How To Mitigate Lower Back Pain In The Computer Operator

As the use of computer workstations has become standard for many occupations, it has become more important for Human Factors Engineering (HFE) to assist individuals to function effectively while protecting their heath at work. Many people spend as much as one-third of their time at work…some more. Effective management of employee safety includes all work-related hazards. Minimizing the risks of back disorders is critical in preventing lower back pain.

In this paper we will examine the practices that can reduce the risk of developing back disorders by avoiding common workplace factors that contribute to them. In addition, communicating this ergonomic information through effective training is a key intervention.

First we will exam the basic elements every ergonomic program should contain.

1. Workstation analysis
2. Hazard prevention and control
3. Medical management
4. Training and education

1. Workstation Analysis
A workstation analysis should identify actual or potential hazards of that workstation. By reviewing illness and injury records, medical safety and insurance records, as well as payroll records to evaluate employees lost work time. The best work site analysis should be systematic and include:

- Workstation checklist (see appendix 1 &2)
- Identify the workstation that put workers at risk
- Determine if risk factors have been mitigated or eliminated
- Provide results of the analysis to personnel
- Conduct frequent surveys of the workstation, annually or when circumstances change. This will assist in identifying new or unnoticed risks or deficiencies in work practices.

2. Hazard Prevention and Control
Hazard prevention and control is designed to measure and prevent hazards. Workstation hazards can primarily be prevented by effective design of workstations and ergonomic controls. Workstation designs should be designed to accommodate the individual working at that station, not just for a typical worker, These workstations should be easily adjustable and designed for a specific task. Work methods should be designed to reduce extreme or awkward postures, repetitive motion and excessive force. Tool and handle design should reduce the risk of Carpal Tunnel Disorders (CTD's). Regular training monitoring at all levels is necessary to ensure employees are

using proper work practices. Monitoring should include periodic technique review to help determine if adjustments or modifications need to be made.

3. Medical Management
Medical Management practices can both eliminate and reduce the risk of symptoms though early detection and treatment to prevent further injury. Medical management should address injury and illness record keeping, reporting injuries or hazards, evaluation and referral process and treatment a return to work plan, monitoring and training of employees on how to report problems. Most people spend one-third of their day at work. Therefore, many back problems that manifest themselves in other illnesses can be traced to improper procedures in the workplace.

Symptoms to watch for:

- Burning, aching, or shooting pain in the fingers, hands, forearms or in the shoulders
- General weakness in the hands and forearms
- Loss of sensation in hands or arms
- Difficulty opening and closing hands or using them
- Hypersensitivity to touch, especially after minimal use.
- Sensitivity and/or pain in the shoulder's or LOWER BACK
- All of these symptoms can lead to more extensive injury to the lower back.

4. Training
As in all quality practices, training and education are critical to success.
The purpose of training and education is to ensure that employees are informed about ergonomic hazards to which they may be exposed and enable them to participate in their own protection from these hazards. Training programs should include all affected persons, supervisors, health care and personnel staff, and all employees involved in job analysis. Specialized training should be provided for any personnel administering this program. The program should provide a list of potential risks, causes and early symptoms, means of prevention and appropriate treatment options. An evaluation process that measures the training effectiveness should also be part of the overall program.

When designing an ergonomic program to mitigate the problem of lower back pain for computer operators it is essential to consider that the back is made up of 33 bones called vertebrae, separated by shock-absorbing disks. The spine is held in place by a large number of muscles and ligaments. The spine also protects the spinal cord and acts as a distribution center for the nerves that run between the brain and the other parts of the body. Anatomically speaking, the spine is an unstable structure. There is an illusion of stability because muscles groups are keeping the back stable. If these muscle groups are out of condition, there is a risk of injury.

Risk Factors for Back Disorders

The risk factors for back disorders are the same categories as for Repetitive Motion Injuries (RMIs). Many back disorders are RMIs as they result from prolonged exposure to micro-trauma, and affect tissues that do not heal quickly. The more risk factors that are involved and the greater the exposure to each, the higher the likelihood of developing an injury. One of the primary workplace risk factors for back disorders are:

Posture. There are certain postures in which we are more susceptible to injury, especially at the extremes of our range of motion. For example, twisting and bending forward while sitting are risk factors for low back pain. Just making people aware that these postures could be causing injury may alleviate some injuries.

Adjusting workstations to fit you, by changing work postures, reducing continuous repetitions, and stretching periodically can control risk factors. Posting a simple clear reminder at the workstation about maintaining correct posture.

The following are some ways to improving workstation ergonomics to mitigate risk factors and lower back pain by creating a workstation that fits the individual by following some simple guidelines:

1. What is right for one person may not be for another.
2. Adjust the workstation
3. Use good posture
4. Change posture often
5. In general keep head balanced over shoulders -- looking forward.
6. Shoulders relaxed and comfortable.
7. Wrists straight.
8. Lower back supported, don't slouch.
9. Feet settled on floor or footrest.
10. Forearms/Thighs parallel to floor.
11. Don't stick your neck out
12. Listen to your body. If your discomfort goes away - you are probably on the
     right track.

By practicing these habits employees can greatly reduce their risk for back pain due to computer operation. There is no best sitting posture for everyone. Studies have shown that 80-90% of computer users prefer a reclined position Bio mechanical studies have shown sitting slightly reclined with a torso-high angle of 110° reduces disc pressure 20-30% and muscle activity 30-40%.

Communication and Training

Office ergonomics needs to be treated separately from industrial ergonomics. Many principles are the same, but there are many subtle differences to take into consideration. Training is imperative and the communication tools used to get the

information across can be the largest single factor in the training's success. Communication is more than just a reading a written manual or attending a facilitated training. Good communication is when the information is not only heard or read but also comprehended and stored in long term memory. A good trainer takes into consideration appropriate communication techniques. These techniques include understanding nonverbal, verbal and written communication forms.

Nonverbal cues such as demonstration are very effective in training human factor principles in this context. Face to face demonstrations can increase the effectiveness and provide an atmosphere for shared conversation and increased understanding within the group. Ambiguity can be cleared up and resolved immediately. When a group shares information a safer workplace can be obtained and benefit all employees.

Video Mediated Communication can also be very useful. By using video to augment voice demonstrations the information can be shared on a larger scale. Video can also be used alone as a training tool for computer operators to use on their own terminals in a tutorial format.

Communication provided through what is called crew resource management could also be used. In this context it is used a little differently than say a cockpit, but the principles still apply. Effective communication supports everybody's performance. Increasing employees interoffice communication can provide a forum for dialogue between staff to learn from each other. This communication can play a big part in enhancing understanding of the ergonomic principles you are trying to teach. A training program that enhances and provides for a strong influence of effective communication including feedback and redundancy can work to instill ergonomic techniques on an ongoing basis. Constant reinforcement and reminders may also be required.

Research on communication clearly makes a case for shared communication on multidimensional platforms for best results. As we can see from the information above, much can be done and should be done to alleviate the hazards of extensive use of the computer workstations and the injuries associated with it. It should be noted that symptoms experienced in various parts of the body could all be related to extended periods of time in front of the computer. These symptoms can all be cause by injuries from repetitive stress and will affect lower back pain. RMIs may affect or damage tendons, muscles, ligaments, nerves and blood flow. These tissues, if not given enough time to recover from excessive workload and repetitive motion may become inflamed, produce swelling and perpetuate a cycle of stiffness in injured areas of the body.

Through the use of analysis, prevention and control, medical management and most importantly training, education and monitoring we can help computer operators practice safe computer use and continue a fully productive relationship with the computer.

APPENDIX 1

UNIVERSITY OF VIRGINIA LIBRARY ERGONOMICS EVALUATION FORM

NAME:
DEPARTMENT:
DATE:
ERGO TEAM SIGNATURE:

EMPLOYEE CHECKLIST

1.While working at your computer/desk, do you have any back/neck pain?
  YES / NO
2.While typing, do you have any pain in forearms/wrists/hands? **YES / NO**
3.While sitting for a long period of time, do you have any legs/feet pain? **YES / NO**
4.Do you have watery eyes or eye strain? **YES / NO**
5.Is the lighting in your work area comfortable? **YES / NO**
6.Is the air quality comfortable? **YES / NO**
7.Do you take task breaks? **YES / NO**
8.Do you do stretching exercises? **YES / NO**

HEAD/NECK BACK/UPPER BODY

1.Are your hips and back resting comfortably against the back of the chair? **YES / NO**
Your ears/shoulders/hips should be in a vertical line.

2.Does your chair have arm rests? **YES / NO**
Arm rests, when used, should comfortably support upper body and neck muscles but should not interfere with arm motions.

3.Does your chair provide good lumbar support? **YES / NO**
If not, adjust your chair backrest up/down or forward/back, or add cushion for support. Your adjustable chair height should be 15" - 21" above the floor.

4.Does your chair have a waterfall (front edge curves downwards) seat? **YES / NO**
A waterfall seat prevents discomfort behind the knees.

5.Does the seat of your chair fit you? **YES / NO**

COMMENTS:

Appendix 2

Check List for Computer Operators Equipment

Chairs should provide...

-   Adjustable height.
-   Adjustable arms.
-   Comfortable lumbar support.
-   Waterfall front (rounded front edge on the seat pan).
-   Five legs (stability) - wheels.
-   Fabric that breathes.
-   Comfortable seat pan that fits and swivels.

Keyboards should be adjusted to provide comfortable (neutral) posture

-   Place keyboard at approximately seated elbow height (25-32" from floor), shoulders should be relaxed.
-   Work with wrists straight - NOT BENT.
-   Place mouse/trackball next to keyboard -- do not stretch/reach
-   Keep wrists straight (neutral).
-   Using a padded wrist rest can help (Keyword is wrist REST not typing support).
-   Move the mouse as close to the centerline of your body as possible when you must us it for periods of time.

Monitors should be adjusted to provide the MOST COMFORTABLE viewing position

-   Position top of screen at or just below eye level.
-   Maintain a COMFORTABLE eye/monitor distance (generally an arm's length - approximately 24 inches for a 14-17 inch monitor).
-   Decrease glare on screen.
-   Place VDT perpendicular to window.
-   Close blinds.
-   Use antiglare screen (if needed).
-   Tilt screen (backward 10 to 20°).
-   Dim lights.
-   Keep monitor ventilated and clean.
-   Adjust color, brightness, contrast for eye comfort.
-   Copy holders should be placed next to screen
-   Distance and eye level from screen and copyholder to your face should be the same

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