University Health Services

uhs.princeton.edu/health-resources/ergonomics-computer-use

Setting Up a Comfortable, Healthy Workstation

Most Princeton students use laptops perched on the basic, institutional desks found in all dorm rooms. Many continue to use the simple wooden chairs as well. Typically, there's nothing wrong with using a basic workstation, but when you spend most of your waking hours sitting at that desk, you may want to consider making it a more comfortable space, for short-term and long-term health. If you have pain or fatigue in your hands, wrists, arms, shoulders, upper back or neck it may be related to using a computer. Perhaps you cannot afford to significantly change the work area in your room, but you can probably make small adjustments to promote comfort. Additionally, there are computers all over campus. Surely you can find a place where you can work comfortably.

Without proper computer set-up and use, there are many injuries that may result. Tendonitis is the most common problem, involving tendon inflammation and localized pain in the elbow, forearm, wrist or hand. Bad posture can cause fatigue, muscle strain, and, in later stages, pain. Back pain, one of the most common complaints of older men and women, is usually the result of years of faulty posture. In addition, poor posture can affect the position and function of your vital organs, particularly those in the abdominal region. Stand up straight to promote health and good appearance. You will exude confidence and dignity as you hold your back up straight using abdomen and back muscles.

Keyboard and Mouse Position

When positioning your keyboard and mouse, you should keep in mind that you want to reduce unnecessary strain in your fingers, wrists, arms, and shoulders, keeping them in as neutral and relaxing a position as possible. While you're typing, your wrists should not be resting, but held up in line with the backs of your hands. This reduces strain to your wrist that may result from holding it at an unnatural angle, and allows you to move your arms to reach the keys, rather than stretching your fingers to reach them. Use a foam pad or towel in front of your keyboard to rest your wrists and forearms while you're not typing. Because you want your arms free to move your hands around the keyboard while typing, you should only use armrests on your chair when you're not typing. Holding your wrists up is not very tiring because most people are not actually typing continuously for long periods, so you'll have plenty of time to rest your arms while you think about what to type next.

Your fingers should be in a straight line with your forearm. This is made easier by tilting the back edge of the keyboard down (the reverse of typical keyboard tilts). The keyboard should ideally be just above your lap so your elbows are bent at least 90°. If you can't move your keyboard, try adjusting the height of your chair, though this may cause problems if you can't adjust your monitor accordingly. If your wrists ache or tire, look into buying an ergonomic keyboard that angles out from the center, making it easier for you to keep your hand and forearm in a straight line. Aching and strain caused by typing may be reduced by typing more gently – avoid banging the keys.

Hold the mouse lightly, don't grip hard or squeeze it, and position it close to the keyboard so you don't have to reach. If you're troubled by pain in your wrist and forearm, use an ergonomic mouse that's moved with a finger instead of the wrist. Keep your arms and hands warm – cold muscles and tendons are at greater risk of injury.

Monitor Position

Your monitor should be slightly below eye level and straight ahead, not to one side. It should be about arm's length away from your face so you can easily read the screen, not leaning your head forward, which puts strain on your neck. To protect your eyes, reduce the glare from the monitor's screen by turning off overhead lights or closing the window blind. Glare screens are also available.

Chair Position

The position of your chair is important to help you maintain good posture. Good posture involves keeping your bones and muscles in line, which promotes efficiency, endurance, and an overall feeling of well-being. If you slouch, your bones are not properly aligned, and your muscles, joints, and ligaments take more strain than they were meant for.

Your chair should support your back in an upright and relaxed arch position. If the back of your chair doesn't provide enough support, try putting a rolled towel or cushion between the small of your back and the chair. The height of the chair should allow you to have your feet resting firmly on the ground, with your thighs roughly parallel to the floor. If your chair is too high, use a footrest to keep your knees and hips level.

To make sure your posture is correct, sit with a neutral spine position, with your hips at about 90°. If your back is straight, supported by back and abdomen muscles, you can relax your shoulders without slouching.

Desk Stretching Exercise Videos

Prolonged periods of sitting at a desk, combined with long commutes, can cause loss of flexibility in the muscles in your legs, hips, back, shoulders and neck. The downloads on this page are designed to help increase your flexibility and combat the stress of everyday life. Select the muscle group you wish to address and follow along with your on-line stretching coach. To prevent injury while sitting at your desk, try these desk-streches throughout your day.

Protecting Your Neck and Back

When you're not at your computer, there are important steps you can take to prevent back and neck pain. When picking up heavy objects from the floor, bend at your knees, not your back, so your legs do the lifting, and carry objects close to your body at about waist level. Carrying a heavy bag with one hand or over one shoulder will strain the muscles that are responsible for keeping your spine in line. In order to avoid this, use a backpack to distribute weight evenly over both shoulders and use suitcases with wheels when traveling.

Avoid wearing high heels or platform shoes for extended periods because they distort the shape of the foot, throwing the back's natural curves out of line. If you suffer lower back

pain, lie on your back and bend your knees, which should take the pressure off your lower back.
Awkward sleeping positions can lead to a sore neck and back. Make sure your pillow is not too big or too small, but maintains the natural curve of the neck. A bed that doesn't offer enough support can also be a source of neck discomfort. You should sleep on your side with your knees slightly bent because lying on your back tends to overarch your lower back, and lying on your stomach strains the neck. Doing stretching exercises before bed and first thing in the morning will help loosen you up and relieve tense muscles.[top]

Repetitive Strain Injury (RSI)

Repetitive Strain Injury results from forceful, awkward, and/or repetitive use of your limbs, producing damaged muscles, tendons, and nerves. The severity of RSI cases varies widely. Tendonitis is the most common example of RSI, while carpal tunnel syndrome is a more rare and serious disorder. RSI occurs frequently among computer users, musicians, lab workers, and other people with occupations requiring repetitive movements.

Although RSI is a broad term that encompasses several disorders, general symptoms include tingling or loss of sensation in fingers, inability to grasp objects between thumb and fingers, decrease in the size of hand muscles, and pain in the wrist, elbow, shoulder, or neck. If you're suffering from these symptoms, get immediate medical attention to increase the chances of quick and total recovery. Discontinue the activities that cause you pain. If using a computer is painful, but necessary, try to vary your work activities so you're not using the keyboard and mouse for long periods of time. You can make adjustments to your workstation to make yourself more comfortable (see above section).

In order to prevent RSI, adjust your desk and computer area to promote good posture. Remember that the human body is not made to sit still for long periods of time, so get up and move around as much as you can. This may involve taking 30-60 second breaks every ten minutes or so, and getting up to walk around and stretch your muscles every hour. You can also vary your motions by changing tasks. Type for a while, then read, take notes by hand, or organize papers. Stretching your wrists, shoulders, and neck will help reduce muscle tension. Roll your shoulders, rotate your head from one side to the other, massage your shoulders, and stretch your wrists by pulling the fingers back toward the wrist. When you're typing, be sure not to bang on the keyboard, and avoid lazy wrists. Using a brace or taking pain relievers doesn't deal with the primary cause of RSI and may lead to further injury.

Carpal Tunnel Syndrome

Carpal tunnel syndrome (CTS) and thoracic outlet syndrome are two of the most disabling repetitive strain injuries. These conditions are disorders of the tendons, nerves, arteries, or veins occurring at the wrist and upper arm, respectively. In CTS, repeated bending or use of the wrist and fingers results in the compression of the median nerve (runs along the palm side of the wrist) causing intermittent numbness, tingling, and pain in the side of the hand including the thumb through the inside of the ring finger. The hand's communication with the brain is disrupted and the fingers have difficulty sensing temperature and gripping objects. Victims may also notice swelling of the hand and forearm. Pain and numbness in

the fingers not only occur while typing, but also at night. The advanced stage is characterized by decreased muscle bulk in the thumb area and decreased sensation. If untreated, these symptoms can become chronic and permanently disabling, and may cause a change in one's lifestyle and career.

RSI Treatment

No matter how much you want symptoms to disappear quickly, treatment and healing cannot be rushed. Generally, the long process of treating RSI should be inspiration enough to prevent misuse or overuse. Rest is a key treatment, the duration of which correlates directly with the severity of the injury. Other interventions can include ergonomic adjustment, stretching, muscle strengthening, postural retraining and other physical therapy modalities. Surgery is rarely necessary and it may not always bring complete relief. Keep in mind that severity of symptoms, diagnoses, and treatments vary from person to person. Splints, fancy and ergonomic keyboards, and wrist pads for computers are not the solution for RSI, although they may help if used properly. The best approach is to be aware of your own work habits, reasons for using a computer, symptoms of overuse, and ways to adjust your work area.

Physical therapy is available free of charge to students who have a referral from a University Health Services (UHS) physician. To make an appointment with UHS, call (609) 258-5357.

RSI-producing behaviors and how to correct them

Behavior: Excessive bend or extension of the wrists.
Correction: Wrists in a neutral position not resting on anything, unless one is not actively typing. Fingers in a straight line with the forearm, and the back edge of the keyboard tilted down.

Behavior: Hunched or slouching posture.
Correction: Comfortable vertical torso with a chair supporting the lower back.

Behavior: Sitting too far from the screen due to a document on one's lap.
Correction: A document holder adjacent to the monitor, sitting 20-24" away from the screen, and at 5-15 degrees below the horizontal line of sight.

Behavior: Excessive bend or extension of the elbow.
Correction: Elbows positioned at a 90-degree angle by adjusting the chair and keyboard position.

Behavior: Two-finger typing or punching the keys.
Correction: Soft touch-typing with proper technique.

Behavior: Squeezing the mouse.
Correction: Lightly grasp the mouse and use two hands to perform key operations when possible. [top]

Computers and Eye Strain

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Carpal tunnel syndrome is probably the most widely known repetitive strain injury (RSI), but eyestrain is the most common. If uncorrected, eyestrain can lead to general fatigue, increased myopia (nearsightedness), and a decrease in overall efficiency. Everyone is at risk for eyestrain, especially those who work at a computer for more than three hours a day.

What are the symptoms of eyestrain?

Eyestrain usually results in a combination of any of the following symptoms:

- headache
- dry eyes, "gritty" feeling in the eyes
- blurred vision
- eye fatigue
- changes in color perception

In addition, while attempting to view the screen more clearly users tend to hold their heads in unnatural positions, which contributes to neck and shoulder pain. When any of these symptoms appear they inevitably lead to decreased visual efficiency and an increase in typing errors.

What causes eyestrain?

Eyestrain is primarily a result of overworking the muscles of the eyes. This can happen in four ways. The first is simply a result of human evolution: our eyes have evolved to see at a distance in a three-dimensional world, but a monitor presents the user with a close-up, two-dimensional environment. As a result, after hours in front of the computer, the eye focusing point extends beyond the screen and out to a resting point of accommodation. This causes the user to exert extra effort to keep the eyes focused on the screen.

Glare is another common factor in eye muscle fatigue. Like a TV screen, if there is a glare on the monitor the eyes have to work harder to discern an image on the screen.

Thirdly is the position of the monitor. In their natural resting position the eyes accommodate a field of vision straight ahead and slightly down. If the monitor doesn't fall in that field of vision, muscles must continually work to hold the eyes differently.

The final way to overwork the muscles of the eye is to use rapid, repetitive movements such as darting your eyes between a source document and the screen.

Aside from eye muscle fatigue, the eyeball itself can become irritated, contributing to eyestrain. Studies have shown that while staring at a monitor, users "forget" to blink which deprives the eye of needed moisture. This is exacerbated by the dry, hot air most monitors and computer CPUs generate and disperse into the environment. Another source of irritation is dust. Most monitors create an electrostatic field that propels particles toward the user and into the eyes. All of these things create a hostile environment for the eyes.

How can I protect my eyes?

There are several things you can do to create a more eye-friendly environment around the

computer. The easiest thing to do is reposition the monitor. It should be squarely in front of you at a distance of 18 to 30 inches with the top of the monitor (not the screen) level with your eyes. Positioning the monitor in such a way will allow your eyes to remain in a natural position (straight ahead and slightly down) and you will be far enough away so that particles propelled from the screen's electrostatic field will not reach your eyes.

To cut down on particle emission wipe down the screen daily with anti-static spray. If you have to read a source document while typing, use a document holder and position it right next to the monitor at the same height.

Although a document should be in a well-lighted area for optimal reading, a monitor should not. Screen glare is caused by both natural and artificial lighting reflecting off the screen surface. For maximum glare reduction, nearby windows should be covered with blinds (vertical are the best), furniture and countertops near the monitor should have non-reflective surfaces, and walls should be soft-colored and matte-finished.

Though most offices are illuminated with harsh fluorescent lighting, this is unsuitable for computer users because it creates a lot of overhead glare and harsh shadows. Ideally, a monitor should be in a softly lit, dim area. If this is not possible, the monitor should be positioned between rows of overhead lights instead of directly underneath them, and a light diffuser should be used. If the sources of glare cannot be eliminated, it might be necessary to buy a hood or a glare guard for the monitor. Glare guards, however, should be considered a last resort because many of them reduce glare at the cost of screen clarity.

The monitor itself can contribute to eyestrain. If the monitor flickers, distorts images, or is set to the incorrect brightness, contrast, or color levels, the eyes will have to work harder. It is recommended that the monitor be professionally serviced when any of these problems arise. There are even software packages available that will run diagnostic tests on your monitor.

No matter what type of environment you work in there are some steps you can take which will go a long way toward reducing eyestrain. The first is to blink. That sounds elementary, but since it is an involuntary action most computer users don't notice that they blink much less in front of the screen. Another helpful idea is to rest your eyes at least every two hours by taking a break, doing a simple exercise or doing a non-computer related task. Even your diet can help cut down on eyestrain! The natural oils in certain fish and potassium-rich foods like bananas and potatoes will help keep your eyes well lubricated.