

Ergonomics Recommendations for Remote Work

Anand Subramanian, Brandy Farris Miller, Jeffrey Fernandez

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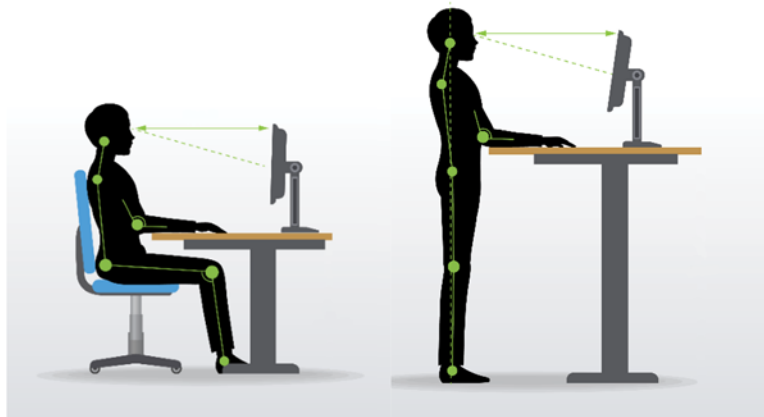
By Anand Subramanian, PhD, CPE, Brandy Farris Miller, PhD, CPE, and Jeffrey Fernandez, PhD, CPE

The world has moved to a reality where many people are working from home and social distancing measures require a new normal. This means more and more people are working at a location other than their business office, most often at home. For a majority of individuals who are going to be working from home for the first time, getting the correct home office setup presents a challenging problem – “*Setting up an effective space that can be used for safe and productive work*”. Sometimes space within the home is limited and office space may double as a dining space, kitchen counter, or general use area. Other times, a desk and chair are present, but may not have the adjustability needed to provide a suitable long-term work environment. When setting up the home work environment remember to implement ergonomics basics.

I. Implement Ergonomics Basics

Ergonomics is about fitting the tasks being performed to the capabilities of the human performing them. To this end, key ergonomic concepts can be summed up with one word ‘N-E-W’. Remembering this acronym will help people working at an office or home maintain productivity and more importantly, reduce injury risk.

- N – Neutral Posture: Attain a proper posture while performing sitting or standing work; a neutral seated posture should include sitting with the neck straight, shoulders straight down loosely at the sides, elbows at a right angle, wrists straight, low back supported on the back rest of the chair, 90° at the hips, 90° at the knees, and feet flat on the floor or on a footrest.
- E – Eye and Elbow Height: Whether seated and standing – ensure that the keyboard (ASDF home row) and mouse are positioned at the elbow level. The top of the monitor should be at or slightly below eye height.



- W – Work Area: Keep items that are used often in the primary work zone (the area when elbows are at the sides and the hands are moved side to side, see figure); keep items that are used less often in the secondary work zone (area within the outstretched arms). In the office, the

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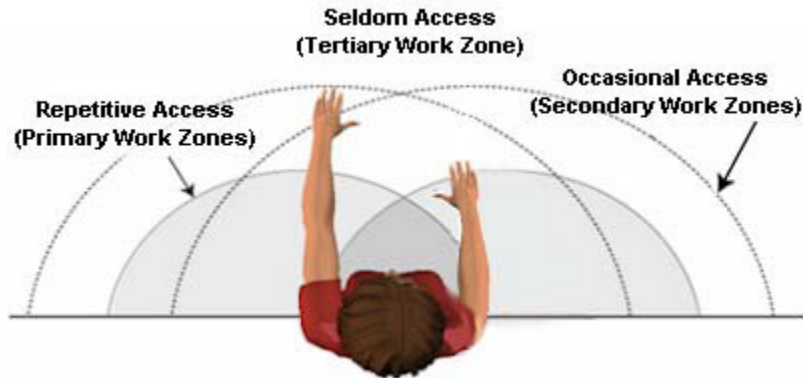
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keyboard and mouse should be in the primary work zone, centered with the user and the monitors.



In addition to implementing the NEW principles, following some basic ergonomic tips will go a long way to reduce the risk of injuries (“*musculoskeletal disorders or MSDs*”) and increase the level of comfort without sacrificing the ability to stay productive.

II. Basic Ergonomic Tips

1. Adjust the chair or seat height so that the thighs are approximately parallel to the floor with the feet resting flat on the floor or on a footrest. The seat pan should not compress the back of the thighs.
2. Adjust the seat back – the lower back (lumbar area) plus mid-back should be well-supported. Adjust the seat back height, angle and tilt tension accordingly and sit back in the chair.
3. Ensure that the ASDF row of the keyboard is at the elbow height for a sitting or standing workstation.
4. Ensure forearms are approximately parallel to the floor – adjust the keyboard and mouse tray or desk height accordingly.
5. Ensure wrists are straight and the hands are in line with the forearms – adjust the height and position of the keyboard tray to keep wrists flat.
6. Keep elbows close to the sides – adjust arm rests so that the weight of the forearms rest on the arms rests. Avoid hunching the shoulders forward.
7. Reduce the awkward postures of the neck, by placing the monitor at or slightly below the height while seated or standing.
8. Ensure monitor is placed 20-40 inches (about an arm’s length) away from the eyes. The monitor distance should be about 20 inches when using a small screen or a laptop screen and further away as the screen size gets larger. Dual monitors should be located closely together and at the same height and distance so that the eyes do not have to re-focus and the head does not turn significantly when looking between the monitors.
9. Reduce eye strain, take micro-breaks and follow the 20-20-20 rule. i.e. take a 20 second break every 20 minutes by looking at things at least 20 feet away.

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10. Incorporate stretch breaks – changes in posture throughout the day. Schedule work and strategically place peripherals so that prolonged seated posture can be avoided (placing the printer in another room would necessitate a micro-break to get up and walk).
11. Position frequently used materials and equipment close to the front of the body (primary work zone) to avoid twisting and reaching.
12. Ensure good task lighting when working on printed materials, and focused, diffused light for computer work. If the monitor is placed next to a window, the window should have a covering that prevents direct light on the monitor screen, or the monitor should be placed at a right angle to the window. Glare will cause eye fatigue and dryness. Adjust the tilt of the laptop screen to minimize screen glare. Use an anti-glare screen only as a last resort.

Various resources and tools are available to ensure ergonomic setup of office workstations. Some of these resources are listed below:

<ul style="list-style-type: none"> • CDC's Computer Workstation Checklist • NIOSH's Elements of Ergonomics Program • OSHA's Computer Workstation eTool 			
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The key components in any office setup, whether at home or in a business office, include seating, the worksurface (table or desk), and external accessories such as keyboards, mice, monitors, and other peripherals. Some important characteristics of home office equipment include:

Seating: Ergonomic seating aims to increase individual efficiency, reduce fatigue, and facilitate proper posture. Unfortunately, the factors most often emphasized when selecting and purchasing chairs are cost and appearance. Seats that lack adjustability can result in poor working postures, which increase the likelihood of body discomfort or musculoskeletal disorders. Lack of adjustability almost guarantees some degree of static muscle loading (the same posture or position is held for an extended period without proper support e.g. unsupported arms while typing for extended time). Some questions that need be considered in the selection of chairs include:

- Does the chair allow a neutral seated posture (as shown in the figure and as described above)?
- How easy is it to make these adjustments?
- Does the seat provide a lumbar support?
- Is the lumbar support of the chair adjustable to the necessary height?
- Does the seat have adjustable armrests?
- Are the arm rests adjustable so that they support the arms in a neutral supported posture when the shoulders are comfortably at the sides?
- Does the seat have swivel mechanism? Does the base have 5 feet, set in a star pattern, that are larger than the seat pan? Are the casters correct for the type of flooring?

Table/Desk: The work area should be adequate to hold the equipment needed to perform the work. In a typical office setup, there should be space for a laptop, external keyboard and mouse, and monitor (if present) as well as for any written or reference material that may be needed. The working height (desk or table) should so that the ASDF row of the keyboard is at elbow height. When seated, the feet should be flat on the floor or on a footrest. If possible, avoid glass topped tables and desks due to the glare. If using

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a laptop, place the laptop on the desk surface. Adjust the arm rests on the chair to fit the seated elbow height. Raise the seat of the chair so that the elbows are even with the desk. Move the desk lamp, if necessary, so that the light is not directed to the eyes. Avoid pressure points on the wrists and arms by staying away from the sharp edges of the table.

External Accessories: An external mouse is possibly the single most important accessory when working outside the office (on a laptop) for more than 20 minutes.

An external keyboard allows the flexibility to raise the laptop monitor to an ideal height for a neutral neck posture. This allows independent adjustment of both the laptop screen and the external keyboard to obtain a better position for both the arms and wrists as well as the neck.

Align the top of the monitor screen with the user's seated eye height (when the user has no glasses, wears computer glasses, or wears single prescription lenses). If progressive, bi-focal, or tri-focal lenses are worn, position the monitor so that the neck is neutral (straight) while looking through the glasses to view the monitor. If more than one person is using the same setup, some monitor adjustability may be needed.

A laptop-stand or monitor riser can assist with proper monitor alignment. Place the monitor between 20 to 40 inches away from the face and so the top of the screen is at or below eye level. Make sure to give the eyes frequent breaks.

A footrest might be needed if the feet do not rest completely on the floor once the chair height has been properly adjusted. The footrest should be adjustable in height and inclination and provide sufficient area for the feet on the face surface of the nonskid bearing surface so that the feet do not slip off the footrest.

Smart phones, tablets, iPads, and other devices have their own considerations. Below are some tips to keep in mind:

- Use both hands to swipe, scroll and select items

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DIY Home Ergonomics

Use what you have at home to improve your ergonomic setup

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Seating



Use pads for support when needed

Use an external keyboard and mouse

Find a comfy chair

<<<<<<<<<<<

Desk Setup



Pressure points are caused by sharp edges

Use boxes, books, or reams of paper for footrests

Use boxes, books, or reams of paper to increase monitor height

Keep things close



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Take Breaks

Stand up when on phone calls

Decrease eye fatigue: Look 20 feet away, for 20 seconds, every 20 minutes

Vary tasks and take micro (20 second) and mini (3-5 minute) breaks every hour

Use a headset when on calls or to reduce noise in a room

More info, special considerations? Schedule a virtual ergonomic assessment or contact a Certified Professional Ergonomist (CPE)

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- Hold the device properly using a straight wrist
- Keep the neck as close to upright as possible
- Move and take frequent breaks

III. Home Office Do-It-Yourself (DIY) Suggestions

Seating: Find the best and most comfortable chair. A hard chair does not support the back or the lower extremities. A cushion provides both support to keep one comfortable and also provides a breathable fabric interface. Additionally, in order to attain a neutral posture, a cushion or memory foam can raise the seat height so that the elbows are closer to the work surface. If the seat does not have a lumbar support, use a pillow or a rolled-up towel. If a chair without arm rests is selected, consider pushing the keyboard and mouse back slightly to use the worksurface for forearm support.

Table/Desk: Select a proper work surface such as dining table or countertop. If a sit to stand type work desk is considered, use stable boxes or step stools to place the laptop or monitor on the work surface to attain the appropriate height for standing work. Make sure the edge of the work surface is not sharp. Sharp edges provide pressure points on wrists and forearms. A simple fix could be to line the worksurface edges with a table edge protector.

External Accessories: Connect a personal computer monitor or TV screen to the laptop. If the laptop (when using an external keyboard and mouse) or monitor are too low, they can be raised using books, boxes, or reams of paper.

If the feet do not comfortably rest on the floor, use a footrest. Footrests can be purchased or can be made by using stable boxes, reams of paper, step stools, etc. The aim should be to have a right angle at the knees and hips with feet comfortably supported.

In order to minimize external noise, use a headphone with a microphone for teleconference calls or to reduce outside noise while working. When possible, use the time during the calls to stand up, walk, and stretch.

During these exceptional times, people working from home can use these recommendations and ensure they can continue to work safely and productively. Although proper ergonomic setup can be obtained, it is important for individuals who have a history of related injuries (such as musculoskeletal disorders) and other disorders to seek the assistance of a certified professional ergonomists (CPEs). The environment, chair, desk, mouse, keyboard, and other items should be optimally designed and positioned based on the tasks performed, specific body measurements, and personal factors which only a well-trained ergonomist can determine, evaluate, and synthesize. Social distancing can still be followed by using remote or virtual ergonomic assessment techniques where ergonomists can obtain the most pertinent information to recommend an optimum workstation setup.

Author Biographies

Anand Subramanian (anands@jfa-inc.com) is a principal at JFAssociates Inc., based in the Washington, D.C. area. He holds a Ph.D. in industrial engineering from the University of Cincinnati, Ohio, and is a Certified Six-Sigma Black Belt, a Certified Professional Ergonomist, and an OSHA-30 certified professional. Brandy Farris Miller (bmiller@apexergonomics.com) is a principal at Apex Ergonomics, based in the Phoenix area. She holds a Ph.D. in business organization and management and master's degree in industrial engineering with an emphasis in applied occupational ergonomics. She is a Certified Professional Ergonomist, Certified Six-Sigma Black Belt, an OSHA

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authorized 10/30 hour general industry outreach trainer, and is known for her expertise in the application of industrial engineering and applied occupational ergonomics principles in a wide variety of industrial settings. Jeffrey Fernandez (jf@jfa-inc.com) is the managing principal at JFAssociates Inc., based in the Washington, D.C. area. He holds a Ph.D. in industrial engineering from Texas Tech University, is a registered Professional Engineer and a Certified Professional Ergonomist, is known for his expertise in occupational ergonomics and classical industrial engineering and is a member of the Editorial Advisory Board at EHS Today.