

Computer Workplace Repetitive Motion

The office environments in which CWA members work have been revolutionized through the advent of computerization. Computers are not new to CWA members. They have been using them for some 20 years. During this time, the number of CWA members utilizing computers has increased from a few thousand to more than 450,000. In the future, the number of members working with computers will continue to increase.

Computer technology has had a tremendous impact upon workers. In some instances, the introduction of computers has improved member working conditions, but, in others, new technology has produced several detrimental effects.

Various health symptoms have been associated with the use of computers. One particular health problem, known as repetitive motion illness, involves the body's musculoskeletal system. Although repetitive motion health symptoms may occur when working with poorly designed hand tools and manual materials handling tasks, most identified and investigated cases have been related to member computer work.

Health Symptoms and Illnesses

Repetitive motion musculoskeletal problems among computer operators are caused by having to perform rapid repetitive work. Most often, the repetitive movement requires some strength, such as sustained pressure or repeated pressure movements. Computer workplace related repetition illnesses usually involve the fingers, wrists, hands, elbows, arms, and/or shoulders.

There are a variety of illnesses that may be caused by repetitive computer work. They are:

- **Tendonitis:** pain and swelling of tendons at the junction between the tendon and its muscle;
- **Epicondylitis** (tennis elbow): pain and swelling where the tendons and bone join around the elbow joint;
- **Ganglion:** usually a smooth round swelling or inflammation that appears near a joint (leg, wrist) or a tendon sheath. Ganglions most often occur on the back of the hand;
- **Tenosynovitis:** pain and inflammation of the tendons and/or their covering sheaths particularly in the hands and wrists;
- **Carpal Tunnel Syndrome** (CTS): a thickening or swelling of the tendons as they pass through the front of the wrist thereby causing pressure on the median nerve. The pressure causes pain, burning sensations, numbness, and tingling of the skin connected to or supplied by the median nerve. CTS can eventually lead to weakness, discomfort, and impaired use of the hand.

Repetitive motion illnesses will most often be identified as pain, swelling, and/or numbness in or around the affected muscles and tendons. Such impairment usually occurs in the fingers, wrists, hands, and/or arms. In some cases, it may affect the shoulder, neck, and back muscles.

Initially, the pain, swelling, or numbness may occur only while performing the repetitive work. However, if the condition intensifies, it may persist while not using the injured part at all. For example, computer operators may experience pain, inflammation, tingling, and/or numbness at work, at night after the wrists have been able to rest, or in the morning upon awakening. Since symptoms may not occur during working hours, members may not associate the discomfort with their work.

Usually there is a gradual progression to more severe symptoms such as burning, aching, prickling, or a painful numbness in the fingers and deep in the palm. With this pain and tingling there occurs an often-reported feeling of uselessness in the fingers, causing the hand(s) to feel swollen. In turn, there may be a dull, aching pain in the arms, shoulders, and back.

During the early stages when the pain is slight, if immediate action is taken, no permanent damage will result. Conversely, if nothing is done and the member continues the repetitive work, then permanent damage may result.

Causes of Health Symptoms and Illnesses

Repetitive motion health symptoms and illnesses are primarily caused by the speed and the type of one's work.

In addition, poor work organization procedures and poorly designed computer and workstation equipment may also contribute to the onset of worker health symptoms.

The introduction of computers has resulted in management's ability to increase the work pace or speed. Too often, the member must work at a pace determined by the computer, rather than at a pace set to meet the individual's capacity. Although over the short term such a system may result in increased worker productivity and efficiency (and, needless to say, corporate profits), over the long term it also produces a corresponding development of occupational safety and health problems, increased absenteeism and medical care costs, and decreased worker morale.

The physical features that may contribute to repetitive motion musculoskeletal problems involve the position of the computer operator relative to the computer keyboard, mouse (or other input device), and screen and the manner in which the work is performed. Thus, issues such as the design of the computer and workstation equipment, the workplace, work load, work pace, the type and nature of the task, repetitiveness of the job, and work and rest break schedules must be addressed to effectively deal with member repetitive motion illnesses.

Proper computer design is crucial to the prevention of repetitive motion illnesses. Issues of concern include the computer itself, adjustability of the screen angle, and reflection quality of the screen.

Computers should be equipped with separate or separable keyboard and screen units. This will allow operators the freedom to position both units for optimal comfort, thus eliminating a major cause of repetitive motion health problems.

Detachable keyboards are generally believed to be one of the most important characteristics of a well-designed computer workstation. Keyboards should be thin and the angle should be designed to be between 5 to 15 degrees measured from the horizontal and preferably adjustable. Key surfaces should be concave for finger comfort and have a matte finish to reduce reflections. Key force, i.e., the force necessary to depress the keys, should not feel either too stiff or too soft. In addition, keys should have tactile (snap-action) or auditory (sound) feedback. The keyboard layout known as QWERTY is most commonly used. When numeric data entry is required, a separate numeric key pad should be provided. Special function keys should be color-coded, distinctively shaped, or grouped together.

Computers equipped with a mouse unit have become commonplace in the modern workplace. Although relatively little research regarding the mouse has been conducted, it is recommended that the mouse unit should be detachable and moveable so that it can be positioned to best suit the posture and work requirements of the individual operator. The mouse should be designed to fit comfortably into the hand and positioned with the click buttons level with the keyboard. The mouse should be located at the same height and angle as the keyboard and situated next to the keyboard. Also, the work surface upon which the mouse is used should be large enough to allow for the proper and intended operation.

When using a mouse, it should be held loosely with the wrist in a neutral position and operated by moving the entire arm and shoulder. Also, a light touch should be used when clicking the mouse buttons.

Computers should be equipped with adjustable angle (tiltable) screen controls. Availability of adjustable angle controls will allow operators to position the computer to fit their particular physical characteristics. Ideally, operators should view the screen at an angle of 10 to 30 degrees below horizontal. For machines not so equipped, adjustable stands should be provided.

Computer screens should be equipped with anti-reflection coatings. Such coatings cause a change in the way light is reflected from the screen, reducing the luminance of reflected images and therefore the need for operators to adopt uncomfortable postures. For computers not equipped with anti-reflection coatings, a variety of screen filters or surface treatments are available to minimize screen reflections.

Factors important to workstation design and repetitive motion health symptoms and illnesses include the computer table, chair, lighting, document holder, foot rests, and wrist and arm rests.

Computer tables or desks should be vertically adjustable to allow for operator adjustment. This is especially important for short (5'2" and below) and tall (5'10" and above) operators to maintain comfortable postures. Failure to be provided with adjustable tables may result in musculoskeletal problems. Tables or desks should be of sufficient size to allow the computer work and other tasks to be performed without excessive twisting, turning, or stretching of the trunk, shoulders, neck, or arms. Proper design should allow for different arrangements of computers as the task requires. The surface of the table should be large enough to allow for all necessary equipment and work materials. Computer tables should have a non-reflective matte surface. Ideally, table tops should be as thin as possible. There should also be adequate space under the table to allow room for the worker's thighs and knees and the ability to vary the position of the legs.

Depending upon the design of the computer, it may be necessary to provide some means of adjusting the height of the screen itself. While adjustable tables that provide this option are available, in some cases the need may be satisfied by providing stands for displays. Adjustable screen height becomes particularly important when different workers must share the same workstation such as in directory assistance and reservation agent jobs.

Poor chair design can also be one of the most significant causes of repetitive motion musculoskeletal stresses and strains. Proper chair height and back support are critical factors contributing to worker musculoskeletal complaints. Many computer operators are exposed to unreasonable postural loads due to poorly designed computer chairs.

Primary factors related to repetitive motion illnesses include the provision of an adjustable back rest and seat pan. Operators who use non-adjustable chairs will develop poor work postures that will result in the occurrence of repetitive motion problems.

The back rest of the computer chair should provide for support of the lower, middle, and upper portions of the back. The back rest should provide proper back support and allow for adequate relaxing of muscle tension while the operator temporarily leans back in the chair. Ideally, back rests should be independent from the main portion of the seat. However, back rests that are fixed in relation to the seat pan may provide adequate postural support.

The seat surface should be 16-18 inches deep and 15-17 inches wide. The seat should also be moderately contoured with the front edge well-rounded to avoid pressure on the underside of the thighs. The ability to adjust the slant of the seat surface forwards and backwards either by a shifting of the body or by means of a specific control can be an added comfort feature. Controls should be easy to use or they may not be used at all. Seats should be covered with cloth materials that allow air circulation.

Another important chair design feature is armrests. Well-designed cushioned armrests can provide appropriate support for the arms.

Due to the nature of the computer itself, computer work environments require less illumination than traditional office settings. When workplace illumination is decreased and operators must work with hard copy, supplementary or task lighting should be provided. Such lighting should be adjustable and fitted with glare control equipment. The need for task lighting is extremely important for operators working with hard copy.

Document holders should be provided at computer workstations involving data input or where hard copy is used. A document holder allows the operator to position and view material without straining her/his eyes or neck, shoulder, and back muscles. Ideally, the document holder should be adjustable both in angle and height to allow for repositioning of work or use by a different worker.

In some cases, a chair may be so high it cannot be adjusted low enough causing the operator's feet to dangle. This condition may lead to a compression of blood vessels at the bottom of the thighs and cause additional pain. To alleviate this problem, foot rests should be provided to concerned workers allowing them to obtain the necessary support.

To avoid strain and pressure on the wrists, hand, and arm muscles, tendons, and nerves, wrist and arm rests should be provided to requesting employees. In addition, palm rests may be necessary when using certain computers.

All too often, computer equipment is installed in traditional offices with little or no redesign of the workplace. In many cases, CWA members have witnessed the implementation of computers in their work environments without proper consideration of workplace design or ergonomic factors.

The principal variable important to proper computer work environment design and the occurrence of repetitive motion health symptoms and illnesses is illumination. The proper amount of workplace illumination is essential for computer work to be performed in a healthful manner. Too much light can cause screen glare or reflections which make screen characters difficult to read; whereas too little light overtaxes the eyes as the operator strains to read other materials. In turn, poor operator postures associated with too much or too little illumination are related to wrist, hand, arm, shoulder, neck, and back pain.

Computer workplace illumination levels should be much lower than traditional offices. Most experts recommend workplace illumination levels between 50 to 70 percent lower than traditional offices.

Light levels may be too high because of the brightness of existing light fixtures and/or light from windows. In the case of existing workplace lighting, fluorescent dimmers or luminaire covers may be installed. In some cases, indirect lighting may provide a more desirable method of illumination and eliminate the harsh brilliance and glare of ordinary fluorescent lighting. Although not preferred, workplace illumination may also be reduced

by turning off certain lights. Another approach would be to reduce by one-half the number of fluorescent lights in a given fixture.

High illumination levels may also be caused by natural light coming through windows. Light from windows may be reduced by the installation and use of curtains, blinds, or shields.

The proper placement of computer screens is also an important means of eliminating glare and reflections. Screens should be positioned perpendicular to windows. In turn, operators' line of sight should be parallel to windows and light fixtures. In cases where computer equipment cannot be properly positioned to reduce/eliminate glare, room dividers, partitions, or screens may be placed behind the computer screen to reduce glare.

As noted, certain work organization factors are associated with the occurrence of repetitive motion health symptoms and illnesses. Such factors include the type and nature of the task, workload, work pace, repetitiveness of the job, and work and rest break schedules.

The type and nature of the task involves the job function and the manner in which it is carried out. Many computer jobs are characterized by a lack of meaningful content. In many cases, these jobs are fragmented and simplified versions of traditional clerical tasks. By diminishing the content of the job, the computer provides the conditions for increased productivity. Put simply, this means increased workload, repetitiveness of the job, inadequate work pace and work/rest break schedules. Such conditions, designed to enhance productivity and profits, not workers' well-being, may result in increased repetitive motion musculoskeletal health symptoms and illnesses.

Resolving and Treating Musculoskeletal Health Problems

The best treatment for a repetitive motion health symptoms and illnesses is rest from that work operation which caused the problem. Once a worker begins experiencing the initial repetitive motion symptoms-- hand, wrist, and forearm pain --, rest should be obtained. This may be obtained in two ways. First, by performing work at a slower speed and, second, by working for shorter periods of time and thus being provided with increased work/rest breaks (given that individual workers will not be able to obtain increased work breaks on their own, computer workers should report their problem to the union steward or representative).

Computer operators who have developed the most advanced repetitive motion health problems such as carpal tunnel syndrome should see a doctor as soon as possible. Computer operators who have been diagnosed as having carpal tunnel syndrome may be told that they need surgery to correct their medical condition. Since there is no guarantee (and considerable controversy among medical experts) that surgery will eliminate the health problem, concerned operators should receive a second opinion from a physician experienced in treating repetitive motion illnesses. Following treatment for carpal tunnel syndrome, involved workers should undergo a rest and rehabilitation program. Quite often, it is unlikely that the victim will be able to return to any repetitive type of work without the problem reoccurring.

Preventing Musculoskeletal Health Problems

Preventing repetitive motion musculoskeletal health symptoms and illnesses is crucial. Prevention can be successfully achieved by adhering to the previously mentioned computer, workstation, work environment, and work organization factors. Failure to adhere to these guidelines will result in CWA member repetitive motion health symptoms and illnesses.

Another issue that merits attention is training. Such training will provide workers with time to develop the skills necessary to perform the job well and time to build confidence in their ability to perform the job. Instruction should include an explanation of why the computer technology is needed, how the computer equipment works and functions-- including ergonomic considerations-- and the benefits of the new technology. For the jobs that require continuous repetitive motion, particular emphasis should be placed upon frequent rest periods and job rotation.

What Can You Do?

Members who experience repetitive motion musculoskeletal health symptoms and illnesses are urged to bring their concerns to the attention of their local officers and stewards, and members of the local union's occupational safety and health committee. The committee can identify dangerous conditions at the workplace and discuss them with management. If the employer refuses to cooperate, the committee can request an OSHA inspection. The committee should always coordinate its activities through the local officers, the CWA Representatives, and negotiated safety and health committees.