Ergonomics for Women in the Trades

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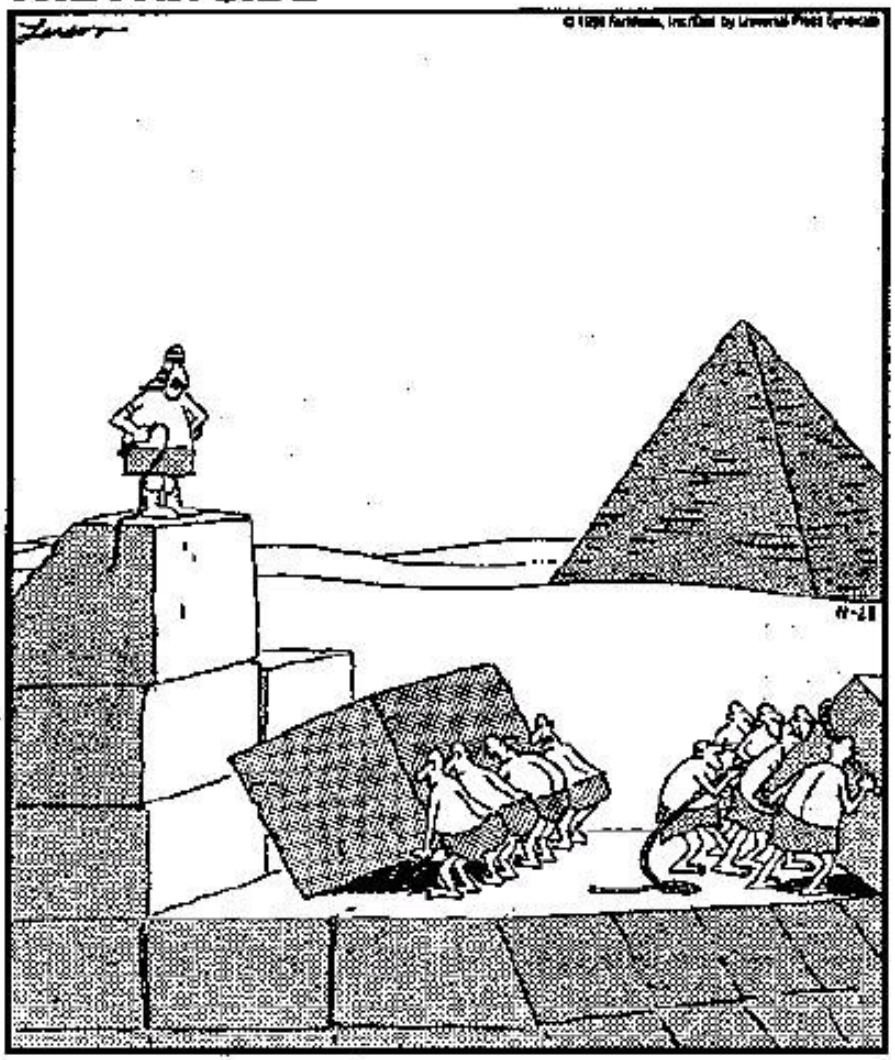
THE FAR SIDE



"Remo! Lift with your knees, not your back!"

Today's Workshop

- Goal is to provide you with a better understanding of ergonomics in your job by:
  - looking at why ergonomics and bodymechanics 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)

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

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

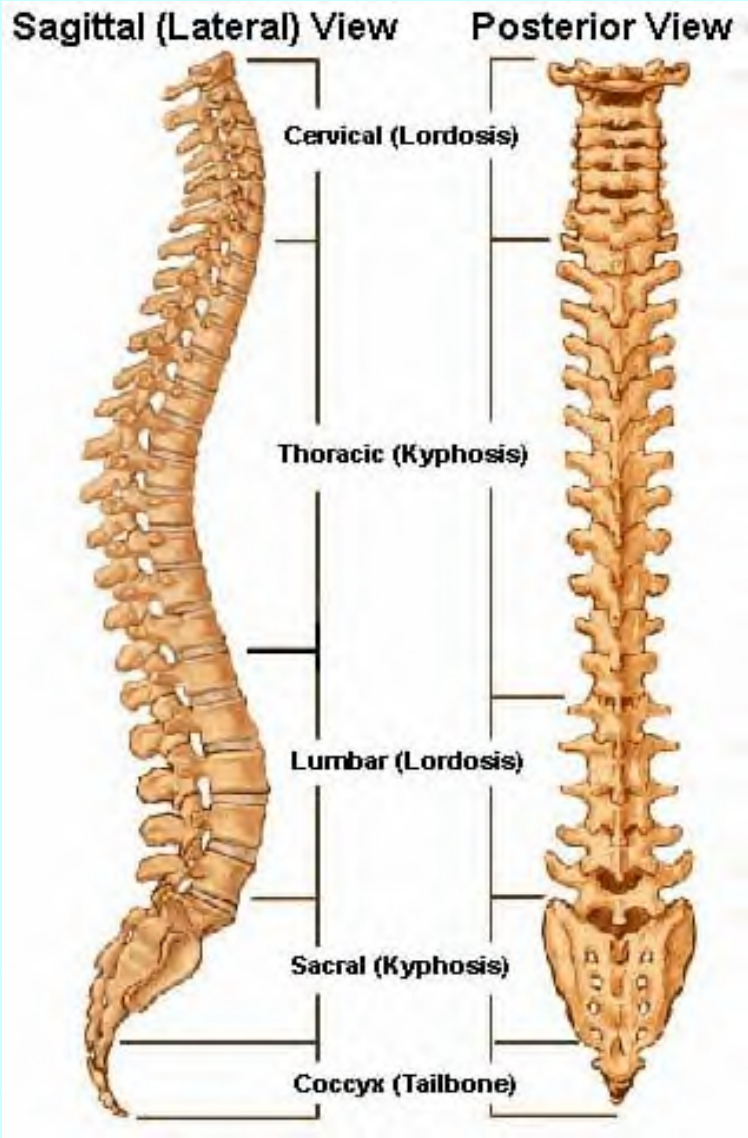
Oregon Statistics

- ~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.

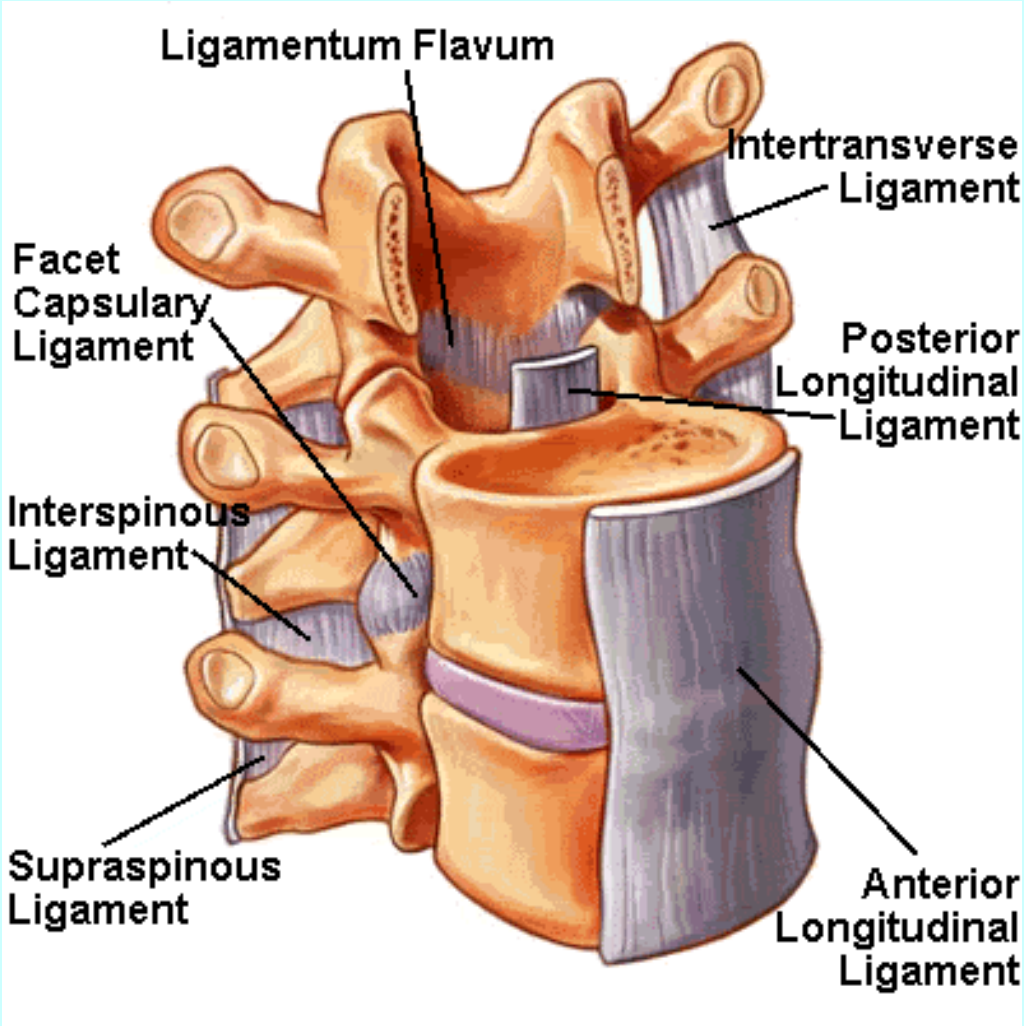
Anatomy

- 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

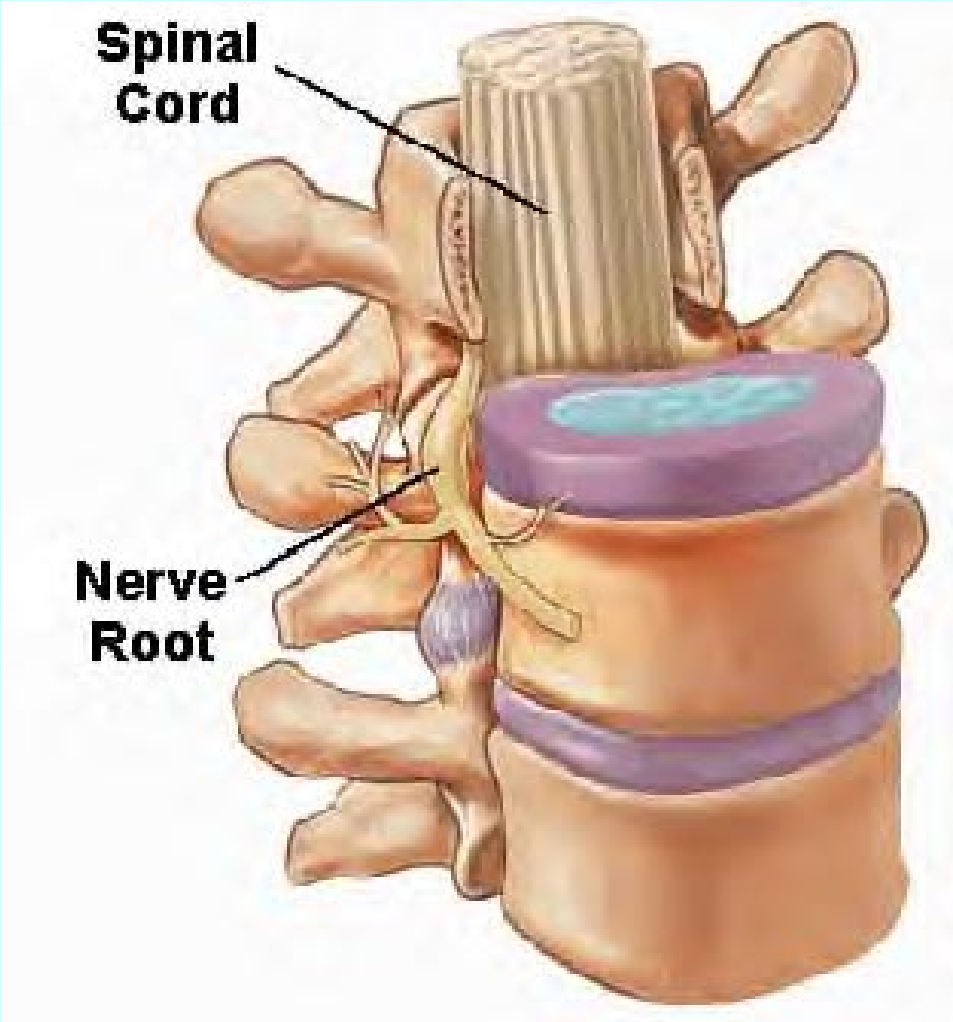
Bones


Sagittal (Lateral) View
Posterior View
Cervical (Lordosis)
Thoracic (Kyphosis)
Lumbar (Lordosis)
Sacral (Kyphosis)
Coccyx (Tailbone)

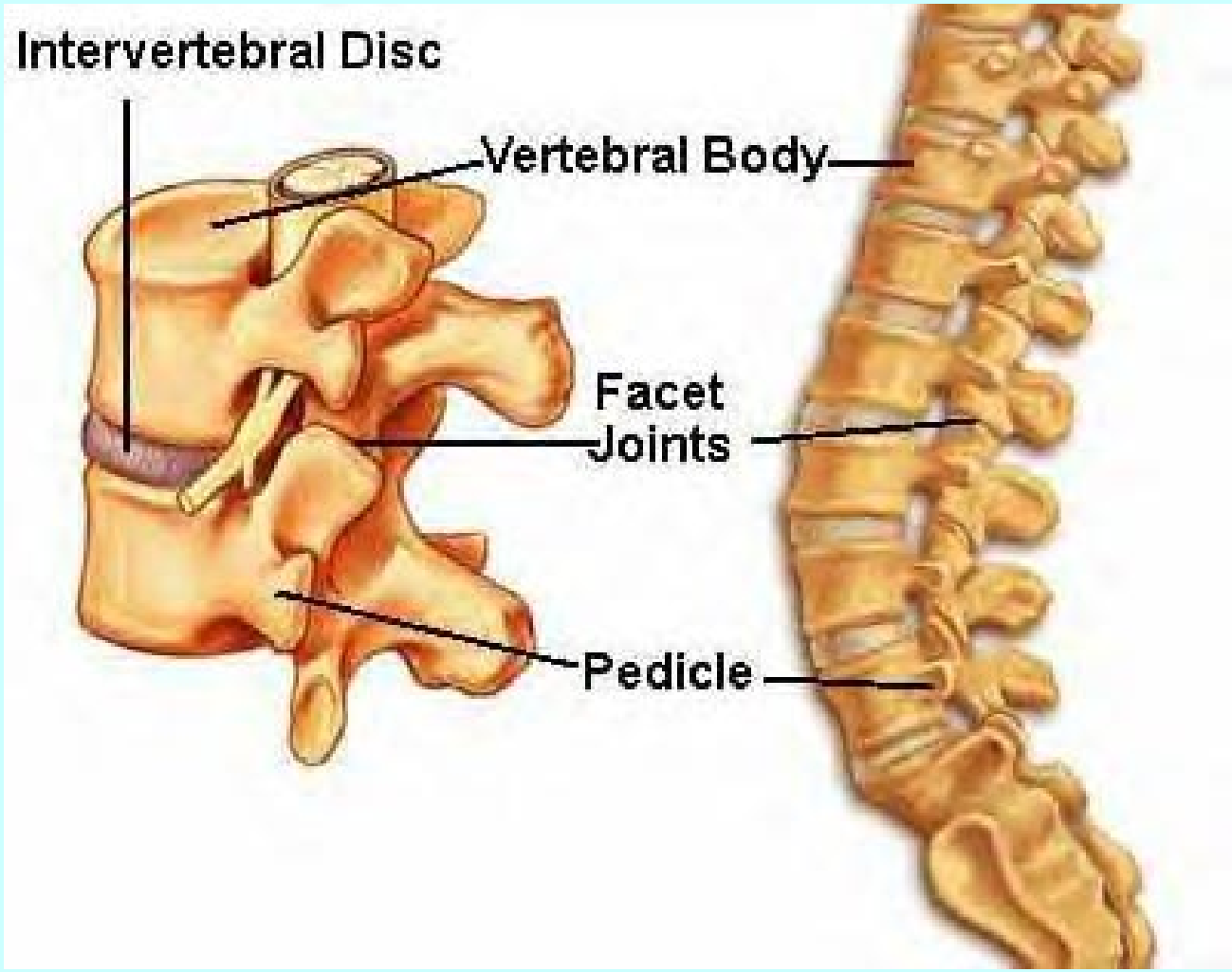
Ligaments


Ligamentum Flavum
Intertransverse Ligament
Facet Capsulary Ligament
Posterior Longitudinal Ligament
Interspinous Ligament
Supraspinous Ligament
Anterior Longitudinal Ligament

Nerves



Facet Joints and Disc



Intervertebral Disc

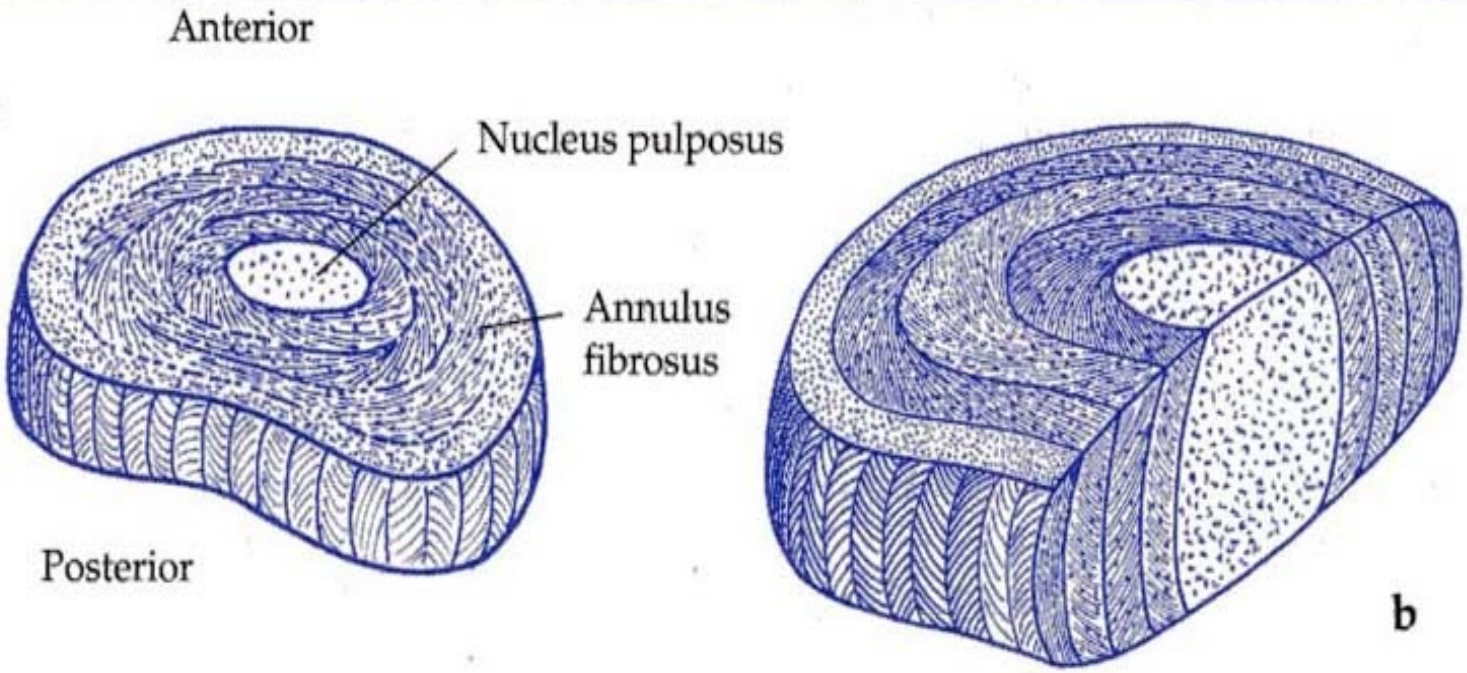


Figure 6.2 Intervertebral disc; (*a*) complete disc; (*b*) vertical section through disc to show relationship between nucleus pulposus and annulus fibrosus.

Disc Movement

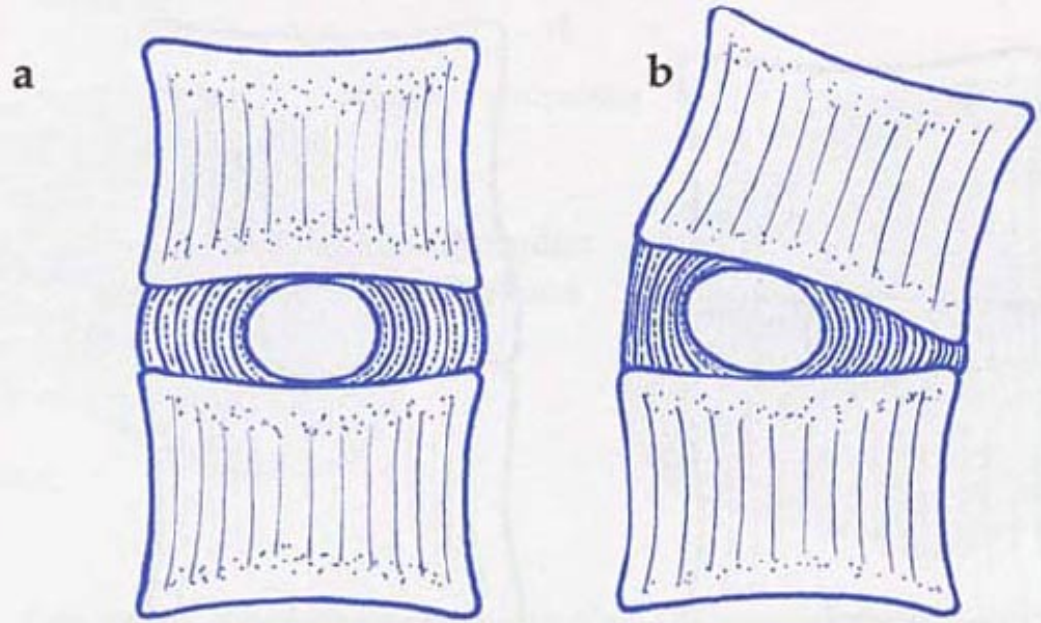
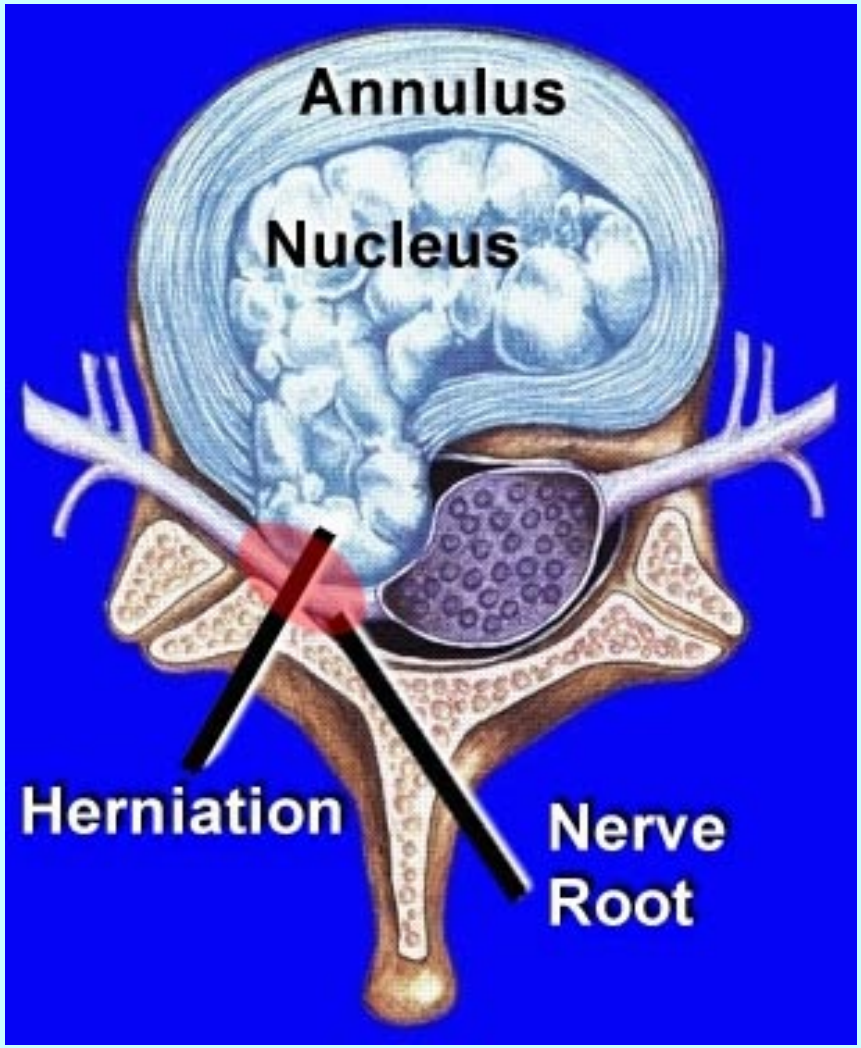
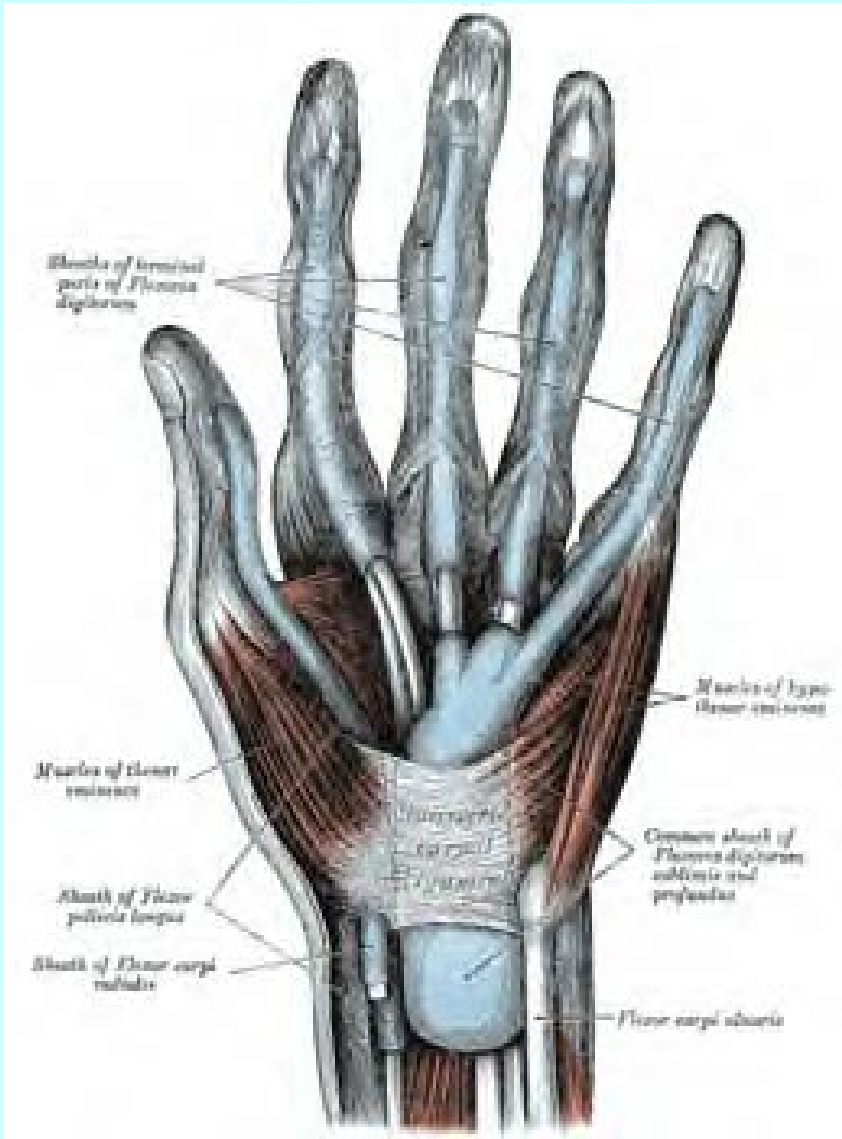


Figure 6.4 (*a*) Orientation of annulus fibrosus and nucleus pulposus in normal upright posture; (*b*) lateral displacement of nucleus pulposus in response to angular displacement of motion segment.

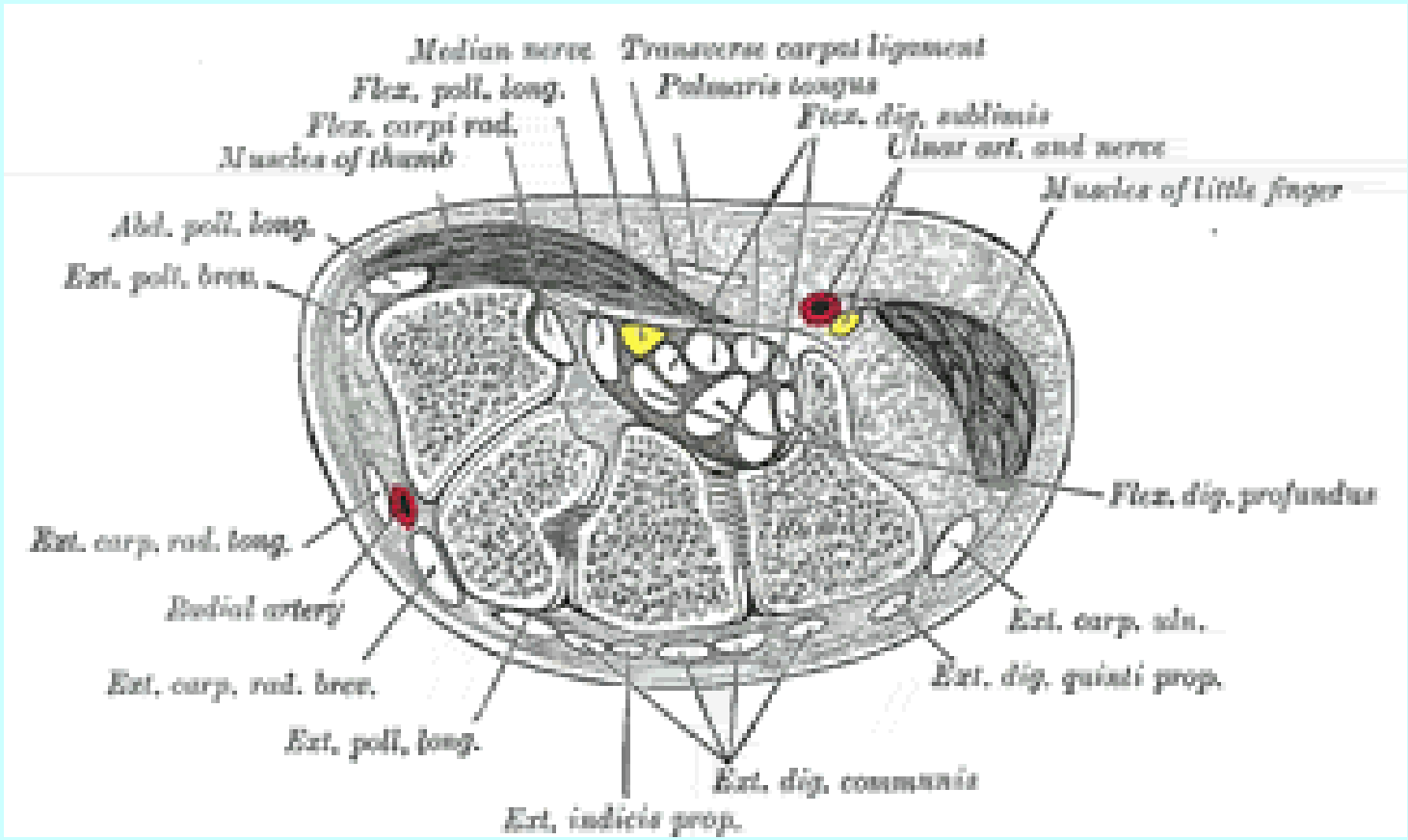
Disc Herniation



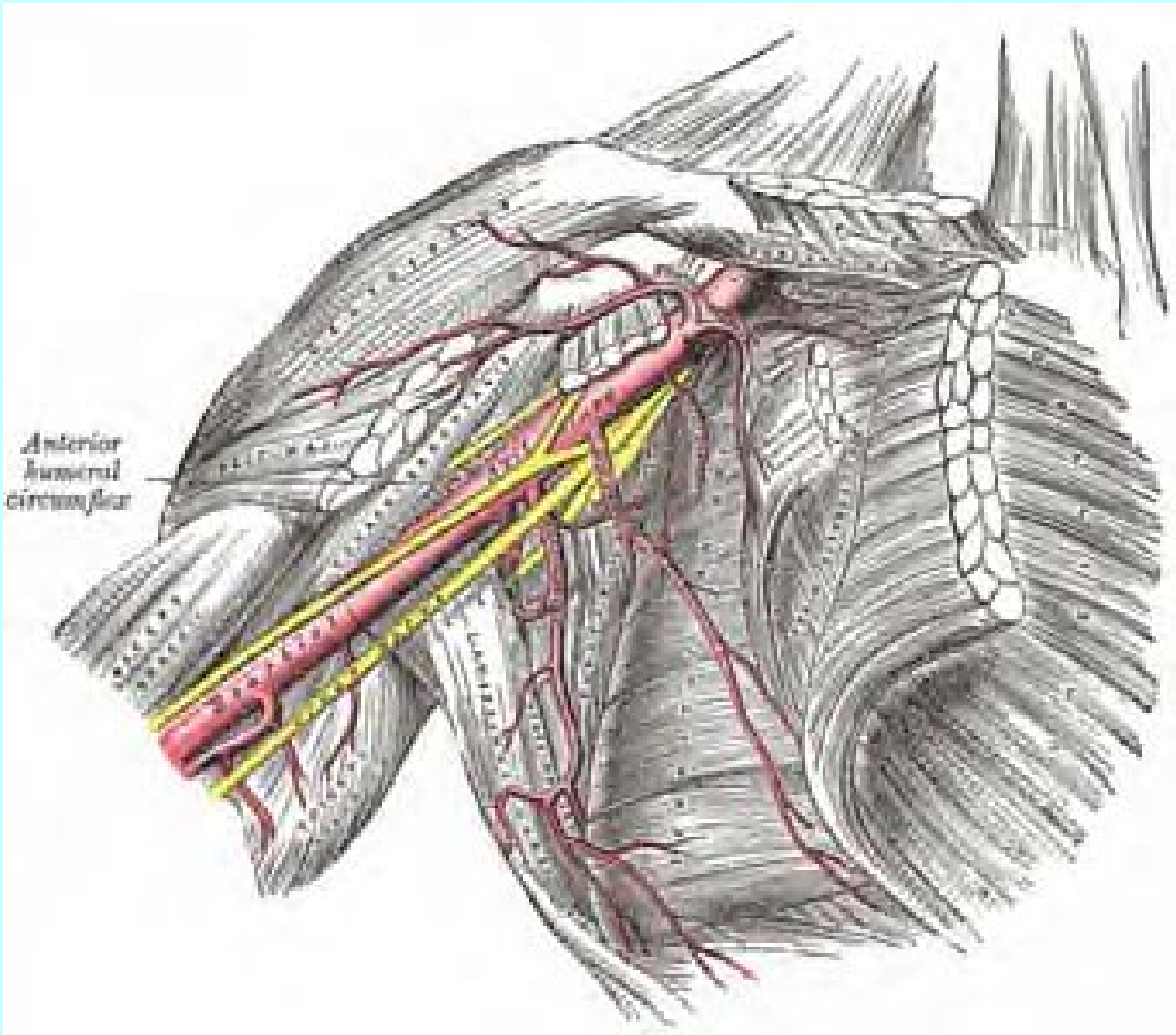
Wrist


Sheaths of terminal parts of Flexores digitorum
Muscles of hypothenar eminence
Muscles of thenar eminence
Common sheath of Flexores digitorum sublimis and profundus
Sheath of Flexor pollicis longus
Sheath of Flexor carpi radialis
Flexor carpi ulnaris

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

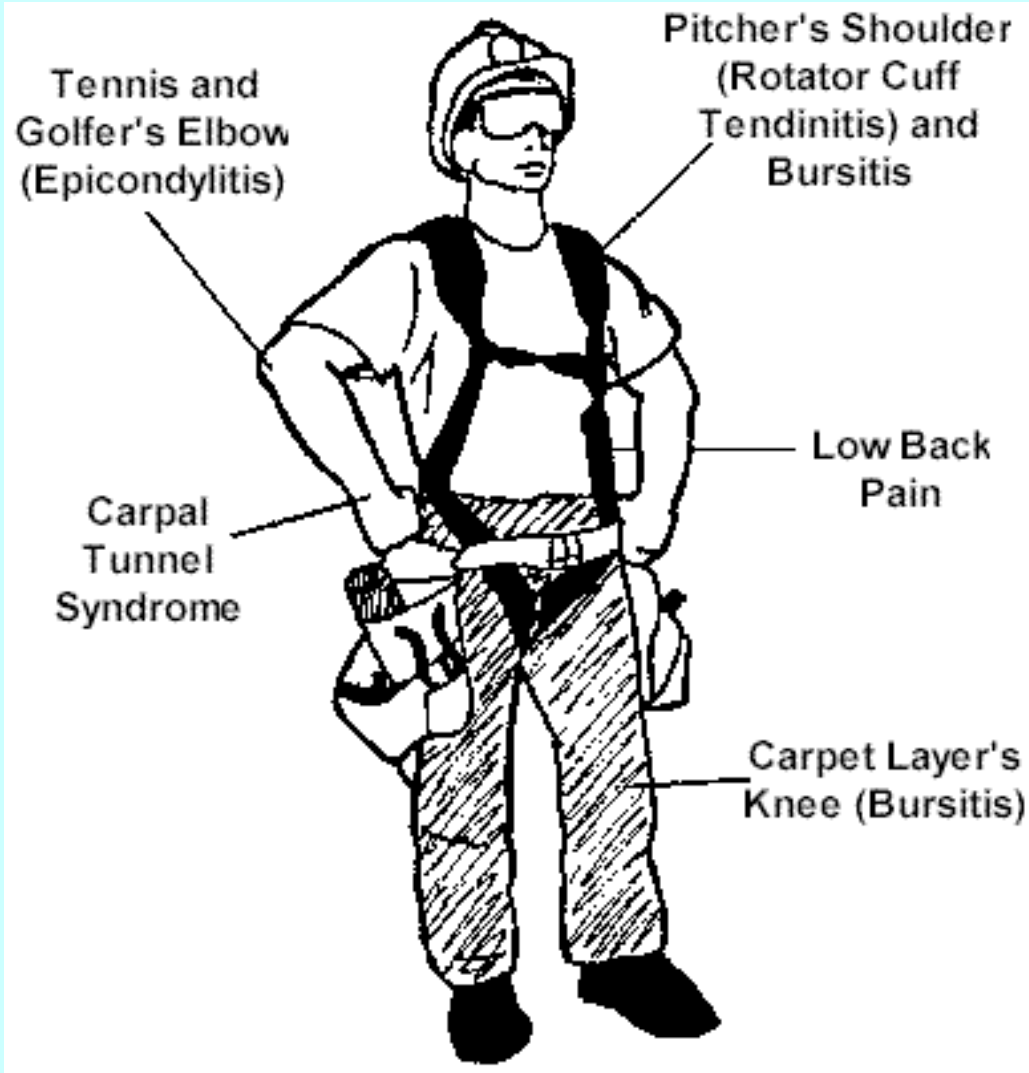
Chronic Injuries

- 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

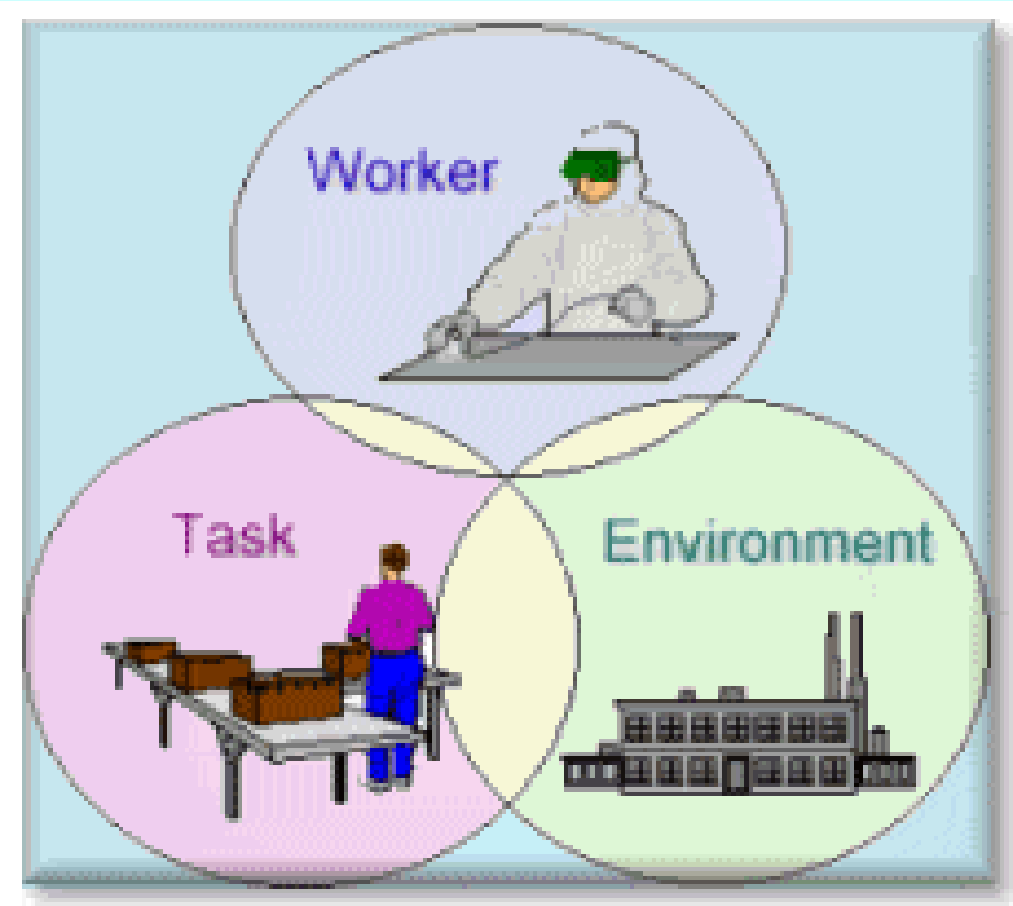
What happens in a chronic injury?

- 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



What is Egonomics?



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

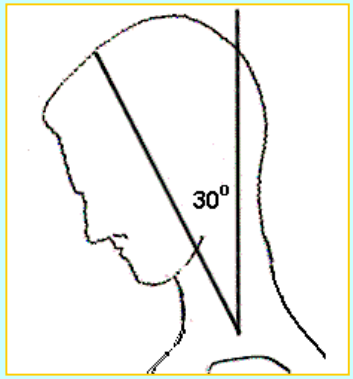
Awkward Postures

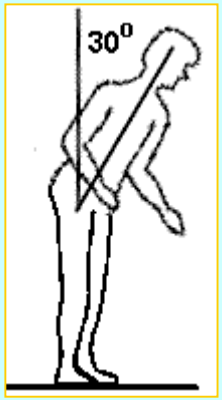
Being in these work positions for more than 2 hours total per day

- 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°

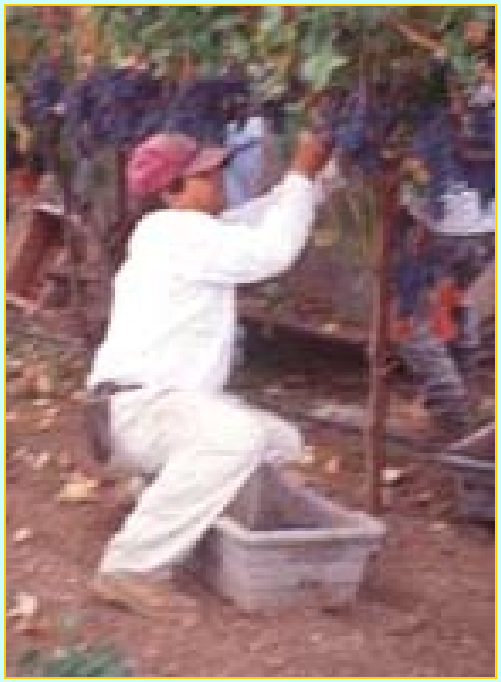
For more than 2 hours per day

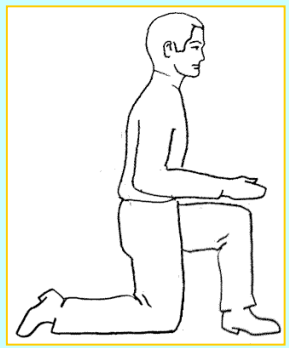




Squatting or Kneeling

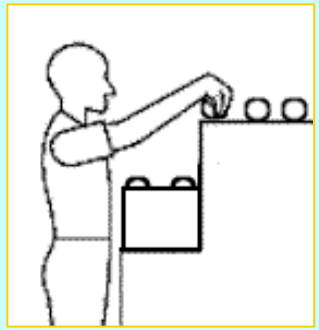
For more than 2 hours per day





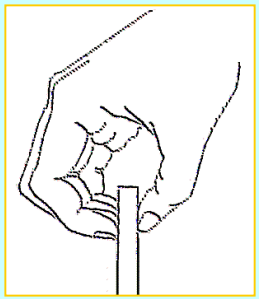
Working with the Hands Overhead

For more than 2 hours per day



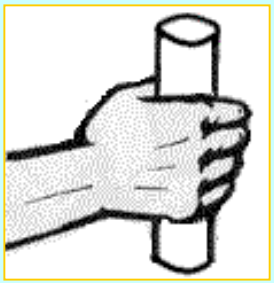
High Hand Force

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



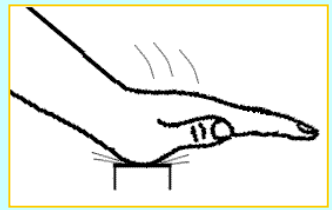
Highly Repetitive Motion

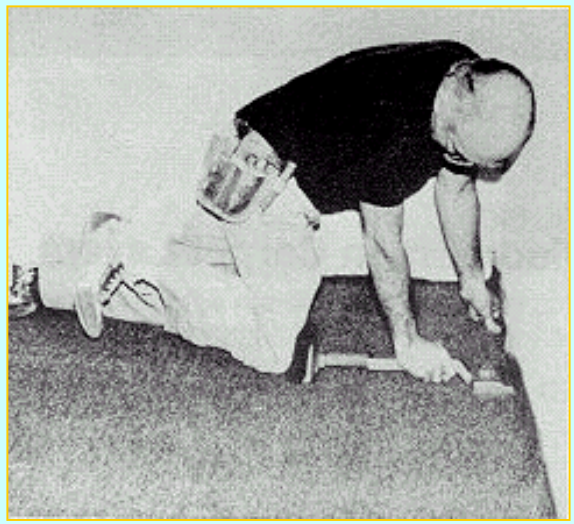
- **Workers repeat same motion every few seconds for more than 2 hours per day with:**
  - neck
  - shoulders
  - elbows
  - wrists
  - hands

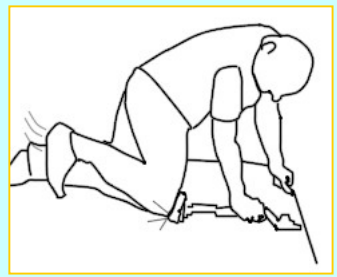
Repeated Impact

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

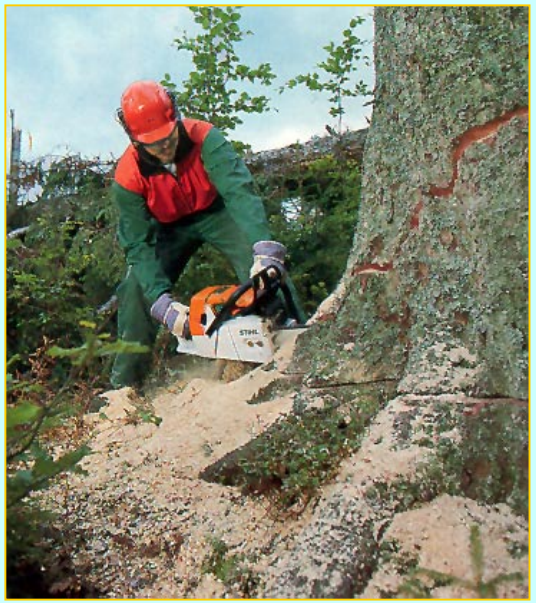
Moderate to High Hand-Arm Vibration

Moderate Level

more than
30 min/day

High Level

more than
2 hours/day



How to Achieve Ergonomic Solutions?

- practice good bodymechanics
- 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

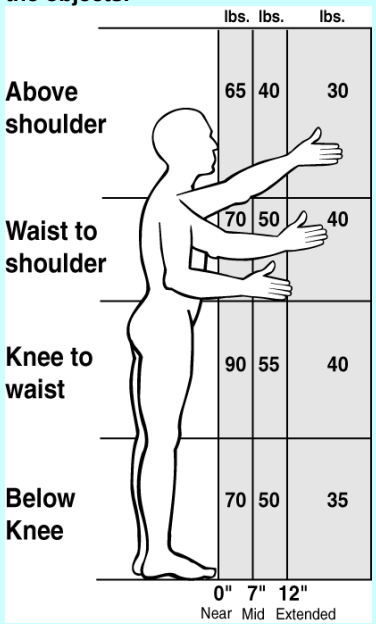
Appendix B: Calculator for analyzing lifting operations

Company		**Evaluator**	
Job		**Date**	

1. **Enter the weight of the objects lifted.**

Weight Lifted
lbs.

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



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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**

How many lifts per minute?	For how many hours per day?		
	1 hr or less	1 hr to 2 hrs	2 hrs or more
1 lift every 2-5 mins.	1.0	0.95	0.85
1 lift every min	0.95	0.9	0.75
2-3 lifts every minute	0.9	0.85	0.65
4-5 lifts every min	0.85	0.7	0.45
6-7 lifts every min	0.75	0.5	0.25
8-9 lifts every min	0.6	0.35	0.15
10+ lifts every min	0.3	0.2	0.0

4. **Circle the 0.85 if the person twists 45 degrees or more while lifting.** 0.85

Otherwise use 1.0

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

lbs.	X		X		=	Lifting Limit
Step 2		Step 3		Step 4		lbs.

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

Yes – OK
No – HAZARD
See back for solution ideas.