Ergonomics for Women in the Trades

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Today's Workshop

• Goal is to provide you with a better understanding of ergonomics in your job by:
  
  - looking at why ergonomics and body mechanics are important
  
  - reviewing musculoskeletal anatomy
  
  - discussing chronic injury and women specific factors
  
  - discussing risk factors for injury
  
  - analyzing job tasks
Is there a problem?
## The Problem is Widespread

The Top 12 Standard Industrial Classifications (SIC)

<table>
<thead>
<tr>
<th>SIC</th>
<th>Industry</th>
<th>WMSDs per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>805</td>
<td>Nursing, Personal Care Facilities</td>
<td>2,177</td>
</tr>
<tr>
<td>421</td>
<td>Trucking and Courier Services (non-air)</td>
<td>1,591</td>
</tr>
<tr>
<td>541</td>
<td>Grocery Stores</td>
<td>1,486</td>
</tr>
<tr>
<td>152</td>
<td>General Bldg Contractors, Residential</td>
<td>1,361</td>
</tr>
<tr>
<td>174</td>
<td>Masonry, Tile, Plaster</td>
<td>703</td>
</tr>
<tr>
<td>836</td>
<td>Residential Care</td>
<td>445</td>
</tr>
<tr>
<td>242</td>
<td>Sawmills, Planing Mills</td>
<td>432</td>
</tr>
<tr>
<td>175</td>
<td>Carpentry, Floor Work</td>
<td>429</td>
</tr>
<tr>
<td>078</td>
<td>Landscape, Horticultural</td>
<td>420</td>
</tr>
<tr>
<td>451</td>
<td>Air Transportation, Air Courier</td>
<td>411</td>
</tr>
<tr>
<td>176</td>
<td>Roofing, Siding, Sheet Metal</td>
<td>388</td>
</tr>
<tr>
<td>177</td>
<td>Concrete Work</td>
<td>287</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>10,130</strong></td>
</tr>
</tbody>
</table>

These 12 SICs alone account for 20% of WMSDs

Source: SHARP Report No. 40-4a-2000
National Statistics

- $20 million for 2.73 million claims (1993)
  - up to $100 million in indirect costs
- Musculoskeletal disorders (MSD) effect
  - 7% of population
  - 14% of doctor visits
- 62% of those with MSD report limitations
- $21,453 for each upper extremity claim
Oregon Statistics

• ~30,564 disabling claims
• 35% due to overexertion
  - 10,700 claims @ $9200 ea = $98,416,000.
• 54% due to strains and sprains
• Back strains/sprains are 24% of all claims
  - 16,500 claims @ $9200 ea = $151,841,950.
Anatomy

- bones: support frame of body
- muscles: stabilize and are the levers that move body
- tendons: connect muscles to bones
- ligaments: connect bones to bones, provide support
- discs: shock absorbers and assist movement of the spine
- nerves: carry sensation and movement information
Bones

Sagittal (Lateral) View

Cervical (Lordosis)

Thoracic (Kyphosis)

Lumbar (Lordosis)

Sacral (Kyphosis)

Coccyx (Tailbone)

Posterior View
Ligaments
Nerves

- Spinal Cord
- Nerve Root
Facet Joints and Disc

- Intervertebral Disc
- Vertebral Body
- Facet Joints
- Pedicle
**Intervertebral Disc**

**Figure 6.2** Intervertebral disc; (a) complete disc; (b) vertical section through disc to show relationship between nucleus pulposus and annulus fibrosus.
Figure 6.4  (a) Orientation of annulus fibrosus and nucleus pulposus in normal upright posture; (b) lateral displacement of nucleus pulposus in response to angular displacement of motion segment.
Disc Herniation

![Diagram of Disc Herniation](image)
Wrist
Carpal Tunnel
Shoulder
Specific to Women

• Women work smarter!

• Menstrual cycles influence our bodies
  - ligaments more stretchy the week prior to period
  - ligaments get more stiff at the onset of the period
  - water retention may contribute to carpal tunnel symptoms

• Knee joint angle (Q angle) greater due to broader hips
  - 13° males, 18 ° females
  - knee under slightly more stress

• Stature
  - tools and work stations may not be designed for our frames

• Strength
  - may play a role in injury cause or prevention
How do Injuries Occur?

• Direct trauma
  - acute injuries
    • sharp pain immediately after lifting heavy equipment
    • injury after tripping over rebar and falling

• Indirect trauma
  - chronic injuries
    • back pain from lifting concrete hoses daily for several months/years
    • numbness in the hand from years of operating power tools
Chronic Injuries

• Musculoskeletal injuries that result over time from a variety of factors
  - tool/worksite design
  - bodymechanics
  - stress
  - level of fitness
  - prior injury

• They have several names:
  - RMI: Repetitive Motion Injuries
  - RSI: Repetitive Strain Injuries
  - CTD: Cumulative Trauma Disorder
  - WRMS: Work-related musculoskeletal disorder
What happens in a chronic injury?

- Tissue irritation: muscles, tendons, ligaments, discs
- Microtrauma: small tears in the tissues
- Production of scar tissue: like a blob of super glue
- Adhesions form, tears combine
- Process continues as long as activity continues
- Results in
  - ↓ flexibility
  - ↓ strength
  - ↓ function
- Can lead to an acute injury or eventual disability
Examples of Chronic Injuries

- Tennis and Golfer's Elbow (Epicondylitis)
- Pitcher's Shoulder (Rotator Cuff Tendinitis) and Bursitis
- Carpal Tunnel Syndrome
- Low Back Pain
- Carpet Layer's Knee (Bursitis)
What is Eaonomies?
What is Bodymechanics?

- Using your body to the best mechanical advantage
- Bodymechanics complements ergonomics
- Trade-off between short term energy efficiency (fatigue) and long term wear-n-tear
Bodymechanics Examples

1. Lift with legs instead of back
   • Bend from the hips

2. Keep the task close to body

3. Keep spine in neutral posture
   • Maintaining the 3 curves

4. Use a wide, scissored stance

5. Keep your nose between toes

6. Test the load

7. Get help from coworkers
Ergonomics Defined

• Finding the best 'fit' between a worker and her job conditions

• Goal is to create a safe, comfortable environment for workers that is also productive

• Usually accomplished by redesigning tools or the work process

• “Make the tool fit the person”
What makes a tool "ergonomic"?

• Ergonomics is not an inherent attribute of tools

• It is common sense

• To be "ergonomic" a tool must:
  • Fit the user
  • Be easy to use
  • Improve comfort
  • Improve performance
    • improve health and safety
Ergonomic Examples
Ergonomic Examples
What are the risk factors for injury?
Look for These Indicators:

- Awkward Postures
- High Hand Force
- Highly Repetitive Motion
- Repeated Impact
- Heavy, Frequent or Awkward Lifting
- Moderate to High Hand-Arm Vibration
When is a task a hazard?

• Risk factors become a hazard when
  - the duration of exposure gets longer
  - the work intensity increases
  - there are a combination of risk factors
Awkward Postures

Being in these work positions for more than 2 hours total per day

- Hands above head
- Elbow above shoulder
- Back bent forward more than 30 degrees
- Neck bent more than 30 degrees
- Squatting
- Kneeling
Neck or Back Bent Forward
More than 30°

For more than 2 hours per day
Squatting or Kneeling

For more than 2 hours per day
Working with the Hands Overhead

For more than 2 hours per day
High Hand Force

More than 2 hours per day of:

- Pinching 2 or more pounds weight or 4 or more pounds force
- Gripping 10 or more pounds weight or force
Highly Repetitive Motion

• Workers repeat same motion every few seconds for more than 2 hours per day with:
  – neck
  – shoulders
  – elbows
  – wrists
  – hands
Repeated Impact

Using hands or knees as a hammer
- more than 10 times per hour
- more than 2 hours per day
Heavy, Frequent, or Awkward Lifting

- Lifting objects more than:
  - 75 lbs. once/day
  - 55 lbs. more than ten times/day
  - 10 lbs. more than twice/minute for more than 2 hours per day
  - 25 lbs. above shoulders, below knees, or at arms length for more than 25 times/day
Moderate to High Hand-Arm Vibration

**Moderate Level**
more than 30 min/day

**High Level**
more than 2 hours/day
How to Achieve Ergonomic Solutions?

• practice good body mechanics

• observe your job for risky tasks
  – alter tasks as needed or able

• talk with your supervisor about
  – purchasing ergonomic tools
  – adapting existing tools
  – adapting the work environment
Ergonomic Solutions

• Heavy loads
  - get help
  - use cart/dolly
  - use smaller quantities

• Repetitive activities
  - rotate jobs
  - rotate body part

• Awkward postures
  - is there another way to do it?

• Vibration
  - use tools with dampeners
  - take breaks, rotate jobs
Obstacles to Ergonomic Improvements

- Cost when workers supply their own tools
- Disincentives for reporting injuries and problems
- Little incentive for employers to pay for ergonomic changes to reduce chronic injuries
- Ergonomic improvement = Productivity improvement = Loss of jobs??
- A need to prove we can do the job
Conclusion

• Staying healthy at work is about
  - using the best tool possible (ergonomics)
  - using your body to the best mechanical advantage (body mechanics)
  - physical conditioning (stretching and strength training)
  - using your head for safe work practices
# Appendix B: Calculator for analyzing lifting operations

**Company**

**Evaluator**

**Job**

**Date**

1. Enter the weight of the objects lifted.

2. Circle the number on a rectangle below that corresponds to the weight where the person's hands are when they begin to lift or lower the objects.

3. Circle the number which corresponds to the times the person lifts per minute and the total number of hours per day spent lifting.

   **Note:** For lifting done less than once every five minutes, use 1.0

<table>
<thead>
<tr>
<th>How many lifts per minute?</th>
<th>For how many hours per day?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 hr or less</td>
</tr>
<tr>
<td>1 lift every 2-5 mins.</td>
<td>1.0</td>
</tr>
<tr>
<td>1 lift every min</td>
<td>0.95</td>
</tr>
<tr>
<td>2-3 lifts every minute</td>
<td>0.9</td>
</tr>
<tr>
<td>4-5 lifts every min</td>
<td>0.85</td>
</tr>
<tr>
<td>6-7 lifts every min</td>
<td>0.75</td>
</tr>
<tr>
<td>8-9 lifts every min</td>
<td>0.6</td>
</tr>
<tr>
<td>10+ lifts every min</td>
<td>0.3</td>
</tr>
</tbody>
</table>

4. Circle the 0.85 if the person twists 45 degrees or more while lifting. Otherwise use 1.0

5. Copy below the numbers you have circled in steps 2, 3, and 4.

6. Is the Weight Lifted (1) less than the lifting Limit (5)?

   **Yes** – OK
   **No** – HAZARD

   See back for solution ideas.