Introduction to Ergonomics

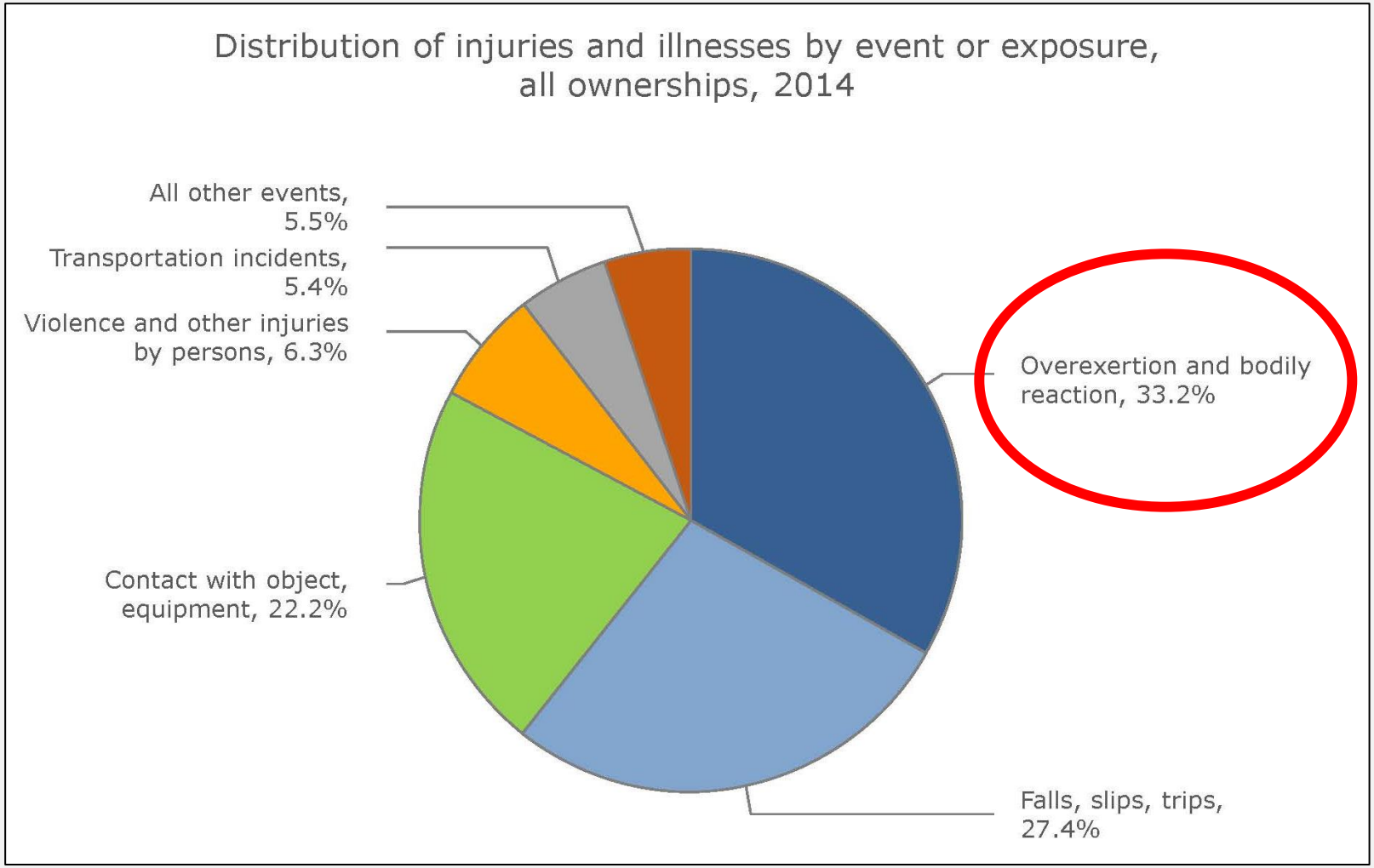
10-hour General Industry Outreach Training

Introduction

Lesson objectives:

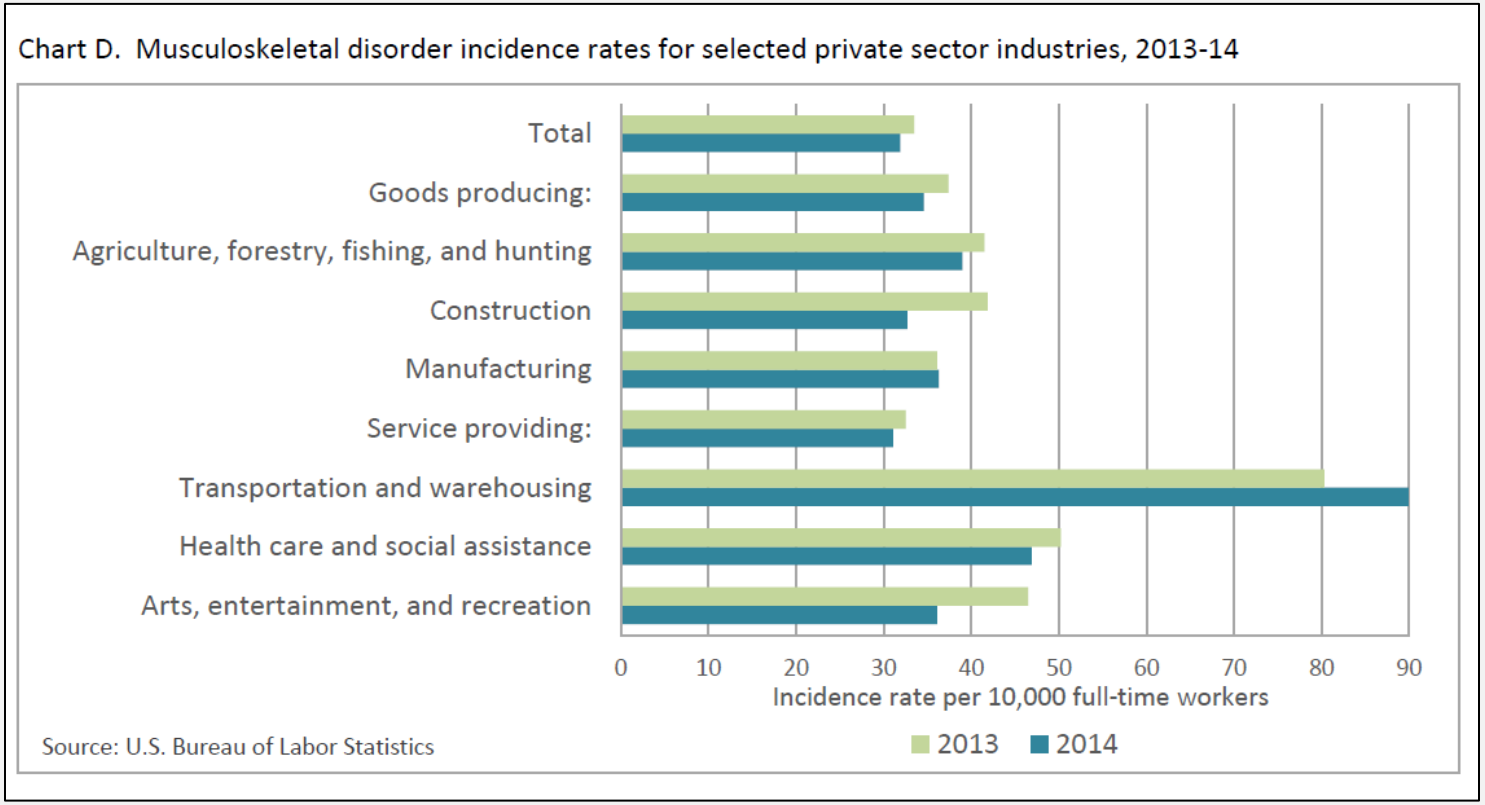
1. Identify common work-related musculoskeletal disorders (MSDs).
2. Recognize risk factors associated with work-related MSDs.
3. Identify ergonomic control methods for eliminating/reducing work-related MSDs.

Introduction



This chart shows how MSDs compare to other hazards based on percentage of injuries and illnesses using statistics from the Bureau of Labor Statistics, FY2014.

Introduction



This chart shows the incident rates of musculoskeletal disorders for selected private sector industries. Source: Bureau of Labor Statistics

Introduction

Ergonomics

"The scientific discipline concerned with understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, methods and data to design in order to optimize human well-being and overall system performance"

Introduction

Ergonomics means
"fitting the job to the worker,"
including:

- Work stations
- Tools
- Equipment

Ergo = Work

Nomos = Law

Introduction

Why is ergonomics important?

- Overexertion leading cause of injuries
  - Most costly
  - Recurring/Persistent pain may develop in future
- Bodily reaction is another leading cause of injuries in workplace
- Repetitive motion also within top 10 most common workplace injuries

Common Work-Related MSDs

Musculoskeletal Disorders (MSDs)

- Affect the muscles, nerves, blood vessels, ligaments, and tendons
- Symptoms
  - Discomfort
  - Pain
  - Numbness
  - Loss of motion/flexibility
  - Spasticity
  - Stiff joints
  - Burning
  - Swelling
  - Tingling
  - Inflammation
  - Throbbing
  - Paralysis

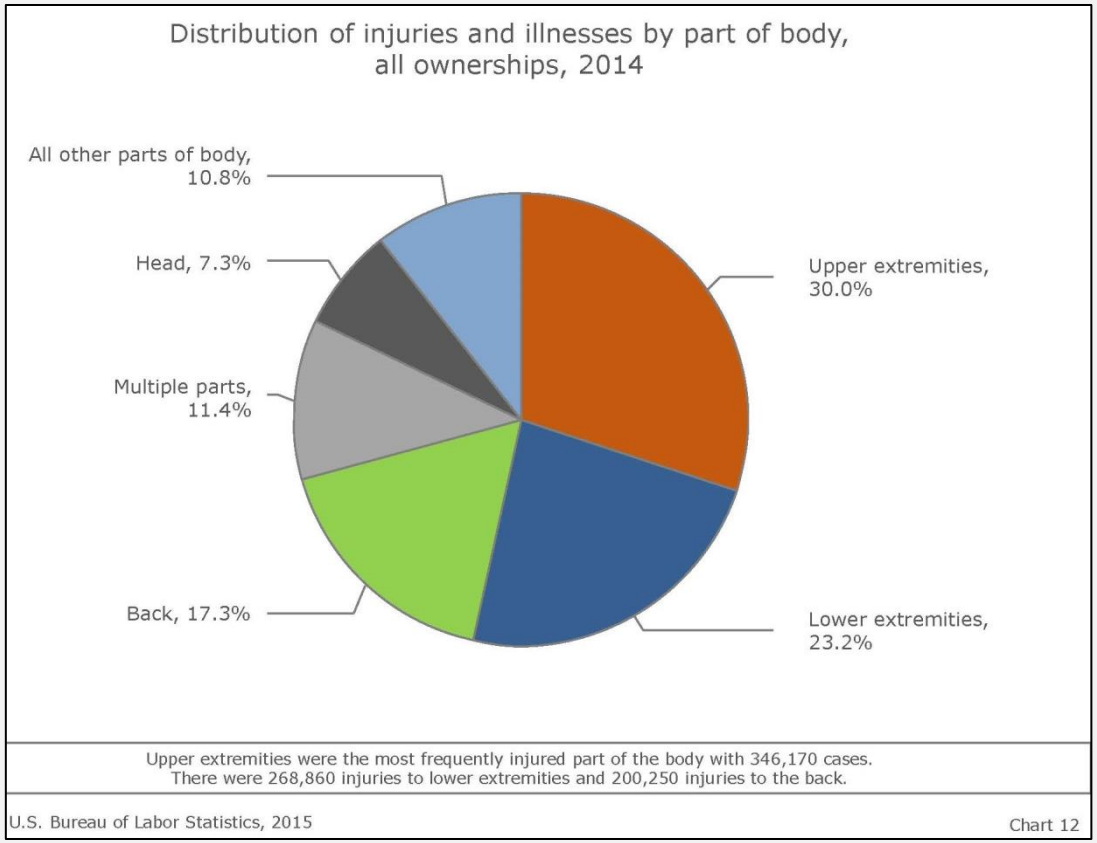
Common Work-Related MSDs

- Common MSD disorders:
  - Carpal Tunnel Syndrome
  - Tennis Elbow
  - Bursitis
  - Ischemia
  - De Quervain's
  - Sciatica
  - Herniated Discs
  - Neck strain/disability
  - Tendinitis
  - Rotator Cuff
  - Neuritis
  - Reynaud's Syndrome
  - Trigger Finger
  - Thoracic Outlet Syndrome
  - Epicondylitis
  - Back strain/disability

Common Work-Related MSDs

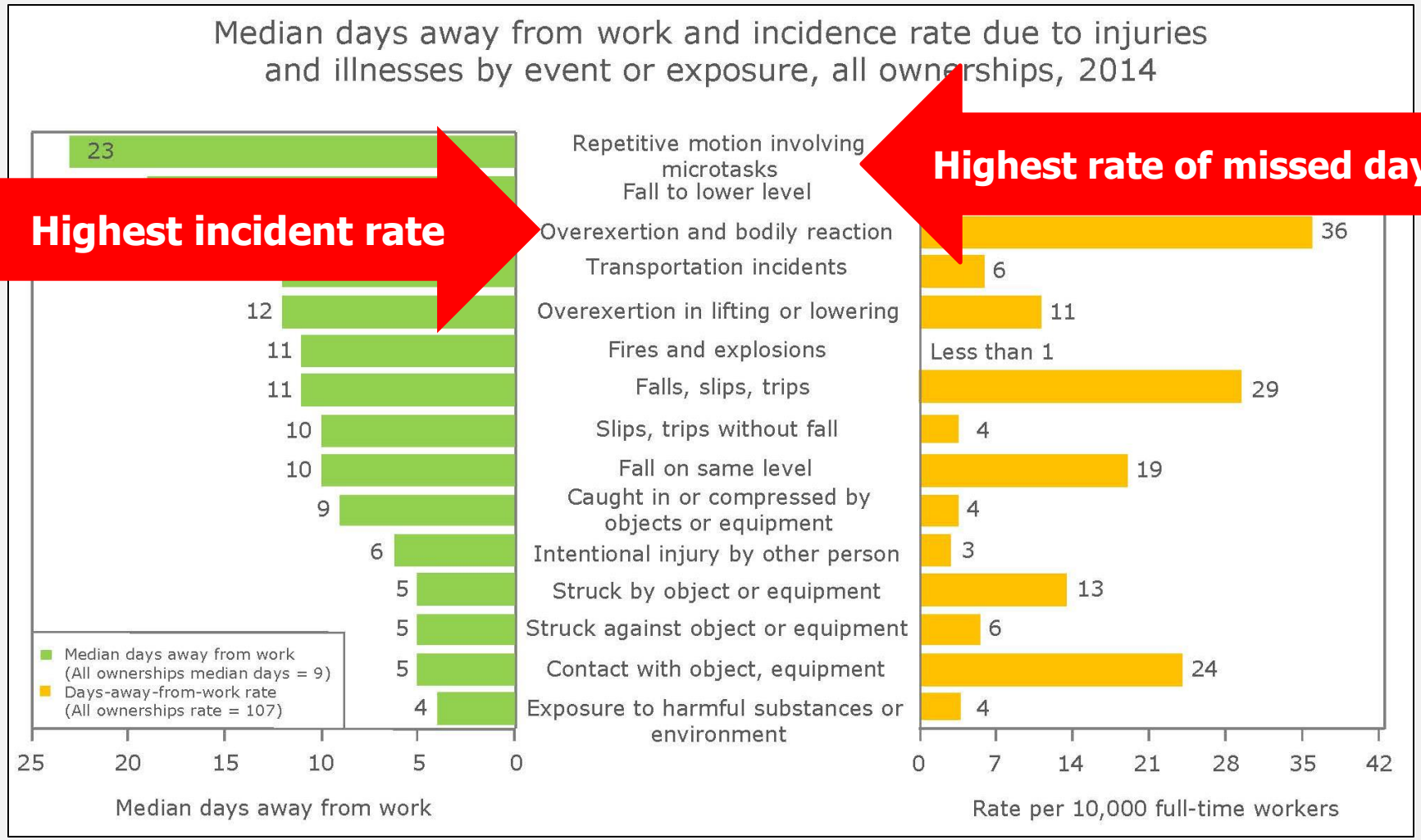
Most commonly affected areas:

- Back
- Arms, Elbows, and Shoulders
- Neck
- Hands, Wrists, and Fingers
- Knees, Ankles, and Feet



This chart shows a distribution of injuries and illnesses to body parts due to MSDs using statistics from the Bureau of Labor Statistics, FY2014.

Common Work-Related MSDs



Source: Bureau of Labor Statistics

Risk Factors Associated with MSDs

Risk factors of MSD injuries:

- Dependent upon:
  - Work positions and postures
  - How often task is performed
  - Level of required effort and duration of task

Risk Factors Associated with MSDs

- Examples of risk factors include:
  - Exerting excessive force
    - Lifting heavy objects/people
    - Pushing or pulling heavy loads
    - Manual pouring materials
    - Maintaining control of equipment or tools
  - Performing same/similar tasks repetitively

Source: OSHA

Risk Factors Associated with MSDs

- Working in awkward postures or same postures for long periods
  - Prolonged/repetitive reaching above shoulder height
  - Kneeling
  - Squatting
  - Leaning over a counter/bending
  - Using a knife with wrists bent
  - Twisting the torso while lifting
- Localized pressure into the body part
  - Pressing the body/part of the body against hard or sharp edges
  - Using the hand as a hammer

Source: OSHA

Risk Factors Associated with MSDs

- Cold temperatures
  (in combination with other risk factors)
- Vibration
  - Whole body
  - Hand-arm
- Combined exposure to several risk factors

Source of graphics: OSHA

Ergonomic Control Methods

Methods of protecting against MSDs:

- Establish ergonomics program
  - Training
  - Feedback from all levels
- Conduct job hazard analysis (JHAs)
- Early recognition and reporting of potential MSDs

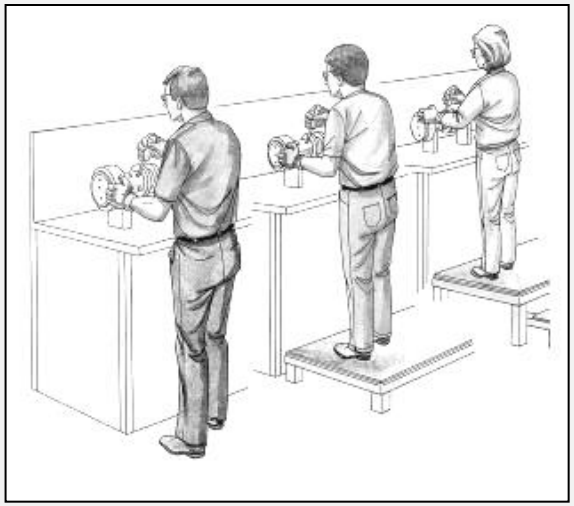
Ergonomic Control Methods

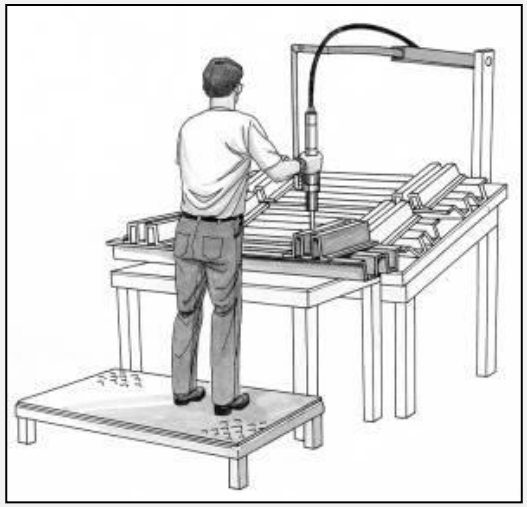
Job Hazard Analysis		
Tasks	Hazards	Controls

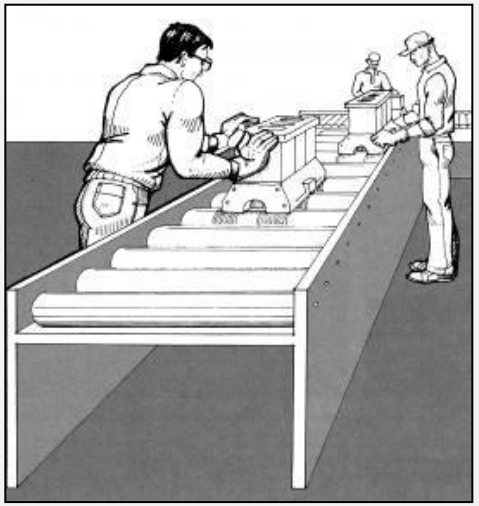
This table provides an example of a tool that can be used when conducting a job hazard analysis. The first column provides a list of tasks performed by a job; the middle column is provided for listing identified hazards; and, the third column provides a list of controls that can be used to mitigate the hazards.

Ergonomic Control Methods

- Examples of **engineering controls**
  - Work station design and setup
  - Ergonomically designed tools
  - Ergonomically designed equipment
  - Load weight reduction







Source: OSHA (International Labor Organization)

Ergonomic Control Methods

- Examples of **proper work practices:**
  - Proper lifting techniques (NIOSH)
  - Team lift heavy/bulky/awkward loads
  - Stretch
  - Work rotation
  - Task variety
  - Increase rest breaks

Source of graphics: OSHA

Ergonomic Control Methods

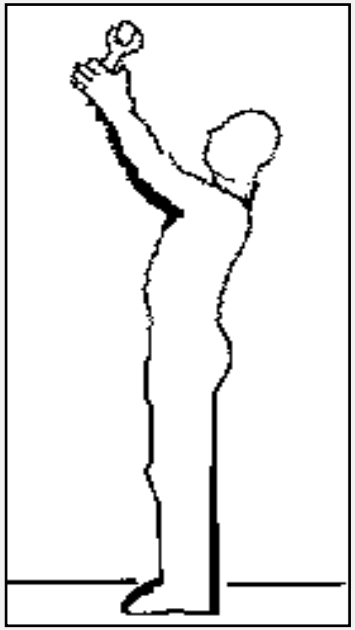
- Examples of **PPE:**
  - Gripping gloves
  - Knee pads
  - Vibration gloves
  - Thermal gloves
  - Lifting straps
  - Shoulder harness
  - Lifting braces

Source of graphics: OSHA

Ergonomic Control Methods

Physical ergonomic **hazards** and **solutions**:

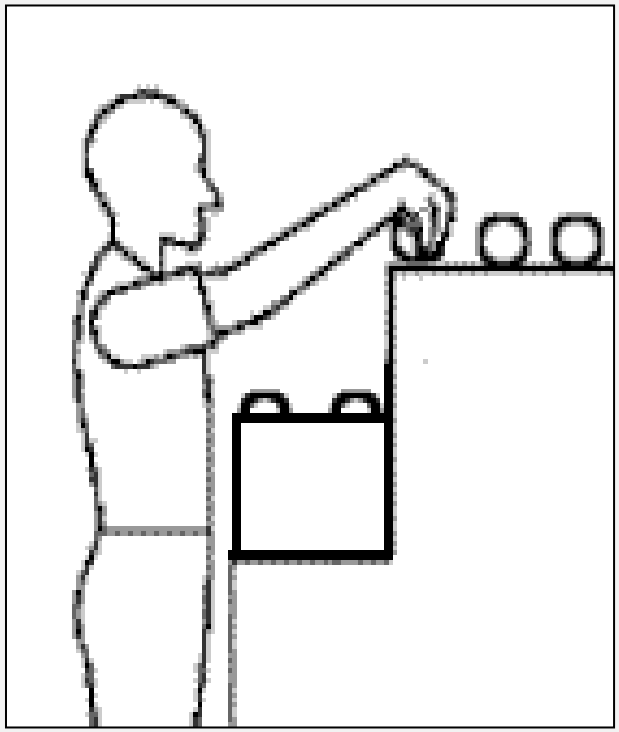
- Reaching above the head/shoulders - **hazards**
  - Working with the hands above head for more than 2 hours per day



Source of graphics: OSHA

Ergonomic Control Methods

– Working with the elbows above shoulders for more than 2 hours per day



Source of graphics: OSHA

Ergonomic Control Methods

- Reaching above the head/shoulders - **solutions**
  - Keep items within close reach
  - Elevate work areas

Source: NIOSH

Source: NIOSH

Source: OSHA

Ergonomic Control Methods

- Reaching above the head/shoulders - **solutions**
  - Remove obstacles
  - Utilize equipment to raise and lower items or move items closer to worker

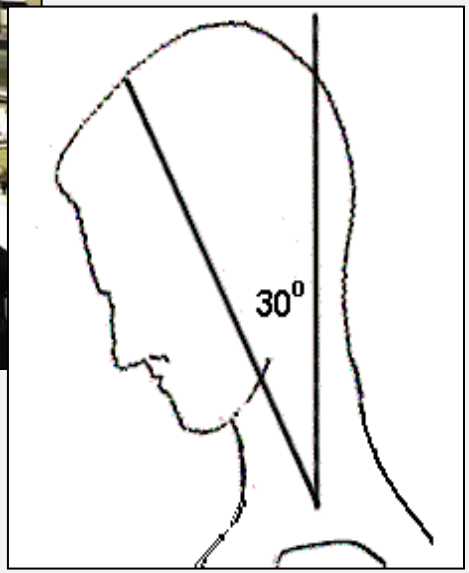
Source: OSHA

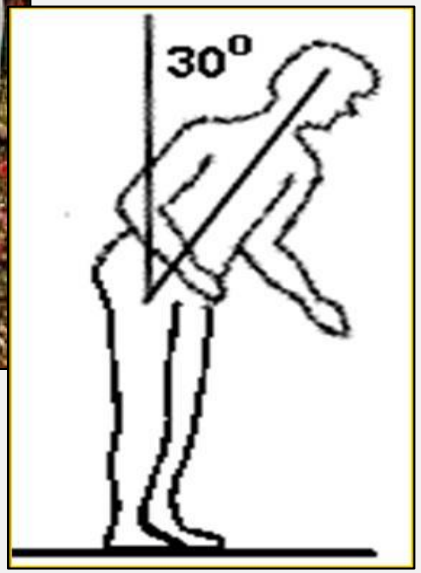
Source: OSHA

Source: NIOSH

Ergonomic Control Methods

- Awkward body postures - **hazards**
  - Working with the neck or back bent forward more than 30° for more than 2 hours per day

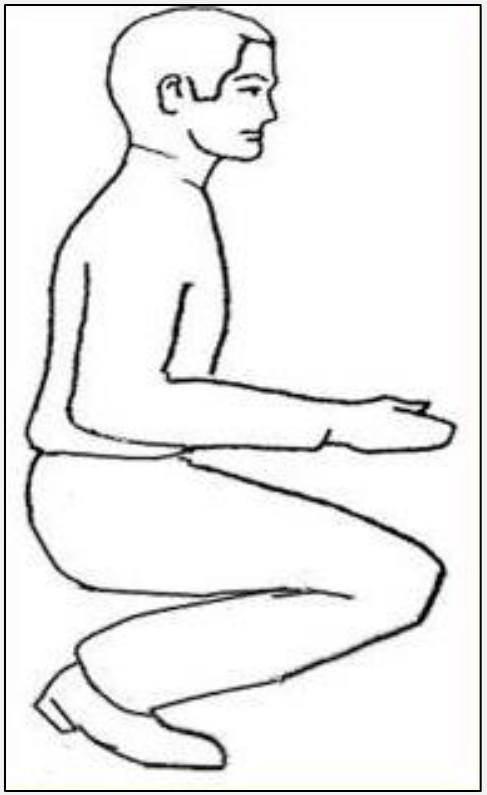




Source of graphics: OSHA

Ergonomic Control Methods

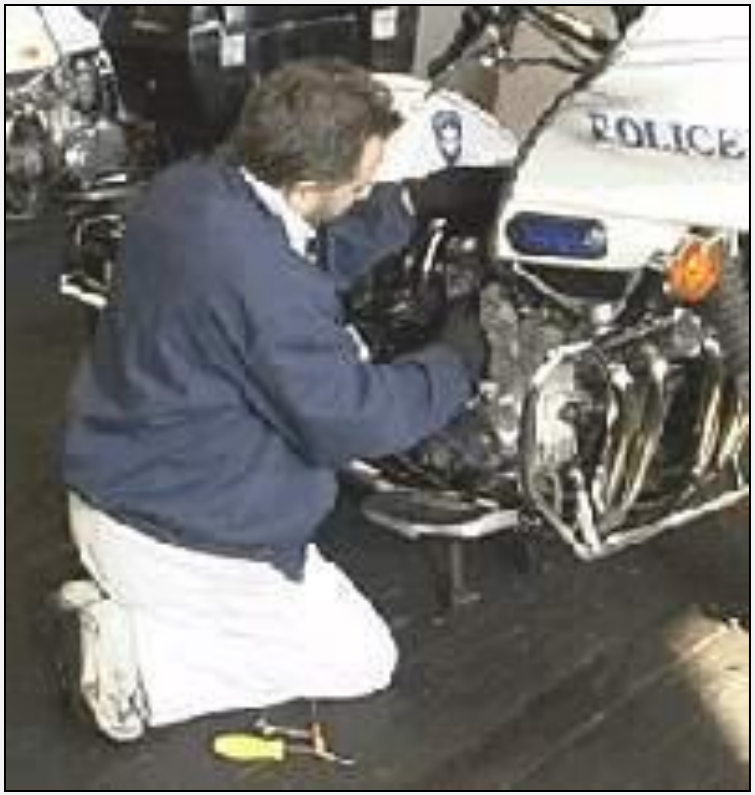
– Squatting for more than 2 hours per day

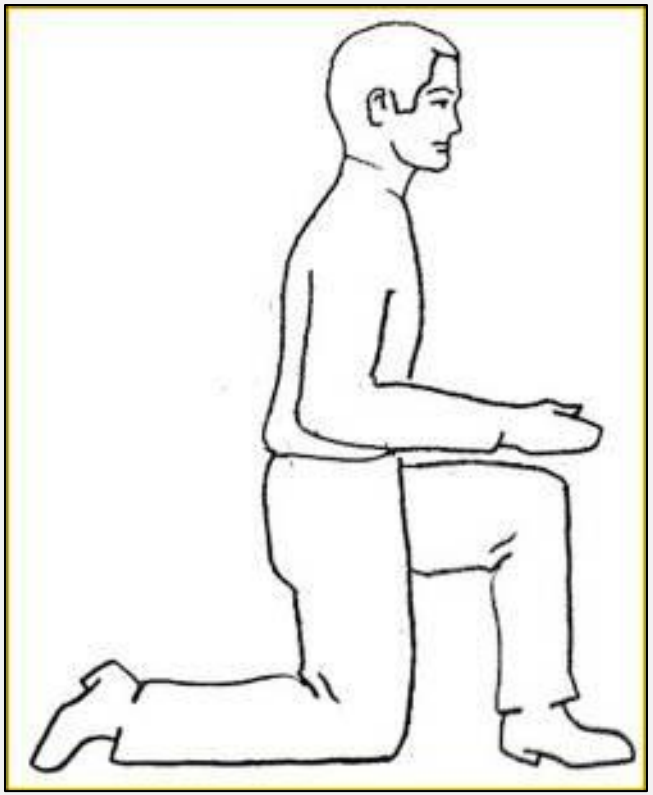


Source of graphics: OSHA

Ergonomic Control Methods

– Kneeling for more than 2 hours per day





Source: OSHA

Ergonomic Control Methods

- Awkward body postures - **solutions**
  - Raise and/or tilt the work for better access
  - Use a stool for ground-level work

Source: OSHA

Source: NIOSH

Source: OSHA

Ergonomic Control Methods

- Awkward body postures - **solutions**
  - Use tools with longer handles
  - Alternate between bending, kneeling, sitting, and squatting

Source: OSHA

Source: NIOSH

Source: OSHA

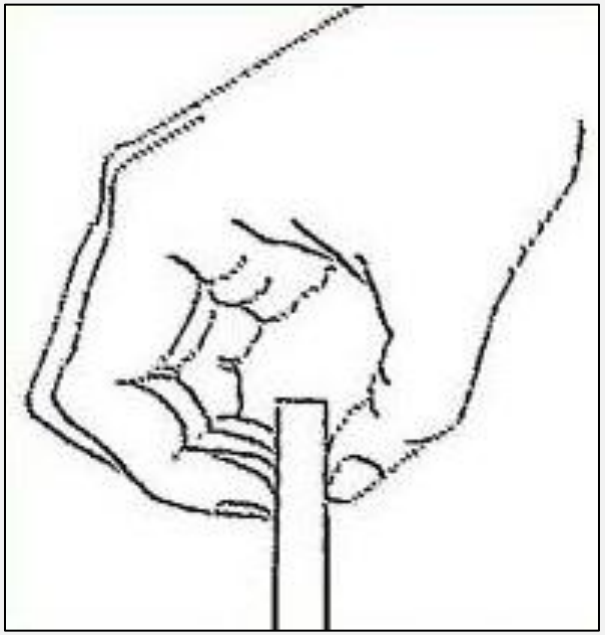
Ergonomic Control Methods

- Awkward grips - **hazards**
  - Gripping 10 or more pounds or force for 2 or more hours per day

Source of graphics: OSHA

Ergonomic Control Methods

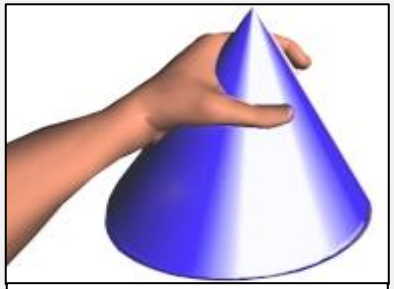
- Awkward grips - **hazards**
  - Pinching 2 or more pounds of weight or 4 or more pounds of force for 2 or more hours per day



Source of graphics: OSHA

Ergonomic Control Methods

- Awkward grips - **solutions**
  - Design work layout to reduce hand-carrying
  - Reduce amount of items carried at one time
  - Use non-pinch grip postures
  - Use ergonomically designed tools/aids
  - Use job/task rotation



"C" shaped posture

Source of graphics: OSHA

Ergonomic Control Methods

- Repetitive motions - **hazards**
  - Repeating same motion for more than two hours per day with hands, wrists, elbows, shoulders, or neck

Source: OSHA

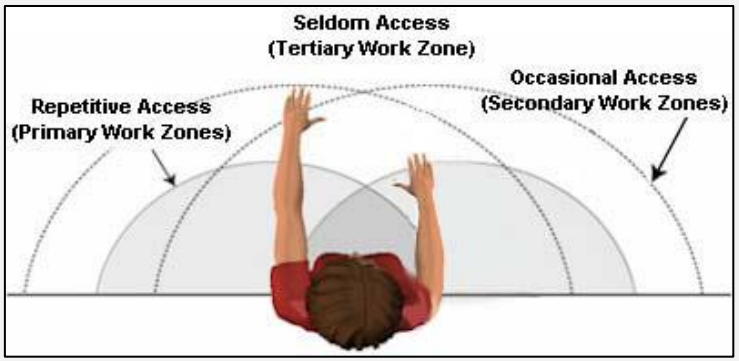
Ergonomic Control Methods

- Repetitive motions - **hazards**
  - Intense keying for more than 4 hours per day

Source: OSHA

Ergonomic Control Methods

- Repetitive motions - **solutions**
  - Arrange work to avoid unnecessary motions
  - Let power tools and machinery do the work
  - Spread repetitive work out during the day
  - Take stretch pauses
  - Rotate task with co-workers if possible
  - Change hands or motions frequently



Source of graphics: OSHA

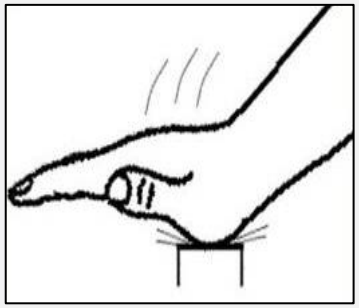
Ergonomic Control Methods

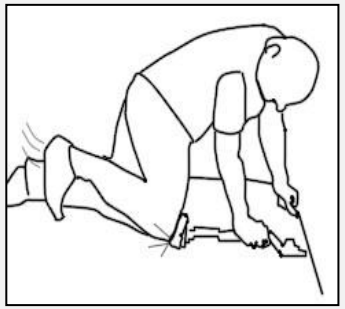
- Localized pressure on body part - **hazards**
  - Pressing the body/part of the body against hard or sharp edges
  - Standing/kneeling for prolonged periods on hard surfaces
  - Using tools with hard handle surfaces or short handles

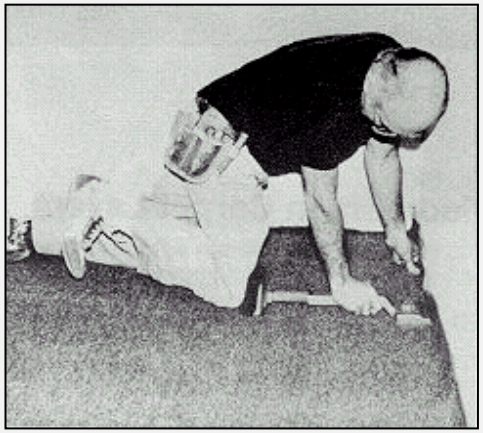
Source of graphics: OSHA

Ergonomic Control Methods

- Localized pressure on body part - **hazards**
  - Using hands/knees as a hammer more than 10 times in 1 hour or more than 2 times per day (long-term)



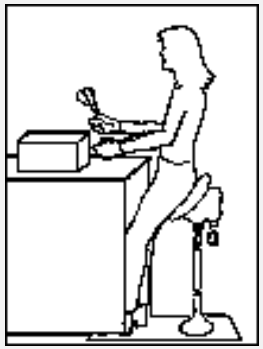




Source of graphics: OSHA

Ergonomic Control Methods

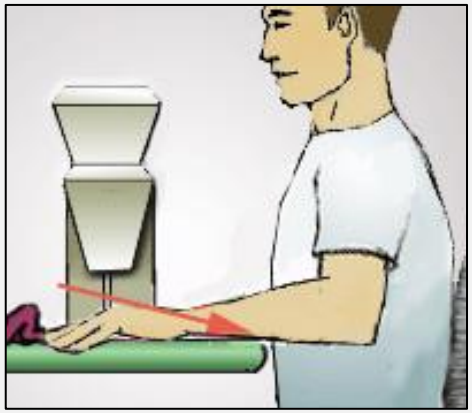
- Localized pressure on body part - **solutions**
  - Use tools with longer handles
  - Use tools with padded grips
  - Alternate between bending, kneeling, sitting, and squatting; use sit/stand stools or tables



Source of graphics: OSHA

Ergonomic Control Methods

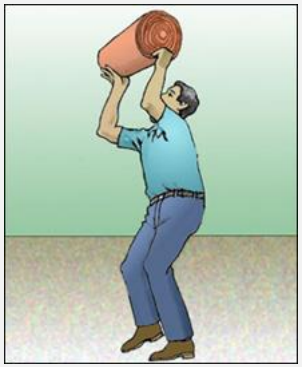
- Localized pressure on body part - **solutions**
  - Pad table edges or use tables/desktops with rounded edges
  - Use wrist rests, anti-fatigue mats, knee pads, shoe inserts or other items that reduce stress on body parts



Source of graphics: OSHA

Ergonomic Control Methods

- Lifting objects - **hazards**
  - Lifting more than
    - 75 lbs. once/day
    - 55 lbs. ten times/day
    - 10 lbs. more than twice/minute or for more than 2 hours/day
    - 25 lbs. above shoulders, below knees, or at arms length more than 25 times/day



Source of graphics: OSHA

Ergonomic Control Methods

- Lifting objects - **hazards**
  - Heavy, frequent, and awkward lifting

Source of graphics: OSHA

Ergonomic Control Methods

- Lifting - **solutions**
  - Managing for safer lifting
    - Plan lifts
    - Minimize lifting distances
    - Position materials to power zone levels
    - Avoid manually lifting/lowering loads to/from floor
    - Identify/reduce unstable or heavy loads
    - Reduce frequency of lifting and duration of lifting tasks
    - Provide clear access

Source of graphics: NIOSH

Ergonomic Control Methods

- Lifting - **solutions**
  - Employee guidelines for safer lifting
    - Stretch before lifting
    - Check for tags on loads
    - Test load for stability and weight
    - Plan the lift
    - Use proper lifting techniques – grip; two hands; smooth, even motions; load close to body; legs to push up and lift load; avoid twisting; alternate with less physically demanding tasks; rest breaks
    - Get assistance when necessary

Source of graphics: OSHA

Ergonomic Control Methods

- Lifting - **solutions**
  - Use proper lifting techniques

Caution: This technique may be effective only if loads are small, light-weight, and can easily fit between the knees.

Keep the load close to your body and lift by pushing up with your legs.

Source: NIOSH

Ergonomic Control Methods

- Lifting - **solutions**
  - Use proper lifting techniques

Lean the sack onto your kneeling leg.

Slide the sack up onto your kneeling leg.

Slide the sack onto the other leg while keeping the sack close to your body.

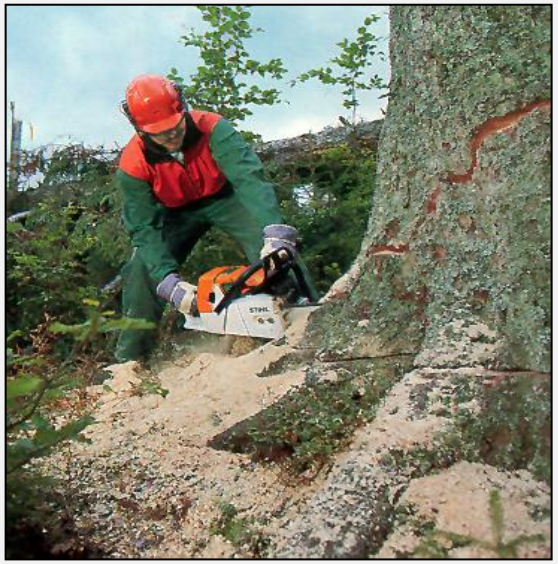
As you stand up, keep the sack close to your body.

Source: NIOSH

Ergonomic Control Methods

Vibration – **hazards**

- Moderate – more than 2 hours per day
- High – more than 30 minutes per day
- Prolonged



Source of graphics: OSHA

Ergonomic Control Methods

Vibration – **solutions**

- Use low-vibration tools and devices that may reduce vibration (tool balancers, extension handles, vibration isolators, damping techniques)
- Adequate rest periods
- Rotate jobs
- Maintenance
- PPE

Source of graphics: OSHA

Ergonomic Control Methods

Environmental ergonomic hazards:

- Amplify/increase risk of MSDs
- Examples
  - Hot weather
  - Cold weather – affects worker coordination and dexterity
  - High-temperature indoor (steam rooms, attics)
  - Cold-temperature indoor (walk-in freezers, cold process rooms)
  - Low visibility

Employer/Employee Requirements

General Duty Clause

- **Each Employer:**
    1. Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
    2. Shall comply with occupational safety and health standards promulgated under this Act.
- **Each Employee:**
    1. Shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

Employee/Employer Requirements

Report signs or symptoms if:

- Pain is persistent, severe or worsening
- Pain radiates
- Symptoms include numbness or tingling
- Symptoms keep you from sleeping at night
- Fingers blanch or turning white

Employee/Employer Requirements

Getting involved:

- Look at jobs
- Come up with solutions
- Work with solutions
- Take part in training
- Take responsibility for changing the way you do your job
- Help to make sure efforts are successful

Five Key Points to Remember

- Ergonomics can help you on your job
- WMSDs can happen in jobs with risk factors
- Risk factors can be reduced and WMSDs prevented
- Reporting signs and symptoms early is important
- You can help your company put ergonomics changes into place

Knowledge Check

1. Ergonomics is the science of ___.
   a. designing the job to fit the worker
   b. fitting the worker to the job
   c. lifting injuries
   d. safety and health

Answer: **a. designing the job to fit the worker**

Knowledge Check

2. MSDs account for approximately ___ of all injuries and illnesses.
   a. 1%
   b. 10%
   c. 33%
   d. 54%

Answer: **c. 33%**

Knowledge Check

3. Which of the following is an example of an ergonomic risk factor?
   a. Neutral postures
   b. Rest
   c. Repetition
   d. Personal protective equipment

Answer: **c. Repetition**

Knowledge Check

4. Ergonomic hazards can be prevented or reduced by which of the following control methods?
   a. Engineering controls
   b. Proper work practices/administrative controls
   c. Personal protective equipment
   d. All of the above

Answer: **d. All of the above**

What questions do you have?

Thank You