

Introduction

Ergonomics in General Industry

- Welcome
- Given current OSHA and industry information regarding worksite incidents and disabling injuries, the student should be able to recognize the hazards associated with musculoskeletal disorders (referred to as MSDs) and Repetitive Motion Disorder (RMD) injuries in the workplace.

Introduction

- Objectives
- At the end of this course, the student should be able to:
 - Identify the major hazards associated with MSD and RMD type injury and illness.
 - Describe types of activities that can lead to MSD and RMD injury and illness.
 - Tools and a better understanding of how to protect themselves from MSD and RMD injury and illness producing hazards.
 - Recognize employer requirements to protect workers from exposure to MSD and RMD injuries.

Introduction

- Course Intentions
- Intended for workers, unions, supervisors, contractors, safety specialists, human resources managers—anyone with an interest in safe work sites.
- Some of the most common injuries in the workplace are the result of job demands that push the human body beyond its natural limits.
- Workers who must often lift, stoop, kneel, twist, grip, stretch, reach overhead, or work in other awkward positions to do a job are at risk of developing a work-related musculoskeletal disorder (WMSD).

Safety Tip: These WMSDs can include back problems, carpal tunnel syndrome, tendinitis, rotator cuff tears, sprains, and strains.

Some Basics

- What is Ergonomics?
- Ergonomics is the “study of work”
 - The rules that govern it, are derived from the Greek words “ergon” meaning work and “nomos” meaning rule or law.
 - Is the science of “Human and machine interaction”-- essentially the science of doing your job safely, and well.
 - Is often referred to as Human Factors Engineering, and relies on principles from many disciplines, including psychology, physiology, biomechanics, and industrial and systems engineering.

Some Basics

- Good ergonomics ...
 - Attempts to fit or adapt the job to the worker rather than forcing the worker to fit the job.
 - Is becoming more and more important as the working world becomes filled with specialized tasks, higher assembly line speeds, and increased repetition, which all have ergonomic injury and illness effects on workers.

Some Basics

- More Disturbing Facts
- Ergonomic hazards lead to work-related MSDs.
 - Account for 1/3d of all occupational injuries and illnesses reported to the BLS.
 - Disorders increasing every year and constitute the largest job-related injury and illness problem in the US today.
 - Employers reported a total of 626,000 lost workday MSDs to the BLS, and these disorders accounted for \$1 of every \$3 spent for workers' compensation.
 - Employers pay more than \$15-\$20 billion in workers' compensation costs for these disorders every year.

Some Basics

- Ergonomic Factors
 - Many factors play a role in ergonomics.
 - Body posture
 - Movement
 - Environmental factors
 - information processing

Ergonomic Disorders

- General Types
- Ergonomic-related disorders principally include:
 - Musculoskeletal Disorders (MSDs)
 - Cumulative Trauma Disorders
 - Repetitive Motion Injuries
 - Back injuries
 - Strains and sprains

Safety Tip: Ergonomic disorders can affect many parts of the body.

Ergonomic Disorders

- How We're Put Together
- The Musculoskeletal System consists of:
 - bones
 - muscles
 - tendons
 - joints
 - ligaments
 - tissue
 - nerves

Ergonomic Disorders

- Our Anatomy
- The Average human adult skeleton contains ...
 - 206 bones joined to ligaments and tendons.
 - Muscles are elastic, contracting and expanding to produce movement and work.
 - Tendons attach muscles to bone.
 - Joints are structures where two or more bones join together.
 - Ligaments are the tough fibrous bands of tissue that bind bone ends together.
 - Tissue is the collections of specialized cells which perform particular functions.
 - Nerves, the body's electrical and alarm system which reports of disturbances in sensation such as numbness or tingling.

Ergonomic Disorders

- What Ails Us
- The following are regarded as ergonomic related disorders, injuries, and illnesses
 - Musculoskeletal disorders known as MSDs
 - Cumulative Trauma Disorders known as CTDs
 - Repetitive Motion Injuries known as RMIs
 - Back injuries
 - Strains and sprains

Ergonomic Disorders

- Work
- Conducting repetitive work,
 - using too much force, working in awkward positions, or using poor lifting techniques can put strain on the body and can cause a workers to suffer.
 - Effects of Ergonomic Injuries may include:
 - Pain
 - Aches
 - Numbness
 - Tingling
 - Restricted movement
 - Employees and Supervisors should learn to anticipate, recognize, evaluate, and control ergonomic hazards in the workplace before these injuries occur.

Ergonomic Disorders

- Common MSDs
 - Musculo-skeletal Disorders (MSDs)
 - Carpal Tunnel Syndrome
 - Tendonitis
 - Tenosynovitis
 - DeQuervain's disease
 - Raynaud's Syndrome (white finger)
 - Epicondylitis (tennis elbow)
 - Rotator Cuff injury
 - Cervical disc syndrome

Ergonomic Disorders

- Carpal Tunnel Syndrome
- Tendons/nerves in wrist pass through 'carpal tunnel'
 - Hand movement causes tendons to slide back and forth through the tunnel
 - Repetitive movement causes friction, inflammation, pain, and swelling.

Ergonomic Disorders

- Tendonitis
- Tendonitis is a form of tendon or muscle inflammation.
 - Caused by tendon overuse or unaccustomed usage.
 - Typically affects wrist and shoulder.
 - Rest/recovery time needed
 - Common among welders, painters, assembly line workers .

Ergonomic Disorders

- Tenosynovitis
- Tenosynovitis is an inflammation or injury of the synovial sheath surrounding the tendon.
 - The tendon is surrounded by a sheath with synovial fluid which acts as a lubricant to reduce friction during movement.
 - Excessive movement of the hands and wrists may cause the sheath to become swollen and painful.
 - Tenosynovitis is common among jobs such as core making and meatpacking.

Ergonomic Disorders

- DeQuevain's Disease
- With DeQuevain's disease,
 - the tendon sheath of the thumb is inflamed because of excessive friction between the thumb tendons and their common sheath.
 - Twisting and forceful gripping motions with the hands, similar to the movement of wringing clothing, can place stress on the tendons and cause De Quervain's disease.
 - Example; an electrician using a screw driver or a carpenter placing "snap ties" for extended periods of time may become susceptible to this condition.

Ergonomic Disorders

- Trigger Finger
 - Trigger finger is tendon disorder.
 - Attributed to a groove in the flexing tendon of the finger.
 - Tendon may become locked in its sheath and attempts to move the finger will cause snapping and jerking movements of the finger.
 - Disorder is common among workers who use tools with handles with hard or sharp edges, such as assemblers, carpenters, and welders.

Ergonomic Disorders

- Raynaud's Syndrome
- "White Fingers"
 - Occurs when the blood vessels of the hand are damaged as a result of repeated exposure to vibration for long periods of time.
 - Skin and muscles of the hands are unable to get the necessary oxygen from the blood and eventually die.
 - Symptoms include numbness and tingling in the fingers.
 - Associated with the prolonged use of vibrating tools such as pneumatic hammers, chain saws, and gasoline powered hand tools.

Ergonomic Disorders

- Effects
- Common effects of Ergonomic Injuries
 - Pain
 - Aches
 - Numbness
 - Tingling
 - Restricted movement

Ergonomic Disorders

- Other MSD / RMI Disorders
- Other ergonomic injuries and illnesses or disorders include:
 - Epicondylitis or tennis elbow.
 - Inflammation of the tendons in the elbow and occurs because of overuse -- such as painting with a brush or roller, running a chain saw, and using many types of hand tools continuously.
 - Rotator cuff disorder.
 - Inflammation of the tendons of the shoulder.
 - Chronic inflammation or injury can cause tearing of the rotator cuff.
 - Key risk factors are an age of over 40 years and participation in sports or work activities that involve repetitive arm motion over the head, such as sheet-rocking.

Ergonomic Disorders

- Other MSD / RMI Disorders
- Back Disorders
 - Expensive to worker and contractor
 - Common reason of job absenteeism
 - Most back disorders caused by chronic or long term injury
 - Muscles, ligaments, tendons, and discs repetitively pulled and strained

Ergonomic Disorders

- Other MSD / RMI Disorders
- Back Disorders: Sources
 - Faulty body mechanics
 - excessive twisting
 - bending
 - reaching
 - carrying
 - lifting heavy or awkward loads
 - Staying in one position
 - Poor physical condition
 - Poor posture

TIP: Nearly all workers are at risk to back disorders.

Hazards Recognition

- Recognize Causes
- Causes of MSDs/Ergonomic Illnesses
 - Primary causes:
 - Excessive repetitive motions
 - Excessive or sustained force
 - Sustained or awkward body positions
 - Secondary causes:
 - Poor tool design
 - Environmental factors (e.g. poor lighting, excessive noise, excessive cold and hot temperatures)
 - Mechanical or contact stress

Hazards Recognition

- Repetitive Motion
 - Many workers spend all day in one posture:
 - performing 1-2 tasks repeatedly
 - performing hundreds of movements with same muscles
 - Keyboard work relies on repetitive movement
 - Likewise with physical work. Even a very physical task such as moving concrete may involve just a few muscles working repeatedly.

Hazards Recognition

- Force
- Force is the energy exerted to cause movement ...
 - Such as turning a wrench to making a nut or bolt move.
 - Using excessive force, such as when turning a wrench on a rusted bolt, can irritate muscles and tendons and compress nerves.
 - Combining excessive force with repetitive motions puts the body at increased risk to ergonomic injury.
 - Combine excessive force and repetitive motion with awkward posture and you have a real likelihood of developing an ergonomic injury.

Hazards Recognition

- Posture
 - Awkward postures ...
 - Create stress and fatigue on the musculo-skeletal system
 - A neutral position--the position that is easiest or most natural for the body--is the least stressful.
 - Your body, when healthy, naturally rests in a neutral posture when still, when no muscles are flexed unnecessarily.

Working for a long time in an awkward posture may cause pain and fatigue. Whenever possible try and find a more comfortable and safe working position. Do not leave unsecured objects that can potentially fall onto co-workers below you.

Hazards Recognition

- Hazards Evaluation
- Good Practices
 - Observe jobs at risk
 - Focus on:
 - repetitive motions
 - forces applied
 - postures
 - tools
 - environment
 - Talk with the operators
 - Try new things
 - Call in an expert

Hazards Recognition

- Causes
- The primary causes of musculoskeletal disorders and other ergonomic related injury and illnesses
 - Excessive repetitive motions
 - Excessive or sustained force
 - Sustained or awkward body positions

Hazard Control

- Engineering Controls
 - Hazard recognition and evaluation is followed by Hazard Control
 - Ergonomic hazards are controlled best by Engineering Controls
 - Engineering controls focus on making the job fit the worker and not forcing the person to fit the job.
 - Controls include designing work stations, tools, and equipment to minimize repetition, forces and posture problems..

Hazard Control

- Administrative Controls

- Administrative Controls include:

- Breaking up the work schedule to minimize repetitive tasks, which involves doing different things with different muscles;
 - Breaking old habits such as poor lifting techniques;
 - Developing new habits such as learning how to lift properly.

TIP: Additional administrative controls include:

- proper work techniques;
- employee training, such as how to properly lift;
- conditioning and stretching;
- regular monitoring/observing work behaviors;
- feedback; and
- equipment maintenance, adjustments and modification of equipment or tools.

Hazard Control

- PPE
 - Personal Protective Equipment useful in controlling or minimizing ergonomic hazards and MSDs.
 - For example:
 - Gloves may be used to minimize the effects of vibration and force.
 - Vibrating tools may be dampened by using rubber backed low pile carpets on the work surface
 - Speciality designed back braces may be useful to promote good posture and minimize the stresses of force on the lower back.
 - As always, the principle is to fit the PPE to the worker and not the worker to the PPE

Hazard Control

- Medical Management
- Medical management is an important tool in an effective ergonomics program.
 - Medical management can identify and evaluate early signs and symptoms of MSDs and help eliminate or reduce the risk of developing MSDs.
 - For example, some wearable braces help diminish the symptoms of repetitive stress, and some workers can receive eye testing and examinations to determine if they need new or special glasses that minimize eye strain and even relieve tension on the neck and shoulders.

Hazard Control

- Engineering Controls
- Two primary engineering controls
 - Making the job fit the worker and not forcing the person to fit the job.
 - Designing work stations, tools, and equipment to minimize repetition, forces and posture problems.

Simple Solutions

- What is simple solutions?
- Simple Solutions is a booklet ...
 - Published by the National Institute for Occupational Safety and Health.
 - Some of the most common injuries in the workplace are the result of job demands that push the human body beyond its natural limits.
 - Workers who must often lift, stoop, kneel, twist, grip, stretch, reach overhead, or work in other awkward positions to do a job are at risk of developing a work-related musculoskeletal disorder (WMSD).
 - Can include back problems, carpal tunnel syndrome, tendinitis, rotator cuff tears, sprains, and strains.

LINK: <http://www.cdc.gov/niosh/docs/2007-122/pdfs/2007-122.pdf>

Simple Solutions

- Simple Solutions
- Floor and Ground-Level Work, The Problem
 - Potential to develop a serious muscle or joint injury.
 - Your risk is higher if you stoop or kneel often or for long periods of time. It is also higher if you twist your body while working in these positions.
 - These positions can also make it harder to do your job. When stooping or kneeling, you can't lift, push, or pull as much weight without putting stress on your body.

Simple Solutions

- Risky Tasks
- You have an increased risk ergonomic related injury/illness if you often:
 - Carry heavy loads
 - Work on your knees
 - Twist your hands or wrists
 - Stretch to work overhead
 - Use certain types of tools
 - Use vibrating tools or equipment.
- On top of that, tight deadlines mean a fast pace. Pushing the pace increases your risk even more.

Simple Solutions

- Ergonomics Program?
- Many ergonomics experts recommend ergonomics programs to analyze risk factors at the worksite and find solutions.
 - Can be a valuable way to reduce injuries, improve worker morale, and lower workers' compensation costs, promote production.
 - May be a particularly urgent need for an ergonomics program at your site if:
 - Injury records or workers' compensation claims show excessive hand, arm, and shoulder problems; low back pain; or carpal tunnel syndrome.
 - Workers often say that some tasks are causing aches, pains, or soreness
 - There are jobs on the site that require forceful actions, movements that are repeated over and over, heavy lifting, overhead lifting, use of vibrating equipment, or awkward positions such as raising arms, bending over, or kneeling.

TIP: Effective ergonomics programs important:

- Employer commitment of time, personnel, and resources
- Someone in charge of the program, authorized to make decisions and institute change
- Active employee involvement in identifying problems and finding solutions
- A system to identify and analyze risk factors
- A system to research, obtain, and implement solutions
- Worker and management training
- Medical care for injured workers
- Regular evaluation of the program's effectiveness

Link: www.cdc.gov/niosh/docs/97-117

Simple Solutions

- Increased Risk
- The following create an increased risk of ergonomic injury/illness?
 - Carry heavy loads
 - Work on your knees
 - Twist your hands or wrists
 - Stretch to work overhead
 - Use certain types of tools
 - Use vibrating tools or equipment

Simple Solutions

- TIP SHEET # 4
- Kneeling Creepers, One Solution
 - Use a portable kneeling creeper with chest support.
 - When the job requires kneeling or squatting to work at floor level, these devices will reduce the stress to your knees, ankles, and lower back.

TIP: Kneeling creepers without the chest support cost around \$200 and the optional adjustable chest support is around \$75.

Simple Solutions

- Tip Sheet # 14
- Ergonomic Hand Tools, The Problem
 - Using a conventional hand tool over and over can lead to muscle strain or even a serious injury like carpal tunnel syndrome or tendinitis.
 - Using the wrong tool, or using a tool the wrong way, can strain your hand, wrist, forearm, shoulder, and neck.

Simple Solutions

- Tip Sheet # 14
- Ergonomic Hand Tools, One Solution
 - Use an "ergonomic" tool that fits the job.
 - Many new tools are available that may help prevent muscle and joint injuries, check them first.
 - A tool can be considered “ergonomic” when it fits the task you do, fits your hand, allows a good grip, takes less effort, does not require you to work in an awkward position, does not dig into your fingers or hand, and is comfortable and effective.
 - A tool designed for one task may put more stress on the hand or wrist when used for a different task.

Simple Solutions

- Computer Workstations
- Millions of people work with computers every day.
 - OSHA's computer workstation e-Tool illustrates simple, inexpensive principles that will help you create a safe and comfortable computer workstation.
 - There is no single “correct” posture or arrangement of components that will fit everyone.
 - Are basic design goals, some of which are shown in the accompanying figure, to consider when setting up a computer workstation or performing computer-related tasks.

LINK: <http://www.osha.gov/SLTC/etools/computerworkstations/index.html>

Simple Solutions

- Computer Workstations – Set Up
- Neutral body positioning, posture in which your joints are naturally aligned.
 - Working with the body in a neutral position reduces stress and strain on the muscles, tendons, and skeletal system and reduces your risk of developing a musculoskeletal disorder (MSD).
 - Hands, wrists, and forearms; straight, in-line and roughly parallel to the floor.
 - Head is level, or bent slightly forward, forward facing, and balanced.
 - Shoulders - relaxed and upper arms hang normally at the side of the body.
 - Elbows - stay in close to the body, bent between 90 and 120 degrees.
 - Feet - fully supported by the floor or a footrest.
 - Back - fully supported with appropriate lumbar support when sitting vertical or leaning back slightly.
 - Thighs and hips - supported by a well-padded seat, generally parallel to floor.
 - Knees - about the same height as the hips with feet slightly forward.

Simple Solutions

- Computer Workstations – Components / Accessories
- If workstation components and accessories are poorly designed, used or placed, ergonomic related injuries are a real possibility.
- Appropriate placement of the components and accessories for the desktop computer workstation will allow you to work in neutral body positions, help you perform more efficiently, and work more comfortably and safe.
 - Monitors
 - Keyboards
 - Pointer/Mouse
 - Wrist/Palm Supports
 - Document Holders
 - Desks
 - Chairs
 - Telephones

TIP: A laptop workstation creates special challenges due to its computer design, size, and the variety of areas in which it is used. Special considerations may be necessary when working with laptop units.

Simple Solutions

- Computer Workstations
- Prolonged Periods of Activity
 - Maintaining postures or performing highly repetitive tasks for extended periods can lead to problems in localized areas of the body.
 - E.g. using a mouse for a few minutes should not be a problem for most users, but performing this task for several uninterrupted hours can expose the small muscles and tendons of the hand to hundreds or even thousands of activations (repetitions).
 - Without rest and recuperation, leads to localized fatigue, wear and tear, and injury.
 - Maintaining static postures, can fatigue the muscles of the neck and shoulder that support the head.

Simple Solutions

- Computer Workstations - Medical Awareness / Training
- Be aware of MSD signs and symptoms.
 - Employees who have not been adequately trained to recognize hazards or understand effective work practices designed to reduce these hazards are at a greater risk of harm.
 - Without proper medical awareness, Musculoskeletal Disorders (MSD) signs and symptoms may go unnoticed and un-addressed.
 - (e.g. users who do not understand the risk of bad body postures or techniques do not have the knowledge to actively participate in their own protection. Detection and reporting delays can result in more severe injury.)

TIP: MSD Signs and Symptoms:

- Numbness or a burning sensation in the hand
- Reduced grip strength in the hand
- Swelling or stiffness in the joints
- Pain in wrists, forearms, elbows, neck, or back
- Reduced range of motion in the shoulder, neck, or back
- Dry, itchy, or sore eyes
- Blurred or double vision
- Aching or tingling
- Cramping
- Weakness

Summary

- Ergonomics is the science of fitting workplace conditions and job demands to the capabilities of the working population.
- Effective and successful "fits" assure high productivity, avoidance of illness and injury risks, and increased satisfaction.
- Common examples of ergonomic risk factors are found in jobs requiring repetitive, forceful, or prolonged exertions of the hands; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and prolonged awkward postures.
- Vibration and cold may add risk to these work conditions. Jobs or working conditions presenting multiple risk factors will have a higher probability of causing a musculoskeletal problem.
- Risk depends on the intensity, frequency, and duration of the exposure to these conditions.

TIP: OSHA does not have a regulation specific to construction ergonomics.

OSHA has stated that they will use the General Duty Clause to cite employers for ergonomic hazards.

Link: <http://www.osha.gov/SLTC/ergonomics/index.html>

Summary

- Employers' Responsibility
- Selected employer responsibilities under the Occupational Safety and Health Act of 1970.
 - Provide a workplace free from serious recognized hazards
 - Comply with standards, rules and regulations.
 - Inspect the worksite and examine workplace conditions.
 - Make sure employees have and use safe tools, equipment and maintain them.
 - Establish or update operating, safety and health procedures and communicate them.
 - Provide medical examinations and training when required.
 - Keep records of work-related injuries and illnesses.
 - Provide access to employee medical records and exposure records.