



# Ergo-NO-mics: Minimizing Repetitive Motion Injuries



**BORETTI, INC.**

INTEGRATED SAFETY SOLUTIONS

*Est. 2003*

# Speaker



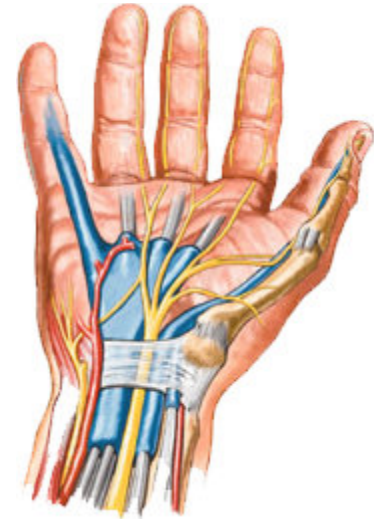
- Mike Burrows, M.S. EOH
  - 7 years, Boretti Inc.
    - Safety Professional
  - Industrial Hygiene
  - Environmental Protection
  - ASSP
    - Professional Member

# How Did They ...?



# Repetitive Motion Injuries: Looking at Some Numbers

- Almost 2/3 of occupational injuries are RMIs
- RMIs 7% of the US population
- Average recovery time is 23 days
- Average cost is \$29,000-\$32,000 per injury
- Carpal tunnel syndrome is the most common
  - Average 31 missed days
  - 8 million Americans



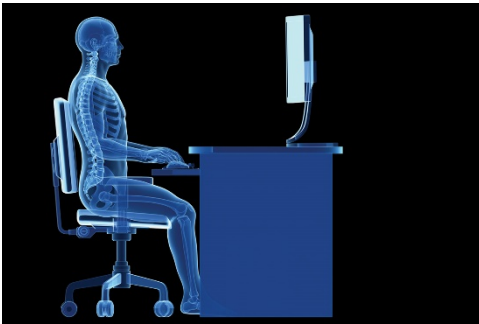
# Objectives

- Know the factors that affect the risk of RMIs
- Understand commonly injured tissues and body parts
- Recognize symptoms of RMIs
- Use control methods in different work applications
- Review some photos and identify risks and improvements

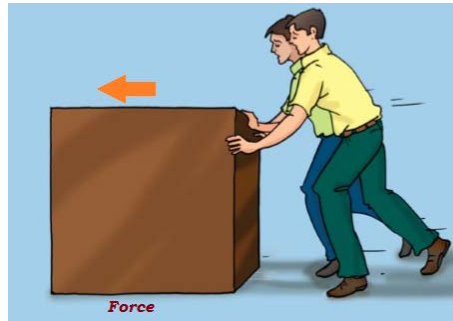
# Repetitive Motion Injuries

- RMI risk factors get magnified due to following factors

Posture



Force



Repetition



# How Do RMI's Occur?

- Demands of Work

## Forceful Exertion

- *Amount of force required*

Examples:

- Carrying heavy equipment
- Abrupt motions
- Lifting materials and supplies

## Repetition

- *Performing same motion over and over*

Examples:

- Loading / unloading a cart or vehicle
- Typing, mouse work, data entry
- Wet mopping

## Awkward Posture

- *Placing body in a position that doesn't distribute forces evenly*

Examples:

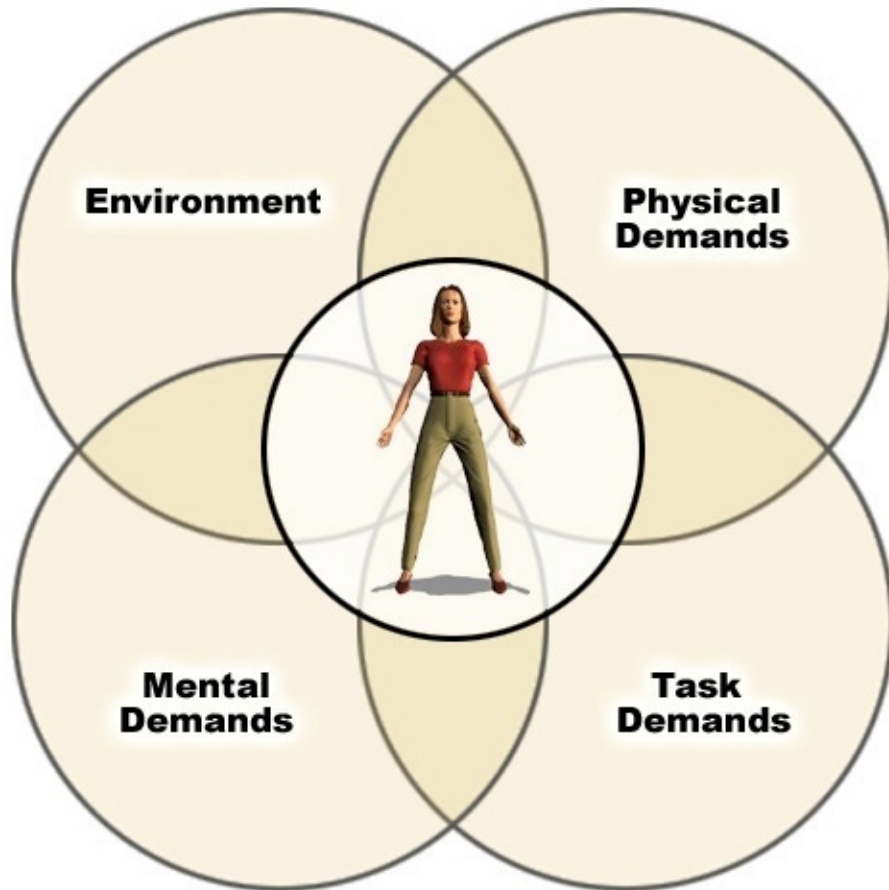
- Standing for long periods of time with bent neck and back
- Working at a poorly set workstation
- Handling large uneven objects

# How Do RMI's Occur?





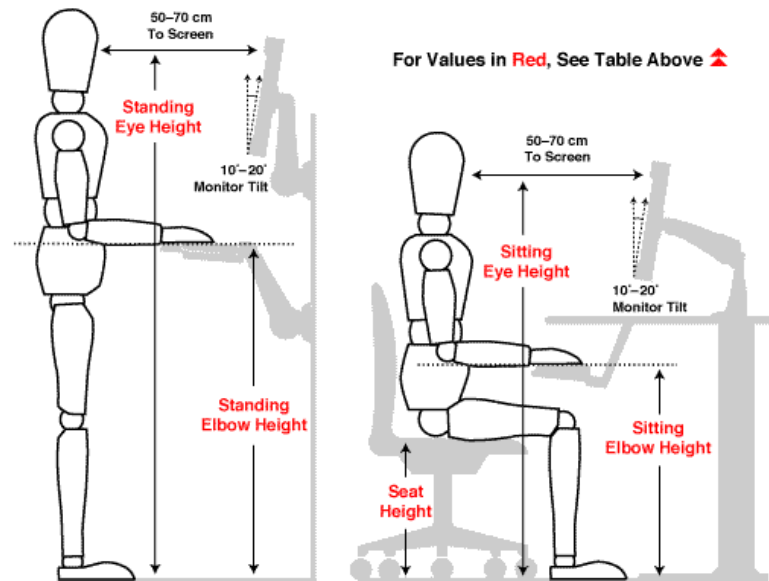
# Ergonomics: Define



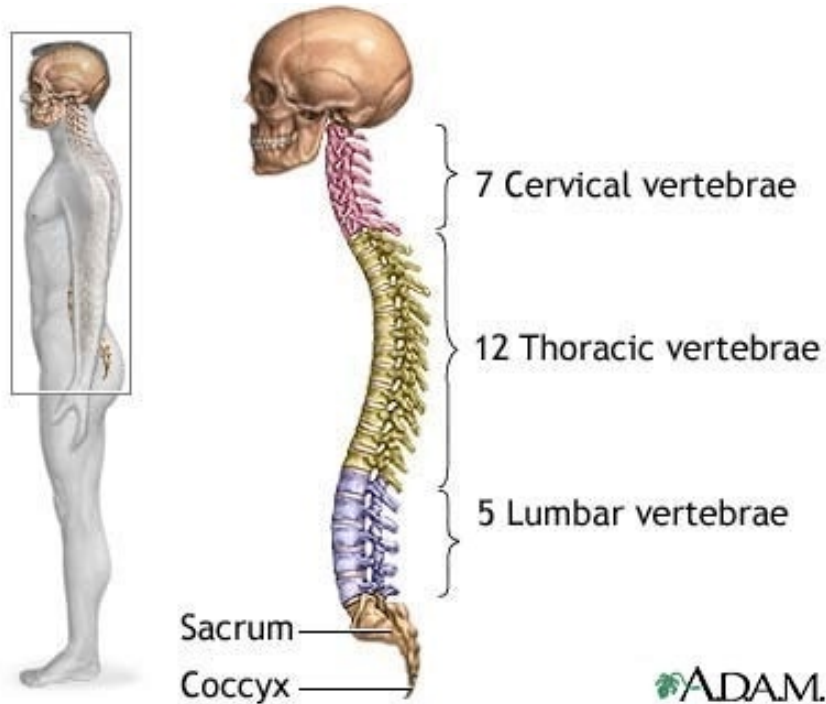
- Study of people's efficiency in their working environment
- Systems science
  - Human body interacting with the work environment
- Fit the task to the worker

# Foundation

- Revisit:
  - Anatomy & Function
  - Injurious Postures
  - Symptoms



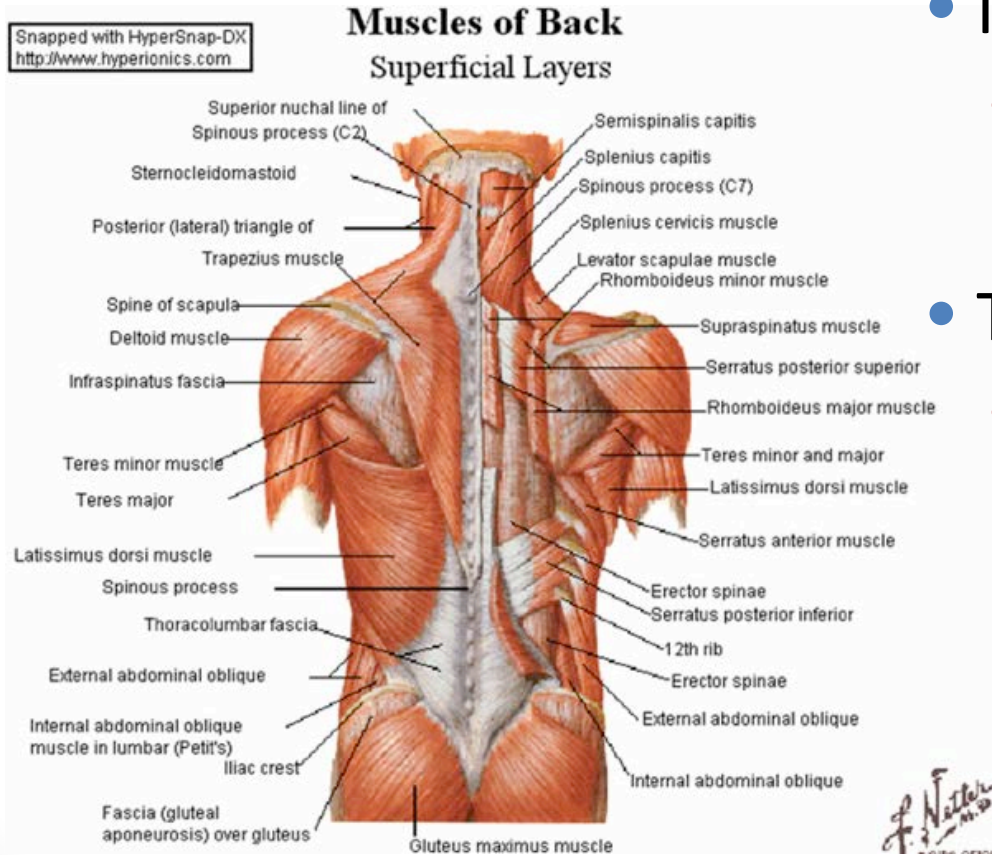
# Anatomy Review & Function



- Bone (Vertebrae)

- Neck (Cervical) – small and flexible, but weak
- Ribs (Thoracic) – less flexible, but reinforced
- Lower back (Lumbar) - Strong

# Anatomy Review & Function



- Muscles

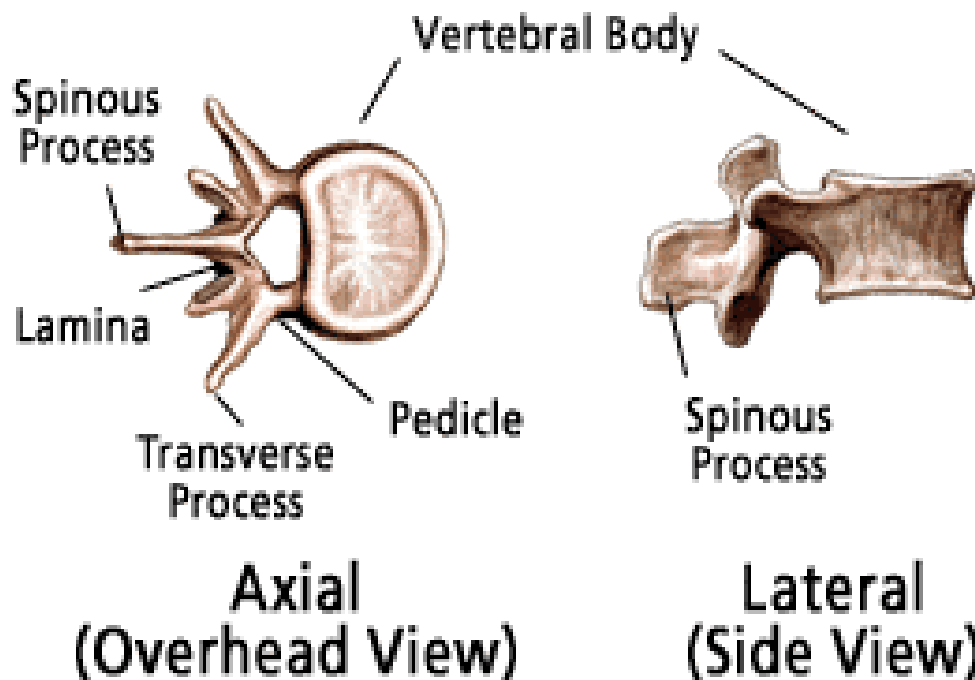
- Strain – stretch or tear

- Tendon

- Strain – stretch or tear

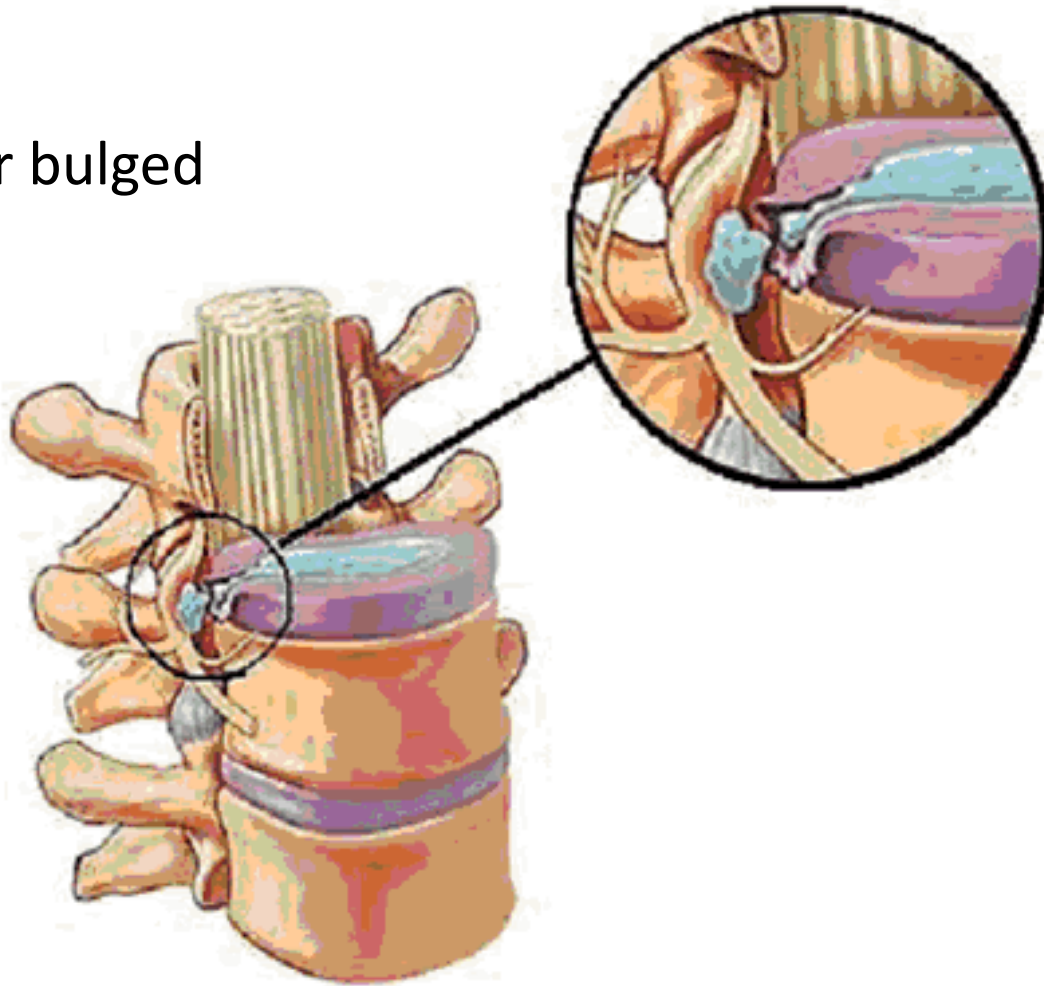
# Anatomy Review & Function

## Lumbar Vertebrae



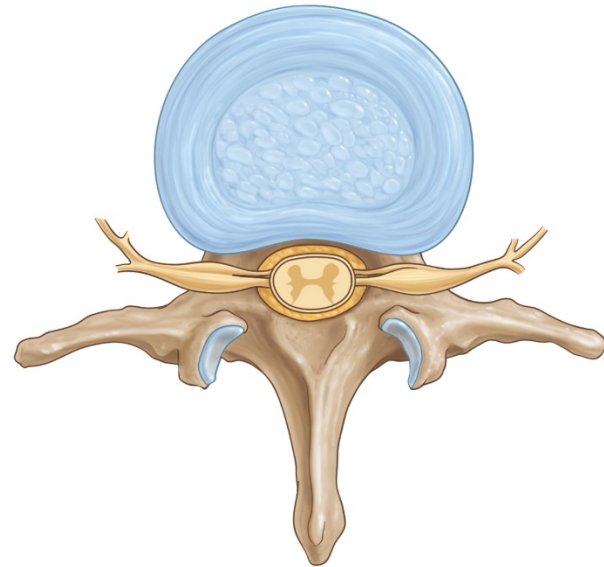
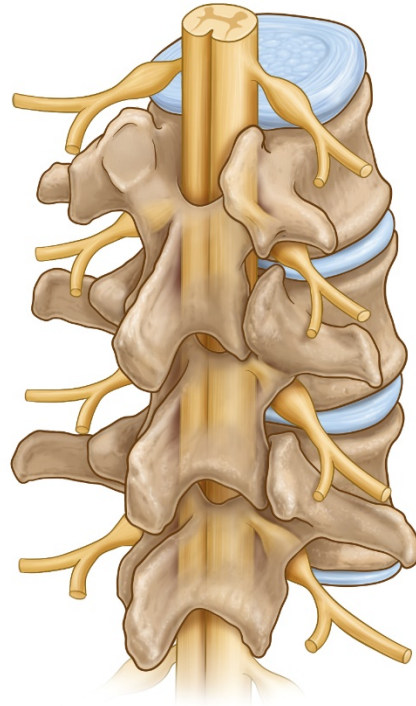
# Anatomy Review & Function

- Disks
  - Bulged disk
  - Ruptured or bulged disk



# Anatomy Review & Function

- Nerves
  - Sensation
  - Motion



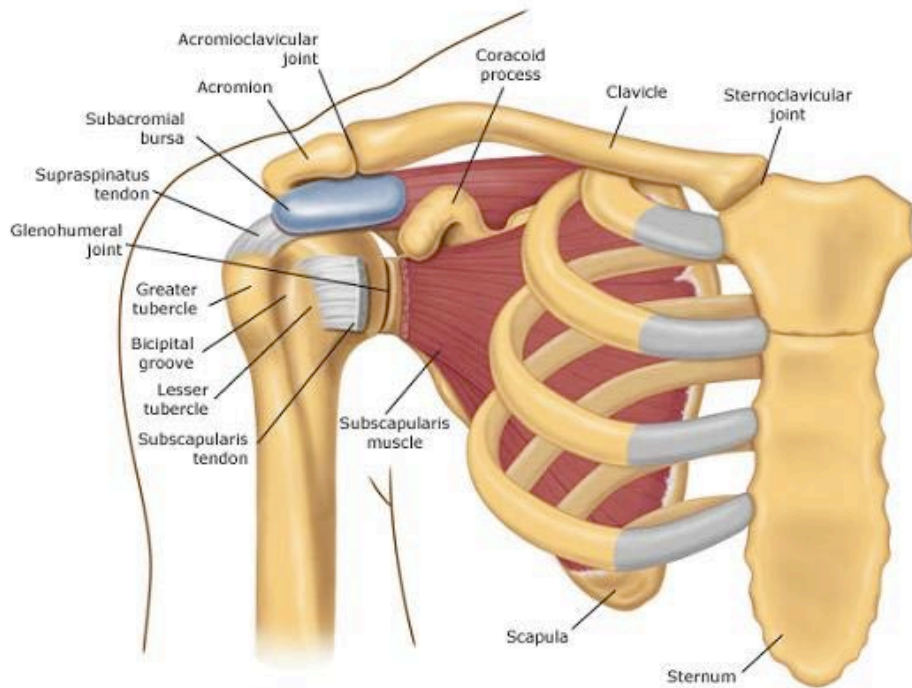
# Bad Back Posture .... Why?





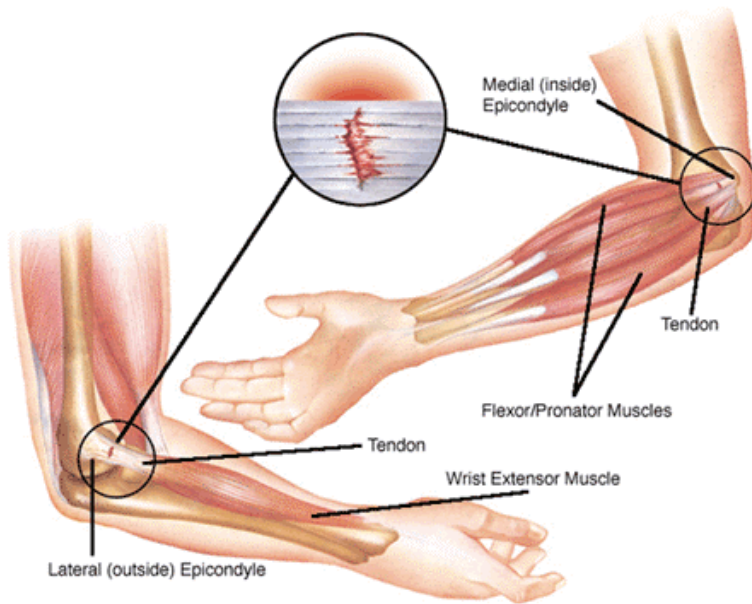
# Anatomy Review & Function

- Upper Limb
  - Structure / Function
    - Shoulder
  - Damaging Postures
    - Flexion, extension
    - Abduction, adduction



# Anatomy Review & Function

- Upper Limb
  - Structure / Function
    - Elbow
  - Damaging Postures
    - Extension
    - Flexion



# Anatomy Review & Function

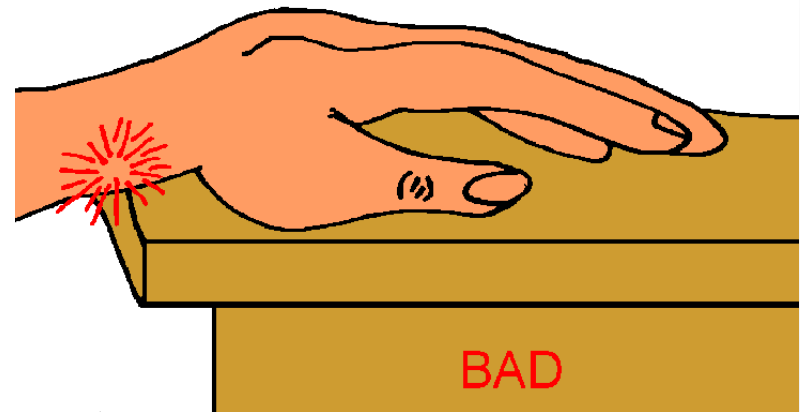
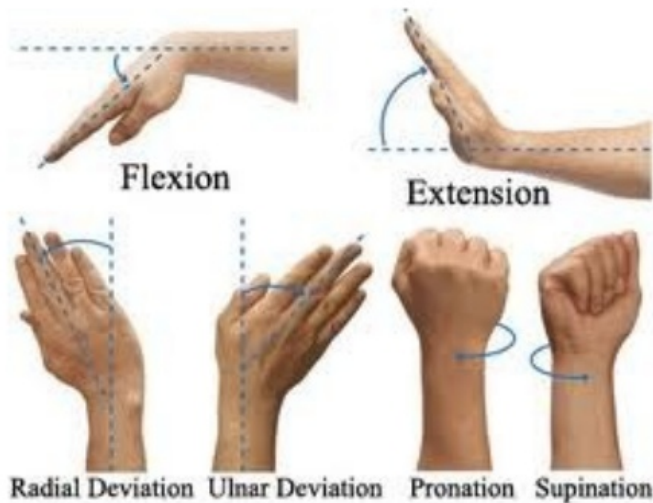


- Upper Limb
  - Structure / Function
    - Wrist
      - Muscles
      - Tendons
      - Carpal Tunnel

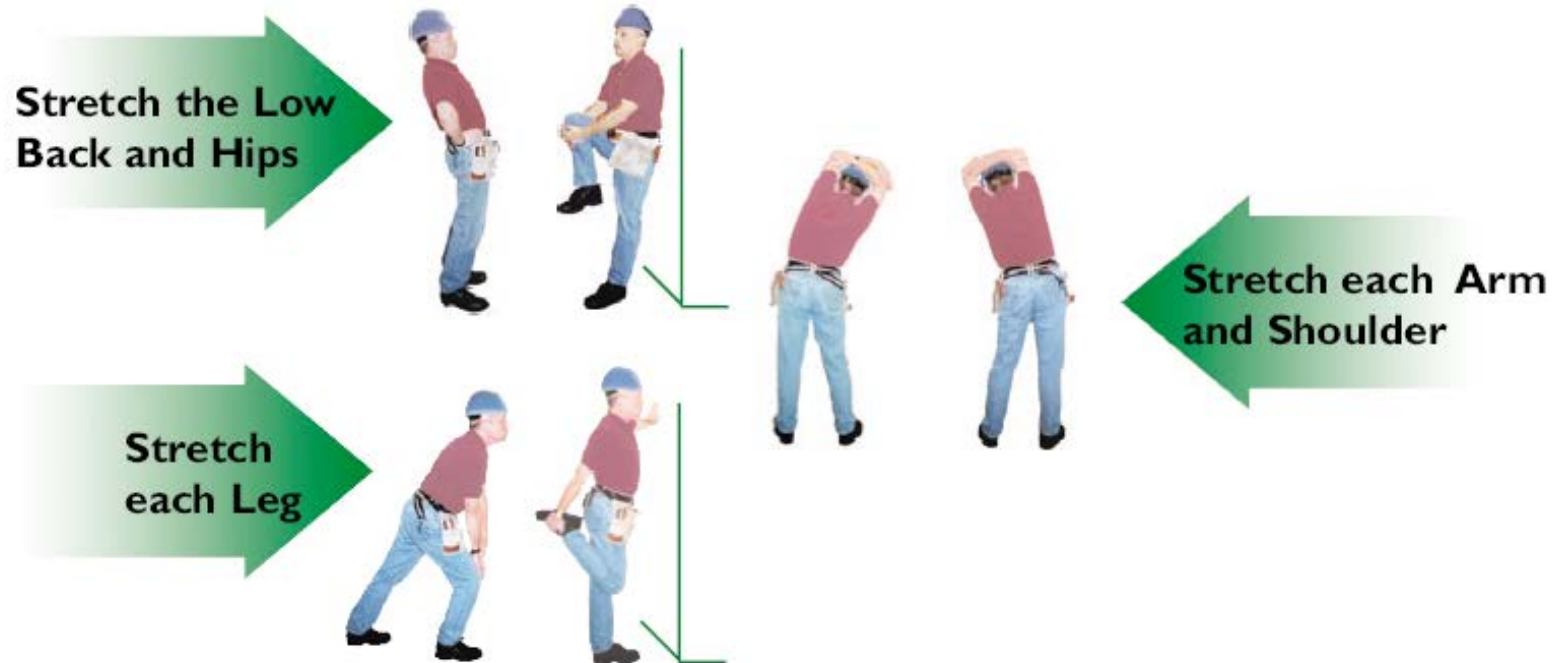
# Anatomy Review & Function

- Upper Limb
  - Wrist
    - Damaging Postures
    - Mechanical Stress

## Wrist Movement



# Stretch



- **Stretch Slowly: hold 3 – 5 seconds**
- **Do before work and periodically throughout the day**

# Stretch



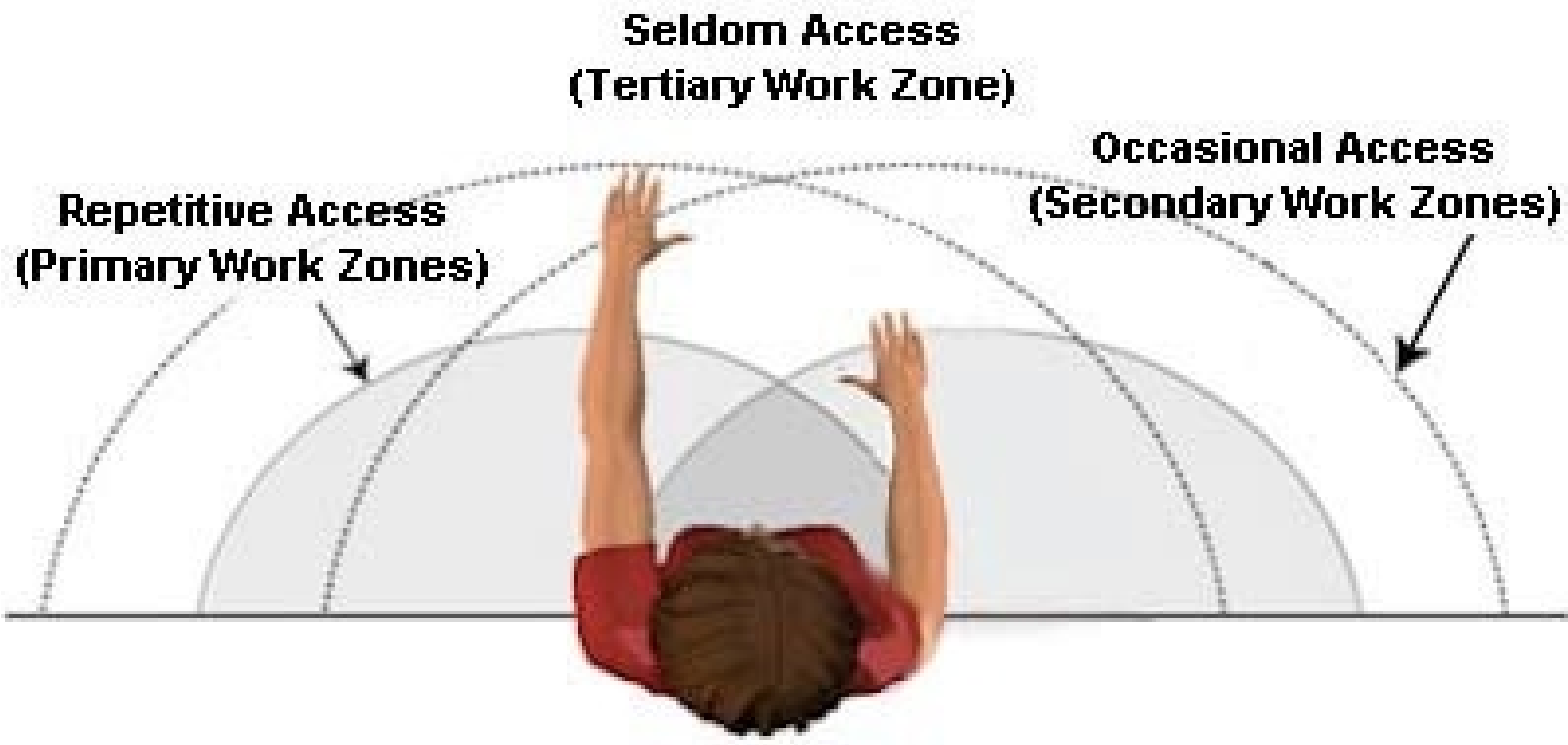
# Examples



BC Textile Innovations Inc.  
[www.textileinnovations.com](http://www.textileinnovations.com)

- Eliminate need
- Reduce:
  - Force
  - Distance
- Optimize the technique

# Work Zones / Organization





# Work Zone / Organization

- Organized to avoid awkward body posture and reaching
- Frequently used items located in easy to reach places
  - Within forearm's reach
- Avoid repetitive tasks requiring arms to be raised above shoulder level or behind the body
  - Relocate frequently used items

# Seated Posture



# Seated Posture: Chair



- Foundation for all other adjustments
  - Neutral seated posture
- Adjust the chair height
  - Thighs parallel to floor
  - Heels flat on the floor
- Adjust the chair back
  - Lumbar (“bulge”) is at “belt line”
- Adjust seat pan depth for firm contact
- Armrests?

# Seated Posture: Workstation

Elbow easily rests on armrest; open 90 – 110 degrees; armrests are even with desk surface

Legs are parallel to the floor when feet are flat on the floor



Top of screen is at same height as the top of the head

Wrists are “neutral”; no bend up or down

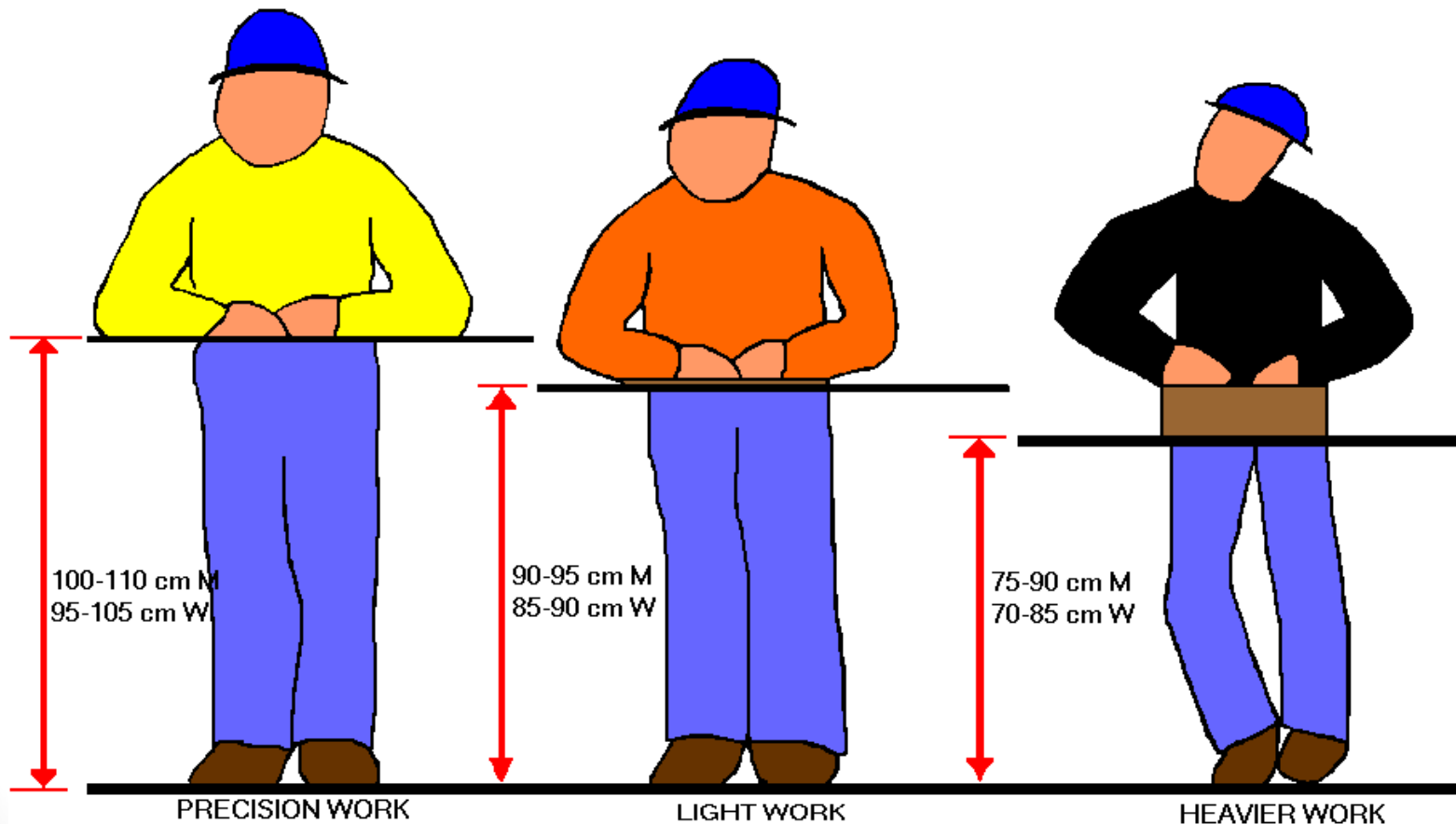
Chair lumbar is at “belt line”

# Seated Posture: Driving



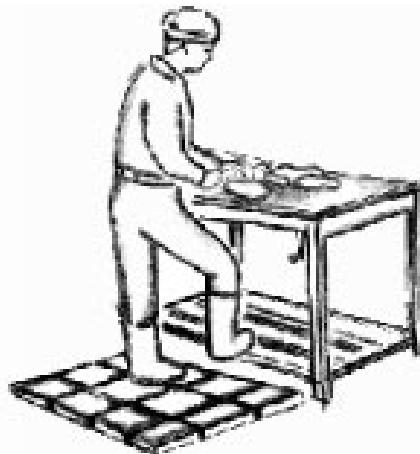
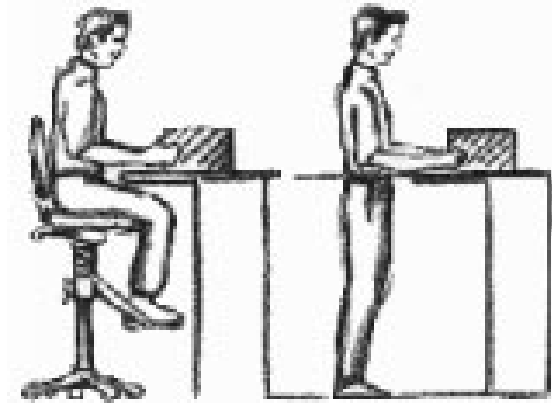
- Foundation for all other adjustments
  - Neutral seated posture
- Adjust the driver's seat
  - Arms are bent at the elbow when the hand is at the top of the steering wheel
  - Legs are bent at the knee and back of leg not pressing on the seat cushion when touching the pedals
- Adjust the driver's seat back
  - Lumbar "bulge" is at "belt line"

# Standing Work Station



# Standing Workstation

- Prolonged standing
  - Keep weight evenly balanced
  - Change foot positions
  - Raise one foot
  - Anti-fatigue mats
  - Slip resistant mats



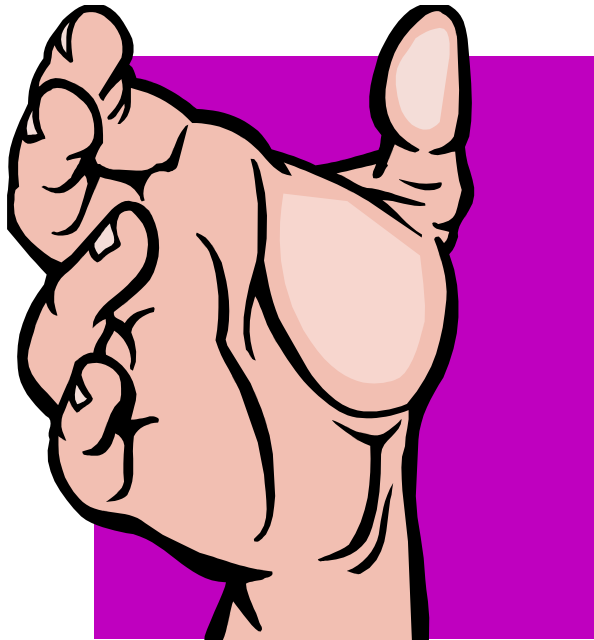
# Reaches & Organization: Example



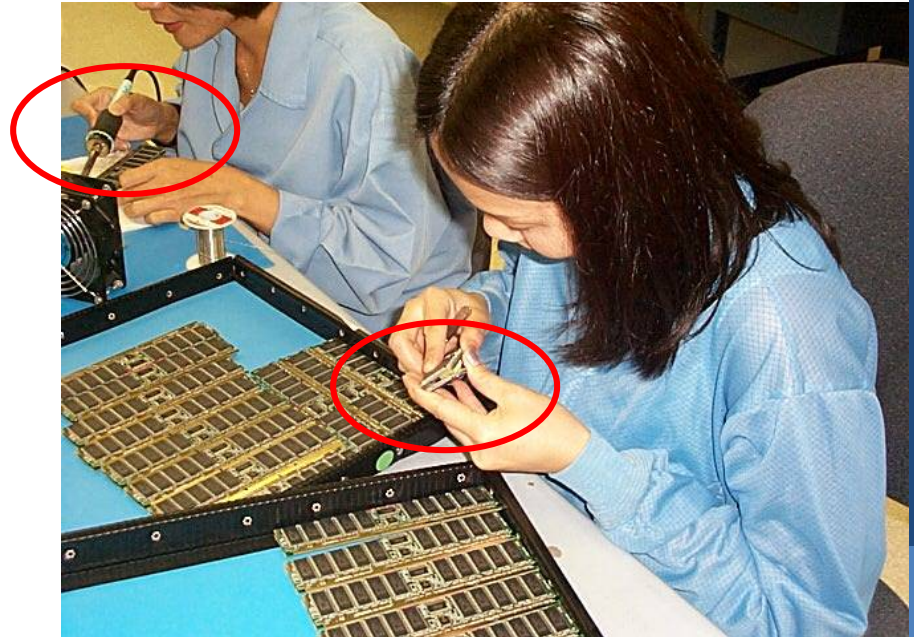


# Tools & Equipment: Grips

- Power



- Pinch



# Tools & Equipment: Grips

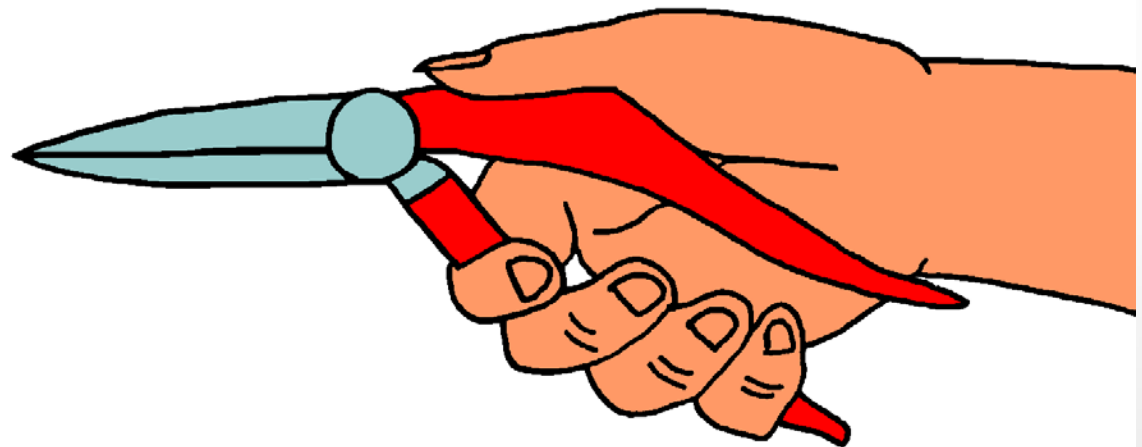
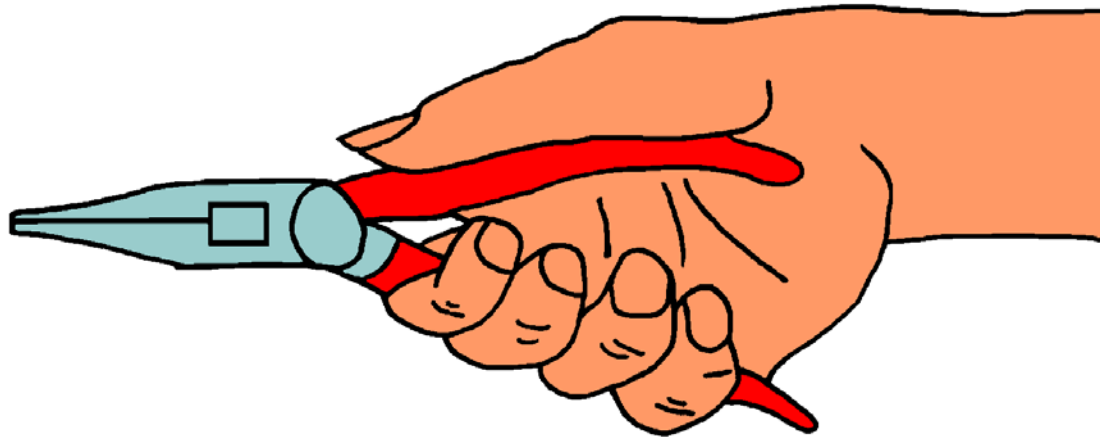
- Power

- Spread the load over as many muscles / tendons as possible
- 25 lbs max
- Use for tools requiring high hand forces
  - i.e., hammer

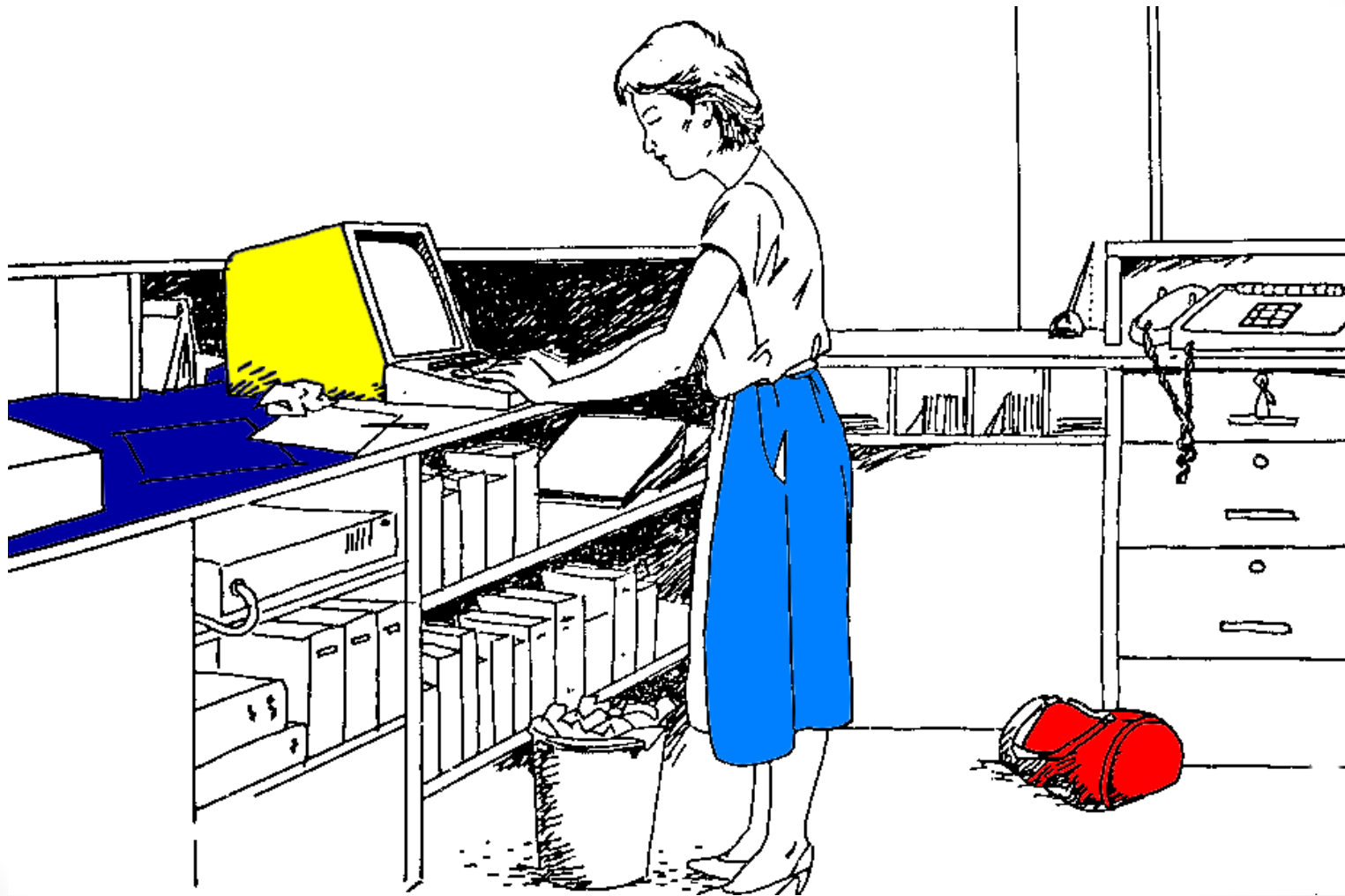
- Pinch

- Problem – using the ends of the fingers as a power grip
- 8 lbs max
- Use for precision tools for precision work
  - i.e., tweezers

# Tools



# ID Symptoms, Causes, Solutions



# Application



# Application



# Application



# Application





# Application



# Application



# Application



# Application



# Application



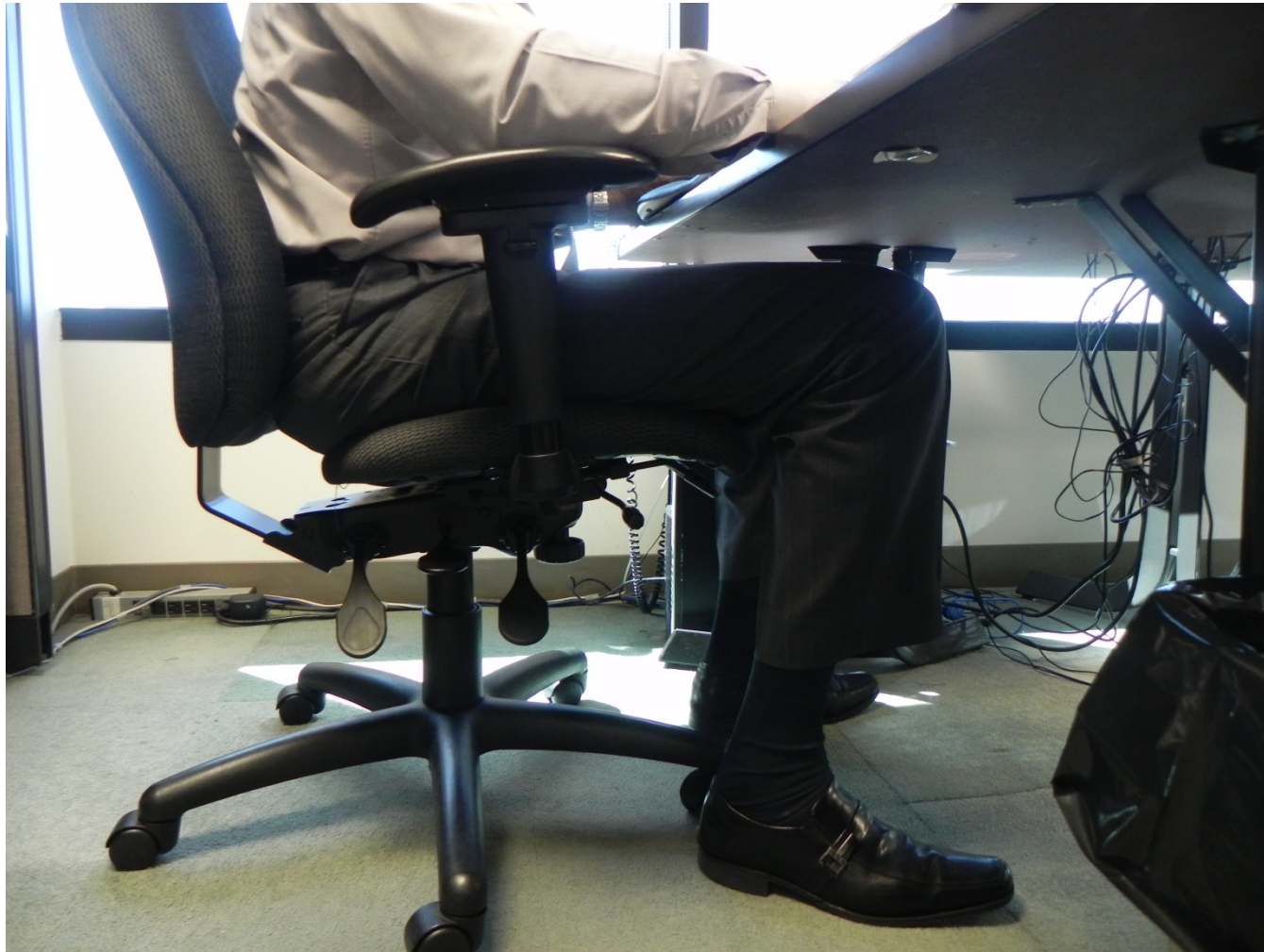
# Application



# Application



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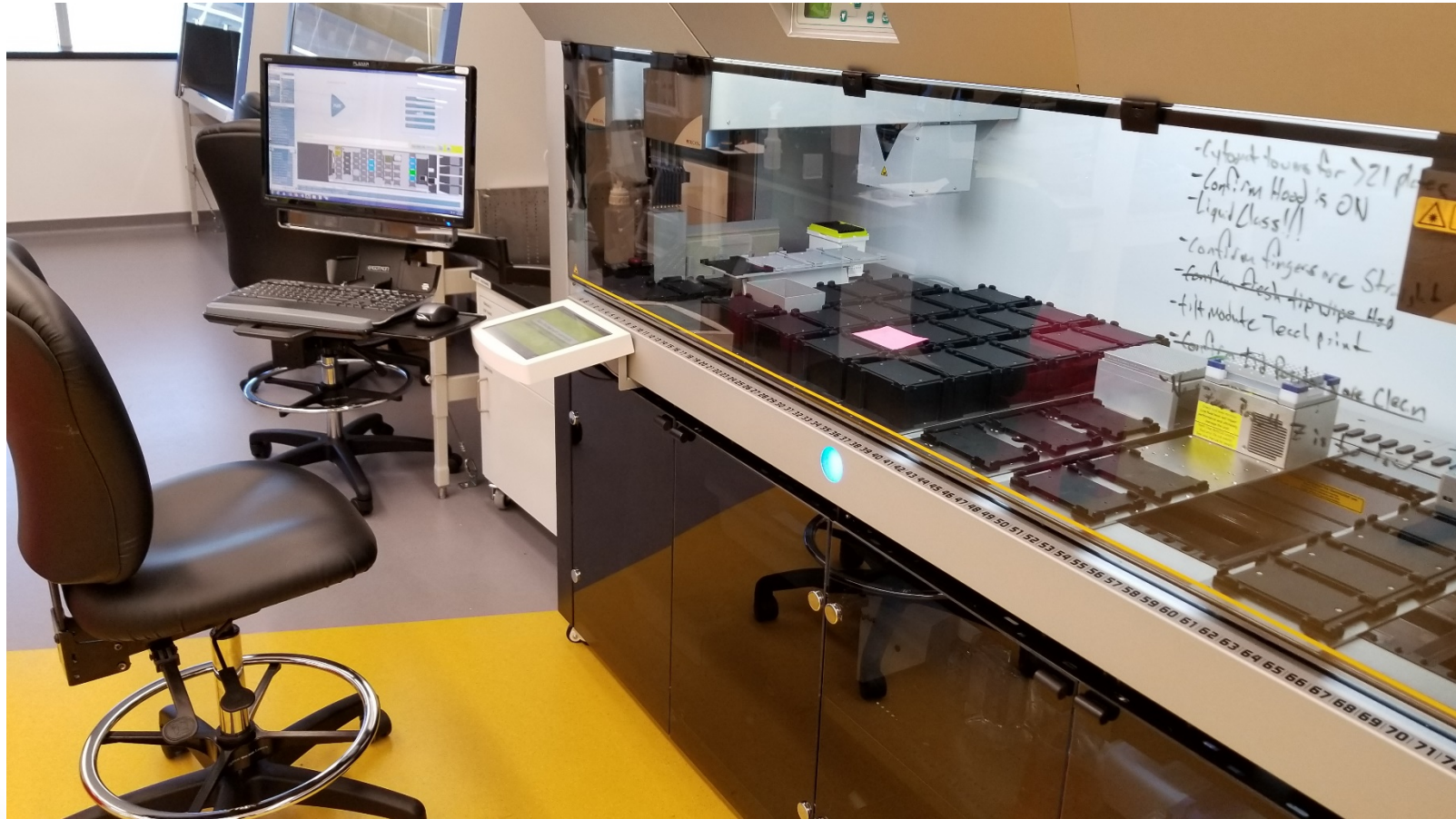




# Application



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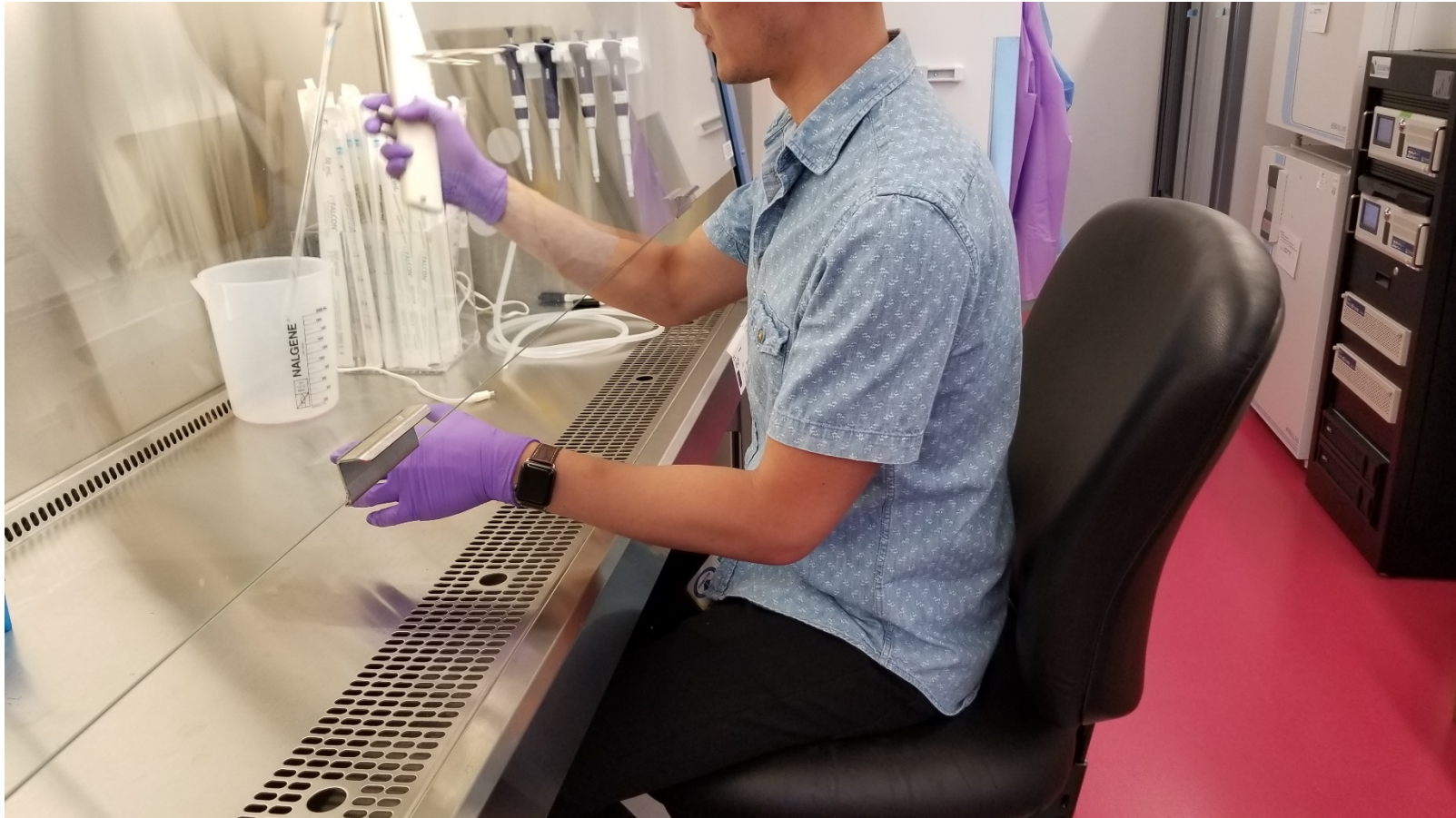


# Application





# Application



# Application



# Application



# Questions





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Thank You!