

UNIVERSITY OF MICHIGAN

Ergonomics Guide

Introduction to Ergonomics
And Methods to Keep You Safe from Injury

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May 2003



This information is designed to help increase your understanding of ergonomics and how to prevent or alleviate work-related musculoskeletal disorders. Musculoskeletal disorders (MSDs) also are known as Repetitive Motion Injuries (RMI), Repetitive Strain Injuries (RSI) or Cumulative Trauma Disorders (CTD).

What is Ergonomics?

The National Institute for Occupational Safety and Health (NIOSH) defines ergonomics as *the science of fitting workplace conditions and job demands to the capabilities of the working population*. In other words, it is the relationship between people, the work they do and their work environment. It is about adapting the workplace to fit the worker. Modifications to the work, work tasks and how people perform their work can help improve comfort, safety and productivity.

What are Musculoskeletal Disorders (MSDs)?

Disorders of the muscles, tendons, ligaments, nerves, joints, cartilage, or spinal discs are known as musculoskeletal disorders. You may know these disorders by other names:

Tendonitis	Carpet Layers' Knee	Shoulder Strain
Carpal Tunnel Syndrome	Trigger Finger	Thoracic Outlet Syndrome
De Quervain's Tenosynovitis	Epicondylitis (tennis elbow)	Ulnar Neuropathy
Low Back Pain	Herniated Spinal Disc	Raynaud's Syndrome

These disorders occur when you have overused or strained muscles. You can develop MSDs when activities you perform include reaching, bending, lifting heavy objects, using excessive force, working in awkward postures over long periods of time, working with tools that don't fit you, performing repetitive motions or when a body part presses against a hard or sharp surface. MSDs can occur anytime and anywhere - whether you are at work or somewhere else.

The good news is that MSDs are **preventable** and **reversible** in the early stages! All you need is an understanding of MSDs, how to prevent them and a commitment to making changes. Being receptive to making changes is critical and lays the groundwork for correcting unsafe conditions and work behaviors. Correcting workstation layouts, work habits, job design and taking good care of your body will reduce the risk of injury while increasing your comfort and productivity.

You should seek medical attention if you experience the following signs or symptoms of MSDs in the joints, neck, shoulders, elbows, forearms, wrists, fingers, back or knees.

- Pain
- Swelling
- Stiffness
- Numbness
- Tingling
- Burning
- Inflammation

What Are the Potential Risk Factors Associated with MSDs?



Workplace MSDs can be caused by frequent and prolonged exposure to one or many risk factors, including:

Repetition

Doing the same motions over and over again places stress on the muscles and tendons. The severity of risk depends on how often the action is repeated, the speed of the movement, the number of muscles involved and the force required.

Forceful Exertions

Force is the amount of physical effort required to perform a task, such as heavy lifting or maintaining control of equipment or tools. The amount of force depends on the type of grip, the weight of an object, body postures used, the types of activity and the duration of the task.

Awkward and Sustained Postures

Posture is the position your body is in while muscle groups are involved in physical activity. Awkward postures include repeated or prolonged reaching, twisting, bending, kneeling, squatting, working overhead with your hands or arms, or holding fixed positions.

Contact Stress

Pressing the body against a hard or sharp edge can result in putting too much pressure on soft tissues, nerves, tendons and blood vessels. For example, using your hand as a hammer can increase your risk of MSD.

Lifting and Carrying

Unassisted, frequent or heavy lifting and carrying of items are risk factors.

Vibration

Operating vibrating tools such as sanders, grinders, chippers, routers, drills and saws can lead to nerve damage. Special padding or anti-vibration gloves can help. If possible, reduce the amount of time you spend working with vibration tools.

Psychological Stressors

Pressure on the body and mind may result from family pressures, life changes, deadlines, rush jobs, high production expectations or strict accuracy requirements. It is important to learn how to deal with daily stresses in our lives to minimize this factor.

Lack of Recovery Time

Performing job or recreational tasks repetitively with little variation and without a break can result in physical stress. Recovery time is needed to rest, rejuvenate and relieve muscle strain.

What You Can Do To Reduce Your Risk Potential

☺ Change Postures Frequently

Muscle strain and tension can build up when you remain in the same position for long periods of time. Taking mini-breaks can help to relax muscles. A break from your work to rest, stretch or move around for two or three minutes every 20 to 30 minutes can make a big difference in reducing fatigue, stiffness and discomfort. Find another position to work in such as changing your chair height or seat angle, standing rather than sitting, or repositioning your armrests. It doesn't really matter as long as you change positions throughout the day! This not only allows muscles to recover, but keeps blood circulating and provides oxygen to muscle tissues.

☺ Organize Your Workstation

How you organize your workstation supplies, tools and equipment determines how you use your body. For example, when you have to reach overhead for a manual or across the desk for the phone or the mouse, or when you are too far away from the monitor to see clearly, the action of leaning forward, reaching, bending the wrists or neck and squinting to see your work can contribute to physical strain if you do it repeatedly throughout the day.

☺ **Alternate Job Tasks**

When you perform the same tasks over and over, it places increasing strain on the muscles and tendons that are doing the work. To reduce the risk of strain that may result from repetitive work, it is important to alternate the tasks that you do. This will allow certain muscle groups to rest while other muscle groups are working. For example, if you spend a lot of time typing on the keyboard, break up this repetitive pattern by making necessary phone calls, copying documents or delivering a package.

☺ **Avoid Eyestrain**

Eyestrain is a common problem. If you perform visually demanding tasks such as use of a microscope or a computer, your eyes may become dry, irritated or strained. If you experience eyestrain, see your eye care specialist. A new optical prescription or special computer glasses may be helpful in reducing eyestrain. For computer work, the position, distance and height of the monitor is important. Glare on the screen and light that is too bright or too dim can contribute to eyestrain. Resting your eyes throughout the day and practicing eye exercises can make a difference. One helpful exercise is to look far up to the right corner of the eye, look down to the left, look up to the left corner, then down to the right. This will work most muscles of the eye. Change focal distance by looking away from close-up work to as far away as you can see. Take a short break and look at the beautiful scenery out the window – it's good for relieving eyestrain and can help reduce stress! Blink often to keep the eyes lubricated.

☺ **Protect Your Back!**

Lifting incorrectly can put you at risk for back injury. Be alert when you need to lift something. Plan how you will lift before you begin. Keep your body properly aligned when lifting and moving heavy or bulky objects. Bring the object close to you. Pick up the object by bending your knees and keeping your back in its natural “S” curve, then lift and carry it. If you have to move the object a long distance, use wheels, a cart or hand truck or request help from another person.

Bending and twisting can cause back strain, too. Avoid bending forward to reach for an object. Even if the object weighs very little, bending forward places a lot of strain on your back. Often, it is the simple movement like reaching for a file folder that throws the back out. Bending and twisting to reach for something, such as files, the phone, a manual or items you need to complete a task, can be dangerous. Move closer to the object and turn your whole body rather than twist.

Adjusting Your Computer Workstation

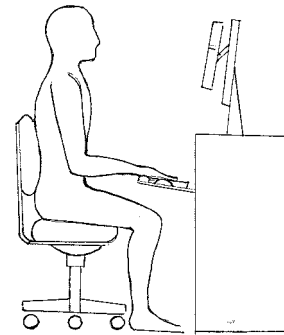
Our bodies were meant to move. Sitting at the computer for hours at a time can cause discomfort in your back, neck, shoulders, arms, wrists and/or hands (when muscles are being overused). Eyestrain and fatigue can also occur. If you sit at the computer, maintaining proper body posture is important. Be sure that all of your body curves and your feet are supported while sitting. A good chair will support you in the upright position. The best position while working at the computer is to sit with the keyboard in front of you and the monitor directly in front of the keyboard. The mouse should be placed next to the keyboard. This is especially important if you work at the computer for more than four hours a day.

The following information and photographs will assist in properly setting up your computer workstation. If you need additional assistance, please contact OSEH at 637-1143.

Seating Basics



Supported and comfortable posture



- Adjust the chair or stool for overall comfort and support. Learn adjustment features on your equipment.
- Adjust the chair or stool to the appropriate height of the worksurface.
- Position the keyboard in front of you and the monitor directly in front of the keyboard.
- Place the mouse next to the keyboard.
- Position the chair close to the worksurface. This will reduce excessive reaching.
- Relax your shoulders and keep your elbows close to your body.
- Place your thighs and forearms somewhat parallel to the floor.
- Clear obstacles from under the desk.
- Change positions frequently to avoid stiffness and to keep blood circulating.

Backs and Legs

- Sit back in the chair and let the back of the chair support your upper body. Add support in the lower back if needed for optimal comfort.
- Sit with your head aligned above shoulders, shoulders above hips.
- Keep your feet supported on the floor or with a footrest.
- Your thighs should be somewhat parallel to the floor with hip angle at 90° to 130° vertically from your spine.

- Avoid pressing the backs of your thighs against the front of the chair or stool. This can interfere with blood circulation to the lower legs.
- Allow for optimal movement of legs under the desk by keeping the area clear of obstacles.

Head and Eyes

- Avoid turning or twisting your spine to view the screen. As you look at the monitor, the first line of type should be about eye level or slightly below. Make sure the monitor is low if you wear bifocals, to eliminate awkward neck posture.
- The monitor screen should be positioned at approximately arm's length away. The best distance is when you can view the screen clearly without leaning forward.
- Avoid extreme postures like leaning forward, bending downward or tilting your chin to look up.
- If you use the phone for extended periods of time, "hold" the receiver rather than "cradling" it against your shoulder. Use a headset to allow you to use your hands while talking.



Potential for neck strain



Headset - reduced risk for neck strain



- Eliminate glare or reflection on the monitor screen. The best position for the monitor is at a 90° angle from the window. Tilting the monitor, closing blinds or using a glare screen can help to reduce glare.
- Document holders elevate materials and allow your head and neck to remain in an upright posture. Position the document holder at the same height as the monitor screen.
- Take short posture and vision breaks regularly.



Awkward posture



Natural shoulder and arm position

Shoulders and Arms

- Keep shoulders relaxed with arms comfortably at your sides.
- Adjust the worksurface or the height of your chair if your shoulders are elevated or you are bending forward to do your work.
- Sit close to the keyboard and place the mouse next to the keyboard or as close as possible.

- Avoid working with your arms extended. Rearrange the workstation so that frequently used items are within easy reach.
- Armrests on the chair can offer support for your arms and shoulders if used properly. Avoid positioning them so high that you elevate (“scrunch”) your shoulders or positioning them so low that you lean on them.
- Avoid repetitive and excessive reaching.



Strain to back and shoulders



Worksurface too high



Shoulder tension



Excessive reach for the mouse

Wrists and Hands

- When keying, your forearms should be somewhat parallel to the floor with wrists at the level of the elbows or below. Avoid bent wrists.



Keyboard too low



Wrists bent



Wrists straight

- Avoid placing your forearms or hands against a hard or sharp surface, such as the worksurface or desk edge, for a sustained period of time. Soft edging and wristrests are available to protect your arms from contact stress.
- Wristrests can offer support when you take breaks from keying.
- When keying, use light pressure on the keys. It is not necessary to use a lot of force.
- Take mini-breaks from repetitive typing or mousing. Two or three minutes every 20-30 minutes to move around and stretch can help relieve muscle tension and fatigue.

Desktop Organization

The design of your work area must allow for natural body postures and positioning. Consider the following:

- Keep items you use frequently close to you to avoid excessive reach.
- Store items between shoulder and knee height to reduce bending and reaching to retrieve and replace them. Lighter items should be stored on higher shelving and heavier items on middle shelving.
- Organize the work area to eliminate or reduce bending and twisting, squatting and kneeling, overextending the arms and bending the wrists.
- Keep shoulders and elbows close to your body as you work.
- Position items on the worksurface so that you avoid leaning on your elbows, arms or wrists in order to reach or use them.



Before



After



Extended reach



Option (stand)



Option (slide)



A Few Tips About Using Laptops

Laptop computer technology, with its high portability, has provided our very mobile society with the capability of working away from the office. Laptops allow us to work when we are out of town on business, when working at home, at remote locations at work or when we are on the road. More employees are working with laptops as their main computer source within the office as well. With the use of laptops comes a unique set of ergonomics issues.

Keeping in mind principles for working at a regular-sized computer, consider the following when you work on your laptop:

- The laptop, with the monitor attached to the keyboard, is only minimally adjustable.
- Try to eliminate glare on the screen from overhead lights or windows.
- Although working in tight spaces, such as on airplanes, in hotel rooms or small cubicles, can make taking mini-breaks difficult, it is important to change positions now and then and to stretch when possible.
- If your work area is not adjustable, use pillows, phone books, newspapers or other available items to position the computer on your lap. Placing the laptop on a chair in front of you may help you to maintain a more upright posture.
- Use a plug-in mouse if touchpads or trackballs present problems.
- Try not to work from source documents that are placed on a flat surface. This can cause awkward neck postures. Prop materials up for a better reading angle.
- When you bring the laptop to the office, plug in a regular design keyboard and mouse, and elevate the laptop screen to promote proper body alignment.

Remember to take mini-breaks and stretch

Additional Tips for Working Comfortably

Standing Postures

Standing upright can place pressure on the back muscles, especially the lower back as well as the legs, shoulders and abdominal muscles. To relieve back pain due to prolonged standing:

- Wear comfortable cushioned shoes. Anti-fatigue mats also are helpful.
- Be sure you are solidly supported on the ground.
- Keep your head aligned above shoulders, shoulders above hips.
- Relieve back pressure by placing one foot on a footrest or a platform and shift from one foot to the other.
- Change positions often to prevent stiffness.
- Avoid leaning your head forward and downward for long periods of time. This increases muscle fatigue in the neck and shoulders.
- Take frequent mini-breaks (2-3 minutes every 30 minutes), exercise and stretch throughout the shift.



Anti-fatigue Mat

Work Area Organization

The design of your work area must allow for natural body postures and positioning. Consider the following:

- Keep items you use frequently close to you to avoid excessive reach.



Keep frequently used items close



Back Stress



Back Relief

- Store items between shoulder and knee height to reduce bending and reaching to retrieve and replace them. Lighter items should be stored on higher shelving and heavier items on middle shelving.
- Organize the work area to eliminate or reduce bending and twisting, squatting and kneeling, overextending the arms and bending the wrists.
- Keep shoulders and elbows close to your body as you work.
- Position items on the worksurface so that you avoid leaning on your elbows, arms or wrists in order to reach or use them.

Lifting and Carrying

Back injuries are the number one workplace injury. Once you hurt your back, you may never fully recover and chances of re-injury increase. When lifting, remember to:

- Stretch first.
- Plan the lift before you start. When team lifting, pick one person to call the signals. Avoid walking backward.
- Check the route and be sure the path is clear.
- Get a firm footing. Keep your feet shoulder-width apart and center yourself over the load.
- Keep your back in its natural “S” curve rather than rounded in a “C” curve when you lift.



Avoid using a “C” curve to lift



Keep the “S” curve

- Use both hands and keep the load close to you. Less force is exerted on your back.
- Size up the load before you lift and make sure that the item is not too heavy or bulky for you to manage alone. If it is, get help.



Get help when you must lift heavy or bulky items overhead



Keep the load close



Turn, don't twist

- Avoid reaching over an obstacle to lift a load.
- Avoid twisting, turning and abrupt motions while lifting. Lift, and then turn if you have to.
- Push, don't pull. You can push twice as much as you can pull.
- Use a stepstool to reach items on high shelves.



Lighter items on high shelves



Stepstool to access higher shelves

- Set the load down smoothly.
- Pay attention to your body for indications of physical stress.



Improper lift



Proper lift and carry



Back Stress



Back Relief

Breaks, Stretching and Overall Health

Computer work often requires sitting for considerable lengths of time with minimal movement of the eyes, head, arms, hands, back and legs. This can result in physical and mental fatigue. To reduce fatigue, alternate work tasks to allow for variation of work patterns, take mini-breaks for stretching muscles and to rest your eyes. Short breaks can make a tremendous difference if you stretch, breathe deeply, rest your eyes, stand up and move around. Be sure to talk with your physician before starting a stretching program.

Activities you do away from the workplace can contribute to muscular strain and discomfort as well. Using the same repetitive motion patterns, awkward postures and excessive force can add considerable strain to your

body no matter where you are. If you are experiencing discomfort, seek medical attention.

Be responsible for your own good health. Exercise, proper nutrition and adequate rest can make a big difference in how your body responds to everyday mental and physical stresses.

Reading

Meditation

Music

Long Walks

Biking

Talk with Friends

Gardening

Cooking

Take a Vacation

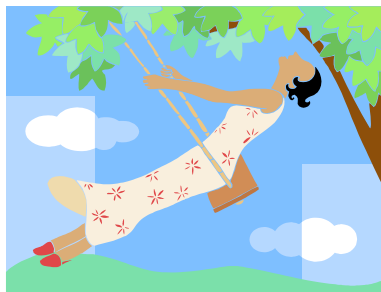
Exercise



Stress can have a negative effect on your body, so..... find ways to cope with stress.

Implementing these ergonomic principles can help you prevent musculoskeletal disorders. Take a look at the way you work and the way your workstation is organized. Watch for bent wrists, dangling feet, worksurfaces that are too high or too low, excessive reach, awkward postures, poor lighting that makes you squint or adds glare to your monitor screen, and how you lift heavy or bulky items. Pay attention to the repetitiveness of job tasks and how you move your body as you work. Are you in a natural alignment? Are you using proper lifting techniques? Is your body supported while you work? Is your workstation organized so that items you use frequently are within easy reach? Are you taking mini-breaks to reduce muscle tension and fatigue?

Employees at the University of Michigan are taking responsibility to prevent musculoskeletal disorders. Remember – these disorders are preventable! Taking care of yourself at work helps you to enjoy the rest of your life!



Visit the OSEH website for a schedule of Office Ergonomics Training. You can register on-line at www.oseh.umich.edu

Additional Resources

The following on-line resources provide more information about ergonomics and ergonomics products:

www.osha-slc.gov/ergonomics
www.afscme.org/health/safe08.htm
www.cdc.gov/niosh/ergopage
www.umich.edu/~oseh
www.umich.edu/hraa/ability
www.engin.umich.edu/dept/ioe
www.ergoweb.com
www.humantec.com
www.office-ergo.com

Contrary to what you may think, taking
mini-breaks actually reduces fatigue while increasing productivity.