Paper SY04

Avoiding Mouse Elbow

Malachy J. Foley, University of North Carolina at Chapel Hill, NC

ABSTRACT

Computer programming or coding may literally be dangerous to your health. Mouse Elbow, which is akin to Tennis Elbow, is just one adverse health condition that is associated with computer use. Other maladies associated with computers include Carpal Tunnel Syndrome (from keyboard and the mouse), shoulder and neck pain, and Sciatica.

This paper describes computer-related health risks with special emphases on musculoskeletal disorder (MSD) and Mouse elbow. The information in this paper will hopefully help you avoid computer-related injury, or detect and cure it at an early stage.

INTRODUCTION

Computer use is the principal cause of musculoskeletal disorder (MSD). The NC Department of Labor says that MSD is "the single highest cause of workplace illnesses and injuries and worker's compensation claims in North Carolina" (see References). As such, MSD is a serious and prevalent threat to a computer programmer's health.

Inasmuch as secretaries used keyboards for decades without having a high occurrence of MSD, one might ask what causes such a high incidence of injury from computer use in recent years. The answer seems to lie in the fact that job descriptions has changed drastically for keyboard users.

In the past, secretaries would not only type, but also file, answer the phone, look up a spelling in a dictionary, make coffee, send out mailings, and do other clerical work. Thus, keyboard use for the old-time secretary was just one of many tasks. Actually the same was true for computer programmers in the past. Their job description included walking to the printer, manipulating round tapes and cards, and distributing and filing hardcopies of results, etc. Today the file drawer has been replaced with the electronic file. So, no one needs to get up from their desk (or away from their computer) to file anything. In a similar fashion, with the advent of email, no needs to leave their computer to distribute a memo or to send out a mailing. Telephone calls are now often replaced with an email. Today, you usually don't need to go to the library to do research. You can do it at your computer. Even faxes can be sent and received on line. In short, people are sending more time at their computers without performing any other task, and using the keyboard more intensely than they did in the past.

Then comes the computer mouse. The mouse (along with point and click) is a relatively new arrival to the workplace and may cause more MSD than an intensely used keyboard. In one group of computer users, 50% had mouse-related MSD problems. These problems were with the neck, shoulder, wrist, hands, and elbow. This group of users had ergonomically designed workstations. Studies have shown that the mouse causes Carpal Tunnel Syndrome and other MSD (Hedge, Muss and Barrero, 1999, p.4, for example). Because the mouse usually causes the wrist to bend at an acute angle, requires more exacting movement than the keyboard and uses the whole arm rather than just the fingers, the author hypothesizes that the mouse is inherently more prone to cause MSD than the keyboard.

With the more intense use of the keyboards in recent years and the advent of the mouse, computer programmers are more at risk to injury than they were just a few years ago. As such, it behooves every programmer to protect himself from MSD.

This article is for anyone who uses computers. It describes MSD, the risks involved, the warning signs, preventive steps and ways to cure MSD. After finishing this paper, the reader should have a general knowledge of the potential health risks of using a computer and how to avoid or cure an injury.

DESCRIPTION OF MUSCULOSKELETAL DISORDERS (MSD)

MSD is a group of medical conditions that consist of an injury to the muscles, tendons, ligaments, joints, nerves, spinal discs, cartilage, blood vessels or related soft tissue that is caused or aggravated by physical tasks.

The tasks that cause MSD can be performed anywhere including the home or office. However, the physical demands of the office are usually greater than those of the home. In fact, most MSD is caused by office-related tasks. Since musculoskeletal disorders are usually caused by occupational tasks, these disorders are sometimes called work-related MSD or simple WMSD.

MSD is not just one medical condition or disorder. Rather it is a name for a group of conditions. The severity of these conditions can vary from mild/sporadic to severe/chronic/debilitating. The most well-known MSD is Carpal Tunnel Syndrome. Other MSD are: De Quervains' disease; Epicondylitis; Synovitis; Muscle strains; Raynaud's phenomenon; Sciatica; Tendonitis; Tennis Elbow; Trigger finger; Trigger points and, Lower back pain. A description/definition of many of these medical conditions can be found in the glossary at the end of this paper.

The average reader and computer programmer does not need to know precisely what these medical conditions are. But rather needs to know how they are caused, what the symptoms are and how to prevent or cure these afflictions. The following sections cover these topics.

DEVELOPING MSD

Unlike an accident, MSD is not the result of a single event. Rather MSD develops gradually over a period of time as you perform your daily tasks.

When you perform tasks, you constantly put stress on your body. Small tears, strains and disorders develop in your tissues all the time. Usually they heal fairly quickly. This is the natural way your body functions. However, when the biomechanical stresses of the task outpace the body's ability to heal and repair itself, damage can build up until a musculoskeletal disorder results. This is the reason MSD is sometimes called cumulative trauma disorder (CTD).

Because MSD develops gradually, you can literally be fine one day and in pain the following day. In other words, MSD can sneak up on you

STEALTH SYMPTOMS OF MSD

The symptoms or warning signs of MSD are not always apparent. Unfortunately, the parts of the body susceptible to musculoskeletal disorders do not always have the appropriate nerve endings to signal that a musculoskeletal disorder is developing. Instead, you must rely on warning signs given to you from nearby parts of the body.

For example, in Carpal Tunnel Syndrome, the hands often feel sore and tingly, like they have fallen asleep. The problem does not lie in the hands however. The problem is with a nerve located the wrists. The wrists may only feel mildly sore or may feel no pain at all.

Muscle knots or trigger points often display a similar behavior: the trigger point is in one place and the

pain (or other symptom) is somewhere else.

The first thing any programmer should know is how to detect the symptoms of MSD. The following warning signs signal that MSD may be present.

- Pain
- Discomfort
- Tingling
- Numbness
- Burning
- Swelling
- Stiffness
- Cramping
- Reduced grip strength in hand
- Reduced range of motion
- Change in color of effected area (blanching)
- Tightness or loss of flexibility

If any of the above symptoms lingers, wakes you up at night, follows you home, or appears as soon as you get to work, take notice! And take **immediate** curative action (see suggestions in sections below). Remember MSD is caused by cumulative damage and the longer you go without taking corrective action the more damage you cause.

ERGO STRESSORS

All tasks at home and in the office put biomechanical stress on the body. However, only some stressors cause MSD if you are exposed to them over a long period of time. These stressors are called ergo stressors. Some examples of ergo stressors are:

- Repeated and/or sustained activity (typing and mouse for example)
- Excessive Force use to grasp (mouse), pinch, twist, push, etc.
- Cold/low temperatures.
- Contact stress (when part of your body rubs against a component of the workstation, for example resting your hands on the edge of the desk, armrests out of position and damaging forearms)
- Damaging Postures. There are 3 kinds of damaging posture:
    - Awkward Postures (outside of neutral positions, for example tilting your head back to see through bifocals or bending your wrist in using a mouse)
    - Extreme Posture (joint positions close to the ends of the range of motion)
    - Static (sitting).

PROACTIVE STEPS TO AVOID MSD (HOW TO PREVENT MSD)

The best way to avoid MSD, including mouse elbow, is to make sure you take all the steps you can think of to eliminate ergo stressors from your workstation. Here is a list of some suggestions of steps you can take to prevent MSD from happening to you.

1) **Have your workstation set up so that you are working in neutral positions**. A fairly comprehensive explanation of how to set up your workstation can be found on the web (Office of Environment).
2) **Have your workstation setup checked by an in-house ergonomist** (if you have one), once you have initially set up your workstation in step 1. Or skip step 1 and just have the ergonomist come in and check all your workstation adjustments.

3) **Get up, stretch, and walk around periodically** at least once an hour. This is good for your vision, your cardiovascular health, your muscles, etc. This is probably the best thing you can do to protect yourself after insuring that your workstation is set up properly.
4) **Intersperse non-keyboarding tasks with keyboarding**. This provides the body time to repair itself and limits the intensity of the keyboarding.
5) **Do upper-body strength training two or three times a week** to help your body be more resilient to ergo stressors.
6) **Move your mouse to the left-side of your keyboard** even if you are right-handed. It can take as little as a day to become accustomed to the new mouse location. This location has three advantages. First, if you are right-handed, you move some of the work from your dominate hand (the hardest working hand) to your secondary hand, thus having stress more evenly distributed across both hands. Second, it aligns the center of the alphabetic keyboard with the center of the monitor where it should be. Third, it puts the mouse closer to the body reducing the ergo stress.
7) **Learn how to use the keyboard instead of the mouse** part of the time. There are ways of navigating the desktop from the keyboard rather than using the mouse ("Shortcut Keys"). If you have a 104-key Windows keyboard (the current de facto standard), you can use the WINDOW key for a variety of functions ("Windows Key Shortcuts"). Another alternative is the Context Menu Key. It simulates the "right" mouse click. Then you can use the ALT key (Also in "Shortcut Keys") For example, you can close a MicroSoft window with ALT-F4 rather than pointing to and clicking the "X".
8) **Consider obtaining a mouse alternative.** Some alternatives are trackballs, joysticks, touch screens, head pointers, touch pads (cats), a whale (or whale mouse, See Hedge, et al, pp6-7) or even just a larger contoured mouse (See Tech Connections).
9) **Consider purchasing single-prescription computer glasses** (glasses designed specifically for working at a computer), if you need bi or even tri-focal glasses.
10) **Keep your blood flowing by**:
    - Avoiding tight/restrictive clothing.
    - Rotating ankles and contract leg muscles, while sitting.
    - Limiting caffeine drinks.
    - Drinking plenty of water.
    - Avoiding sitting cross-legged.
    - Asking doctor about taking low-strength aspirin, IF you are at higher risk of blood clots (for example have some kind of coronary artery disease),
11) **Heed any warning sign** given in the section above (Stealth Symptoms of MSD) and immediately take reactive steps (see next section)

REACTIVE STEPS (HOW TO CURE MSD)

If you have any of the symptoms of MSD, you should probably first notify your employer and see a Doctor.

Since the 1970 passage of the Occupational Safety Health Act (OSHA) employers are required to maintain a report of all cumulative trauma disorders (CTD) or MSD. Employers are supposed to monitor the incidence of these disorders and intervene when new cases or high-incidence jobs are identified. So, your employer is supposed to help you through the problem and notify OSHA.

The doctor can help you identify the problem and may prescribe specific stretches/exercises for your specific problem. The doctor may also prescribe medicine to reduce inflammation and pain. However, the doctor often prescribes a very limited range of remedies to any given problem. To cure a specific

MSD, it is probably best to go way beyond what the doctor orders and use the shotgun approach of doing everything reasonable and imaginable to help. Here are some suggestions:

- Do what the doctor says.
- Do everything given in the previous section.
- Resting the affected area is always helpful, but sometimes impractical.
- Alter your routine immediately at home and at the office to avoid the stressors causing the MSD. For example, if you have mouse elbow, twisting is bad for you. So, avoid opening bottles and jars without some sort of tool.
- Research your specific MSD to know what causes the problem and what can be helpful in curing it.
- Look into Trigger Point Therapy (Davies).
- Consider Massage.
- Stretch (Anderson).
- If you are have vision problems, see the appendix

CONCLUSION

The incident of musculoskeletal disorder (MSD) in computer users is on the rise. MSD can and does cause injuries and even disabilities. Therefore, it behooves all computer users to become aware of what MSD is, what its causes are, what its symptoms are, and how to avoid it. This paper addresses all of these questions and gives suggestion on what to do if you develop MSD.

If you read only one section of this paper, read the section entitled "Proactive Steps to Avoid MSD". You do not want to be injured or disabled by MSD.

GLOSSARY

Biomechanical stressor - the physical aspects of workstation, work piece, tools, and work process that exert stress on the body

Carpal Tunnel syndrome – a disorder caused by compression of the median nerve in the carpal tunnel (where the nerve passes through the wrist); characterized by discomfort and weakness in the hand

De Quervains' disease - a hand and wrist disorder with an aching pain, swelling and tenderness on the thumb side of the wrist and at the base of the thumb, which becomes worse with movement.

Epicondylitis – painful inflammation of the muscles and soft tissues around the attachments of the ligaments or muscles to the bones

Ergo stressor - task elements that create discomfort, or even injury, if exposed over a long period of time

Mouse elbow – same as Tennis elbow except cause by using a computer mouse rather than playing tennis

Raynaud's phenomenon – sensitivity of the hands to cold due to spasms of the digital arteries resulting in blanching and numbness of the figures

Scitica – pain along the sciatic nerve. This pain can be in the lower back, buttocks, hips, or adjacent parts. Often, it is in the back of the thigh.

Synovitis – inflammation of the synovial membrane in joints or tendon sheaths

Tennis elbow - painful inflammation of the tendon at the outer border of the elbow resulting from overuse of lower arm muscles (as in twisting of the hand)

Trigger finger - difficulty in straightening or bending a finger, caused by inflammation and thickening of its tendon. An abnormal bending of a finger which may include a momentary spasm

Trigger point – a muscle "knot or a small lump that can range in size from a pinhead to a pea" (Davies, p.19)

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APPENDIX

This appendix describes some specific steps you can take if you are having vision problems.

- See an eye doctor.
- Locate screen 18-30 inches from your eyes.
- Have eye level at top of screen
- Use eye glasses designed for the 18-30 inch distance (computer glasses), if you need glasses.
- Keep your glasses clean.
- Use a visor over the top of the screen to reduce glare from overhead lighting.
- Place your screen perpendicular to you window to avoid glare.
- Have proper ambient lighting.
- Blink often.
- Look away from the screen from time to time.

TRADEMARK INFORMATION

ABOUT THE AUTHOR

Since his undergraduate work, Mal Foley has been interest in human factors and ergonomics. He took his first class in human engineering over 30 years ago. More recently, Mal served on the University of North Carolina (UNC) Office Environment Safety Committee from 1994 to 2002, chairing the committee for many years. Furthermore, from 1998 to 2002, Mal was the chair of the UNC Ergonomic Team.

Mal is also a software engineer and a SAS programmer. He started programming computers in high school and never stopped. His career includes being an international computing consultant, a university professor, and the CEO of his own computing company. Currently, Mal is a senior SAS programmer/analyst in the Department of Biostatistics at the UNC-Chapel Hill. He actively participates in local, regional, and national SAS user's groups. He is also a part-time SAS trainer and gives in-house SAS seminars around the county.

AUTHOR CONTACT

The author welcomes comments, questions, corrections and suggestions. You may contact the author at:

Malachy J. Foley
2502 Foxwood Dr.
Chapel Hill, NC 27514

Email: FOLEY@unc.edu