

Introduction



- Certain activities present employees with physical challenges that are ergonomically hazardous. This module defines and provides solutions for these challenges.
 - Human factors engineering/ergonomics is the study of worker's interaction with their job environment to minimize physical and psychological stress in the workplace.
 - Human factors/ergonomics studies also seek to maximize worker capacities, capabilities, and productivity through job design, workplace environment and equipment, and products.

Learning Objectives – Ergonomics/Human Factors



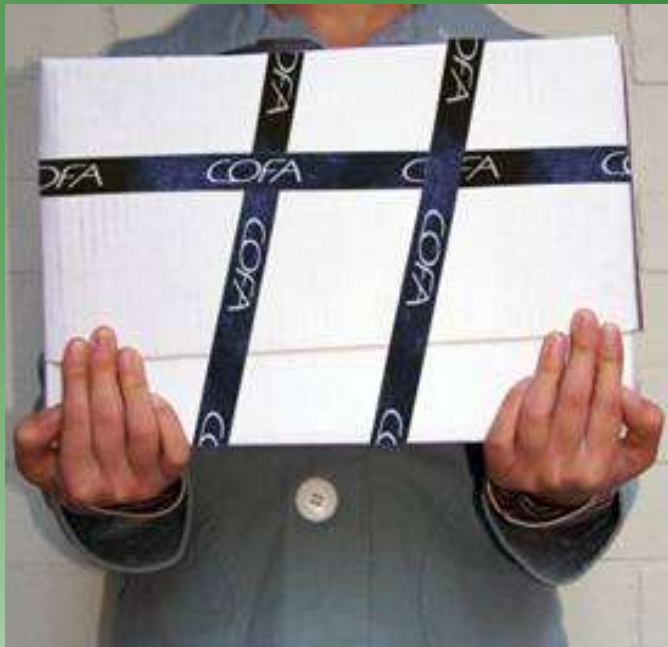
- At the end of this module, you will be able to:
 - Explain the basic concept of **ergonomics**
 - Recognize the fundamental components of human anatomy commonly affected by ergonomic-related disorders
 - Identify the ergonomic risk factors associated with a job task
 - Describe how to evaluate ergonomic risks and identify control measures for avoiding ergonomic-related disorders.

General Principles of Occupational Ergonomics



- The workers role should be based on physical, cognitive, physiological, and psychological capabilities and limitations.
- Equipment should support or complement the worker in accomplishing a task.
- The environment should provide working conditions that maximize human performance.
- Job design should minimize the potential for exposures which may result in injury or illness.

Job Design



- The following factors determine an effective job design:
 - How much a person can do
 - How long a given level of effort can be sustained
 - How work can be organized or patterned to reduce the possibility of accumulating fatigue.
 - How external pressures can influence the workers perception of job difficulty.

The Human Components of Job Design



□ Job design is critical to ergonomics. There are three human components of job design:

- Work physiology
- Biomechanics
- Anthropometrics.

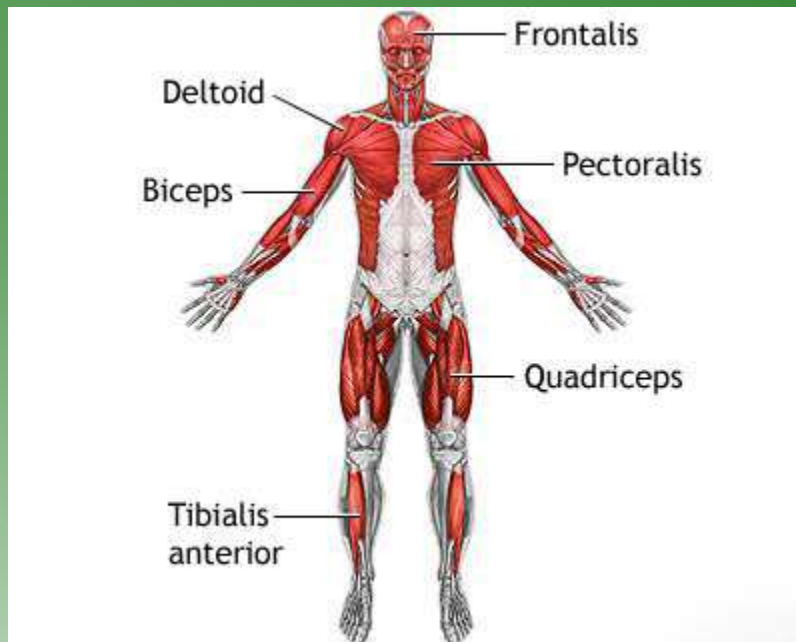
Test your knowledge

□ Job design emphasizes fitting the person to the job.

□ True

□ False

Basic Human Anatomy



□ The performance of work requires energy. This energy is made possible through the coordinated efforts of the:

- Musculoskeletal system
- Circulatory system
- Respiratory system.

Test your knowledge

- _____ provides the joints with sliding surfaces of low frictional resistance.
 - Alveolus
 - Cartilage
 - Venous Blood

Overexertion Phenomenons and Disorders

- Overexertion can cause a number of disorders.
 - Localized and Whole-body Fatigue
 - Lower Back Pain
 - Carpal Tunnel Syndrome
 - Tendonitis
 - Tenosynovitis
 - Bursitis



Test your knowledge

- One of the most commonly encountered and compensated occupational injuries is

_____.

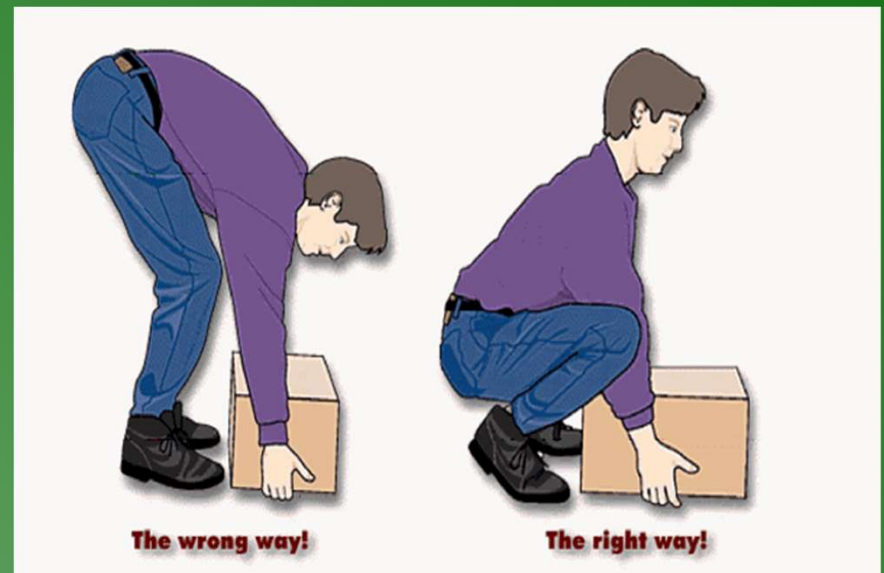
- Carpal tunnel syndrome

- Lower back pain

- Tendinitis

Risk Factors

- Understanding the risk factors which can lead to disorders may help you alter your behavior.
 - Forceful Exertions
 - Awkward Postures
 - Localized Contact Stresses
 - Vibration
 - Temperature Extremes
 - Repetitive Motions



Test your knowledge

- A factory operator is responsible for physically opening and closing valves. The worker has the potential to be exposed to the following stress(es):
 - Localized contact stresses
 - Repetitive motions
 - Awkward postures
 - Forceful exertions

Job-Task Analysis



□ The analysis of tasks for the purpose of ergonomics evaluation should address the following four tasks characteristics:

- Range of motion and reach requirements
- Exertion and strength requirements
- Dexterity and fine motor control requirements
- Frequency and duration concerns.

Work Station Analysis

- The work station as well as the job task may be a cause of stress. Furniture and other comfort indices such as heat and humidity can create stress.



Test your knowledge

- After observing a group of workers, their new supervisor has decided to examine the equipment and tools that they use on a daily basis. This is an example of a

_____.

- Job-task analysis
- Workstation analysis

Control Methodology



□ Once ergonomics hazards have been identified, control measures should be implemented. These controls can be described as:

- Engineering controls
- Administrative controls.

Learning and Skills Acquisition Training Programs



- One of the most effective administrative control measures is an effective training program. Courses can be used to instruct personnel in the proper use of appropriate equipment and safe lifting/carrying techniques.
- The use of these controls methodologies can increase productivity as well as workers' physical and mental well-being. The time that it takes for a worker to become fully skilled in a job task depends on that task, the worker's capabilities and capacities, and his/her environment.

Proper Use of Appropriate Equipment

- Use tools with handles of appropriate size and shape, with all edges and sharp corners rounded off.
 - Avoid narrow tool handles that concentrate large forces into small areas of the hand.
 - Use tools with preformed grip handles that comfortably fit your hand.
 - Minimize the vibration of powered hand tools.
 - Avoid repetitive or sustained exertions, especially if they are accompanied by deviations from a straight wrist or forceful exertions.
 - Keep the working elbow at the side of the body, the forearm **semi-pronated**, and the wrist straight. Hands are stronger and less vulnerable to injury when the wrists are kept straight.



Safe Lifting/Carrying Techniques



- Use two hands.
- Keep the load in front of the body.
- Do not twist your back.
- Make sure the load is balanced.
- Make sure you have good footing and unobstructed walkways.
- Maintain good posture, lift with your legs, not your back.
- Lift and carry the load as close to the body as possible.
- Maintain the back in the natural posture as much as possible when lifting and carrying (natural S curve).

Test your knowledge

- When a supervisor decides to reassign the workers performing a specific task as the result of introducing an automation component to that specific task, it is an example of an _____ control measure.
 - Engineering
 - Administrative

Summary

- Ergonomics can help reduce physical and mental stress in the workplace by helping employees:
 - Design the job for human capabilities and capacities
 - Understand ergonomic risk factors
 - Use ergonomically-designed tools, equipment and workstations
 - Practice ergonomic control methodologies.

- Some measures you should take to prevent physical stress are:
 - Know your limitations
 - Be aware of your work environment. Take steps to control any potential stresses from comfort indices like noise and lightening
 - Be familiar with the signs and symptoms of ergonomic-related disorders. Inform your supervisor or your facility's medical center if symptoms persist.

Summary

- Understand the components of job-task and workstation analysis:
 - Range of motion and reach requirements
 - Exertion and strength requirements
 - Dexterity and fine motor control requirements
 - Frequency and duration
 - Furniture and fixtures
 - Comfort indices (noise, illumination, temperature, etc.)
- Use ergonomically designed tools when possible.
- Keep the elbow at the side of the body, the forearm semi-pronated, and the wrist straight when using hand tools.
- Finally you should:
 - Always size up a load before attempting to lift or carry it
 - Practice safe lifting and carrying techniques.

- You have completed the Module:
 - Human Factors/Ergonomics.