Ergonomics Best Practices - Preventing Workplace Injuries In Office Environment

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Abstract:

The fastest-growing category of workplace injury involves damage that is much harder to see; injuries caused by repetitive motion, posture, and stress. Most of these injuries are called Muscular Skeletal Disorders (MSDs) which often occur in office work environment. The branch of Ergonomics that attend to office situations is called Office Ergonomics (OE).

Office Ergonomics (OE), the science and art of adjusting task, equipment, and office environment to self-comfort uses combination of techniques to prevent situation of discomfort associated with office work. The common associated risk factors in OE are: static posture, awkward posture, repetition, compression, and other factors such as the use of force in a task, frequency and duration of tasks, personal risk factors (sports), all involve people's behaviour and equipment use.

Common signs of MSDs especially at critical stages include: dull aching sensation at specific joints, discomfort with certain movements, and tenderness to the touch. In severe cases of Carpal Tunnel Syndrome on the wrist/fingers, the following symptoms have been observed: pain and numbness – which may become worse at night, swollen feeling in the fingers, and wrists and weakness when gripping.

Frequent and regular work breaks can help prevent pain or discomfort in part of the body that is applied to work. This is in addition to having adequate work tools and adopting appropriate work behavior.

1.0 Introduction:

The term Ergonomics emanates from Greek word Ἔργον, meaning, "work", and Νόμος, meaning "natural laws". It is therefore the Science of Work, based on the Truths Taken from the Natural Science. However, the coining of the term Ergonomics is now widely attributed to British psychologist Hywel Murrell, at the 1949 meeting at the UK's Admiralty, which led to the foundation of The Ergonomics Society. He used it to encompass the studies in which he had been engaged during and after the II World War[4].

The culture of Ancient Greek appears to have laid the foundations for the science of ergonomic as evidence indicates that Greek civilization in the 5th century BC used ergonomic principles in the design of their tools, jobs, and workplaces. Hippocrates gave a description in his work of how a surgeon's workplace should be designed and how the tools he uses should be arranged (Marmaras,

Poulakakis and Papakostopoulos, 1999).[5]

The International Ergonomics Association defines ergonomics as follows:[1] Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. Ergonomics is employed to fulfill the two goals of health and productivity. It is relevant in the design of such things as safe furniture and easy-to-use interfaces to machines and equipment. Proper ergonomic design is necessary to prevent repetitive strain injuries, which can develop over time and can lead to long-term disability.[2]

2.0 Office Ergonomics:

Activities like jumping, running, boxing and other form of sports have an element of risk associated with them, and so is working in an office environment. Office works also have exposure to risk and injuries though may not be as obvious as sport activities. Why? This is because of exposure to muscles and tendons to exhaustion and stress as a result of static or awkward postures and long duration.

Each year in the United States over 2 million workers suffers disorders caused by ergonomics risk factors in the workplace with a significant proportion occurring in the office environment. This results in over 34% of loss days and in over $15 Billion annually in workers compensation cost (Summit Training Source, Inc). [3]

Therefore, Office Ergonomics (OE) is the study of the kind of work you do, the environment you work in, and the tools you use to do your job. The goal of office ergonomics is to provide you with the required knowledge of the interaction between you, your tasks, and your workspace and tools. This is to ensure that you set up your office work space so that it fits you and the job you are doing and not vice versa. Office Ergonomics involves the interaction of the three components of work tasks termed the 3Ws:

- The Work
- The Worker
- The Workspace

When your workstation is set up right, you may:

- Be less likely to have problems such as headaches or eyestrain.
- Reduce neck and back pain.
- Prevent tendon problems that are linked to doing the same task over and over (repetitive tasks).

The main associated risk factors in Office Ergonomics are: Static or Awkward Posture, Repetitive task, force, personal life (sports), and frequency and duration.

The fastest-growing category of workplace injury involves damage that is much harder to see; injuries caused by exposure of muscles, tendons, ligaments, joints, nerves, cartilage, or the spinal

disk to static or awkward posture, excessive repetition, compression of soft body tissue on hard surfaces or sharp objects, excessive force, and stress. These injuries are called Muscular Skeletal Disorders (MSDs). Each of these risk factors causes reduce blood flow which deplete the required nutrients needed for proper function of the affected body parts causing inflammation (swelling) and pain. MSDs are caused by strained and inflamed tendons. Tendons connect muscles to bones. They do not contract or expands but simply transmit muscle movements and force to the bones. When they become strained, the following symptoms can occur. [3]

- Dull aching sensation at specific joints
- Discomfort with certain movements
- Tenderness to the touch

3. The Risk Body Parts :

A research by Dr. Ben Amick of the University of Texas, Health Science Center at Houston indicate that volunteers that were provided with adjustable ergonomic chair and also received ergonomics training experienced a significant reduction in symptom growth over the course of the work day, compared with those that received ergonomics training only and those with no training (control group). In a similar study of over 2000 participants conducted by Dr. Kelly DeRango of Upjohn Institute for Employment Research, result indicate that people who received the ergo chair and office ergonomics training achieved a 17.8% increase in productivity. It can be inferred from these researches that the chair is the most important tools in a workspace. However, such chair designed such that it can allow a configuration that aligns with the double "S"-shape structure of the back to allow for the proper way of sitting (Figure 1).

Figure 1: Chair-to-Back configuration

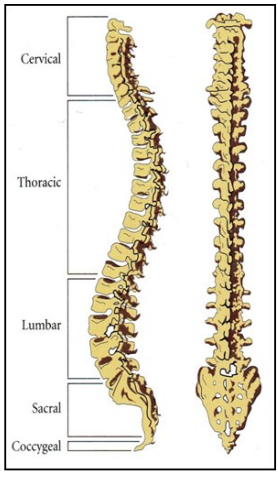

Figure 2: "S" shaped vertebrae column in man (Source: ANATOMICA, page 114)

3.1. The Back:

There are 33 vertebrae in man which extend from the back of

the skull to the tail bone (Figure 2). These vertebrae form a double "S" and designed by nature for support, strength, flexibility, proper balance and weight bearing. If it is placed directly on top of each other, the back will only be 5% as strong as it is now. Also, abdominal and back muscles are essential for supporting the back and maintaining posture (Figure 3). [1]

Back pain occurs mostly at inflection and terminal points of the vertebrae in the back (Figure 4). Poor posture often result in muscles, tendons and ligaments weakness, which give symptoms of pain. 7 out of 10 back problems are due to the improper alignment of the spinal column i.e. not maintaining the natural "S" shape configuration. [1]

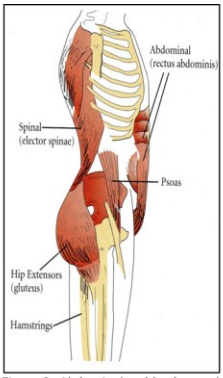

Figure 3: Abdominal and back muscles (Source: ANATOMICA, page 114)

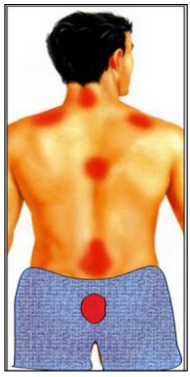
Figure 4: Most Likely Pain-points at the Back [(Source: ANATOMICA, page 114), modified image]

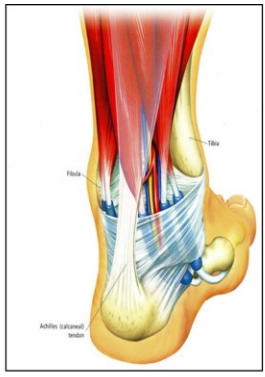
Figure 5: Connection of muscles to the back of the heel bone (Source: ANATOMICA, page 55)

No single cause can be isolated that triggers an episode of back pain. Some of the more common causes include:

- Physical injury
- Hard sneezing or coughing
- Improper lifting or bending
- Standing or sitting for long hours
- Sitting slumped in an overstuffed chair or automobile seat
- Tension, anxiety, depression, obesity and diseases

However, one can reduce the chance of developing back pain by paying attention to the way you stand, sit, bend, lift objects, sleep, exercise etc.

It is better to prevent painful condition in the back than treatment as prevention is always better than treatment of any condition, and it is less expensive and time savings.

Some general preventive measures are:

- Avoid strain upon muscles, joint, bones, and ligaments
- Ensure correct body posture – allows internal organs to have enough room to function normally and blood circulates more freely
- Practice good body posture to develop proper carriage and stronger muscles needed to protect and support your hard-working back

- Use appropriate (adjustable/ergo-friendly) chair and office equipment, and adjust to fit to your body and not vice versa.

3.2. The Wrist/Hand/Fingers:

When the wrist is placed against a hard surface for duration that causes reduce blood flow to the wrist thereby starving the supply of required nutrients and lubricants to the fingers, a condition called Carpal Tunnel Syndrome may occur. Usually the affected person may experience the following symptoms:

- Swollen feeling in the fingers and wrists
- Pain and numbness may be worse at night
- Weakness when gripping

3.3. The Leg :

The most common strain area on the leg is back of the heel bone. When it became strained, it present a condition called Achilles Tendonitis (Figure 5) that occur when the tendon that connect the calf muscles to the back of the heel bone suffers: [1]

1. Too much wear and tear
2. Wearing high heels or worn shoes, running, jumping,
3. Pushing forwards suddenly
4. Improper sleeping posture -places abnormal stresses on the tendon, and may cause rupture and inflammation.
5. Faulty sleeping positions that pushes the Achilles Tendon forward or backward may result in Achilles Tendonitis

The ruptured tendon can heal itself if proper posture is maintained. It may also require being placed in plaster cast for about six weeks to heal. [1]

The knee is also a major inflection points in the leg that must not be pressed against edges to avoid loss or reduce blood flow to the lower part of the leg. When reduce blood flow occur, numbness and irritating pain can occur which may cause inability to move the legs.

The Eyes:

Like connecting cables, too much strain can be placed on the eyes (Figure 6) in a too long activity without adequate breaks. Symptoms of Eyestrain are : [1]

1. Blurred Vision
2. Dry Eyes
3. Headaches
4. Even Neck and Backaches

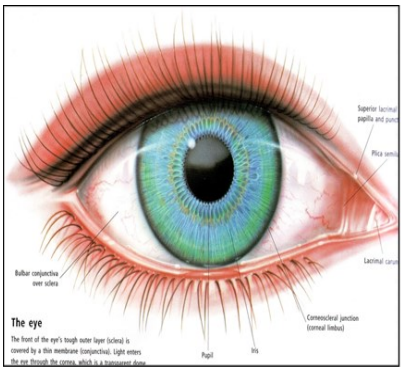

Figure 6: Front view of a human eye (Source: ANATOMICA, page 274)

4. Work Habits or Behaviour:

Office Ergonomics knowledge can only become useful to you in your workplace when you make an intentional effort to apply them through modification to your work habits. Office workers are encouraged take regular breaks away from the computer by doing something else for 10 minutes every hour. This break can be used for simple office ergonomics exercises or walking down the corridor to chat with a colleague, etc.

4.1. Office Exercises:

Expert recommends at least a 5 to 10 minutes break every hour. Such short breaks can be used to conduct the following exercises: There are simple office exercises that can be integrated into a daily schedule to eliminate injury of the muscles and tendons at work. Such exercises include:

1. 'Tip and Turn' of neck and head
2. Shrugging and squeezing of the shoulder
3. Sitting straight
4. Rotation of arms and feet
5. Shaking your hands
6. Palming and rolling your eyes.

Drinking water regularly helps you take a bathroom break! In addition it help you maintain body water balance (Total Intake = Total Output).

In a workplace, designing an Office Ergonomics program, that incorporate having the appropriate equipment, discipline body posture and behaviour, taking appropriate work breaks, and paying attention to early warnings are key to the success of such program.

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