Laptop Computer Ergonomics

Picture Sources – The Root Stand

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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 of 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.

Tips for making your laptop workstations ergonomic.

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 of numerous painful and inconvenient computer injuries that are generally referred to by titles of 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. Very useful tips for using your laptop follow. There are also adjustable laptop computer arms that can be clamped to your wall, pole, or a desk.

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 very 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 a number of 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 isn't, 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 in order to avoid muscular-skeletal disorders, headaches, fatigue, and similar complaints that result from non-ergonomic computer use.

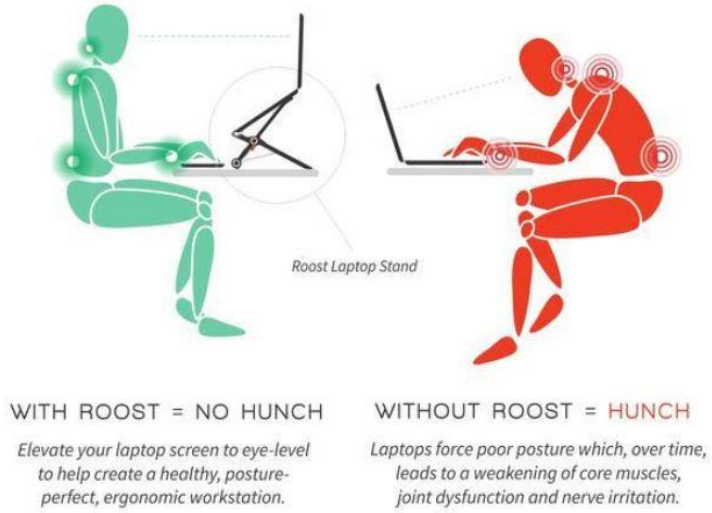
2. **Laptop user type** - Are you an occasional user who works on your laptop for short periods of time or less than two hours per day? Are you a full-time user whose laptop functions as your main computer? Occasional users will have less risk of injury than full-time users, but all users should pay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

3. **Computer Posture** - As explained above, laptops violate basic ergonomic design requirements, so using a laptop results 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 fulltime laptop 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 be easily read 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 independent mouse rather than the touch pad, trackball, or small joystick incorporated into your keyboard. Connecting ports for a keyboard and mouse can usually be found in the rear or side of your computer. However, wireless devices have become increasingly popular.
   - 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 position mouse platform.
   - 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 at a slightly reclined position. This takes much weight off muscles and joints in the low 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"

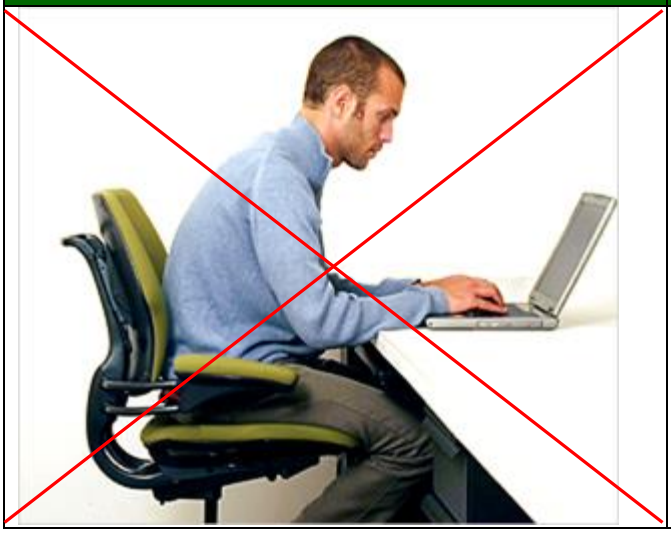
4. **Laptop dimensions** - Laptops are available with screens as large as 17". However, bigger is not always better. Consider your likely usage. The larger the screen the more difficult it may be to use your laptop in mobile locations, such as airplanes or trains. On the other hand, if you enjoy DVDs, "wide screen" laptops are also be proportioned with screens of less height but wide viewing for DVD convenience. There are a number of 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'll 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 image bellow illustrates good and bad laptop workstation setups. When setting up your workstation use these pictures as examples and guidelines to follow.

Picture 1	Picture 2
	

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 hours every day will find very useful and comfortable. 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) in order to help keep wrists straight while typing.

Ergonomics Program Resources

- CSU Ergonomics Program Home Webpage
- Ergonomic Evaluation Request
- Ergo Lab & Equipment Trials
- Ergonomics Matching Funds Program

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