

North Carolina Division of Air Quality

Office Ergonomics

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1. Introduction

Ergonomics is the process of designing the work environment to fit the worker, rather than fitting the worker to the work environment. The goal of this ergonomic program is to minimize accidents and illnesses due to chronic physical and psychological stresses, while maximizing productivity and efficiency.

Cumulative trauma disorders (CTD) or repetitive motion strain injuries are musculoskeletal disorders that result from repeated exposure to physical stressors. Stressors affect tendons, ligaments, nerves, muscles and bones. Physical stressors in the office environment are caused by sustained awkward postures, repetitive motions, using excessive force or compression.

2. Office Computer Workstations

The workforce population varies greatly in physical size and stature. The idea of the average size person is obsolete. Adjusting office furniture and office equipment help employees make changes in the office to ensure proper posture is maintained throughout the day. There is no single "correct" posture or arrangement of components that will fit everyone. However, there are basic design goals to consider when setting up a computer workstation or performing computer-related tasks.

Consider your workstation as you read through this guide and see if you can identify areas for improvement in posture, component placement, or work environment. This guide provides suggestions to minimize or eliminate identified problems, and allows you to create your own "custom-fit" computer workstation.



Good Working Positions:

To understand the best way to set up a computer workstation, it is helpful to understand the concept of neutral body positioning. This is a comfortable working posture in which your joints are naturally aligned. Working with the body in a neutral position reduces stress and strain on the muscles, tendons, and skeletal system and reduces your risk of developing a musculoskeletal disorder (MSD). The following are important considerations when attempting to maintain neutral body postures while working at the computer workstation:

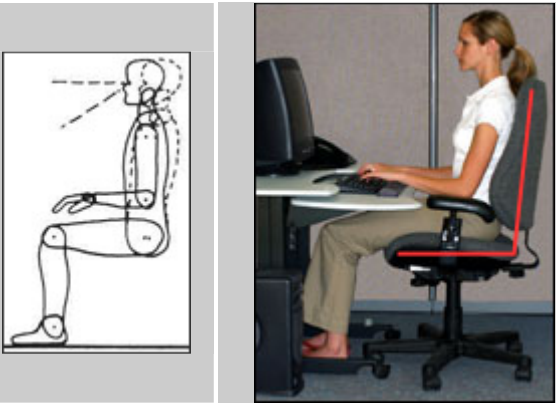

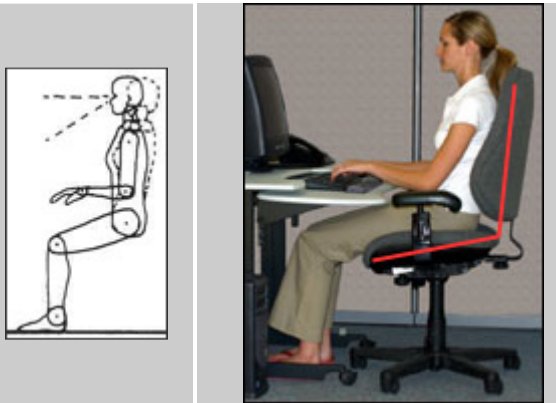
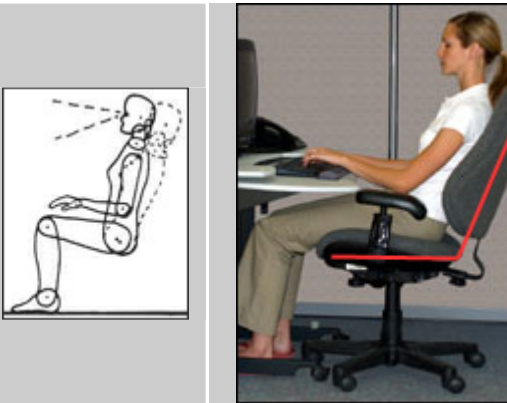
- Hands, wrists, and forearms are straight, in-line and roughly parallel to the floor.
- Head is level, or bent slightly forward, forward facing, and balanced.
- Shoulders are relaxed and upper arms hang normally at the side of the body.
- Elbows stay in close to the body and are bent between 90 and 120 degrees.
- Feet are fully supported by floor or footrest.
- Back is fully supported with appropriate lumbar support when sitting vertical or leaning back.
- Thighs and hips are supported by a well-padded seat and generally parallel to the floor.

- Knees are about the same height as the hips with the feet slightly forward.

Regardless of how good your working posture is, working in the same posture or sitting still for prolonged periods is not healthy. You should change your working position frequently throughout the day in the following ways:

- Stretch your fingers, hands, arms, and torso.
- Stand up and walk around for a few minutes periodically.

These four reference postures are examples of body posture changes that all provide neutral positioning for the body.

<p>Upright sitting posture: The user's torso and neck are approximately vertical and in-line, the thighs are approximately horizontal, and the lower legs are vertical.</p>  <p>The diagram on the left shows a side view of a person sitting upright. A vertical dashed line represents the spine, and a horizontal dashed line represents the thigh. The photograph on the right shows a woman sitting at a desk in an office chair, with a red line tracing the spine and a horizontal line across the thighs.</p>	<p>Standing posture: The user's legs, torso, neck, and head are approximately in-line and vertical. The user may also elevate one foot on a rest while in this posture.</p>  <p>The diagram on the left shows a side view of a person standing. A vertical dashed line represents the spine, and a horizontal dashed line represents the arm. The photograph on the right shows a woman standing at a desk, with a red line tracing the spine and a horizontal line across the arms.</p>
<p>Declined sitting posture: The user's thighs are inclined with the buttocks higher than the knee. Angle between the thighs and the torso is > 90 degrees. The torso is vertical or slightly reclined with legs vertical.</p>  <p>The diagram on the left shows a side view of a person sitting with a reclined backrest. A vertical dashed line represents the spine, and a horizontal dashed line represents the thigh. The photograph on the right shows a woman sitting at a desk in an office chair with a reclined backrest, with a red line tracing the spine and a horizontal line across the thighs.</p>	<p>Reclined sitting posture: The user's torso and neck are straight and recline between 105 and 120 degrees from the thighs.</p>  <p>The diagram on the left shows a side view of a person sitting with a reclined backrest. A vertical dashed line represents the spine, and a horizontal dashed line represents the thigh. The photograph on the right shows a woman sitting at a desk in an office chair with a reclined backrest, with a red line tracing the spine and a horizontal line across the thighs.</p>

Work Process and Recognition:

Even when the design of the workstations is correct and environmental factors are at their best, users can face risks from the workload, which can intensify the impact of other risk factors, such as repetition.

Failing to recognize early warning signs could allow small problems to develop into serious injuries. Addressing the workload factors and medical awareness can help minimize the risk of developing musculoskeletal disorders (MSDs) and stop the progression to injury.

Potential Hazard - Computer work may appear to be a low effort activity when viewed from a total body perspective, but maintaining postures or performing highly repetitive tasks for extended periods can lead to problems in localized areas of the body. For example, using a mouse for a few minutes should not be a problem for most users, but performing this task for several uninterrupted hours can expose the small muscles and tendons of the hand to hundreds or even thousands of activations (repetitions). There may not be adequate time between activations for rest and recuperation, which can lead to localized fatigue, wear and tear, and injury. Likewise, maintaining static postures, such as viewing the monitor, for a prolonged period of time without taking a break can fatigue the muscles of the neck and shoulder that support the head.

Possible Solutions -

- Provide variation in tasks and workstations so there is time to recover from the effects of activity. There are several ways to provide recovery time for overused muscles.
- Adjust your workstation to change the “work exposures”. This allows different muscle groups to provide support while others rest.
- Substitute keystrokes for mousing tasks, such as Ctrl+S to save, Ctrl+P to print. Especially if your job is highly mouse intensive
- High repetition tasks or jobs that require long periods of static posture may require several, short rest breaks (micro breaks or rest pauses). During these breaks change your position so you are standing, stretching, and moving around. This provides rest and allows the muscles enough time to recover.
- Alternate tasks whenever possible, mixing non-computer-related tasks into the workday. This encourages body movement and the use of different muscle groups.



MSD Signs and Symptoms:

It is important to report signs and symptoms as early as possible to prevent serious injury or permanent damage. Users at risk for MSDs associated with computer use may experience some of the following signs or symptoms:

- Numbness or a burning sensation in the hand
- Reduced grip strength in the hand
- Swelling or stiffness in the joints
- Pain in wrists, forearms, elbows, neck, or back
- Reduced range of motion in the shoulder, neck, or back
- Dry, itchy, or sore eyes
- Blurred or double vision
- Aching or tingling
- Cramping
- Loss of color in affected regions
- Weakness

Although these symptoms may not necessarily lead to an MSD, if experienced, the user should make an evaluation of their working positions and their workstation layout. The checklist may be helpful.

3. Computer Workstation Evaluation Checklist

The Computer Workstation Evaluation Checklist (Appendix A) is designed to help you to evaluate what is needed for a good ergonomic workstation arrangement. Specific dimensional constraints intentionally are omitted and replaced by a principles oriented approach for this checklist. A checklist is a guide to good decision-making, not an end point in it. No checklist alone is able to capture the interactions and complexities of all possible combinations of people, task, equipment, and work environment. However, use of this checklist, will allow you to identify workstations which need redesign work, and it will give you guidance on the goals of any workstation redesign that is required.

At a minimum, while using this checklist, remember that designing for ergonomics requires understanding and consideration of

- The physical and psychological attributes of the person that will perform the job
- The design and arrangement of the workstation furniture, computer hardware and other workstation accessories
- The tasks required to perform the job

The interaction between these general topics is critical, and will define the postures, forces, and repetitions assumed by the person(s). Remember, all parts of the body are linked together, and consequently a modification in one area may have significant effects in another, no single change can be performed without considering the effects on other areas. For example, lowering seat height so that someone may comfortably rest his/her feet on the floor may force a stressful upper body posture if the monitor position and table or keyboard height are not adjusted in concert (this is often a good reason to provide a footrest).

When using this checklist,

- Remember that there is no "perfect posture for all time" and that a dynamic posture (frequent changes in posture) is a good way to reduce stress and redistribute pressure related to long duration static postures. However, work can be sustained for longer times without causing harm if the person is working in a neutral posture.
- Remember that the checklist is not all-inclusive, and may not cover all of the topics important to your specific situation.
- Remember that a good ergonomics approach will improve comfort, productivity and quality, as well as health and safety.

"NO" responses indicate conditions that may be associated with higher risk of illness/injury and steps should be taken to address the source of the problem. "YES" responses to questions indicate acceptable ergonomic design conditions.

4. Appendix

Appendix A – Computer Workstation Evaluation Checklist

Appendix A

COMPUTER WORKSTATION EVALUATION CHECKLIST

WORKING POSTURES–The workstation is designed or arranged for doing computer tasks so it allows you	Y	N
1. Head and neck to be upright, or in-line with the torso (not bent down/back). If "no" refer to Monitors, Chairs and Work Surfaces.		
2. Head, neck, and trunk to face forward (not twisted). If "no" refer to Monitors or Chairs.		
3. Trunk to be perpendicular to floor (may lean back into backrest but not forward). If "no" refer to Chairs or Monitors.		
4. Shoulders and upper arms to be in-line with the torso, generally about perpendicular to the floor and relaxed (not elevated or stretched forward). If "no" refer to Chairs.		
5. Upper arms and elbows to be close to the body (not extended outward). If "no" refer to Chairs, Work Surfaces, Keyboards, and Pointers.		
6. Forearms, wrists, and hands to be straight and in-line (forearm at about 90 degrees to the upper arm). If "no" refer to Chairs, Keyboards, Pointers.		
7. Wrists and hands to be straight (not bent up/down or sideways toward the little finger). If "no" refer to Keyboards, or Pointers		
8. Thighs to be parallel to the floor and the lower legs to be perpendicular to floor (thighs may be slightly elevated above knees). If "no" refer to Chairs or Work Surfaces.		
9. Feet rest flat on the floor or are supported by a stable footrest. If "no" refer to Chairs, Work Surfaces.		
Notes:		

SEATING–Consider these points when evaluating the chair:	Y	N
10. Backrest provides support for your lower back (lumbar area).		
11. Seat width and depth accommodate the specific user (seat pan not too big/small).		
12. Seat front does not press against the back of your knees and lower legs (seat pan not too long).		
13. Seat has cushioning and is rounded with a "waterfall" front (no sharp edge).		
14. Armrests , if used, support both forearms while you perform computer tasks and they do not interfere with movement.		
Notes:		

KEYBOARD/INPUT DEVICE–Consider these points when evaluating the keyboard or pointing device. The keyboard/input device is designed or arranged for doing computer tasks so the	Y	N
15. Keyboard/input device platform(s) is stable and large enough to hold a keyboard and an input device.		
16. Input device (mouse or trackball) is located right next to your keyboard so it can be operated without reaching.		
17. Input device is easy to activate and the shape/size fits your hand (not too big/small).		
18. Wrists and hands do not rest on sharp or hard edges.		
Notes:		

MONITOR—Consider these points when evaluating the monitor. The monitor is designed or arranged for computer tasks so the	Y	N
19. Top of the screen is at or below eye level so you can read it without bending your head or neck down/back.		
20. User with bifocals/trifocals can read the screen without bending the head or neck backward.		
21. Monitor distance allows you to read the screen without leaning your head, neck or trunk forward/backward.		
22. Monitor position is directly in front of you so you don't have to twist your head or neck.		
23. Glare (for example, from windows, lights) is not reflected on your screen, which can cause you to assume an awkward posture to clearly see information on your screen.		
Notes:		

WORK AREA—Consider these points when evaluating the desk and workstation. The work area is designed or arranged for doing computer tasks so the	Y	N
24. Thighs have sufficient clearance space between the top of the thighs and your computer table/keyboard platform (thighs are not trapped).		
25. Legs and feet have sufficient clearance space under the work surface so you are able to get close enough to the keyboard/input device.		
Notes:		

ACCESSORIES—Check to see if the	Y	N
26. Document holder , if provided, is stable and large enough to hold documents.		
27. Document holder , if provided, is placed at about the same height and distance as the monitor screen so there is little head movement, or need to re-focus, when you look from the document to the screen.		
28. Wrist/palm rest , if provided, is padded and free of sharp or square edges that push on your wrists.		
29. Wrist/palm rest , if provided, allows you to keep your forearms, wrists, and hands straight and in-line when using the keyboard/input device.		
30. Telephone can be used with your head upright (not bent) and your shoulders relaxed (not elevated) if you do computer tasks at the same time.		
Notes:		

GENERAL	Y	N
31. Workstation and equipment have sufficient adjustability so you are in a safe working posture and can make occasional changes in posture while performing computer tasks.		
32. Computer workstation, components and accessories are maintained in serviceable condition and function properly.		
33. Computer tasks are organized in a way that allows you to vary tasks with other work activities, or to take micro-breaks or recovery pauses while at the computer workstation.		
Notes:		