

The Trouble with Mice

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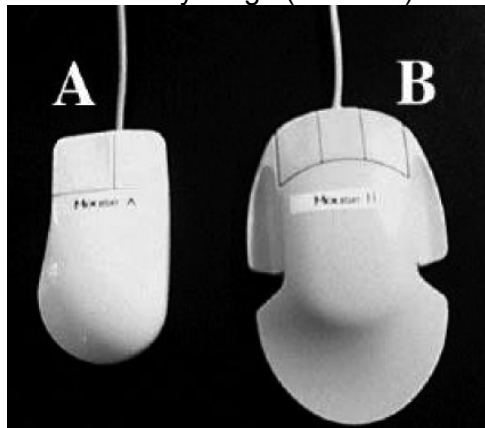


The mouse is one of the most frequent things computer users blame when they experience hand or wrist pain. Is the mouse really to blame for so many problems? The answer is both “yes” and “no”. Studies have looked at several different aspects of mouse design and, although this has a significant impact on how people position their hands and wrists, there are many other factors that are extremely important also, such as mouse height, distance from the keyboard, and individual mousing habits.

Wrong mouse

The standard-issue mouse may not be right for your hand or your computing activities. One-size-fits-all is not at all true for input devices.

Unfortunately, people may not be good judges of what mouse is best for their hands and wrists. A small study conducted at Cornell University found that subjects vastly preferred a mouse that resulted in significantly more stressful and risky hand and wrist positions.¹ In addition, the speed at which the required mousing task was performed (clicking on a list of radio buttons) was significantly slower with the mouse that was a healthier choice. Over time, practice might result in speedier use. The two mice studied were the Whale Mouse (B, shown below) and a Microsoft mouse (A below) designed to reduce ulnar (side-to-side) wrist deviation. The Whale Mouse can be adjusted in length to fit the users' hand length and is generally larger so the user is less likely to extend the wrist (deviation of the hand upward from a level position). Men were significantly more likely to exhibit wrist extension in a risky range (over 20°) than women with either mouse.



Research on the 3M Ergonomic Mouse significantly reduced pain in neck, shoulder, forearm, wrist, and hand for a period of up to 3 years of use in people experiencing pain.² The



conclusion was that using the hand in a more neutral position reduces strain associated with hand and wrist rotation required with a mouse on the flat surface. We extrapolate that other mice designed to reduce wrist rotation would have similar reduction in strain and resulting pain such as the Evoluent Vertical Mouse. We do have some questions about the required rotation between using the vertically oriented input devices and the horizontally oriented keyboard, however. Does rotation back and forth between these orientations cause more irritation to the muscles and tendons than keeping the hand pronated all the time in the horizontal position? The above research appears to dispel this concern somewhat, but we look forward to more research on the topic.

We would suggest that people experiencing issues with their forearm switch to a vertically oriented input device as well as a keyboard such as the Goldtouch which allows tenting to a more vertical orientation to minimize the constant rotation of the arm.



Finally, there appears to possibly be an interaction effect between mouse style and placement. A small pilot study of six subjects found that mouse placement on a raised mouse surface that covers the keyboard and brings the mouse closer to the body resulted in lower muscle activity in the deltoid and trapezius muscles, but also led to the most ulnar deviation (lateral angle of the wrist) of any conditions.³ The first observation is desirable, while the second is definitely not. The researchers decided upon observing the subjects in action, that the mouse style used was to blame, causing the ulnar deviation because it required orientation of the mouse to a certain angle that required the deviation when the hand was closer to the body.

Since people appear to be poor judges of mice that are correct for them, it's probably best to enlist the assistance of an ergonomist to watch you while you use the mouse and decide what works best with your workstation setup. If you do not have access to an ergonomist, ask a friend to review the guidelines for selecting and using a mouse, then have them watch as you use your mouse to determine if the mouse fits your hand correctly and if your wrist is positioned correctly while you are working. Guidelines are given on our mouse Products webpage (<http://working-well.org/pmice.html>) and our Mouse Tips webpage (http://working-well.org/mouse_tips.html).

Overuse

Overusing the mouse is a known source of problems for computer users. Even if you have a mouse (or other input device) that works properly and fits your hand, and you use it correctly, you are still at risk for experiencing symptoms associated with chronic muscle fatigue. When left untreated, the achy, tender, tight muscles become very painful.

What does it mean to “overuse” the mouse? Basically, it means that your hand is on the mouse a large part of the time, either resting on it or hovering over it while reading, reaching for the mouse every time you need to click a link or scroll a page, using the mouse to select choices on forms rather than using keyboard options available. Using a break reminder and learning some keyboard shortcuts are two ways you can reduce your mouse use and associated risk for injury.

Mouse-reducing software

There are several break reminder programs you can download and set to operate in the background on your computer. We describe these and provide links to them on our Breaktimer webpage (<http://working-well.org/pbreaktmr.html>). One mouse-reducing software package is RSI Guard which has an “auto click” feature, otherwise known as a dwell. The software automatically clicks wherever you have moved the cursor so that you do not have to do any button-clicking yourself. The user can set the delay time before the click occurs. RSI Guard also has a break reminder program. The software can be downloaded from www.RSIguard.com. Try it out for 45 days at no cost! It’s \$40 to purchase. It has a break reminder, autoclick features, animated stretch exercises, forget-me-not tips, and Key Control which allows you to program single keys to perform frequent operations. This software is available for Windows or MAC.

Shortcuts

Almost everyone uses the mouse far too much. In most all cases, there are keyboard shortcuts which can be used instead of grabbing the mouse for every single input. Back to the good ol’ days before the mouse, everything was done with keyboard commands. The life of ergonomists was much happier because we didn’t have to minister to people with mousing injuries. We invite you to go to our webpage devoted to Keyboard Shortcuts to learn some commonly-used keyboard commands:

http://working-well.org/keyboard_shortcuts.html

Frequently used Firefox keyboard shortcuts can be found at:

<http://support.mozilla.com/en-US/kb/Keyboard+shortcuts>

It is actually much faster to use keyboard shortcuts than to stop typing, grab the mouse, and click. And you will reduce the wear and tear on your hand resulting from overuse of the mouse. Try to learn two or three shortcuts a week for your most frequently-used operations. Pretty soon you’ll be amazed at how easy they are and how much faster you can perform these tasks!

Firefox “type and find” tool

If you use the Firefox browser, the “type and find” tool is very handy. You can type an apostrophe before the letters to links on the page and it will find and highlight the links containing that letter for you. As you type more letters, it will narrow the search. When it gets to the link you want, you can simply hit “Return” and the link will be activated. For instance, if you want to go to the link labeled “next”, you could type ‘x. You could also type any letter in the word, but since there are probably few “x’s” on the web page, you are likely find the desired link more quickly using ‘x than if you were to type ‘n. If you type ‘n, it will go through every instance of “n” on the web page. Press F3 to find the next occurrence of the string you type. Press Shift + F3 to find the previous occurrence of the string you type. Use Backspace to delete the last character you typed. Press ESC to cancel a search.

Mouse location or height

If you are experiencing problems, your mousing surface may be the wrong. Even well-designed equipment will be problematic if it is not installed and used properly. If the mouse is too high or too low, you will experience back pain and shoulder tension, as well as forearm and hand strain. To determine the correct height for your keyboard and mouse, refer to our webpage: http://working-well.org/wkstn_design.html. Your keyboard should be no higher than your elbow (unless you need to look at the keys to type) and

the mouse surface should never be lower or significantly higher than the keyboard. Your wrists should remain flat while using the mouse.

If your keyboard surface is not adjustable and it is too high, or if your elbows are the same height as your thighs, you will need to install a keyboard tray. You can see these products on our worksurface products webpage: <http://working-well.org/pwksfc.html>

If the mouse is too high, your elbow has to bend sharply when your hand is on the mouse, causing compression of the ulnar nerve and reduced circulation in your elbow. In addition, your wrist is likely to contact the edge of the surface. When your wrist is resting on the edge of a hard surface, you are restricting necessary circulation, causing forearm tension, and putting pressure on the tendons and nerves running through your wrist to your fingers. You might experience tingling and numbness in your fingers as a result.

Be sure to keep the mouse as close as possible to the side of your keyboard to avoid reaching and the resulting incorrect elbow and wrist position. Research has shown that when the mouse is adjacent to the keyboard and the keyboard has no numeric keypad (for right-handed users), there is significantly less electromyographic activity in the deltoid.^{3,4} One study found no greater muscle activity in the trapezius.⁴ The other study, which used a raised mouse pad that rotated over the numeric keypad on a negative tilt keyboard tray, did find that reaching out farther to the side resulted in greater activity of the trapezius.³ Both studies lead to the conclusion that there is less tension in the muscle at the top of your shoulder and upper back when the mouse is placed closer to the keyboard. Differences in the trapezius activity could be attributable to differences in the equipment used and setup.

Another review of computer users found that although there did not appear to be a relationship between the number of hours of mouse use per day and symptoms, there was a relationship between arm abduction (rotating outward) and symptoms in the neck.⁵ These findings support the observation that mouse use results in more symptoms in the mousing side of the body and upper extremities.

People are sometimes amazed at how a fairly minor adjustment in any of these workstation variables can eliminate muscle tension and soreness in a matter of hours or days, if not immediately. Conversely, improper placement can cause real problems and by simply not being aware of the guidelines, pain and agony can build over time.

Habits

Like other computer users, you have most likely developed bad habits concerning mouse use. The most important habit to break is dropping your wrist on the work surface or wrist rest when using the mouse. Four problems occur when you plant your wrist (even on a soft wristrest!) and move the mouse:

- 1) You overuse your forearms
- 2) ...which causes the muscles to shorten
- 3) ...which restricts the circulation to your hand and forearm
- 4) ..., which ultimately leads to nerve compression.

Resting your wrist on **any** surface can cause aching in your wrist, the under side of your forearm, tingling or numbness in your fingers and loss of grip. When your wrist is bent, it is not in a neutral position. The muscles and tendons on the upper side of your forearm

are in a contracted state, so by the end of the day you probably are experiencing severe fatigue in this area (the beginning of Repetitive Strain Injury).

One small pilot study of six subjects found that one of the most significant effects of all variations of keyboard and mouse height was actually subject variability.³ This indicates that people have very different styles of using the keyboard and mouse. Interpreting such a small subject pool was difficult, but it appeared that there were two styles of mousing. People rested their wrists and made small movements with their wrists and hands, or they didn't rest their wrists or arms and moved the mouse by making larger upper arm motions. Another finding was that higher platforms, such as desktops or raised mouse pads appear to encourage people to rest their arms more than lower surfaces such as conventional keyboard trays.

Having your mouse at the right height is important, but equally important is your awareness of what you are doing that can be adding to your body's stress. When you are using a mouse or trackball, do not plant your wrist on anything. Be certain your wrist is in the neutral position (knuckles even with, and fingertips lower than, your wrist).

When you pause to think, refer to documents, or wait for the computer to respond, be aware of what you are doing with your hands. If possible, drop your hands in your lap and let them relax, but at least do not keep your arm reaching to the side with your hand on the mouse.

Wristrests.

Does a wristrest help? It is far better to move the keyboard and mouse right to near edge of the table and very close to your body so there is no space to rest your wrists at all. You are forced to relax your hands in your lap when not typing/mousing and forced to move the mouse with your entire arm. If this is not possible for some reason, or you cannot learn to break the habit of dropping your wrists when you are resting, there are a few wristrests which are soft enough not to cause serious compression of the nerves and limit blood supply in the wrist. You can see our recommendations on our wristrest webpage: <http://working-well.org/pwristrst.html>. If you have an old wristrest that is made of firm (or petrified) foam, please throw it out. Wristrests made of soft gel or beanbag materials are recommended if you must use a wristrest.

Good circulation is of highest importance in the prevention and treatment of injuries. Regular exercise is recommended. Stand up, stretch, take a break, or take a little walk down the hall every ½ hour.

References:

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Mouse rules:

<http://ergo.human.cornell.edu/cumousetips.html>