

Laptop Computer Ergonomics



Picture Sources – The Root Stand



CSU Ergonomics Program
Office of Risk Management & Insurance
141 General Services Building
Fort Collins, CO 80523-6002
rmi.colostate.edu/ergonomics

Contents

1. [Ergonomic Tips for Using a Laptop Computer](#)
2. [Ideal Laptop Computer Positioning Examples](#)
3. [Ergonomics Program Resources](#)

***How you type on a laptop computer matters:
Tips partially adapted from Cornell University Ergonomics Web***

Correct computer posture is essential for health and comfort as well as working effectiveness.

Most people spend many hours every day at their computers, whether for work, school, emailing, surfing the internet, or gaming. There are also increasing numbers of laptop users, due to their easy portability and variety of accessible programs. With this explosion in computer usage has also come a significant increase in computer-related injuries not only in working adults but among children and teens. While laptops are designed less ergonomically than standard desk mounted computers, combining proper equipment placement, viewing angle, and typing height of your laptop with proper keyboard posture can significantly reduce muscular-skeletal strain in muscles and joints of shoulders, neck, back and arms.

Because the laptop computer screen and keyboard are connected as one unit, establishing a proper viewing and keyboarding position can be difficult. Incorrect set up creates the potential for developing any number of painful and inconvenient computer injuries that are often referred to as Repetitive Stress Injuries (RSI), Cumulative Trauma Disorders (CTD), and Computer Vision Syndrome (CVS).

In addition to posture and office set up, your work requirements and office environment may benefit by using ergonomic accessories such as a laptop desk, laptop stands, laptop drawer. Below are some useful tips for using your laptop:

Ergonomic Tips for Using a Laptop Computer

Text partially adapted from Cornell University Ergonomics Web, Professor Alan Hedge

Laptop computers, also known as notebooks, are not recommended for use as primary computers that are used for numerous hours every day. However, they have been adopted for just that purpose by thousands of people.

1. **Laptops are not designed ergonomically** - The design and construction of laptops violates a basic ergonomic requirement for computer usage, namely that the keyboard and screen can be positioned independently for appropriate viewing and typing. In the early days of personal computing, desktop devices also had the screen and keyboard integrated as a single unit, and this resulted in widespread complaints of musculoskeletal discomfort. By the late 1970s, several ergonomic design guidelines were written calling for the separation of screen and keyboard. The reasoning is simple. With a fixed design, if the keyboard is in an optimal position for the user, the screen is not, and if the screen is optimal the keyboard isn't going to be placed properly. Even contemporary laptop designs fail to satisfy this basic ergonomic positioning requirement, which means that users must pay special attention to how they use their laptop to avoid musculoskeletal disorders, headaches, fatigue, and similar complaints that result from non-ergonomic computer use.

2. **Laptop user type** - Are you an occasional user who works on your laptop for short periods of time or less than two hours per day? Are you a full-time user whose laptop functions as your main computer? Occasional users will have less risk of injury than full-time users, but all users should pay attention to how they use their laptop computers.

3. **Computer Posture** - As explained above, laptops violate basic ergonomic design requirements, so using a laptop will result in some tradeoff between either poor neck/head posture and poor hand/wrist posture.

Occasional users - Because the neck/head position is determined by the actions of large muscles, people who use their computers occasionally for short periods of time less than two hours can more easily compensate for neck posture than arm and wrist posture. Examples include:

- Find a comfortable, adjustable chair that allows you to recline very slightly.
- Angle the laptop screen so you can easily view the images with the least amount of neck deviation.

Full-time users - Many people use these portable computers as full-time workstations. If you use your laptop frequently and for periods of longer than two hours, as is typical in workplace settings where a notebook computer may be the employee's main computer, begin to sit in a correct computer posture consistently and utilize other ergonomic practices, including the following:



Picture Sources – PCD International

- Position the laptop on your desk/work surface directly in front of you.
- Set the unit's height and screen angle so the images can read easily without bending your neck. This may require that you elevate the laptop off the desk surface using a stable support surface, such as a computer monitor pedestal.
- If your desk height is satisfactory for your screen's placement, attach a separate, full-sized keyboard to your computer and use an external mouse rather than the touch pad, trackball, or small joystick incorporated into your keyboard. USB ports for connecting a keyboard and mouse are usually found in the rear or side of your computer. However, wireless devices have become increasingly popular.
- Change the settings on your laptop to enable function of the laptop while it is closed. This will help to avoid using the laptop as one of your primary screens, but still allows the laptop to be your primary computing device.
- Place the separate keyboard on a negative-tilt keyboard tray connected beneath your desk surface. This helps ensure a neutral wrist posture.
- The mouse can be placed on an adjustable mouse platform, if necessary.
- Shoulders should be in a relaxed position and arms at your side, with elbows at a 90° position when typing. (Arms should not be splayed wide or extended to reach and use the mouse)



Picture Sources – The Root Stand

- Sit in a comfortable, adjustable chair with lumbar support which allows you to sit in a slightly reclined position. This takes much of the weight off muscles and joints in the lower back.
- Take "microbreaks" every half hour or so (including moving your eyes off the screen image to rest on distant objects for several seconds), perform desk stretches (neck, shoulder, arm, and leg stretches) at your desk occasionally, and get up from your desk to move around or perform standing stretches every couple of hours.
- Follow the guidelines outlined in Ergo in Demand's ["Ergonomic Design for Your Computer Workstations"](#)

4. **Laptop dimensions** - Laptops are available with screens as large as 17". However, bigger is not always better. Consider your usage. The larger the screen, the more difficult it may be to use your laptop in mobile locations, such as airplanes or trains. On the other hand, if you enjoy DVDs, "wide screen" laptops are proportioned with screens of less height but wide viewing for DVD convenience. There are several smaller notebooks and ultra-portable laptops on the market that provide more compact portability and lighter weight. Consider issues of screen size and screen resolution, as well. A small screen (e.g., 12.1") will be useful in mobile settings, but if the resolution is high (e.g., XGA - 1024 x 768), make sure that you can read the screen characters and can easily use the input device to point to areas on the screen. The smaller the laptop, the smaller the keyboard, so make certain that you can comfortably type on a keyboard that may be only 75% the size of a typical laptop's keyboard.



Picture Sources – Amazon - 5 Cities

5. **Laptop weight** - People who travel frequently and use their laptops on the road must consider the weight of the system they will be carrying. By "system" we mean the weight of the laptop plus the required accessories (e.g., power supply, spare battery, external disk drive, printer, etc.). Many lightweight portables can become as heavy as larger laptops after you add all the components into your carrying bag. If your laptop and components weigh 10 lbs. or more, certainly consider using a pull-along laptop carry-on bag. If you prefer a smaller bag and can comfortably carry your laptop, select a bag that is well designed for that purpose and features a well-padded shoulder strap system.

Ideal Laptop Computer Positioning Examples

Example Workstation Setup: The images below illustrate good and bad laptop workstation setups. When setting up your workstation use these pictures as examples and guidelines to follow.



Picture Source – Humanscale Ergonomics

Keyboarding on Laptop Computers - How to Use a Laptop Keyboard Ergonomically

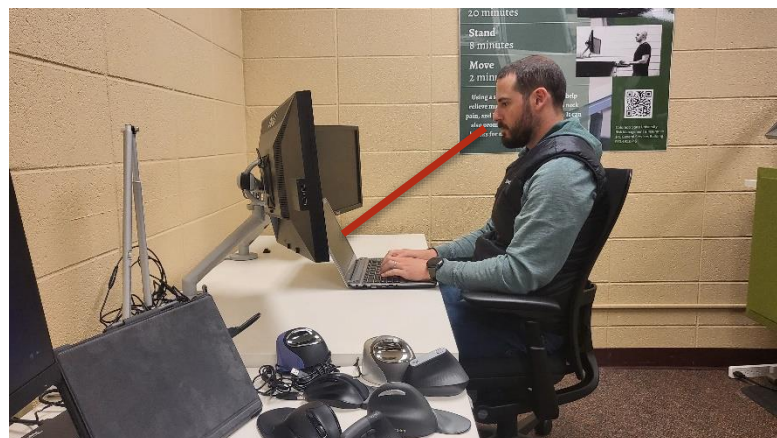
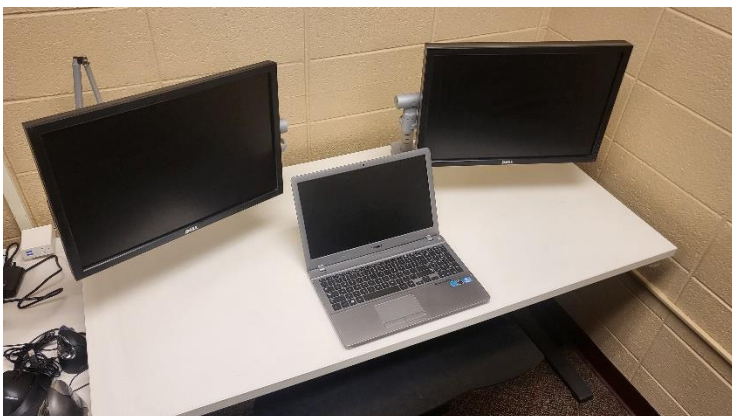
Maintain a neutral posture by using an adjustable laptop stand and a laptop wireless keyboard and mouse.

As the name suggests, laptop computers are designed for convenience, but care must be taken when keyboarding on laptop computers. Despite its name, these portable computers should not be positioned on your lap for two reasons: first, this positioning will result in poor keyboarding posture that can result in neck, shoulder, back pain, or headaches; second, the extreme heat given off by these units has been shown to cause some internal damage when placed on laps for regular periods of time. Maintaining a "neutral posture" is preferable, and tips are included below to help you.

Position your laptop keyboard on a stable laptop stand at an ergonomic height. Laptops or notebooks are not designed ergonomically. The fact that the screen and keyboard areas are connected means that proper monitor height and keyboarding hand positions cannot be set independently. There are solutions and suggestions which those who use notebooks for more than a couple of hours every day will find particularly useful. Adding a full-size plug-in or wireless laptop keyboard and mouse, for example, will allow you to position the keyboard more comfortably, such as on a separate keyboard tray while your notebook remains on the desk surface.

Ergonomic positioning of notebook computers. Keeping your body in "neutral posture" means keeping your body's joints in a mid-range of motion while working at your computer workstation. When your arms are relaxed at your sides and not reaching, they are in neutral posture. Wrists that are kept straight and not bent down, up, or to either side, are also in neutral posture. Keeping all this in mind, let's look more closely at how to establish the most ergonomic position while working on your laptop.

- Maintain a comfortable viewing distance from the screen.
- Tilt the screen at an angle for easy viewing so you are not stretching or compacting your neck to view the screen.
- Keep glare off screen to avoid eye strain.
- Keep laptop keyboards at a height and angle that maintains your shoulders, arms, and wrist in neutral position.
- Optionally, place a separate, full-sized keyboard on an adjustable height, negative tilt keyboard tray so your shoulders can relax and arms rest easily at your side.
- Position laptop keyboards directly in front and close to you to avoid excessive extended reaching.
- Your mouse (one that is independent of the laptop) should be placed adjacent to the keyboard and at the same height. Avoid extended and elevated reaching for either the keyboard or mouse. Keep the back of your wrist flat in a neutral position.
- If you have a separate keyboard connected to your laptop, place it on a "negative tilt" keyboard tray (angled slightly back) to help keep wrists straight while typing.
- Recently, there has been a growing trend of workers using a laptop as their primary keyboard and mousing device, while also using two larger standard monitors on either side of the laptop. Examples of this setup are pictured below:



Placing the laptop on the desk surface forces the user to look down, and place the neck in flexion, more frequently. Neck flexion is a primary ergonomic risk factor for neck pain and discomfort.

As mentioned previously, using a laptop with the above setup as a full-time user will result in awkward postures and body positions that can increase the risk of musculoskeletal discomfort and, potentially, musculoskeletal injuries (MSD's). Additionally, using 2 (or even 3) monitors creates awkward postures and repetitive motion of the head and neck, as you will need to move your head and neck frequently to view these monitors. **This setup is not recommended for full-time laptop use and should be avoided.**

Shown below are examples of the recommended setup if you choose to use a laptop in addition to standard monitors as part of your workstation:



Ergonomics Program Resources

- [CSU Ergonomics Program Home Webpage](#)
- [Ergonomic Evaluation Request](#)
- [Ergo Lab & Equipment Trials](#)
- [Ergonomics Matching Funds Program](#)
- [Laptop, Tablet and Smartphone Ergonomics](#)

Contact Information

FRANK GONZALES, CPE, CIE
ERGONOMICS ADMINISTRATOR

Tel 970-491-2724

Fax 970-491-4804

Frank.Gonzales@colostate.edu

Last updated 5/20/2024.

Subject to change without notice.