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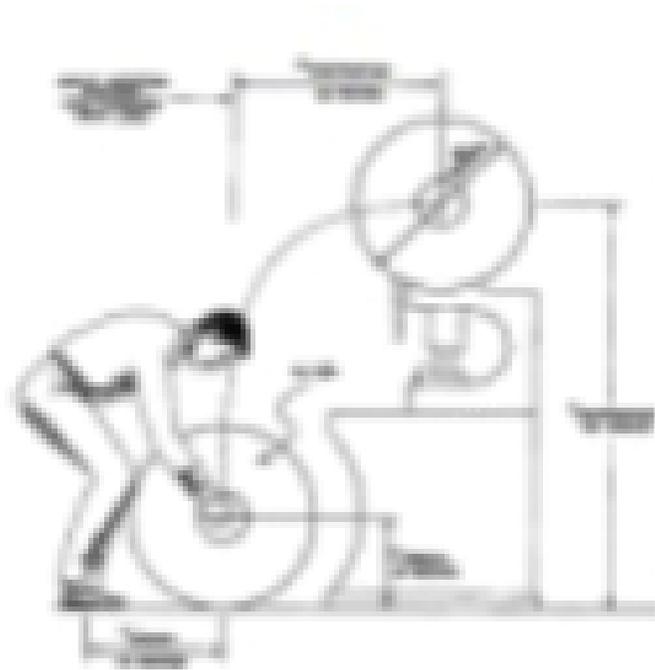
**Introduction to Safety – Unit Eight: Ergonomics and Back Safety**

*Chapter Reading*

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# Unit 8

# Ergonomics and Back Safety



**ALLOTTED LEARNING TIME:**

**1.0 week**

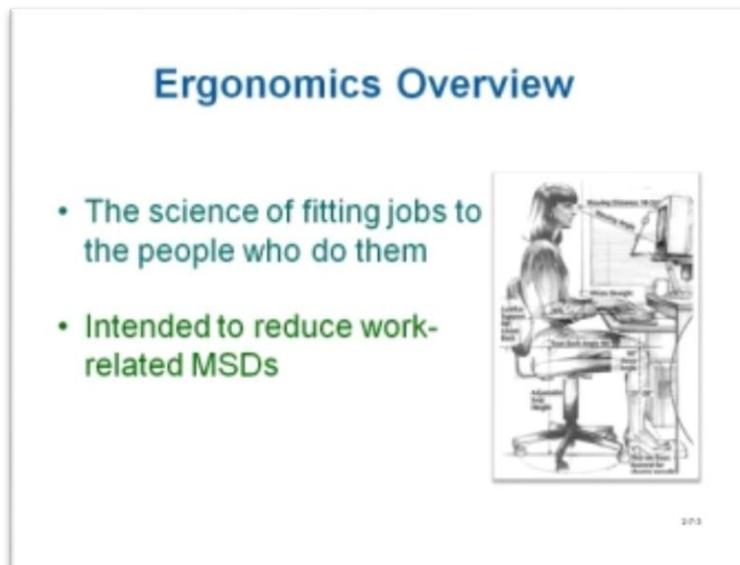


## Introduction to Safety – Unit Eight: Ergonomics and Back Safety

### Chapter Reading

#### Orientation

**Ergonomics** (derived from the Greek word *ergon* meaning *work*, and *nomoi* meaning *natural laws*), is the applied science of refining the design of objects and equipment to optimize them for human use, and determining where they are placed in the space within the work area in which individuals will use them. The objective of ergonomics in the workplace is to maximize productivity by reducing operator fatigue and discomfort, and to minimize the probability of injury. Various factors are taken into consideration in the design process, such as human characteristics which include height, weight, and proportions, as well as information about movements individuals will make in certain positions, such as when sitting, standing, turning or lifting. Ergonomics is sometimes known as **human factors engineering**. Individuals at the workplace responsible for the study and design of objects, motions and the environment for ergonomic purposes are typically **industrial engineers**. When adopted by a company, one of the primary benefits derived by an effective ergonomics program is the reduction in medical costs because it eliminates injuries and disabilities caused by processes that result in **musculoskeletal disorders (MSDs)**.



Back safety is another priority stressed by many companies. Each year more than one million people hurt their backs on the job, usually from lifting objects that are too heavy, by handling objects improperly, or through excessive repetitive movements. The result can be serious consequences for both the employer and employee. The employer is effected by possibly having a reduction in production when there are fewer individuals present to do the work, especially if absent individuals are highly skilled and difficult to replace by either a permanent or temporary worker. Employees are affected by lost wages and the possibility of long term pain if the injury is significant. To address potential back issues, employers provide training to their employees that educates them on how to use the back properly, and about what situations to avoid.



## Introduction to Safety – Unit Eight: Ergonomics and Back Safety

### Chapter Reading

#### Introduction

**Ergonomics** is a term associated with how companies design tools, objects, tasks and work areas to maximize the efficiency, safety and quality of the employee's work. Specifically, **ergonomics** is the science of fitting the workplace environment to the people that perform them. When ergonomics is observed and applied correctly on the job, musculoskeletal discomfort and fatigue are significantly reduced, which then reduces work-related musculoskeletal disorder (MSDs) problems.

Following ergonomic principles properly helps reduce stress, eliminates many potential injuries and disorders associated with the overuse of muscles, (see Figure 8-1) bad posture, and repeated tasks. This is accomplished by designing tasks, work spaces, controls, displays, tools, lighting, and equipment to fit the employee's physical capabilities and limitations.

The science and study of ergonomics is applied to the workplace to increase productivity and efficiency, reduce errors, improve quality, reduce waste, increase employee retention and satisfaction, and ultimately improve work, products, and a company's bottom line, profit. Ergonomics principles are not limited to the workplace. It also applies to everything that involves people; work systems, sports and leisure, health and safety should all embody ergonomic principles.

The proper use of the back is just important as ergonomics. There are proper techniques that should be followed to ensure proper lifting, turning and bending. Training should be provided by the employer to educate their workers on back safety to avoid injury. Even though proper techniques using the back will not completely eliminate injuries, potential problems will be reduced.

The topics in this unit covering ergonomics and back safety include:

- Musculoskeletal Disorders (MSDs)
- Injuries related to ergonomic hazards
- Contributing factors
- Hazard prevention and control
- Structure of the back
- Common back problems
- Proper lifting techniques
- Maintaining a healthy back

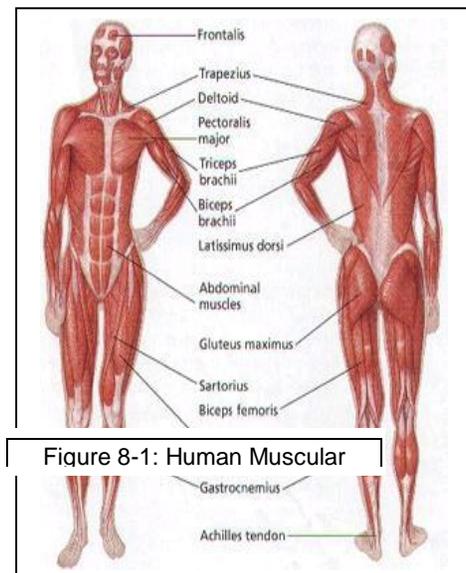


Figure 8-1: Human Muscular



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## Introduction to Safety – Unit Eight: Ergonomics and Back Safety

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#### Review Questions

1. Individuals in the workplace responsible for the ergonomics design of objects are typically \_\_\_\_\_.
  - A. OSHA representatives
  - B. the foreman
  - C. industrial engineers
  - D. safety managers
2. The application of ergonomics does not affect the following?
  - A. Improving quality
  - B. Reduction of errors
  - C. Higher efficiency
  - D. None of the above
3. The major cause of MSDs in the workplace is \_\_\_\_\_.
  - A. twisting
  - B. lifting
  - C. reaching
  - D. bending
4. Most industrial injuries are to the \_\_\_\_\_.
  - A. neck
  - B. back
  - C. hands
  - D. eyes



## Introduction to Safety – Unit Eight: Ergonomics and Back Safety

### Chapter Reading

#### 1. Musculoskeletal Disorders (MSDs)

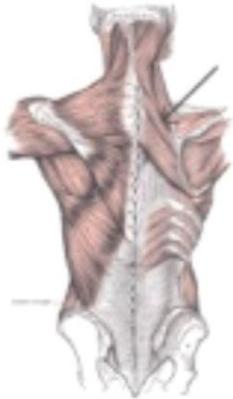
Musculoskeletal disorders (MSDs) are injuries and disorders that occur to muscles, nerves, tendons, ligaments, joints, cartilage and spinal discs. MSDs can be directly and indirectly related to various work activities, or the work environment that involves risk factors. Typically, these injuries are caused by repeated motions, or from strains when there is not sufficient recovery and healing time afterwards. When harmful motions or strains continue to reoccur, their affects can accumulate to the point of causing pain and injury. When an MSD is caused by a work activity, it is usually referred to as a work-related musculoskeletal disorder (WRMSD or WMSD). Specific categories of MSDs include:

- Cumulative trauma disorder (CTD)
- Repetitive stress injury (RSI)
- Repetitive motion injury (RMI)

The U.S. Centers for Disease Control and Prevention (CDC) estimated that in 2001, there were 522,528 recordable cases of MSDs. Almost half the cases (219,665) involved lifting, another 13 percent involved bending, climbing, reaching, and twisting, and over 60,000 recordable MSD cases were due to repetitive motion. An approximate 67 percent of MSD cases were caused by of overexertion to the back. Approximately 25 percent of those MSD cases involved resulted in more than 31 missed workdays. In the United States, it is estimated that the financial costs associated with MSDs run into billions of dollars.

### Musculoskeletal Disorders (MSDs)

- Injuries resulting from repeated strains not afforded sufficient recovery and healing time
- Over half a million reported cases in the US in 2001
- Overexertion to the back accounts for nearly 67% of all cases
- Financial costs of MSDs run into the billions of dollars



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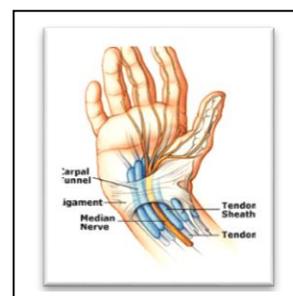
## 2. Injuries Related to Ergonomic Hazards

Most MSDs injuries that could be prevented by proper ergonomic practices are the result of repetitive motions that stress some type of soft tissue, such as tendons, ligaments, muscles or nerves. The following list of injuries provide information about various types of musculoskeletal disorders caused by ergonomic stressors, and possible activities that cause them.

### Types of MSDs

**A. Carpal Tunnel Syndrome** – This is a specific MSDs disorder in which the **median nerve in the wrist is injured or damaged**.

This nerve and nine tendons run from the forearm to the hand through a thumb-size space in the wrist called the **carpal tunnel** (See Figure 8-2). The symptoms of this condition are tingling, burning, numbness, pressure or severe pain in the wrist or the hand. The problems caused by this injury are the lack of strength in the hand, the inability to make a fist or hold objects, and difficulty performing various manual tasks. If the problem persists and is not treated, or the activity which is causing the nerve to be injured is not stopped, there can be a permanent loss of sensation, or partial paralysis can develop. Carpal tunnel syndrome is a common injury developed by electricians or assembly line workers who use a pliers where repetitive closures and twisting motions are made.



**Figure 8-2**  
**Carpal Tunnel**

**B. Lower Back Pain** – A very common MSD condition is a continuous pain in the lower back or lumbar region, which is located below the rib cage. There are many causes of lower back pain. Generally speaking, the lower back is subject to a lot of mechanical stress and strain. The reason is the weight of the upper body, which always puts loads on the lower back. Also, overuse work activities are a very common source of lower back pain and stiffness.

**C. Herniated Spinal Disc** – This condition occurs when the **tissue that separates the vertebral bones of the spinal column ruptures**. When this injury occurs, it may create pressure against one or more of the spinal nerves, causing symptoms such as pain, weakness or numbness in the neck and arm.

**D. Carpet Layer's Knee** – (Prepatellar Bursitis) This injury is a painful **inflammation** of the bursa, which is a fibrous, fluid-filled sac located around **the knee**. This condition is commonly caused by work activities at the floor level that requires repeated kneeling on hard surfaces.



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- E. Tendonitis** – This injury is the **inflammation of a tendon**, which is the fibrous structure that joins muscle to bone. The inflammation is the result of the tendon being irritated, causing it to be swollen. Tendonitis occurs at or near the joints of the body, where the tendons rub against ligaments and bones. Continual rubbing of the tendons when making repetitive motions from a variety of occupational motions and actions causes the inflammation to develop. Tendonitis can also be caused by the tendon being strained. Symptoms of this condition range from being a dull to sharp pain, depending on the level of the inflammation. Once inflamed, the recovery is usually slow because there is little blood flow through the tissue of the tendon to help it heal. The condition may become chronic if the cause of the injury is not eliminated.
- F. Rotator Cuff Injuries** – The rotator cuff is a group of tendons and muscles in the shoulder, connecting the upper arm (humerus) to the shoulder blade (scapula). The rotator cuff tendons provide stability to the shoulder; and the muscles allow the shoulder to rotate. One type of injury to the rotator cuff is tendonitis, which is commonly caused by repetitive overhead use of the arms (such as painting or throwing) causes a painful strain injury. **The symptoms are extreme** pain, which often causes a restriction in the arm's range of motion. Another type of rotator cuff injury is a tear of the tendon that's been weakened by age or wear and tear. Weakness in the arm (and usually pain) are the symptoms. The rotator cuff tendon can also become impinged by being squeezed between the humerus and a nearby bone called the acromion.
- G. Trigger Finger** – This injury is a condition in which **one of the fingers** or the thumb **locks** or catches in a bent position. The finger or thumb may straighten with a snap **by being** pulled and released.
- H. Raynaud's Syndrome** – This condition is a disorder characterized by episodic attacks that cause **the blood vessels in the fingers and toes** to **constrict**. The constrictions dramatically limit the flow of the limit blood supply temporally. As a result, the symptoms that appear are that the skin turns a pale and dusky color due to the lack of blood flow to the area.
- I. De Quervain's Disease** – This disease is a painful inflammation that affects the **tendons** on the thumb side **of the wrist**. The swollen tendons and their coverings rub against the narrow tunnel through which they pass, resulting in pain at the base of the thumb.



## Introduction to Safety – Unit Eight: Ergonomics and Back Safety

### Chapter Reading

### Types of MSDs

- Carpal tunnel syndrome
- Tendonitis
- Trigger finger
- Raynaud's syndrome
- De Quervain's disease
- Rotator cuff tendonitis
- Carpet layers' knee (Bursitis)
- Herniated spinal disc
- Low back pain



### 3. Causes of MSDs

There are a variety of work-related reasons why MSDs injuries occur on the job. They are typically the result of when there is a mismatch between the physical capacity of the employee and the physical demands required to do the work. MSDs are often the result of:

### Causes of MSDs



- Repetition
- Forceful exertion
- Awkward posture
- Contact stress
- Vibrations



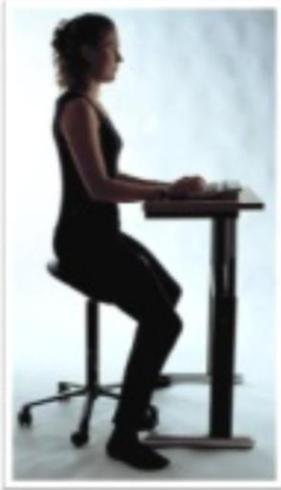
## Introduction to Safety – Unit Eight: Ergonomics and Back Safety

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- A. **Repetition** – Repetition means making a motion over and over while performing a work-related activity.

### Causes of MSDs (Cont'd.)

- **Repetition**
  - Same motion performed over and over
  - Severity of injury based on:
    - how often the movement is repeated
    - speed of the movement
    - number of muscles involved
    - required force



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- B. **Forceful Exertion** – During some work activities, a certain amount of force provided by muscles of the body is required to cause a motion. If there is significant resistance to the motion, it can strain the muscles to the point of causing inflammation or a tear of its tissue. Specific causes of this type of MSDs are:

### Causes of MSDs (Cont'd.)

- **Forceful exertion**
  - Amount of physical effort required to perform a task
  - Effort needed to control equipment/tools involves:
    - Type of grip
    - Weight of object
    - Body posture
    - Type and duration of the task





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- C. Awkward Posture** – If the body is in an awkward position while performing a work-related operation, it can result in a poor posture that can cause an MSDs condition to develop. **Two aspects of posture that contribute to MSD occurrences are** the position of the body that performs the task, and the fixed position of the neck and shoulders. The following motions are elements of awkward posture:

### Causes of MSDs (Cont'd.)

- **Awkward Postures**
  - Reaching
  - Twisting
  - Bending
  - Kneeling
  - Squatting
  - Working overhead
  - Holding fixed positions



- D. Contact Stress** – This type of stress that causes an MSDs condition involves pressing your body against a hard or sharp edge, resulting in pressure on nerves, tendons, and blood vessels. Examples include:

### Causes of MSDs (Cont'd.)

- **Contact stress**
  - Pressing the body against a hard or sharp edge
  - Puts pressure on nerves, tendons, and blood vessels
  - Allowing wrists to rest on the keyboard while typing
  - Holding tools with hard handles





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- E. Vibrations** – Vibrations are typically associated with the use of some power tools that can cause muscles and tendons to loosen.

The following are some [examples of vibrating tools](#):

### Causes of MSDs (Cont'd.)

- **Vibration**
  - Sanders
  - Grinders
  - Chippers
  - Routers
  - Drills
  - Saws



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**Question:** What is a forceful exertion?

**Answer:** The amount of physical effort needed to complete a task.

**Question:** What types of awkward postures are required for you to perform your job?

**Answers:** It will vary, but should include reaching, bending, twisting, and working overhead while maintaining a fixed neck/shoulder position.

**Question:** How can awkward postures lead to MSDs?

**Answer:** Twisting or bending while carrying heavy loads can cause muscle strains or tears.

**Question:** What areas in your workplace might expose you to contact stress? Think of anything that might put pressure on nerves, tendons, and blood vessels.

**Answers:** Wrists resting on a keyboard while typing.

**Question:** What items cause vibrations in the workplace and contribute to MSDs?

**Answer:** Machinery, tools, etc.



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#### Review Questions

5. Which of the following does not contribute to MSD?
  - A. Bad posture
  - B. Overuse of muscles
  - C. Repeated tasks
  - D. None of the above
  
6. Carpal tunnel syndrome is the irritation of the \_\_\_\_\_ in the wrist.
  - A. muscles
  - B. nerves
  - C. tendons
  - D. bones
  
7. A herniated spinal disc is an injury to \_\_\_\_\_.
  - A. the spinal cord
  - B. vertebral bone
  - C. tissue separated vertebral bone
  - D. the neck
  
8. Which factor does not contribute to an injury from forceful exertion?
  - A. The type of grip
  - B. The weight of an object
  - C. The duration of a task
  - D. None of the above
  
9. Contact stress is an injury created by putting pressure on \_\_\_\_\_.
  - A. nerves
  - B. tendons
  - C. blood vessels
  - D. Any of the above



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#### 4. Common Symptoms of MSDs

Early indicators of MSDs include, but are not limited to:

### Early Indicators of MSDs

- Decreased strength for gripping
- Decreased range of motion
- Loss of skeletal muscle function
- Inability to do everyday tasks

The slide features a bulleted list of four early indicators of MSDs: 'Decreased strength for gripping' (teal), 'Decreased range of motion' (red), 'Loss of skeletal muscle function' (purple), and 'Inability to do everyday tasks' (green). To the right of the list is a grey silhouette of a human skeleton. Below the list are three small images: an X-ray of a shoulder, two diagrams of a knee joint, and a hand with red and yellow spots on the fingers. A small '2012' copyright notice is visible at the bottom right of the slide.

The most common MSD-related symptoms include, but are not limited to:

### Common Symptoms of MSDs

- Painful joints such as wrists, shoulders, forearms, knees
- Pain, tingling, numbness in hands or feet
- Shooting pain in arms or legs
- Swelling, inflammation, burning sensation
- Fingers or toes changing color
- Back or neck pain/stiffness

The slide features a bulleted list of six common symptoms of MSDs: 'Painful joints such as wrists, shoulders, forearms, knees' (teal), 'Pain, tingling, numbness in hands or feet' (red), 'Shooting pain in arms or legs' (purple), 'Swelling, inflammation, burning sensation' (green), 'Fingers or toes changing color' (blue), and 'Back or neck pain/stiffness' (black). A small '2012' copyright notice is visible at the bottom right of the slide.

**Question:** What are some early indicators of MSDs?



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**Answers:** Answers will vary, but should include decreased strength, diminished range of motion, and weakness.

**Question:** What are some common symptoms of MSDs?

**Answer:**

- Persistent pain and swelling
- Numbness
- Tingling sensation in the extremities
- Dropping objects/clumsiness
- Waking with numb hands or fingers

### 5. Report Signs of MSD

It is very important to understand that the benefit of reporting an MSD incident by an employee will likely result in their working conditions being improved.

Production technicians should also know that there will be no disciplinary action taken against them for submitting an MSD report. Whenever technicians are having trouble with simple tasks or if they are constantly having trouble with swelling, joint disorders, and pain in the arms, legs, shoulder, back, or neck, they should report these problems to their supervisor. The earlier these types of signs and symptoms are reported, the better the chance of being able to determine the source of the problem to correct it, and the earlier the individual will recover from the disorder that developed.

As an employee, you should:

- Report MSD hazards.
- Know that your employer is required to respond promptly to your report.
- Report signs or symptoms of MSDs to your supervisor or a human resources representative.
- Know that permanent disability may result if not reported early.

### 6. MSD Incident

When an employee reports signs or symptoms of an MSD, the employer must determine if the signs or symptoms qualify as an MSD incident. The following two examples qualify as reportable incidents:



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### MSD Incident

- Work-related and requires medical treatment beyond first aid
- Work-related and signs or symptoms last seven or more consecutive days after reported



#### 7. Is the Incident Work-Related?

Determining if an MSD is caused by a work-related activity requires approved methods in which the specific hazards, workplace conditions, and exposures are tracked over a period of time. Establishing whether or not an injury is work-related may include the following actions by the employer:

- conduct a thorough medical examination,
- record a detailed history of the patient and the illness that affected him or her,
- evaluate both on- and off-the-job activities that may have contributed to the MSD.



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#### Review Questions

10. An early indicator of MSD is \_\_\_\_\_.
  - A. weakness
  - B. pain
  - C. diminished range of motion
  - D. numbness or tingling
  - E. Any of the above
  
11. An MSD incident of a worker should first be reported to \_\_\_\_\_.
  - A. the company nurse
  - B. HR
  - C. the supervisor
  - D. an attorney
  - E. OSHA
  
12. When employees first detect a possible MSDs injury, they should wait a reasonable period of time to report so that it can be verified there is actually a problem.
  - A. True
  - B. False
  
13. Which case qualifies as an MSD incident?
  - A. Symptoms last for 7 consecutive days
  - B. Injuries result in medical treatment, restricting work, or days away from work.
  - C. Both A and B
  - D. Neither A or B



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#### 8. Employer's Response to an Incident

The following list is a guide related to OSHA rules for an employer to follow in response to an MSD-related incident:

### Employer's Responsibility

- Determines if report is an MSD incident
- Provides access to a healthcare provider
- Ensures that wages and benefits are protected
- Analyzes job for MSD hazards
- Takes steps to reduce MSD hazards
- Identifies risk factors: action trigger



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#### 9. Job Hazard Analysis

When responding to an MSD-related incident the employer should use a basic screening tool, which analyzes and identifies risk factors that could lead to MSD hazards. When it is determined that there are risk factors on the job that is causing an MSDs situation, proper action should be taken. This action by the employer is to – for the employee's job and all jobs in the workplace that are the same as that job – develop and implement an ergonomics program. Included in this effort is a job hazard analysis. The analysis process to identify risk factors entails:

- using one or more of OSHA-approved hazard identification tools to conduct the analysis,
- talking with employees about the tasks they perform to determine which ones may contribute to an MSD disorder,
- observing the employee's job activities to identify the MSD-related risk factors in the job and to evaluate the magnitude, frequency, and duration of exposure to the risk factors.



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## Job Hazard Analysis

- OSHA-approved hazard identification tools
- Talk with employees
- Observe employees' job performance to identify and evaluate risk factors.



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**Question:** Are all MSDs work related?

**Answer:** No. They can develop outside the workplace.

**Question:** How does the employer prove that an MSD is work-related?

**Answer:**

- Conduct a thorough medical exam (patient history).
- Check job hazard analysis results.
- Examine history related to the workplace.

**Question:** What is the purpose of a job hazard analysis?

**Answer:** A job hazard analysis breaks a job into its various elements or actions, describes them, measures and quantifies the ergonomics risk factors inherent in the elements, identifies conditions contributing to the risk factors, and determines corrective measures

### 10. Management Leadership and Employee Participation – OSHA Requirements

OSHA has established guidelines that management personnel must follow as it relates to workplace ergonomics and MSD incidents:

- establish an MSD reporting, response tracking, and documenting system;



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- appoint designated persons and give them authority, information, and resources to run the program;
- ensure that policies do not discourage employee participation or the reporting of MSDs;
- ensure that employees participate in developing, implementing, and evaluating the ergonomics program;
- ensure that employees have the means to promptly report MSDs and hazards when they are identified or occur;
- ensure that there are prompt responses after employees' reports of MSDs and hazards are submitted.

### 11. Managing MSDs

Once it is determined that an employee has experienced, encountered or identified a workplace-related MSD incident, the employer must provide a prompt and effective response to the situation. At no cost to the employee, it must include:

### Managing MSDs

- Access to a health care professional (HCP)
- Evaluation and follow-up of MSD incident.
- Appropriate work restriction and protection.



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#### 12. Work Restriction Protection (WRP) Program

Under the WRP program, when it has been determined that an employee encountered a work-related MSD incident, in some situations the worker will be assigned a job assignment with temporary work restrictions. **WRP program provisions under these circumstances may include:**

### Work Restriction Protection Program (WRP)

- 100% wages/benefits while on light duty
- 90% wages and full benefits if removed from work
- 90-calendar-day limit
- Company-provided HCP determines work restrictions
- Second opinion can be obtained by employee



Work restrictions are determined by an employer-provided health care professional. If the employee is not granted or is uncomfortable with the reassignment, he or she may seek a second opinion from another health care professional at no cost.

#### 13. Evaluating the Ergonomics Program

To ensure that the company's ergonomics program is effective, the employer must at least once every three years evaluate the program. The evaluation entails:

### Evaluating the Ergonomics Program

- Ask employees about the program
- Perform functional review
- Ensure that hazards are identified and addressed
- Correct deficiencies





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#### 14. Recordkeeping

When an employer has eleven or more employees (part-time and temporary included), they must maintain records about the following information:

### Recordkeeping

- Reports of MSDs, signs/symptoms of MSDs, and MSD hazards
- Responses to reports
- Job hazard analyses
- Hazard control measures
- Ergonomics program evaluations
- Work restrictions and HCP's written opinions
- Employees may have access to these records



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**Note:** HCP's means health care professionals.

**Question:** What should management do to get participation?

**Answer:** Designate a person(s) with authority to run the program and involve the employees in that process of development and evaluation of the ergonomics program.

**Question:** Will someone on light duty receive full benefits and wages?

**Answers:** Answers will vary, but the most common answer is "yes."

**Question:** Why should you evaluate your ergonomics program?

**Answer:** To ensure that you are getting the most from the program and that it is accomplishing what it was designed to do

**Question:** Why is recordkeeping so important?

**Answer:** Without the true numbers and/or incidents how can you come up with fair answers and make good decisions about MSDs?



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#### Review Questions

14. It is important that the employer determines if an employee's MSD is work or non-work related. True or False
15. An employer is obligated to provide any wages and benefits to an employee who is injured on the job. True or False
16. When a job hazard analysis process determines that an employee has developed an MSD condition at work, an ergonomics plan must be developed and implemented. True or False
17. Who is primarily responsible for developing ergonomics and effective MSD incident reporting?
  - A. Management
  - B. Employees
  - C. Designated personnel
  - D. All of the above
18. An employee in a WRP (Work Restricted Program) receives \_\_\_\_\_ percent of wages if removed from work.
  - A. 50
  - B. 75
  - C. 90
  - D. 100
19. An employee in a WRP receives benefits for a minimum of \_\_\_\_\_.
  - A. 30 calendar days
  - B. 60 calendar days
  - C. 90 calendar days
  - D. 1 year
20. To determine if an ergonomics program is effective, it must be evaluated at least once every \_\_\_\_\_.
  - A. 6 months
  - B. 1 year
  - C. 3 years
  - D. 10 years
21. Employers with \_\_\_\_\_ or more employees must maintain MSD reporting.
  - A. 5
  - B. 11
  - C. 50
  - D. Any number

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## 15. Posture and Lifting Objects

There are various muscles in the back. Some of them are located near the joints of the spinal column. Other muscles are located closer to the surface just under the skin. Injuries to the back are one of the most common reasons why people go to a doctor or chiropractor. Back injuries often caused by lifting heavy objects improperly, or are related to poor posture.

**A. Lifting** Back injuries commonly occur when people lift objects off the floor improperly. The mistake usually made is that they will bend over and pick up the object while keeping their legs straight, as shown in Figure 12a. The result is that a large amount of stress is placed on the back muscles and the spine when in this position. The injury occurs not because the forces are large, but because the spine is relatively weak.

The probability of injuring the back can be minimized by lifting the object with the back erect and bending the knees when grabbing the object, as shown in Figure 12b. As it is being lifted, the back should remain erect while using the legs to raise the body. Using this technique, the amount of force on the back is about 5.6 times smaller.

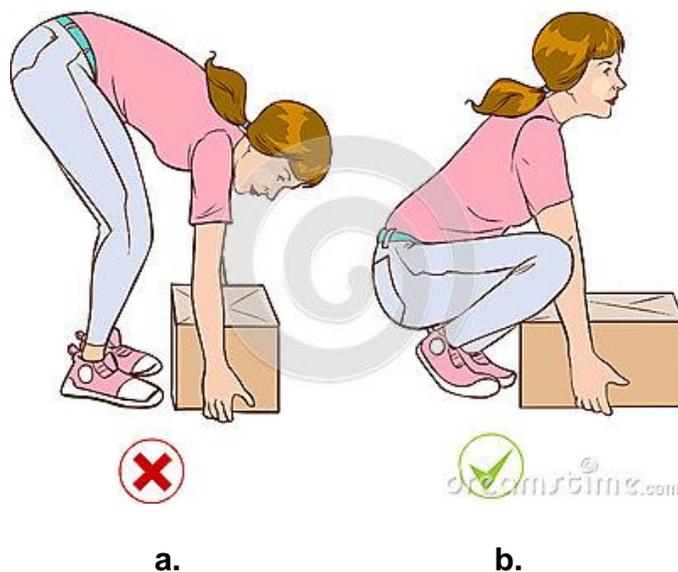


Figure 12

**B. Posture** Some people have good posture, which means they stand and walk erect (see Figure 13). Standing straight enables the upper body's center of gravity to be located directly above the hips. The result is that there is minimal

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torque exerted around the hips. Good posture is an example of unstable equilibrium, and only small forces are needed to bring the upper body back to a vertical position when it becomes displaced.

When a person has bad posture, the center of gravity in the upper body is in front of the pivot point of the hips. The weight of the body that is off-center therefore must be supported by the muscles in the lower back. Over a period of time, the person experiences muscle strain. Another cause of muscle strain in the back is poor posture when sitting, as shown in Figure 14. Computers and related products, such as computer desks and chairs, are frequently the focus of ergonomic design. A great number of people use these products for extended periods of time -- such as the typical work day. If these products are poorly designed or improperly adjusted for human use, the person using them may suffer unnecessary fatigue, stress, and even injury. Special chairs have been designed to help people sit upright.

Figure 13

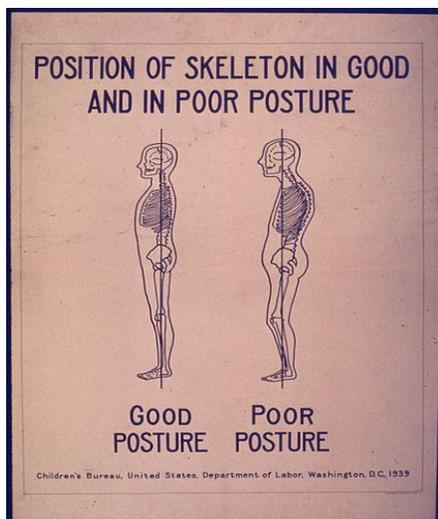


Figure 14



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#### Review Questions

22. When lifting an object, \_\_\_\_\_.
- A. keep the back erect and bend your knees when grabbing it
  - B. pick it up while keeping your legs straight
  - C. start with bent knees and shins placed flat on the floor
  - D. twist the trunk of your body while it is being lifted
23. When a person has bad posture, the center of gravity of the upper body must be supported by \_\_\_\_\_.
- A. muscles in the back of the neck
  - B. hip muscles
  - C. the Achilles tendon
  - D. muscles in the lower back
24. Ergonomically-designed chairs at computer work stations should cause the person to sit leaning forward so that they look directly at the monitor.
- A. True
  - B. False



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#### Summary

In this unit, the principles of ergonomics and information about the causes and prevention of MSDs at the workstation was provided. While not all MSDs are preventable, advice on how to reduce the risks of becoming injured is available. To minimize the effects of MSDs injuries through early detection, information about how to recognize some of the more common signs and symptoms of MSDs was provided, along with the importance of reporting MSDs in the workplace and the employer's responsibilities. Because employees are intimately involved and exposed to the conditions in the workplace, they a vital source of information about hazards in their environment. They are capable of identifying hazards, of providing advice on solving problems, and add to the enhancement of job satisfaction, motivation, and acceptance of change. Employers should pay particular attention to the information employees can offer, and should consider ergonomic issues when providing tools, designing workstations and work areas. Ergonomic elements can often be added to the workplace with little or no cost to the employer, and can prevent expensive medical bills or litigation expenses before MSDs issues arise.

### Summary

- Understand MSD hazards
- Recognize MSD signs and symptoms
- Report MSDs
- Participate in the ergonomics program

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#### Module 7 Chapter Questions

1. Ergonomics reduces \_\_\_\_\_.
  - a. Overuse of muscles
  - b. Bad posture
  - c. Repeated tasks
  - d. All of the above
2. Implementing ergonomics helps to maximize productivity.
  - a. True
  - b. False
3. Ergonomics is the science of fitting jobs to the people who perform them.
  - a. True
  - b. False
4. MSDs are injuries to the \_\_\_\_\_.
  - a. Spinal discs
  - b. Muscles
  - c. Ligaments and tendons
  - d. All of the above
5. Most work related injuries are to the \_\_\_\_\_.
  - a. eyes
  - b. hands
  - c. back
  - d. feet
6. The main cause of work related MSDs injuries are the result of \_\_\_\_\_.
  - a. repetition
  - b. lifting
  - c. climbing
  - d. reaching
7. \_\_\_\_\_ is an MSD of the wrist.
  - a. Raynuad's Syndrome
  - b. Carpal Tunnel Syndrome
  - c. Rotator Cuff Tendonitis
  - d. Trigger Finger



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8. Factors that affect Forceful Exertion MSD injuries involve \_\_\_\_\_.
  - a. duration of the task
  - b. weight of an object
  - c. body posture
  - d. type of grip
  - e. All of the above
  
9. The severity of an injury from repetition depends on which factors?
  - a. frequency
  - b. speed and movement
  - c. required force
  - d. All of the above
  
10. An injury that causes injuries to the wrists by resting them on a keyboard while typing is categorized as \_\_\_\_\_.
  - a. Repetition
  - b. Vibration
  - c. Contact stress
  - d. Awkward posture
  
11. The type of injury caused from vibration is \_\_\_\_\_.
  - a. the loosening of muscles and tendons
  - b. a tear of the cartilage
  - c. a rupture of the spinal disk
  - d. a stress fracture of the bone
  
12. Early indicators of MSDs is \_\_\_\_\_.
  - a. diminished range of motion of various body parts
  - b. decrease in strength of arms and hands
  - c. weakness of skeletal muscles
  - d. Any of the above
  
13. A common symptom of MSDs is \_\_\_\_\_.
  - a. painful joints
  - b. tingling or numbness of the hands or feet
  - c. shooting pain in the arms or legs
  - d. Any of the above
  
14. As soon as a worker detects any signs of MSD, he/she should report it to \_\_\_\_\_.
  - a. a supervisor
  - b. the HR office
  - c. a or b
  - d. OSHA





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15. What situation qualifies as an MSD incident?
  - a. days away from work
  - b. restricted work
  - c. medical treatment beyond first aid
  - d. Any of the above
  
16. If an MSD incident occurs, OSHA requires that the employer \_\_\_\_\_.
  - a. not change the employee wages and benefits while on light duty
  - b. take steps to reduce the MSD hazard
  - c. provides the employee access to a healthcare provider
  - d. All of the above
  
17. Which of the following actions are implemented when conducting a job hazard analysis?
  - a. Use OSHA approved hazard identification tools
  - b. Talk with employees
  - c. Identify and evaluate risk factors by observing employees performing their work
  - d. All of the above
  
18. A job hazard analysis does not include the determination of corrective measures to eliminate an MSD incident.
  - a. True
  - b. False
  
19. OSHA requires that employees participate in developing, implementing, and evaluating an ergonomics program.
  - a. True
  - b. False
  
20. MSD management does not include \_\_\_\_\_.
  - a. access to a health care professional
  - b. evaluation and follow-up of an incident
  - c. appropriate work restrictions
  - d. None of the above
  
21. Under the *Work Reduction Protection Program*, employees affected by an MSD receives \_\_\_\_\_ percent of their wages and benefits while on light duty.
  - a. 50
  - b. 75
  - c. 90
  - d. 100





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22. When lifting an object, \_\_\_\_\_.
- A. twist the trunk of your body while it is being lifted
  - B. Pick it up while keeping your legs straight
  - C. start with bent knees and shins placed flat on the floor
  - D. keep the back erect and bend your knees when grabbing it
23. The maximum amount of time an employee affected by an MSD is allowed to Receive wages and benefits is \_\_\_\_\_.
- a. 30 days
  - b. 90 days
  - c. 6 months
  - d. 1 year
24. To ensure that a company's ergonomics policies are effective, the employer must evaluate the program at least once every \_\_\_\_\_.
- a. 90 days
  - b. 6 months
  - c. 1 year
  - d. 3 years
25. Employers with \_\_\_\_\_ or more employees must maintain MSD related records.
- a. 6
  - b. 11
  - c. 16
  - d. 50



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#### **Review Question Answers**

1. C
2. D
3. B
4. B
5. D
6. B
7. C
8. D
9. D
10. E
11. C
12. B
13. D
14. True
15. True
16. True
17. A
18. C
19. C
20. C
21. B
22. A
23. D
24. B



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