

Home Office Ergonomics

By Tamara Mitchell



What does your home office look like?



This?



Or maybe the bed?



Or the dining table?

What about your kids?



Lying on their stomach?



Sitting cross-legged on the floor?

We would not be surprised if any of the above situations are typical in your home. Unfortunately, most people don't put much effort into designing a home office and if they do, they seem to forget the basic rules of ergonomics. While searching for illustrations of good ergonomic design in home laptop use, we found very few pictures that were even close to being correct, and most were really horrible!

Laptops and tablets were originally designed to be used for a short period of time while on the go. Laptops and smaller devices have become so powerful that they have essentially replaced the need for desktop computers. Tablet computers now have almost all of the capabilities of laptops, so we are quite aware that people are taking this technology to its limits. With cloud applications like MS Office 365, Adobe's Creative Cloud and Document Cloud, VMWare for programmers, and secure cloud file storage like Box.com, it's possible to create, modify, and share documents and other files with pretty much any electronic device.¹

We want to do what we can to point out ways that people can set up a home office environment to avoid causing strain and injuries to themselves and their families. Popular media does great harm by featuring home workstations that are unsafe. Surfaces that are too high and chairs that are better suited for the living and dining room are common offenders. Interior decorators and architects can create pretty places, but they usually have no training in ergonomics. When the public tries to follow ideas they see in popular media, a lot of effort and expense is wasted by creating workstations that increase the risk of injury.

There is absolutely nothing that says a home office cannot be both beautiful and functional!

Home office challenges

Not everyone has an extra room for a designated home office. But if the computer is going to be used at home for extended periods of time -- whether for work, homework, online shopping, emailing, or just cruising the 'net -- it's very important to carve out a space to create a setup that can be used without causing fatigue and risking injury. In addition, if users of varying sizes share the work location, adjustability of the work surface and chair height is mandatory. Before designing a workstation, make sure you consider the following:

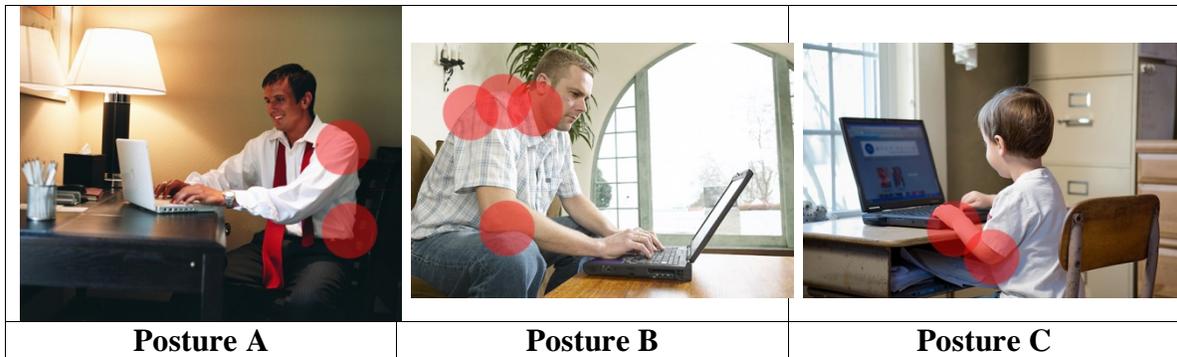
- Is one or more person using the workstation?²
- Will the computer be used for more than 1 hour?²

Here are just a few ideas for home office design:

- Remove closet doors and create a space in a closet for a workstation
- Take advantage of the small space beneath stairs
- Place the computer in a niche in the kitchen or living room
- Create a workstation in an under-used guest bedroom or den

Posture problems

Laptops and tablets pose unique challenges because there is no setup that allows correct display height at the same time as correct keyboard and mouse height without other devices.



In Posture A, the display might be at the right distance (depending upon how well the user can see), but the keyboard is too high and the display is too low. The user is sitting much too far away from the table, causing stress in the shoulders, neck and back due to his extended arms.

The person in Posture B is stabilizing his elbows on his knees, dropping his wrists on the front of the laptop, holding his head forward, and elevating his shoulders. Both the screen and the keyboard are too low and the keyboard is too far away. Neck, shoulder and back pain are a result of this extremely stressful posture that restricts circulation and causes irreparable damage to soft tissues.

The child in posture C is resting his wrists and upper arms on the sharp edge of the worksurface, a perfect recipe for inducing carpal tunnel syndrome. Also, his elbows are at an acute angle which puts strain on the cubital tunnel in the elbows, risking another of the “tunnel” syndromes. In addition, he is getting no low back support from the inappropriate chair. An adjustable chair would still not create a safe environment since the table is too high and the laptop is not set up correctly.

Sitting at a dining table or traditional desk will result in a posture much like that shown in postures A and C, since the typical table height is 29”. Even if the work surface was at an acceptable height for the keyboard and mouse, the display would be too low. Most people will eventually end up slumping to see the display, as shown in the left illustration below. Using a laptop or tablet stand with an external keyboard and mouse can improve or correct the display height and allow the use of input devices (i.e., keyboard and mouse) at the correct height for typing and mousing, assuming the work surface is the correct height, as seen in the illustration below right.

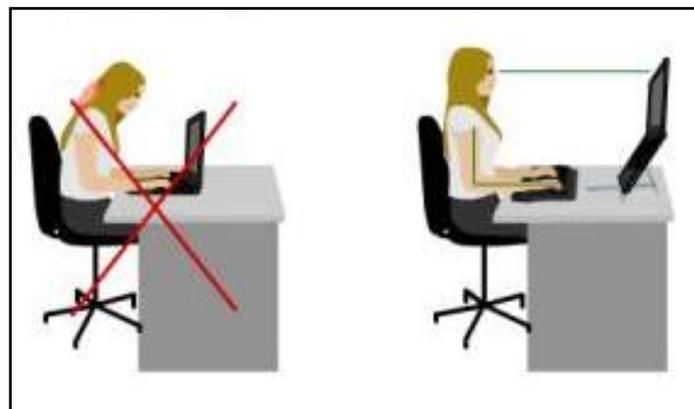


Image courtesy Ref. 3



Image courtesy Ref. 4

Use of tablet computers and posture is investigated in only one small study of 15 users, but it was found that use of tablets without the use of a stand on a work surface results in greater neck flexion than for laptop or desktop computers, likely to cause strain to the neck, shoulders, and back as shown in the illustration above.^{4,5,6} The effect of tablet usage on the hands and arms was not included in this research and the duration of the tasks involved in the study were only 3-5 minutes long.⁶ Subjects were all seated in a lounge-type chair with ottoman footrest, which although it may reflect a posture many people assume while using a tablet at home, it did not allow the user to select a chair or setup that they might have found more comfortable. The study also conjectures that users may have not maintained the awkward posture of extreme neck flexion if the task had continued for a longer duration.

If interaction with the tablet is limited to reading, watching movies, or surfing the internet, it is probably sufficient to follow the guidelines suggested for reading books or the tips suggested by the study mentioned in the last paragraph.^{4,7}

- Sit so that your back is straight and your head is in a fairly upright position.
- Avoid slouching
- Raise the tablet up toward your eyes. Use a tablet stand on a work surface.
- Change your position frequently
- Take a break every 15 minutes, get up, walk around, and do something completely different.

There are a few folio cases on the market like the Kensington folio with a removable Bluetooth keyboard that enable the user to set up the tablet at any angle or height and use the keyboard on a separate surface at an appropriate height. This is still not ideal for extensive use since the display is small and the keyboard is a mini-keyboard that is not intended for extensive use. Most tablet stands and keyboard folios require the display to be mounted on the keyboard, so postures are actually generally worse than for a laptop computer and the keyboard is tiny and awkward as shown at right. The most stable,



Image Ref. 9

functional, and comfortable setup is one that allows you to plug into a full-sized monitor and full-sized keyboard. (Even printing is possible if you have a wireless Bluetooth enabled printer.) Depending on your tablet, it is possible to get an AV adapter cable that will allow you to connect to any larger HDMI or HDTV compatible display.⁸ Check with your manufacturer to determine what connectors or docking stations are available. Attaching USB devices is quite easy through the use of a USB hub. If you use a Bluetooth keyboard, no adaptor is required at all.

We have many suggestions that can help you find accessories that will enable a great setup for your laptop, tablet, or other device on our laptop and tablet products webpage: <http://working-well.org/Website/plaptop.html>

Setting up your home office

The principles of ergonomics do not change when you leave work and head for home, so you can use the measurements taken and recommendations made during your office evaluation at work and use them to set up your home office. Use the workstation design rules outlined on our website at:

http://working-well.org/Website/wkstn_design.html

And use our guidelines for children on the ErgoKids section of our website:

<http://working-well.org/Website/kidstation.html>

Please also review the laptop tips pages (http://working-well.org/Website/laptop_tips.html) and the laptop supplies pages (<http://working-well.org/Website/plaptop.html>) if you use a laptop or tablet anywhere.

At a minimum, you will have to pay attention to, and probably invest in, the following basic components of a good laptop workstation:

Office Chair

The chair is one of the most critical items in any computer workstation, so this is where you should start. Without a fully adjustable chair, you will be at risk for back and neck problems as well as leg fatigue and sciatica. There are many styles and fabrics available. As stated before, if more than one person is using the computer workstation, an adjustable chair is mandatory. Please check these suppliers to obtain a good ergonomic chair: <http://working-well.org/Website/pchair.html>.

Work Surface

Working on traditional desks or tables puts the keyboard and mouse at a harmful height. We highly recommend that you do one of the following:

- Build a custom shelf that will place the input devices at a proper height. Raise the laptop so the top of the screen is at straight ahead height (or lower for bifocal wearers). Check our website for recommended laptop stands and docking stations - <http://working-well.org/Website/plaptop.html>
- Build a custom shelf that will allow the display to be at a proper height and install a height-adjustable keyboard tray to accommodate an external keyboard and mouse - <http://working-well.org/Website/pwksfc.html>. Or use a lapboard to support both the keyboard and mouse.
- Use an adjustable height work surface, such as those available at Ikea. Set the surface at typing height and raise the laptop or tablet to the correct height - <http://working-well.org/Website/pwksfc.html>. Other laptop table options are shown at: <http://working-well.org/Website/plaptop.html#tables>

Document Holder

If you frequently refer to written materials, a document holder is imperative. It prevents neck strain caused by dropping the head to see documents. Not all document holders will work with every workstation setup, so set the workstation up first and then decide what document holder will work in your particular situation. Supporting the document in line with the display and keyboard is preferred; however, if there is not enough space, it might be necessary to have a holder next to the computer. See the various options on our website: <http://working-well.org/Website/pdochldr.html>.

Keyboard and mouse

No input device is “ergonomic”. This is a marketing falsehood. Choose the product that fits you correctly. Read the guidelines in the keyboard and mouse tips featured on the website: http://working-well.org/Website/keyboard_tips.html and http://working-well.org/Website/mouse_tips.html.

View the approved keyboards at <http://working-well.org/Website/pkybds.html> and input device options at <http://working-well.org/Website/pmice.html>.

A smaller, more compact keyboard and mouse that packs easily is best when using the laptop during travel. Use a keyboard folio when using a tablet during travel: <http://working-well.org/Website/plaptop.html#tablets>.

Lighting

Ambient light in the room should be approximately the same as the display brightness. Sharp contrasts between light and dark cause eye strain and headaches.¹⁰ If you are in a dark corner or tend to work at night, it’s important to provide an external light source. Indirect lighting bounced off a ceiling is the least likely to produce glare on the screen, although diffused overhead lighting can be successfully used. Beware of bright light from windows. Placing the display so that you look directly out a bright window will cause eye strain. Placing the display so that a window is behind you will cause glare on the screen. The best solution is to place the workstation so that windows are at a right angle to the display. It may be necessary to use window coverings to adjust bright outside light sources.

Additional lighting may be necessary to illuminate documents. The challenge with task lighting is to avoid putting glare on the display. Raising the ambient light level is not recommended because it will cause the whole work area to be over lit, and it wastes a lot of energy. Lighting of documents requires 20-25% more light than ambient lighting. Therefore, task lighting is recommended to illuminate reading material.¹⁰ Task lighting should be placed beside the work, not in front of it, to avoid glare.

Some task lighting options for the home office are shown on our task lighting web page, although many other possibilities exist: <http://working-well.org/Website/ptskltg.html>. There are several small portable LED lights that plug into the laptop or tablet’s USB port that can be used when you travel: <http://working-well.org/Website/plaptop.html#accessories> .

Rules for your home office

Learn how to maintain a relaxed, neutral posture that reduces stress and strain to your muscles. Below is a summary of ergonomic principles associated with computer use.¹¹

- Take mini-breaks every 20 to 30 minutes to avoid static postures.
- Position the screen and documents so you can see them without holding your head forward.
- Keep your wrists straight while typing and using the mouse. NEVER drop your wrists on anything. Always maintain the natural hand position.
- A wristrest is not necessary if the input devices are at the correct height. If you choose to use a wristrest, never touch it while typing or moving the mouse/trackball.
- Use an external mouse instead of using the small touchpad or trackpoint on your laptop.
- If you have to raise your chair to get your elbow 1" above the keyboard and mouse, support your feet on a footrest (a large, 3-ring notebook is a temporary option). When seated, your hips should only be slightly higher than your knees. When your feet are not supported, there is excessive strain on hip, leg, and low back muscles.
- Keep glare off the computer screen by moving the screen, changing the lighting and/or covering the windows.
- Carefully clean the screen regularly using appropriate cleaning fluid for a laptop's LCD screen. Touching the screen may damage screen pixels.
- Do not place a laptop directly on your lap since its excessive heat has been proven to cause internal physical harm. Place it on one of the many adjustable laptop computer stands. <http://working-well.org/Website/plaptop.html#portable>

More laptop information

There is a lot of information regarding safe laptop use on this website, including articles:

Laptop Beefs: http://working-well.org/articles/pdf/laptop_beefs.pdf

Laptop Props: <http://working-well.org/articles/laptop2.html>

Other website resources:

- Cornell University – “5 Tips for Using a Laptop Computer”
<http://ergo.human.cornell.edu/culaptoptips.html>
- UC Davis – “Laptop Ergonomics” <http://safetyservices.ucdavis.edu/ps/ebm/office-ergonomics-1/laptopLogistics>

This article and all of our articles are intended for your information and education. We are not experts in the diagnosis and treatment of specific medical or mental problems. When dealing with a severe problem, please consult your healthcare or mental health professional and research the alternatives available for your particular diagnosis prior to embarking on a treatment plan. You are ultimately responsible for your health and treatment!

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