

Orthopaedic Observations

A Matter of Medicine...

TM Pending

Ergonomics at the Keyboard

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Computers have become commonplace in our day-to-day lives, not only in the workplace, but also in our home life. It seems we are always “connected” with the others whether by Email, texting, or blogging, using our desktop/laptop computers or handheld devices such as cell phones or personal digital assistants (PDA). Excessive use of these input devices can lead to a multitude of overuse problems such as cervical spine issues, carpal tunnel syndrome (CTS), or lateral epicondylitis (tennis elbow), just to name a few. These conditions fall under the generalized category of repetitive strain injuries (RSI) and can occur or be aggravated as a result of exposure to the following factors:

- Repetitive use - excessive use without rest periods.
- Forceful use - straining area by using overly forceful muscular contractions.
- Awkward or sustained postures - utilizing the upper extremity joints in extreme positions for prolonged periods of time.
- Contact stress - placing acute pressure over specific anatomical regions.

When treating patients with these conditions, therapists spend a great deal of time educating patients regarding activity modification. Ergonomics at the keyboard is one of the areas we address during our patient education session. Making physical changes to the workstation as well as modifying input technique can help lessen the potentially harmful factors mentioned above.

The following are key areas to consider when creating the optimal workstation setup: refer to the below diagram from Cornell University Ergonomics Website at www.ergo.human.cornell.edu



1. **Chair** - One of the most important factors to keep in mind when selecting a chair is adjustability. This adjustability should include seat height, lumbar support, and arm rest height to name a few. A chair that includes a low back support can help maintain the normal curvature in the lower spine that in turn promotes improved alignment of the upper quadrant (neck and arms). The seat back should be in a slightly relaxed position.
2. **Cervical Spine** - Be sure to keep your neck region in an upright position - with your ear in alignment with your shoulder. Avoid the “forward head position” which can lead to neck strain posteriorly. Shoulder blades should remain in a retracted position (squeezed back together).
3. **Monitor height** - Keeping the monitor at eye level helps maintain the desired upright spinal posture preventing the neck from dropping into a potentially harmful prolonged flexed position.
4. **Monitor distance** - Optimally position the monitor at an arms length away to prevent eye strain. If it is too far away, there is a tendency to push the neck forward to be able to view the screen, which can be problematic as mentioned previously.
5. **Foot position** - Ideally both feet should be able to comfortably touch the floor. If they are unable to make contact with the floor, consider the use of a footrest to position the knee and hip joints in a relatively open posture. Avoid sitting on a bent leg or resting feet on legs of chair; these positions can impede circulation in the lower extremities.
6. **Document holder** - If part of the work at the computer is inputting from a separate hard document, consider attaching a holder to the side of the monitor to prevent unnecessary repetitive and twisting neck motions.
7. **Wrists** - The wrists should be held in a neutral alignment - avoiding the extreme flexed (down) or extended (back) position. Avoid leaning on wrist rests (which are actually there for rest periods - NOT while typing!). This direct contact pressure over the carpal tunnel is a test for carpal tunnel syndrome! Also, using the wrist rests can change the way you type, causing undue repetitive use of the wrist and finger muscles.

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8. **Elbows** - Do not lean elbows and forearms on chair's armrests while typing - pressure is not healthy for the nerves and blood supply in this region. Similarly to wrist rests distally, using armrests can alter the mechanics of typing, causing overuse of the wrist and finger muscles. Ideally, the elbows should be relaxed at your side (not abducted away from your body) and typing should arise from the shoulder region.
9. **Monitor and Keyboard position** - Be mindful to place the monitor and keyboard directly in front of you if possible. This will prevent rotational strain in the cervical region. When using laptops, consider an external keyboard and position the laptop itself as you would for a traditional desktop monitor - at eye level directly in front of you.
10. **Keyboard** - An adjustable keyboard tray is the key to providing the ideal joint positions for the entire upper extremity. If the keyboard is too high, there is a tendency to bend the elbow too much and use extreme wrist positions while typing. These positions put you at risk for developing nerve compression issues or tendonitis. Preferably, keep the keyboard in a relatively low, negatively tilted (reclined downward) position (positioned nearly in your lap in most cases.) This allows for the relatively open elbow position and neutral wrist alignment. For a low cost quick fix, try using a lap desk with the keyboard placed on top. In regards to the actual mechanics of typing, remember to type with the least amount of force possible to conserve muscle power and minimize excessive pressure on the fingertips.
11. **Mouse** - Most importantly, remember to position the mouse at the same level as the keyboard on the adjustable tray. This prevents the need for awkwardly overreaching forward with your arm to operate the mouse if it remains on the desk itself. Prolonged use in this sustained forward posture can lead to shoulder/elbow problems. If possible, utilize an optical, wireless mouse that allows for more freedom in positioning and use compared to some of the older, wired models. Choose a mouse size/design that is comfortable for your unique hand. If you have a thumb problem, perhaps using one with a scroll operated via the index finger might be a good choice or vice versa. Also, set the programmable buttons to minimize the clicking required for the software you use the most often.
12. **Miscellaneous** - To minimize the repetitious nature of using a computer, take frequent breaks. This allows your muscles and nerves to recover from the repetitive activity and get refreshed for the next session of use.

Patients should appreciate that just because a workstation is generally deemed "ergonomic" does not necessarily mean that it is right for their body. There are many so called "ergonomic" products on the market - just Google the word and see how many hits you get! But buyer beware, there are many unsubstantiated claims out there, be cautious with what you buy. Just keep in mind that not all ergonomic workstations fit everyone's body - our individual size, shape, and pre-existing conditions need to be taken into account to create a truly healthy set-up. The key to successful ergonomic intervention is looking at each situation and patient individually. As therapists with knowledge regarding your specific diagnosis, we can facilitate this process of modifying an existing workstation to suit your particular needs. We will take into account the existing set-up and make recommendations to create an optimal work environment. Commonly, solutions can be simple with little to no cost involved. Your therapist can work with you to establish a healthy set-up both at work and home - just ask!

Noelle is a graduate of the Quinnipiac University who obtained her Master's degree at the University of Connecticut with a special focus on Allied Health Education. She has been in the art and science of splinting for over 12 years. She owns CJ Education and Consulting, LLC which is dedicated to providing quality clinical education for therapists around the country. Noelle is co-author and co-editor of the book; Splinting the Hand and Upper Extremity: Principles and Process published by Lippincott, Williams and Wilkins, 2003. She co-authored the Jul-Sep 2004 article published in The Journal of Hand Therapy: "A comparison of high-profile and low-profile dynamic mobilization splint designs." In addition, she wrote the chapter "Wrist and Hand Complex" in the 4th edition of Joint Structure and Function (Levangie and Norkin) published by FA Davis in 2005. She also co-authored "Orthotics in the Management of Hand Dysfunction" in 2nd edition of Orthotics and Prosthetics in Rehabilitation (Lusardi and Nielson) published by Elsevier in 2007. Noelle has been with The Orthopaedic Group, LLC since its beginning in 1998.