip back the top of the monitor at much the same angle you use when reading a book (10 to 20 degrees).

This may reduce neck and backaches.

- Bifocals, trifocals, and half glasses (for reading) may cause an ergonomic problem when working on the computer. Attempting to read a vertical display with bifocals means raising your chin and forcing your entire head into an uncomfortable backward tilt. This position places stress on the disk and nerves in the neck.

You may need an extra pair of glasses for computer work, preferably a pair of full reading glasses. However, these also limit the range of vision you need when looking away from your workstation.

Lightly tinted eyeglasses can help cut screen glare. Discuss tinted "computer glasses" with your optometrist.

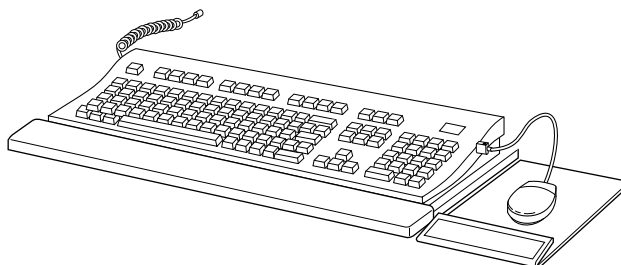
- Place your computer monitor perpendicular to a window to minimize glare on the screen.
Use blinds, shades, or drapes to control the amount of daylight in the room.
- Decrease glare on your computer screen.
Monitor hoods and anti-glare screens may help to block out glare and reflections.
- Select a soothing color scheme for your screen backgrounds and windows.
- Adjust brightness and contrast for optimum eye comfort.
- Clean your screen regularly before the dust becomes noticeable. A clean screen increases your monitor's performance, producing brightness and more contrast. This may help to reduce the effects of glare and reflections.
Check your display owner's manual for cleaning instructions.

Look away often at objects that are further away than 13 feet (3.96 meters). This relaxes eye muscles that are used for viewing close-up objects.

Keyboard and Mouse

Position these components of your computer comfortably and use them properly.

- Position your keyboard and mouse on the same level, as close as possible to each other, at approximately seated elbow height, 25 - 32 inches (63 - 80 cm) from the floor.



- Put down the fold-out legs that are sometimes affixed beneath the keyboard so the keyboard is flat. Minimize upward slopes of the keyboard to allow your wrists to remain in a neutral position (not bent up nor bent down).
- Place the wrist rest flush with the front edge of the keyboard. The wrist rest should be:
 - soft with a rounded front edge
 - low enough in height to allow you to maintain your wrist at its natural angle while keying.

Note Avoid using the wrist rest as a typing support. Use only when you are *not* typing.

- Do not stretch or reach for the mouse or use unnecessary force to hold the mouse. Practice using minimum force when guiding and clicking the mouse.
- Try releasing the mouse completely when you are not using it. When reading from your screen, let the mouse go and rest your hands in your lap.

- Teach yourself to use the mouse with your left hand as well as your right.

It may seem impossible at first; your cursor will be all over the screen. Keep trying and soon you will be as adept with your left hand as you are with your right.

Switch “mouse hands” frequently to help prevent constant stress on one hand and wrist.

- If you can, reprogram your mouse so that one of the buttons acts as a double-click key, reducing the need to “double-click” or “click-and-drag.”
- Keep your wrists straight by moving your entire hand and forearm when using the function keys or numeric keypad.

Adjust your computer equipment to afford you the most comfort possible. Experiment, rearrange, lower or raise components of your computer until you find the right “fit” for you.

Copy holder

If you are typing from or frequently referring to a document while using your computer, you may wish to use a copy holder placed next to your screen.

- To determine if the copy holder should be placed to the right or left of your monitor, you need to determine which eye is your dominant eye.

Stand, extend your arms straight in front of you, and make a circle touching the index fingers and thumbs of your left and right hand. Look through the circle of your fingers at words or an object about 15 feet (4.57 meters) away. Alternately close each eye. Decide which eye sees the object most clearly; that eye is your dominant eye. If your right eye is dominant, your document holder should be placed at the right side of your monitor.

- Maintain the same distance and eye level from the screen and copy holder to prevent the need for constant refocusing.
- To help reduce stress on your neck and prevent eye fatigue, keep the back and forth movement of your head to a minimum while using a document holder.

Laptop Computers

One of the fastest growing trends in the world of business today is the use of laptop computers. People who take work home or work while on vacation will most likely use a laptop.

If you use a portable computer away from your normal work area, you may not have as much control over lighting, desk height, and other factors. In that case, try to follow the suggestions in [Table 2-1 on page 2-8](#).

If you work on a portable computer in your office, try connecting a separate display to give you more control over your viewing angle and a remote keyboard to keep your wrists in a neutral posture. Attach a mouse if possible.

Table 2-1. Working ergonomically with laptops

Features/ Usage	Issue	Response
Keyboard Size	Many laptop keyboards are smaller than the norm and can put the wrist in an uncomfortable position.	Take frequent breaks and allow your body to relax. Try the following exercise for reducing strain and tension: the finger fan - spread the fingers of both hands apart while keeping your wrists straight. Hold for 3 seconds, repeat several times.
Trackball/ Touchpad	These items are most often stationary and cannot be adjusted by the user.	Frequent breaks help to reduce wrist strain. Perform the finger exercise described above if you feel discomfort. Try attaching a mouse if possible.
Screen Location	Screens are usually attached to the keyboard, and cannot be independently adjusted.	Whenever possible reduce glare spots on the screen. Take breaks to reduce tension in the upper back and shoulders, roll shoulders up and down. Relax eyes by looking out to a distance greater than 13 feet (3.96 meters).
Stagnation	Some people tend to remain stationary during computer use, causing fatigue and discomfort.	Be conscious of how long you are in one position. Change positions periodically. Take breaks and stand when possible.

You arrive at work -- your little corner of the world for the next eight hours. You know your workstation so well, but do you know what is right or wrong with it ergonomically?

Make it fit

Look around you. What can be changed to increase your comfort level? Can clutter be reduced, giving you more work space on your desk and, perhaps, under your desk? Did you adjust your chair once when it was new and never touched it again? Are you able to reach your telephone, calculator and other often-used equipment without twisting, stretching, or straining your body?

Eight hours is a long time to be in one place. Therefore, your workstation and equipment should be adjusted as much as possible to fit your physical size, your work habits, and the tasks assigned to you. This lessens the chance of work-related stress or injury to your body, and contributes to a comfortable, relaxed work day.

Chair

3

You sit to reduce strain on muscles. However, other muscles must work to keep you sitting. If you remain in one position for any length of time, lactic acid may build up in your tissues, causing fatigue.

No one posture is best for all computer work or for all people. Bodies come in all shapes and sizes. An ergonomically designed chair supports different body types in multiple positions.

A good work chair should provide

- adjustable height
- comfortable lumbar support
- “waterfall” front (rounded front edge on the seat pan, sloping downward)
- five legs for stability
- side-to-side swiveling ability
- fabric that breathes
- adjustable arm rests

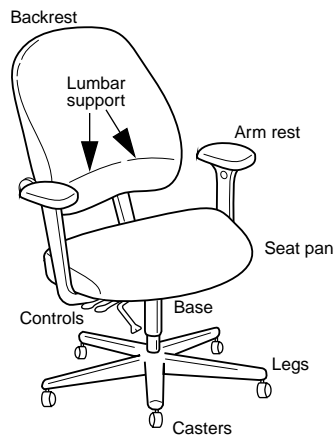


Figure 3-1. Ergonomically designed chair

Your chair should fit you and your job. Adjust it often and use it properly. Move the backrest forward/back and up/down; tip the angle of your seat pan a few degrees; adjust the arm rests. Just as your body should never remain in a fixed position indefinitely, neither should your chair.

Table 3-1. Desired ergonomic results of chair adjustment

Adjust....	Strive for this....
Seat height (adjust first)	Forearms parallel to floor or slanted slightly downward when wrists are straight and fingers rest on keyboard
	Feet flat on the floor (if not, use a foot rest)
	No underside pressure on thighs near the knees
Seat angle (tilt slightly downward)	Some of pressure transferred from spine to thighs and feet, potentially relieving back fatigue
Back rest height	Buttocks fitting comfortably into space between backrest and seat pan
	Good support in the hollow of the back, promoting the natural lumbar curve or providing a forward tilt for the hips
Arm rests (should be padded for comfort)	Barely touching the elbows when typing
	Fairly short, allowing chair to be drawn close to desk

Desk

Adequate leg space beneath your desk adds to your working comfort. There should be enough room under your computer workstation for you to stretch out your legs completely. Your desk should be high enough to prevent your knees and thighs from touching the underside of your desk. There should also be room enough for you to move your knees and feet from side to side.

Without adequate room under your desk, you are forced to sit further away than normal. This causes you to reach with your arms and to bend forward with your trunk, leading to possible shoulder and lower back strain.

Make sure you have enough desk space **in front of the computer** -- not only to comfortably accommodate your forearms and the keyboard but to move both freely.

Work habits, posture, and good health

4

To help maintain good health and well-being, strive for good posture, altering your body position from time to time.

Work in comfort

Body position is important.

- Type with your wrists and forearms parallel with the floor.
Do *not* rest your wrists on the wrist pad while keying.
- Use minimum force when pressing the keys.
To reduce impact on the fingers and hands, “drop” your fingers gently on the keys instead of pounding them.
- Move your entire arm when sliding the mouse around your desktop.
Avoid resting your arm on the desk and bending your wrist as you move the mouse.

Notes *Avoid* leaning your head and shoulders forward to look at the computer screen -- your neck is not designed to hold the weight.

Avoid resting your chin on your hand while reading from your screen or folding your feet under you while you work.

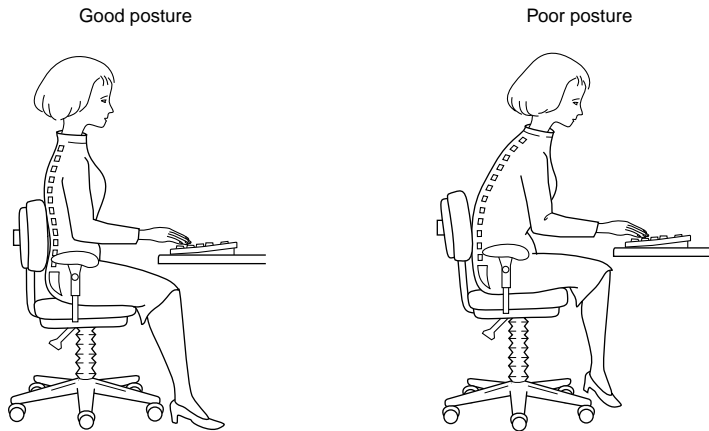


Figure 4-1. Good and poor posture

By leaning forward in your chair, with no upper and little lower back support, the pressure on your lumbar disks increases to twice what it would be if you were standing. Your neck also feels stress since it must balance the forward weight of your head.

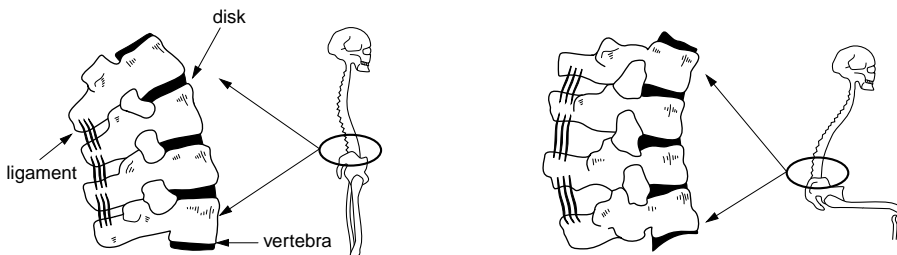
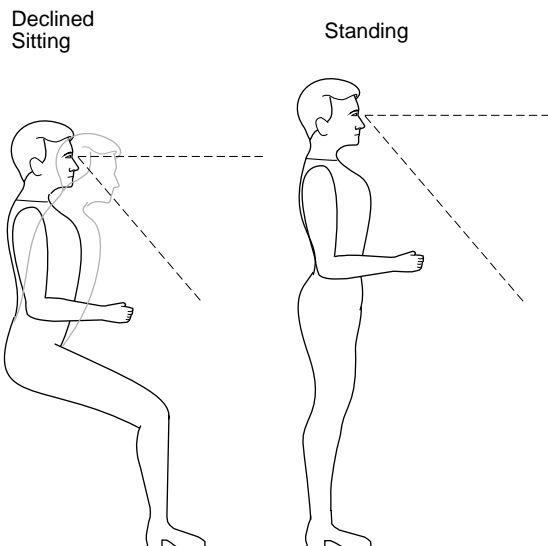
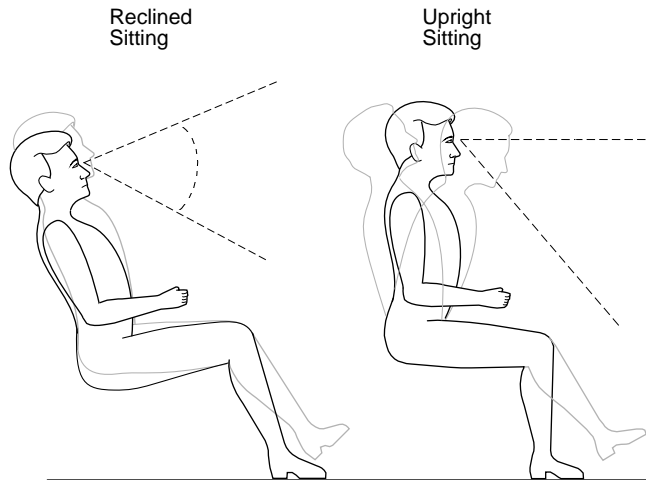


Figure 4-2. Standing and sitting spine alignment

In the standing position illustrated above, the ligaments are correctly aligned, disks are not as compressed, the vertebrae have little stress. The opposite is true when a seated body leans forward, especially for long periods of time.

Some ergonomists recommend a range of sitting and standing postures throughout the workday. Note the following positions, listen to your body, and choose the most comfortable position for you (depending on what is acceptable in your workplace).



Vary your activities

Movement and changing positions are important to reduce stress and remain comfortable at work. Take a break *before* you feel fatigued; you will be more productive. Try one or more of the following:

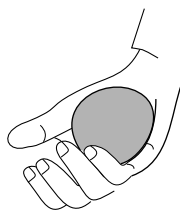
- Stand up and stretch
- Readjust your chair
- Make copies
- Walk to the printer
- Stand up and return phone calls
- Neaten your workstation
- Get a drink of water

Stress

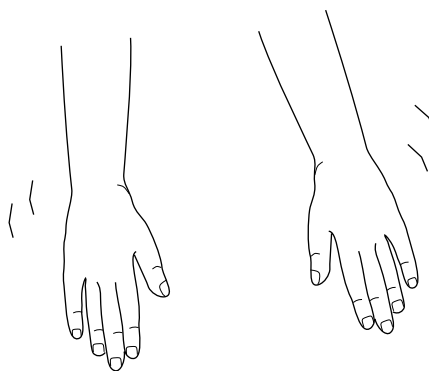
Stress does not always result exclusively from physical tasks. For example, interpersonal friction affects how you feel and move. A tense and antagonistic office atmosphere makes it very difficult for you to relax your body while you are working.

Non-obtrusive exercises at your desk several times a day may help to relieve mental *and* muscular stress and strain. Try the following:

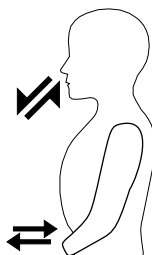
- Hold a soft, foam ball in your hand. With your palm turned up, gently squeeze ten to fifteen times. Do this several times a day with each hand.



- Periodically drop your hands to your sides and shake them gently as though you were trying to shake off drops of water. This helps to restore circulation and to reduce tension.



- Oxygen is good -- breathe more. Breathing deeply provides more air to the brain and helps to calm you.



Relaxation

Relaxation is critical to the body's ability to bounce back from the pressures of deadlines and day-to-day work-related tasks. Stretching and strengthening active muscles promotes relaxation. Take an active role in promoting your general fitness both at and away from work.

Here are some things you can do to relieve tension and to help prevent stress:

- Cut down on stimulants like coffee, sweets, or nicotine.
- Drink water throughout the day.
Keep water at your desk; it makes for a smart microbreak. The first symptom of dehydration is fatigue, not thirst. Experts recommend six to eight glasses of water daily. Juice and soda are not substitutes for pure water.
- Fruit and vegetable snacks prevent mid-morning and mid-afternoon blood sugar dips. These dips can affect alertness, mood, productivity, and decision making.
- Productivity and your own well-being profit from complex carbohydrates, reliable sleeping patterns, and time for yourself.

- Take short pauses at regular intervals, especially if you are doing some attention-absorbing kind of work.
 - Refocus your eyes on long distances for a few seconds.
 - Stretch periodically (roll shoulders, bend backwards, turn head from side to side).
 - Vary your work activities.
- Add walking, bicycling, or swimming to your weekly schedule on three separate days.

Get clearance from a doctor before you begin.




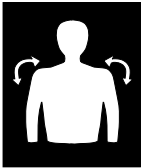
Exercise

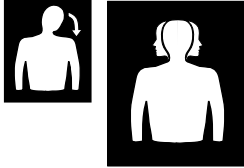

Exercise briefly several times a day to relieve stress, to stretch and lengthen muscles, tendons, and ligaments in various parts of your body.

4

Workstation stretches

All of the following exercises can be done in approximately 2 to 3 minutes:

<p>Deep breathing</p>		<p>Breathe in slowly through your nose letting your abdomen expand. Hold for 2 seconds and exhale through your mouth. Repeat this cycle 5 times.</p>
<p>Upper Back</p>		<p>Bend your arms at the elbow. Then move your arms up so your elbows are slightly below your shoulder. Push elbows back squeezing your back together. Hold for 5 seconds. Slowly repeat 5 times.</p>
<p>Wrist/Forearms</p>		<p>Hold both arms in front of you. Slowly stretch your fingers up, then down. Hold for 5 seconds when up, when down, and when level. Repeat 3 times.</p>
<p>Shoulders</p>		<p>Roll your shoulders backwards 5 times using a circular motion. Then roll forwards 5 times. Be sure and get a good and comfortable range of motion forward, backward, up, and down.</p>

Neck		<p>Slowly rotate your head to the right. Hold for 3 seconds. Rotate to the left side and hold for 3 seconds. Repeat 8 times. Then gently press your right ear towards your right shoulder. Hold for 3 seconds. Repeat with the left ear. Do 3 times.</p>
Hands		<p>Stretch your fingers as far apart as you comfortable can. Hold for 3 seconds. Then make a tight fist. Hold for 3 seconds. Repeat 5 times.</p>

Repetitive Strain Injury (RSI)¹

Repetitive Strain Injury may be caused by excessive motion of a body part.

Common types of RSIs in the hand and arm include:

- tendinitis and tenosynovitis
tendons or tendon sheaths, respectively, become irritated due to overuse.
- carpal tunnel syndrome
irritation and swelling in wrist tendons that move the fingers
- epicondylitis of the elbow
 - lateral epicondylitis
outside bump of bone (or epicondyle) of the elbow becomes inflamed.
 - medial epicondylitis
inside bump of bone (medial epicondyle) at the inside edge of the elbow becomes inflamed.

The three primary risk factors which can lead to RSI are:

- repetition
- force
- awkward posture

1. Also known as Work-Related Musculoskeletal Disorder (WRMD)

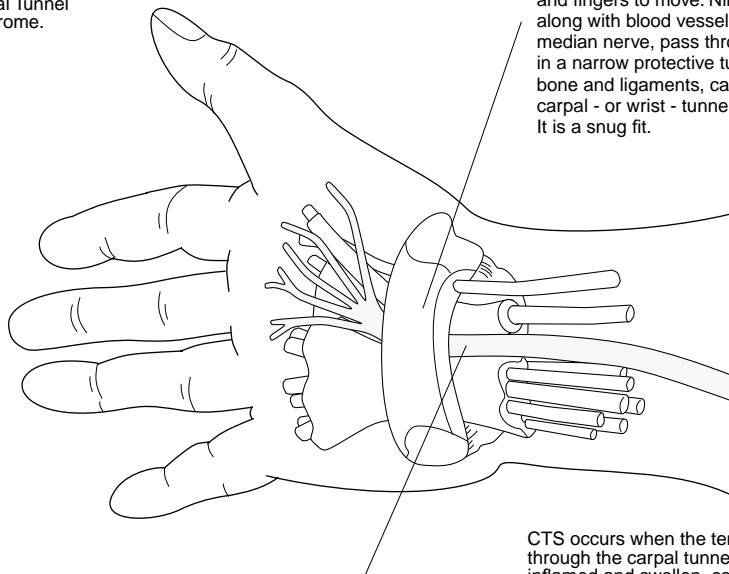
RSI risk factors can be controlled by adjusting workstations to fit you and by:

- changing work postures
- reducing continuous repetitions
- stretching periodically

5

Awkward postures combined with long hours or repetitive motions are associated with irritating the hand tendons which could trigger Carpal Tunnel Syndrome.

A network of tendons controlled by muscles in the forearm enables hands and fingers to move. Nine tendons, along with blood vessels and the median nerve, pass through the wrist in a narrow protective tunnel made of bone and ligaments, called the carpal - or wrist - tunnel. It is a snug fit.



Median nerve

CTS occurs when the tendons that pass through the carpal tunnel become inflamed and swollen, compressing the median nerve. The carpal tunnel just does not have the room to accommodate swollen tendons.

Figure 5-1. Physiology of Carpal Tunnel Syndrome (CTS)

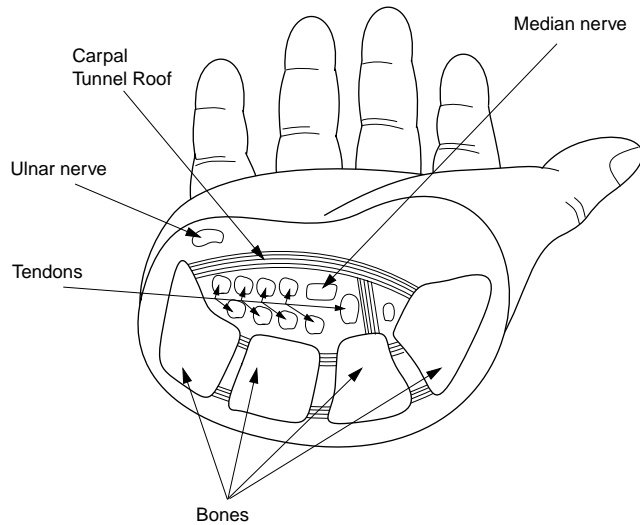


Figure 5-2. Simplified view of the carpal tunnel

The impingement on the nerve and tendons in the carpal tunnel can produce the following symptoms:

- tightness, stiffness, pain, and weakness in the hand, fingers, wrist, forearm or elbow, sometimes accompanied by swelling and cramping
- coldness, numbness, and tingling in the first three fingers, often first noticed at night
- pain that wakes you up at night
- feeling a need to massage your hands, wrists, and arms
- clumsiness and restriction of movement, loss of hand strength and control

Note This can be a serious condition and prompt medical treatment is needed.

Other RSI factors

RSI can also be caused by other factors not related to work, such as:

- use of oral contraceptives
- pregnancy, menopause, other conditions affecting hormone levels
- excessive weight
- smoking
- diabetes, gout, rheumatoid arthritis
- genetic predisposition
- stress
- alcoholism
- general poor physical condition
- trauma such as a blow to the wrist or forearm
- previous fractures of the wrist
- hobbies, such as knitting, bowling, gardening

Take care away from work

- Keep moving! Try to avoid sitting in front of the television or reading a book for long periods of time. Get up, take a walk, go dancing, anything that gets your upper body moving.
- When driving, try to shift arm positions frequently; keep your shoulders down. Adjust the steering wheel down as far as possible. Try cushions to raise you up a bit.
- When writing, do not lean forward or down. Try using a lower seat or higher work surface. Keep your shoulders loose and relaxed.
- Be aware that home and hobby activities can contribute to discomfort that you may be experiencing at work. Repetitive activities (home improvement projects, even computer games) can lead to overuse injuries.

Listen to your body

Pain is your body telling you that there is trouble. Learning what is comfortable or awkward for your body *before* you are in pain may prevent injury.

Take a break from your keyboard a few minutes each hour. Perform other job-related tasks during this time.

Earlier in this manual, we outlined recommendations for good seating posture. Remember, it is important that you not stay in one position for extended periods of time. If possible, change your working posture several times during the day. If you can, work part of your day sitting, and part of it standing. *It is imperative to take rest breaks.*

5

Get help

People sometimes ignore and work through pain or discomfort. Care and attention should be taken as soon as pain or discomfort is noticed. Generally, discomfort that goes away overnight is usually a sign of fatigue. Pain that is continuous and does not go away is more serious and should be attended to by a qualified medical practitioner.

Note Remember, if the pain does not go away after a good night's sleep, or if you cannot *get* a good night's sleep because of the pain, get help. See a doctor as soon as you can. *Do not* diagnose yourself.

Summary

Work environments vary as do people. However, the original design of our bodies remains constant.

Remember that education and constant awareness, along with the adjustment of workstations, equipment, and work habits will help to maintain a comfortable work environment

A healthy, comfortable worker is usually a productive worker.

Make yourself comfortable.

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Index

A

adjustments
 chair 3-3
 keyboard, mouse 2-4
 laptops 2-8

B

body position
 chair 3-3
 good and poor posture 4-2

C

computer
 keyboard 2-4
 monitor 2-2
 mouse 2-4
 wrist rest 2-4

E

ergonomics
 meaning 1-1
exercise
 stretches 4-8

H

health 4-1
 driving 5-5
 hobbies 5-5
 sleep 4-6
 snacks 4-6
 stimulants 4-6
 water 4-6
 writing 5-5

L

laptop computers 2-7

P

posture 4-1, 4-2

R

relaxation 4-6
repetitive strain injury 5-1
 carpal tunnel syndrome 5-1
 epicondylitis 5-1
 other factors 5-4
 tendinitis 5-1
 tenosynovitis 5-1

S

stress 4-5

V

vision care
 bifocals 2-2
 computer glasses 2-2

W

work habits 4-1
workstation 3-1
 chair 3-2
 copy holder 2-6
 desk 3-4
 stretches 4-8