



Ergonomics & Back Safety



WE ARE THE ARMY'S HOME



Garrison Safety Office (GSO)
U.S. Army Installation Management Command

What is 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”.

Ergonomics means
“fitting the job to the worker”

Source : International Ergonomics Association (IEA) in 2000



Benefits of Ergonomics

- Helps to prevent injuries
- Improve quality of work and life
- Reduce fatigue and discomfort
- Increased productivity and efficiency
- Improved morale and job satisfaction
- Reduced turnover



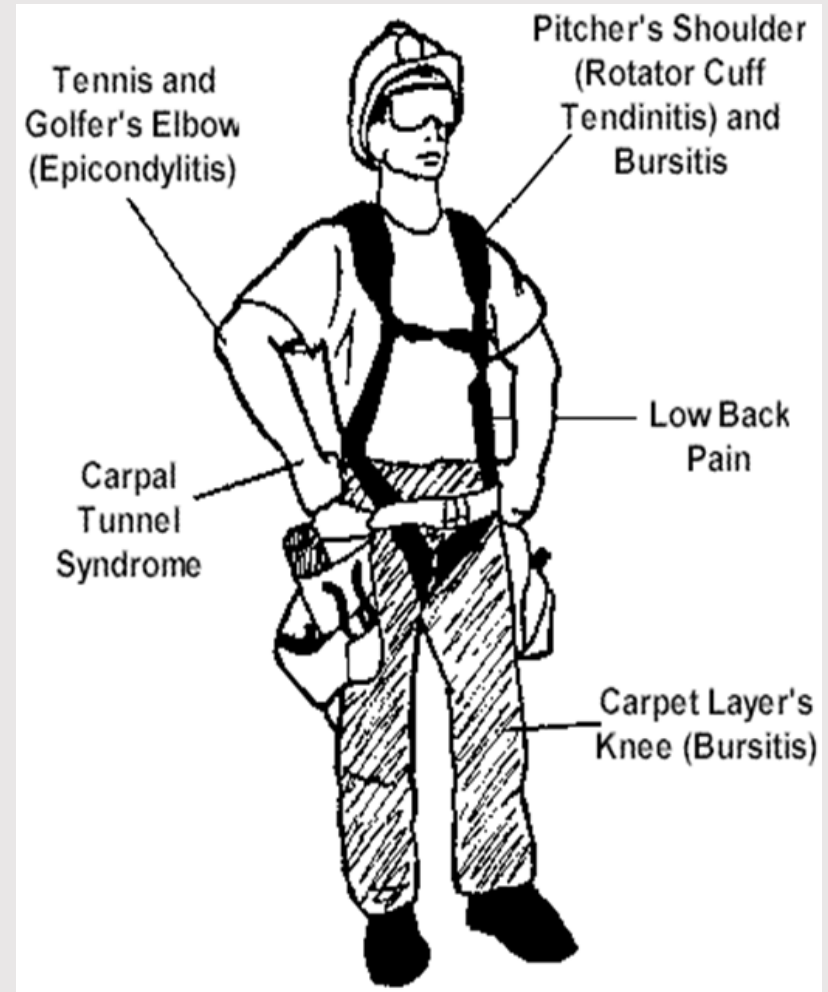
What are Work Related Musculo-Skeletal Disorders (WMSDs)?

- WMSDs are also known as:
 - Cumulative Trauma Disorders (CTDs)
 - Repetitive Strain Injuries (RSIs)
 - Overuse injuries
- They are soft tissue injuries which occur gradually

WMSDs

WMSDs are occupational disorders of the soft tissues:

- muscles
- tendons
- ligaments
- joints
- blood vessels
- nerves
- spinal disks



Ways WMSD's injure the body:

- **Muscles**: can be strained or torn.
- **Tendons**: can be strained, torn or inflamed. Tendons attach muscle to bone.
- **Tendon Sheaths**: can be inflamed. Tendon sheaths are the protective wrapping for the tendons, which contain fluid so that the tendon can slide back and forth within the sheath
- **Nerves**: can be pinched
- **Ligaments**: can be sprained or fibers torn from the bone. Ligaments attach bone to bone
- **Discs**: can slip or bulge. Discs are the shock absorber between the vertebrae of the spine



WMSD Symptoms

- Discomfort
- Pain
- Numbness
- Tingling
- Inflammation
- Burning
- Swelling
- Change in color
- Tightness, loss of flexibility

WMSD Causes

- Heavy, Frequent, or Awkward Lifting
- Pushing, Pulling or Carrying Loads
- Working in Awkward Postures
- Hand Intensive Work
- Vibration
- Contact Stress



Risk Factors

Risk of injury depends upon:

- Duration of exposure
- Frequency of exposure
- Intensity of exposure
- Combinations of risk factors

(how long)

(how often often)

(how MUCH)

+++

Duration

- Duration – the length of exposure to a risk factor (usually need hours of exposure before risk factors become a concern).
- Can be all at one time or cumulative over the day

How Long

Frequency

Frequency is often a concern in:

- Assembly tasks
- Sorting tasks
- Loading or off-loading materials
- Inventorying products
- Product stocking
- Keying/typing or frequent mousing

How Often



Intensity

Intensity refers to:

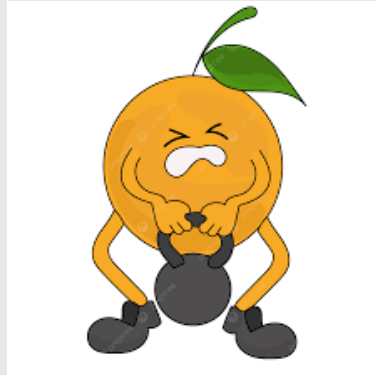
- weight in pounds of items lifted or carried
- grip or pinch force of lifted or manipulated items
- vibration
- force on keys when typing

How Much



Risk factors for WMSDs

Heavy



Frequent



Awkward

Lifting

Heavy lifting



There are only recommendations for maximum weight a person can lift.

Frequent lifting

Lifting more than twice per minute



Awkward lifting

Lifting above the shoulders, below the knees or at arms' length



Alternatives to lifting

- Use carts, hand trucks, hoists, conveyors or other mechanical assistance
- Slide objects instead of lifting them
- Store heavy items where you won't have to bend or reach to lift them
- Use forklifts or other mechanical equipment to get items down from high shelves



Ergonomics at Work



Risk of injury - Heavy lifting



Cart reduces risk of injury

Ergonomics at Work

Reducing heavy lifting

Mechanical assistance



Ergonomics at Work - Reducing awkward lifting

Mini-pallet for hand truck



Risk factors for WMSDs

Awkward postures

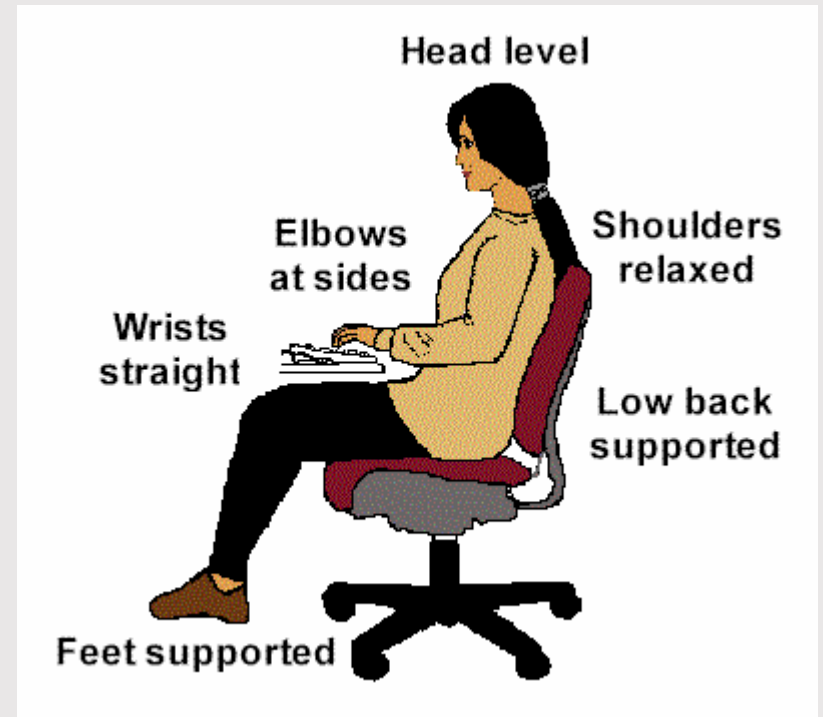
- Extended reaching
- Bending or twisting of the trunk
 - Working with arms away from the body
 - Kneeling or squatting



Neutral Posture

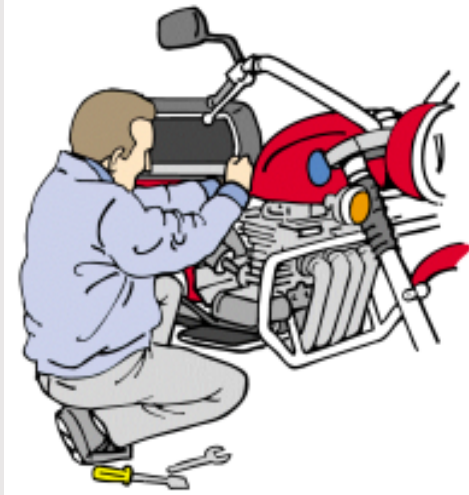


Standing neutral posture



Seated neutral posture

Awkward Posture



Too low

Too high



Too far away

Awkward Postures - Low work

Bending



Kneeling



Squatting



Reducing low work

- Raise and/or tilt the work for better access
 - Use a stool for ground level work
 - Use tools with longer handles
- Alternate between bending, kneeling, sitting, and squatting



Ergonomics at Work

Reducing low work

Raise and tilt the work



Ergonomics at Work

Reducing low work

Raise the work



Awkward Postures - High work



Reducing high work

- Use an elevated work platform or rolling stairs
 - Use tools with longer handles
- Limit overhead storage to infrequently used items
 - Bring the work down and tilt for easier access



Ergonomics at Work

Reducing high work

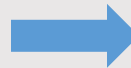
Use a tool with longer handles



Ergonomics at Work

Reducing high work

Fixture lift for overhead applications



Awkward Postures - Reaching



Reducing Reaching

- Keep items within close reach
(design reach distance for the shortest worker)
 - Remove obstacles
 - Use gravity feed racks



Ergonomics at Work

Reducing reaching

Tilt table for sanding



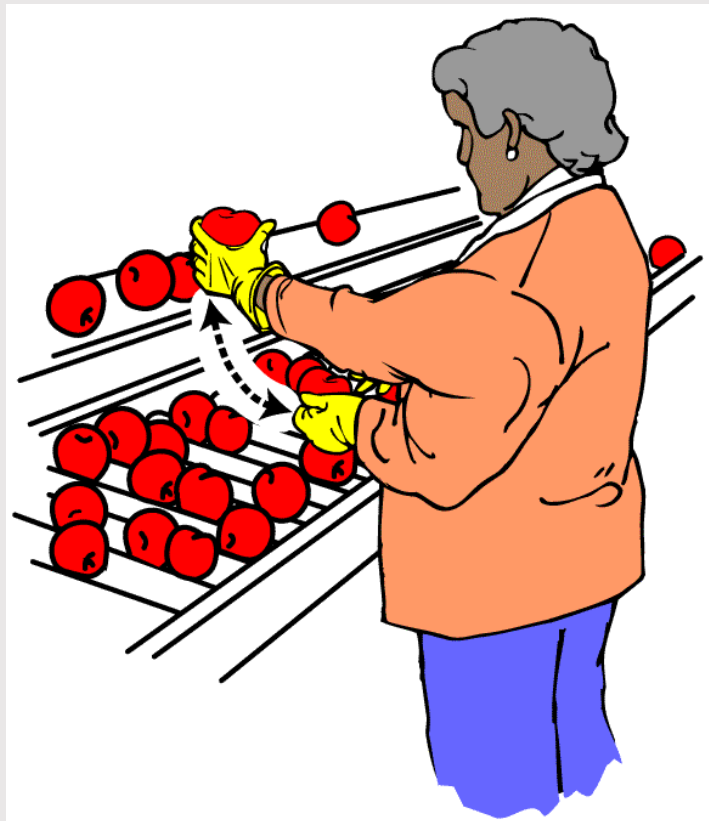
Risk factors for MSDs

Hand Intensive Work



Hand Intensive Work

Repetitive motions



Hand Intensive Work

Highly repetitive motion

Making the same motion repeatedly can cause a lot of wear and tear on the joints being used, and if you don't rest to allow time for them to heal, the damage can just keep building up.



Reducing repetition

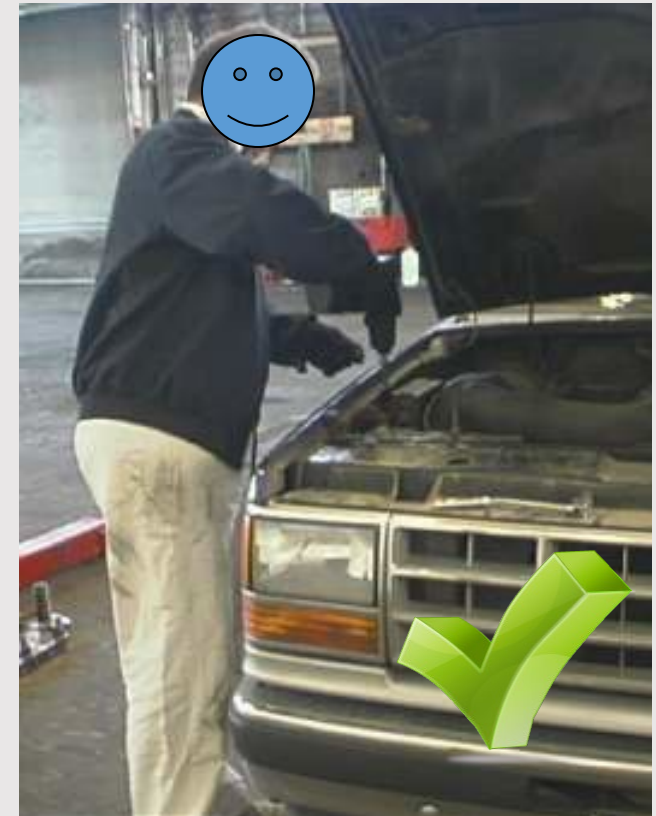
- Arrange work to avoid unnecessary motions
- Let power tools and machinery do the work
- Spread repetitive work out during the day
- Take stretch pauses
- Rotate task with co-workers if possible
- Change hands or motions frequently



Ergonomics at Work

Reducing repetition

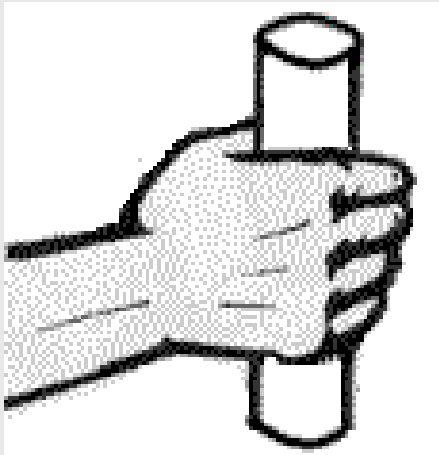
Use power tools



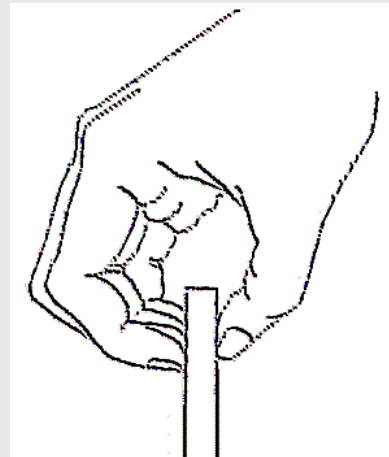
Hand Intensive Work

Gripping and Pinching

A power grip is 5 times stronger than a pinch grip



=



10 lbs

2 lbs

Hand Intensive Work – Gripping



Pinching with the fingertips



Other factors

Your grip strength decreases when you:

- Bend your wrists
 - Pick up slippery items
 - Wear poorly fitting gloves
 - Have cold hands



Ergonomics at Work

Reducing gripping

Use a clamp or vise to hold parts



Hand Intensive Work

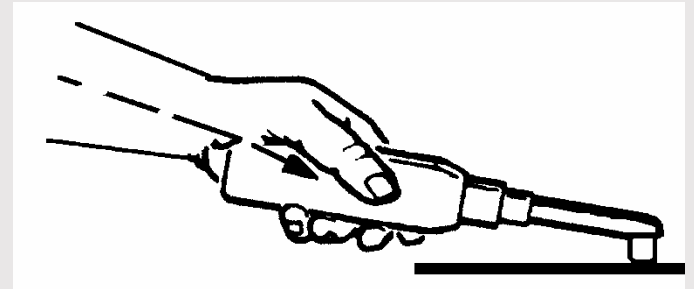
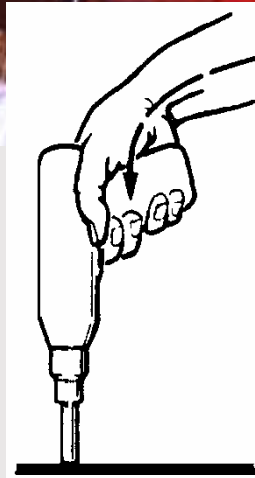
Bent Wrists



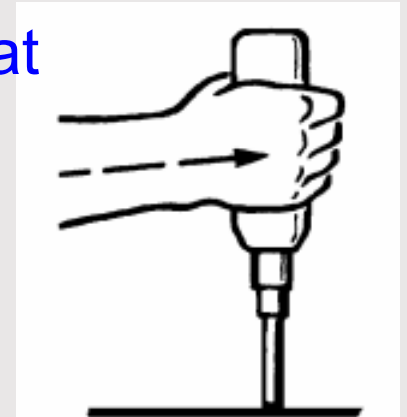
Tool use example



Working with bent wrists decreases grip strength

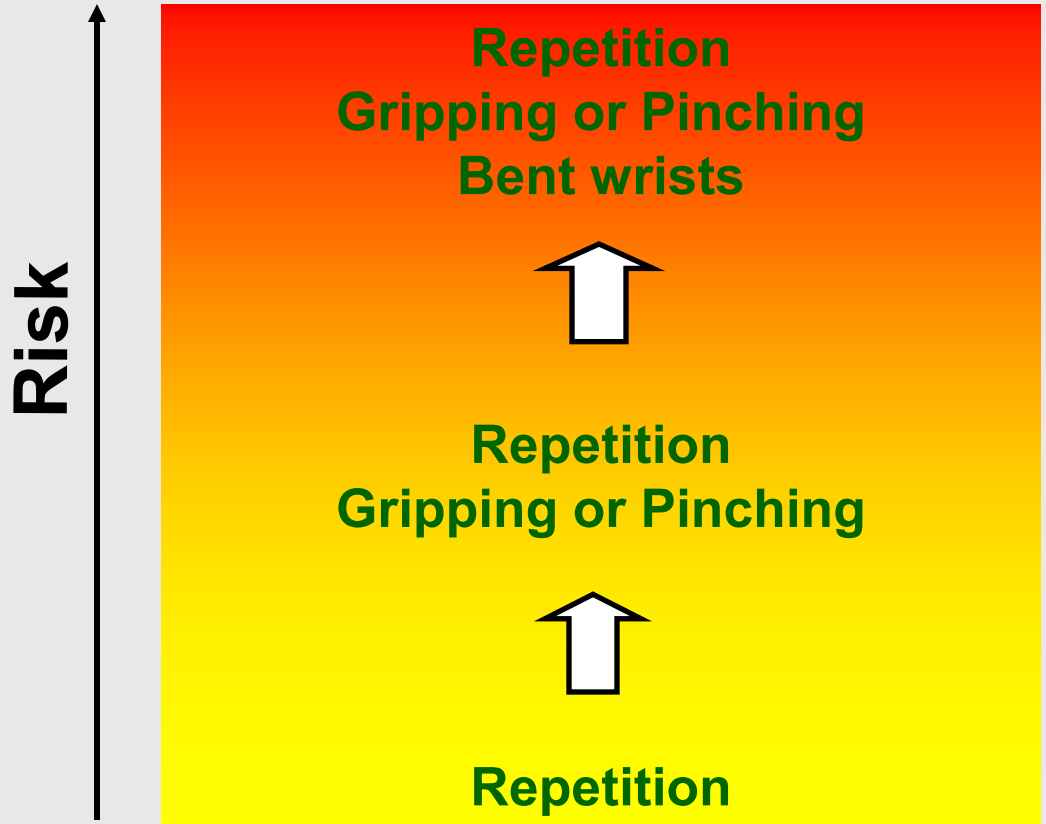


Use tools that let you keep your wrist straight



Hand Intensive Work – Combinations

Risk of injury goes up as you combine factors



Intensive keying



Reducing intensive keying

- Spread keyboard work throughout the day
 - Take stretch pauses
- Improve your posture and move around as much as possible



Risk factors for WMSDs

Vibration

Vibration

Moderate vibration



High vibration



Reducing vibration

- Use low vibration tools if available
- Maintain tools 
- Use anti-vibration gloves or tool wraps
- Keep hands warm



Vibration Syndrome

- Vibration syndrome, also known as [Hand-Arm Vibration Syndrome \(HAVS\)](#), is characterized by a combination of neurological, vascular, and musculoskeletal effects resulting from exposure to vibration.
- Here's a more detailed look at the characteristics:
 1. **Neurological Effects:**
 - **Tingling and Numbness:** A common initial symptom is tingling or numbness in the fingers.
 - **Loss of Sensation:** The ability to feel temperature, texture, and even pain can be impaired.
 - **Reduced Dexterity:** Difficulty with fine motor skills and manipulating small objects can occur.
 2. **Vascular Effects (Vibration White Finger):**
 - **Blanching (White Fingers):** Fingers may turn white due to reduced blood flow, often triggered by cold.
 - **Pain and Throbbing:** Pain may be experienced in the fingers, especially when they return to normal color after blanching.
 3. **Musculoskeletal Effects:**
 - **Muscle Weakness:** Weakness in the hands and arms can develop.
 - **Loss of Grip Strength:** Decreased ability to grip and hold objects.
 - **Joint Pain:** Pain and stiffness in the joints of the hands and arms are possible.
 - **Bone and Joint Disorders:** In some cases, more severe musculoskeletal issues can develop.
- In summary, vibration syndrome is characterized by a range of symptoms, including numbness, tingling, loss of sensation, blanching of the fingers, muscle weakness, pain, and difficulty with fine motor skills and grip strength.
- Use low vibration tools if available
- Maintain tools
- Use anti-vibration gloves or tool wraps
- Keep hands warm



OSHA Guidelines for Ergonomics

- OSHA has developed industry- or task-specific guidelines for a number of industries based on current incidence rates and available information about effective and feasible solutions
- OSHA is conducting inspections for ergonomic hazards and issues citations under the General Duty Clause and issues alert letters where appropriate
- OSHA is providing assistance to business to help them proactively address ergonomic issues in the workplace
- OSHA has chartered an advisory committee to identify gaps in research and application of ergonomics and ergonomic principles in the workplace



**Remember, OSHA does not have
regulations to address ergonomics,
only Recommendations and
Guidelines**



What you can do:

- Recognize and report signs and symptoms early
- Get involved in ergonomics
- Request ergonomic assessments of work processes or stations from the GSO



Questions?

