

ارگونومی محیط کار اداری

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OCCUPATIONAL HAZARDS

CHEMICAL

PHYSICAL

ERGONOMIC

PSYCHOLOGIC

BIOLOGIC

هدف ارگونومی



طراحی ایستگاه یا پست کاری



متناسب با ویژگیهای فیزیکی و
روانی کاربر

Ergonomics...

...is the science and practice of designing jobs and workplaces to match the capabilities and limitations of the human body.

Ergonomics means “fitting the job to the worker”

Ergonomics at Work



Risk of injury - Heavy lifting



Cart reduces risk

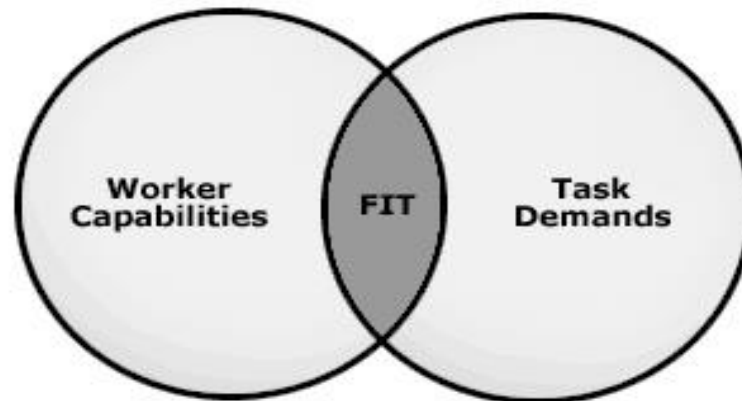
Benefits of ergonomics

- Ergonomics helps to prevent injuries
- Ergonomics has other benefits
 - Improved quality of work
 - Improved quality of life
 - Reduced fatigue and discomfort

Modern Definition

- ❖ Science of fitting *workplace conditions* and *job demands* to the *capabilities of the working population*.
- ❖ Ergonomics is the laws of work that define the limits to human capability.

The Basics of Ergonomics



Working capacity

- Age
- Gender
- Selection
- Training
- Lifestyle
- Motivation
- Adaptive Reserves

Ergonomic Hazards (Risk Factors)

NATURE & ENVIRONMENT

- Awkward working postures
- Static postures
- Forceful exertions
- Repetitive movements
- Pace of work
- Point pressures
- Temperature extremes
- Vibration

ORGANIZATIONAL INFLUENCES

- Wage system
- Quality Control
- Management-Labor Relations
- Machine-paced vs. self-paced work
- Overtime
- Shift work
- Rest breaks

Non-Work-Related Risk Factors

- Physical conditioning
- Medical conditions (e.g. diabetes, arthritis)
- Pregnancy
- Hobbies (hand-intensive or manual handling)

RESULTING INJURIES ARE CALLED:

- Cumulative Trauma Disorders (*CTD*),
Or
- Repetitive Strain Injuries (*RSI*),
Or
- Musculoskeletal Disorders (*MSD*)

Branches of ergonomics

- Physical ergonomics
- Cognitive ergonomics
- Organizational ergonomics

Physical ergonomics

- Concerned with anatomical, anthropometric, physiological and biomechanical aspects of human –environment- interaction. This includes working postures, MMH, repetitive movements, WRMSDs, energy expenditure, workplace layout, safety and health
-Work place intervention.

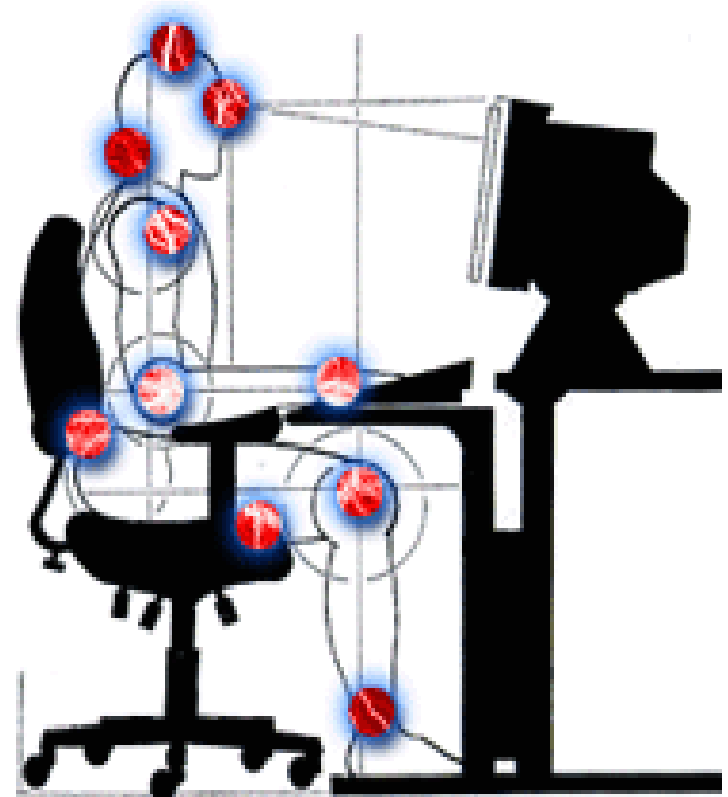
Work place interventions : Tools

- **OWAS** —(Ovako Working -posture Analysing System) To register different work postures
- **RULA** — Rapid Upper Limb Assessment
- **VIDAR** — Video and computer based method for ergonomic assessment.
- **NIOSH-equation** — MMH
- **2DSSPP** — 2 Dimensional Static Strength Prediction Program
- **3DSSPP** — 3 Dimensional Static Strength Prediction Program
- **EEPP** — Energy Expenditure Prediction Program

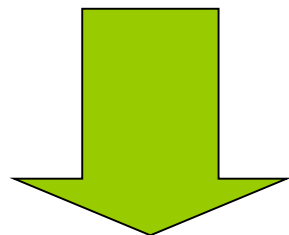
Multi-Disciplinary Nature of Ergonomics

- **Anatomy and Physiology**
- **Engineering Psychology**
 - **Engineering**
 - **Anthropology**
 - **Biomechanics**
 - **Medicine**

ERGONOMICS STRESS AREAS



عدم رعایت اصول ارگونومیک در طراحی ایستگاه کاری



ایجاد وضعیتهای بدنی نامناسب هنگام کار



ایجاد بیماری

آنتروپومتری

□ تفاوت بین دو جنس:

مردها درشتتر از زنها

□ تفاوت در نژادهای مختلف:

نژاد آمریکایی در برابر آسیای جنوب شرق

□ تفاوت در سنین مختلف

People Are Different



Age Differences



Height Differences

وسایل و تجهیزات در حد دسترسی کوچکترین
فرد قرار داشته باشند و با بزرگترین فرد تطبیق
داشته باشند.

Injuries and risk factors

- What are **W**ork-related **M**usculo-**S**keletal **D**isorders (WMSDs)?
- Common types and symptoms of injury
- Causes and prevention of injury

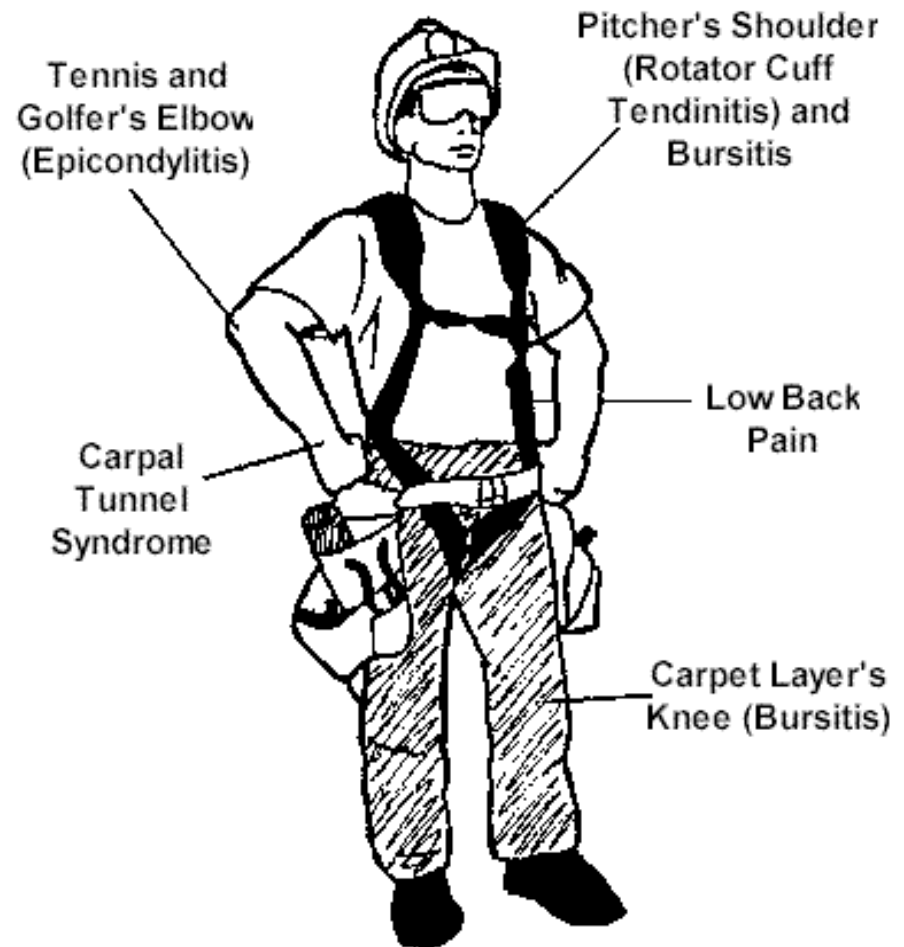
What are Work-related Musculo-Skeletal Disorders (WMSDs)?

- 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



What causes WMSDs?

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

Risk Factors

Risk of injury depends upon:

- Duration of exposure (**how long**)
- Frequency of exposure (**how often often**)
- Intensity of exposure (**how MUCH**)
- Combinations of risk factors **+++**

Duration

- ❑ Duration – You usually need hours of exposure before risk factors become a concern
- ❑ Exposure can be all at one time or cumulative over the day

Frequency (Speed of work)

Frequency is often a concern in:

- ❑ assembly tasks
- ❑ sorting tasks
- ❑ loading or off-loading materials
- ❑ inventorying products
- ❑ product stocking
- ❑ software programming
- ❑ telemarketing
- ❑ customer service

Lifting 30 lb boxes more than 5 times a minute can be considered frequent, while typing more than 5 words a minute probably wouldn't. Use **your good judgement** to determine what is frequent for the various tasks in your workplace

Intensity

Intensity refers to:

- ▣ weight in pounds of items lifted or carried
- ▣ grip or pinch force of lifted or manipulated items
- ▣ vibration level (meters/second²)
- ▣ force on keys when typing

Combinations of risk factors

- ❑ Exposure to more than one risk factor at a time greatly increases the risk of injury.
- ❑ For example:
 - Bending and twisting while lifting
 - Repetitive, forceful use of the hands with the wrists bent

Risk factors for WMSDs

Heavy, frequent or
awkward lifting

Heavy lifting



Frequent lifting

Lifting more than twice per minute



Awkward lifting

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



When you bend over to pick something up from below your knees, not only does your back have to lift the object, but it also has to lift the **weight of your upper body**. Something else to keep in mind, the same stresses are there when you lower something as when you lift it.

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 ladders to get items down from high shelves



Ergonomics at Work - Reducing heavy lifting

Mechanical assistance



Height-adjustable platform allows heavy box to be slid across

Ergonomics at Work - Reducing awkward lifting

Mini-pallet for hand truck



Allows hand truck to slide under stack of bins without having to restack them

Risk factors for WMSDs

Awkward postures

Neutral Posture –

The opposite of awkward posture



Standing neutral posture



Seated neutral posture

وضعیت خنثی

- همه اجزای بدن در امتداد هم باشند، گوش، شانه، هیپ، زانو و مچ
- سر مستقیم به جلو نگاه کند
- شانه ها در وضعیت آرامش بدون چرخش باشند و بازوها در اطراف بدن باشند. مچ دستها کشیده و مستقیم قرار گیرد
- در حال نشسته: حمایت کمر، وجود و محل قرارگیری پاها، زانوها کمی پایین تر از مفصل هیپ
- قرارگیری بدن در تمام روز در این وضعیت مناسب نیست. زیرا بدن باید اکتیو باشد.

Awkward postures happen when the work is:



Too low

Too high



Too far away



Awkward Postures - Low work

Bending



Kneeling



Squatting



These postures are hard on the back and the knees

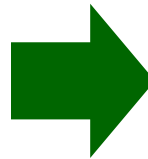
Reducing low work

- ❑ 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
(don't spend too much time in any one position)



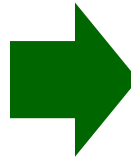
Ergonomics at Work - Reducing low work

Raise and tilt the work



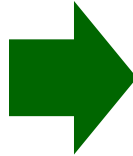
Ergonomics at Work - Reducing low work

Raise the work



Ergonomics at Work - Reducing low work

Meter reader – golf club handle extension



Awkward Postures - High work



This posture is hard on the shoulders, neck and back

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

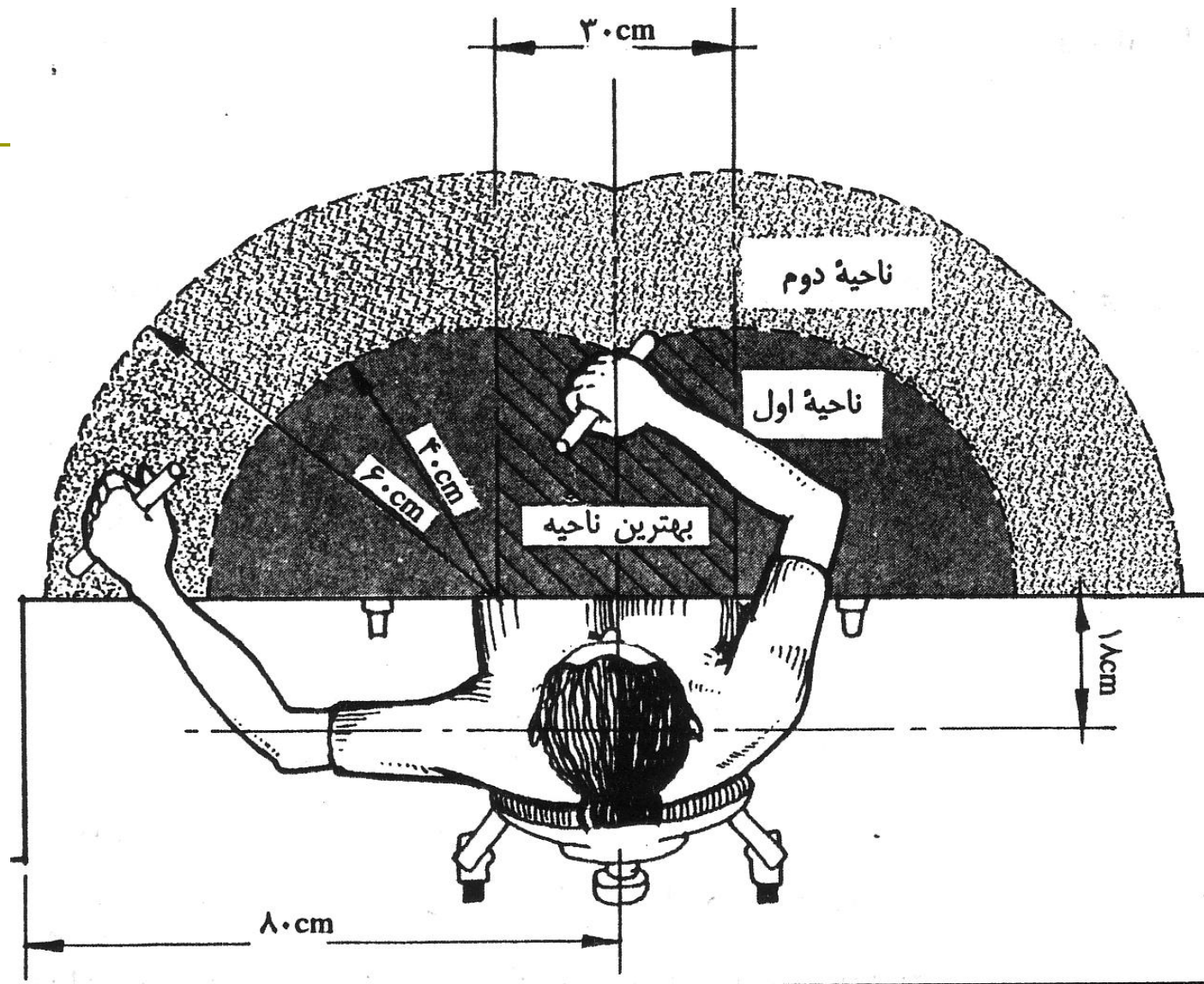
Fixture lift for overhead installations



Awkward Postures - Reaching



This posture is hard on the arms, shoulders, and back



Reducing Reaching

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

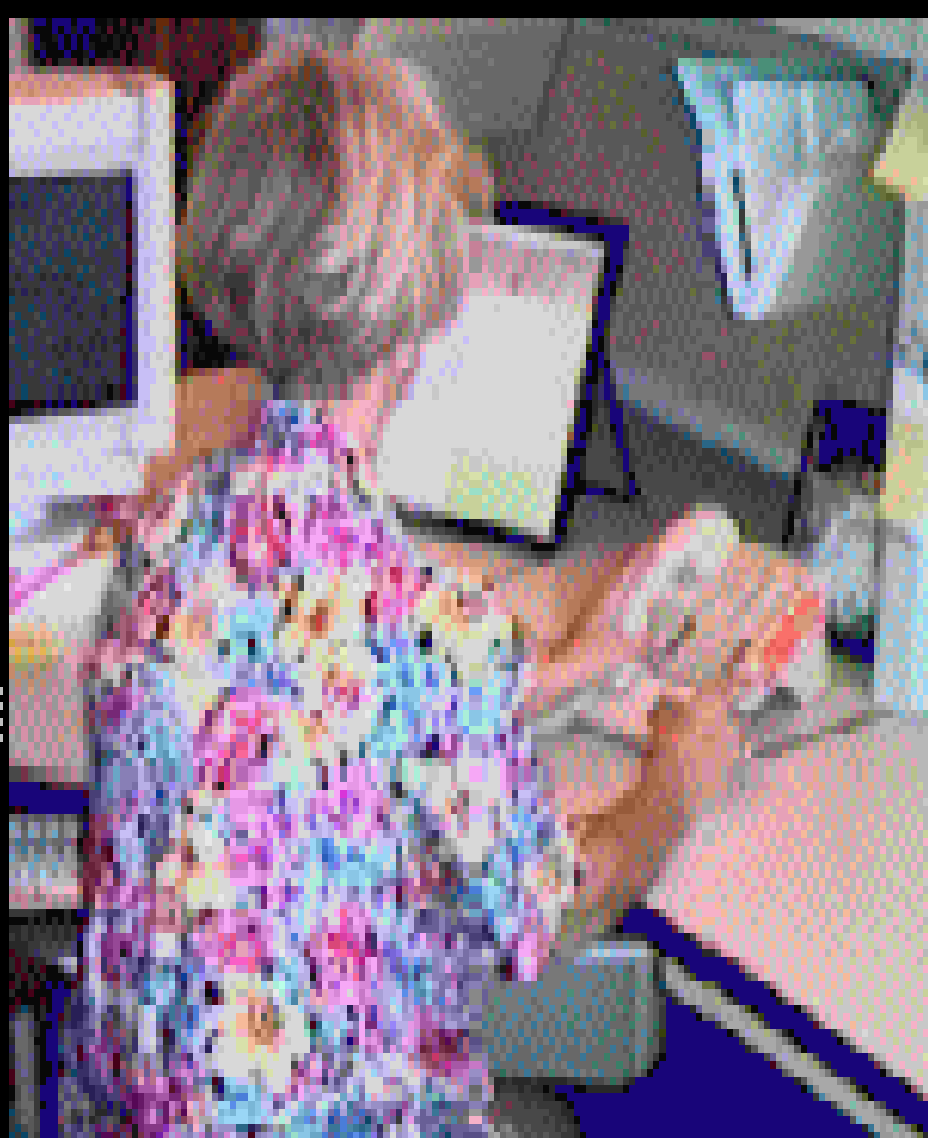
Ergonomics at Work - Reducing reaching

Tilt table for sanding





Avoid bending to the side or
over reaching to grab items



Put frequently used items
closer to avoid reaching



Avoid reaching above the shoulder when lifting items



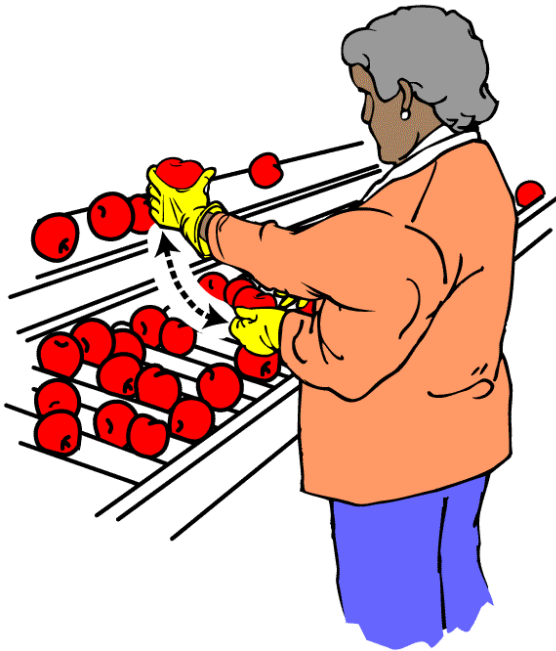
Stand to lift items onto or off of a shelf

Risk factors for WMSDs

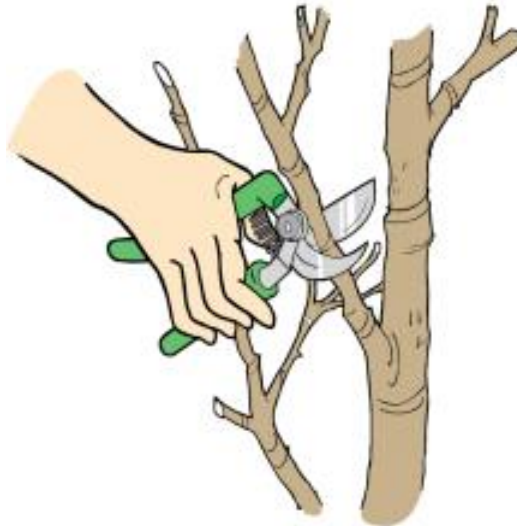
Hand Intensive Work

Hand Intensive Work

Repetitive
motions



Gripping
Pinching



Bent wrists



Hand Intensive Work – Highly repetitive motion

Most repetitive motions involve the hand, wrist, arm and shoulder

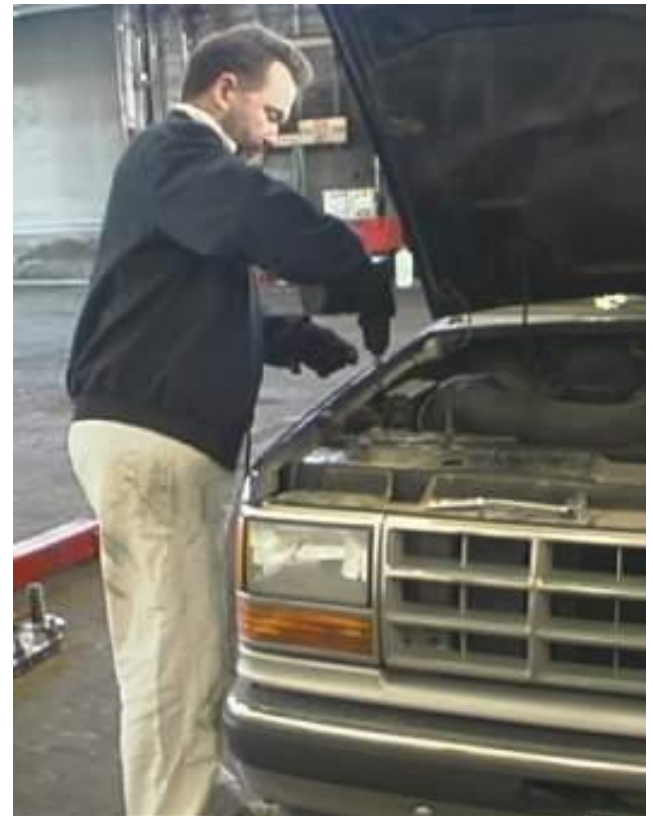
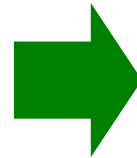


Reducing repetition

- ❑ 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**

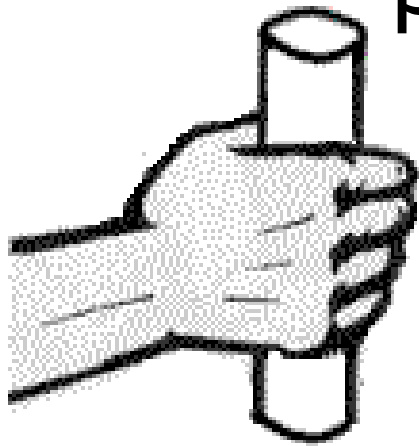
Ergonomics at Work - Reducing repetition

Use power tools



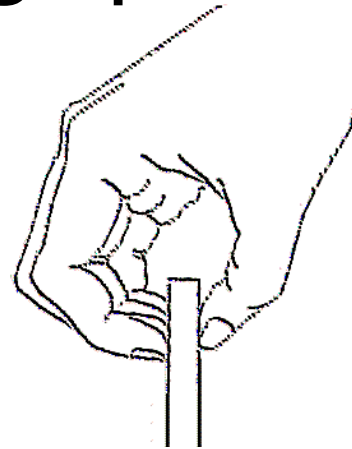
Hand Intensive Work – Gripping and Pinching

A **power grip** is 5 times stronger than a pinch grip



10 lbs

=



2 lbs

Hand Intensive Work – Gripping



Gripping with the whole hand can be a problem if what you are gripping is relatively heavy, such as a tool that weighs **more than 10 pounds**

Hand Intensive Work – 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

Reduce grip force

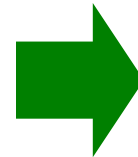
- ❑ Grip with the **whole hand**, not just the fingertips
- ❑ Pick up smaller loads
- ❑ Use **carts or handtrucks** instead of carrying
- ❑ Keep tools in good working order (maintenance)
- ❑ Use **lighter tools or** tool balancers
- ❑ Use two hands
- ❑ Keep your wrists straight

Avoid pinch grips

- ❑ Pick objects up from the bottom using whole hand
- ❑ Attach **handles or use lift tools**
- ❑ Build up handles on small tools to reduce grip force

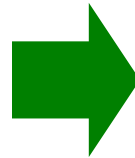
Ergonomics at Work - Reducing gripping

Tool Balancer



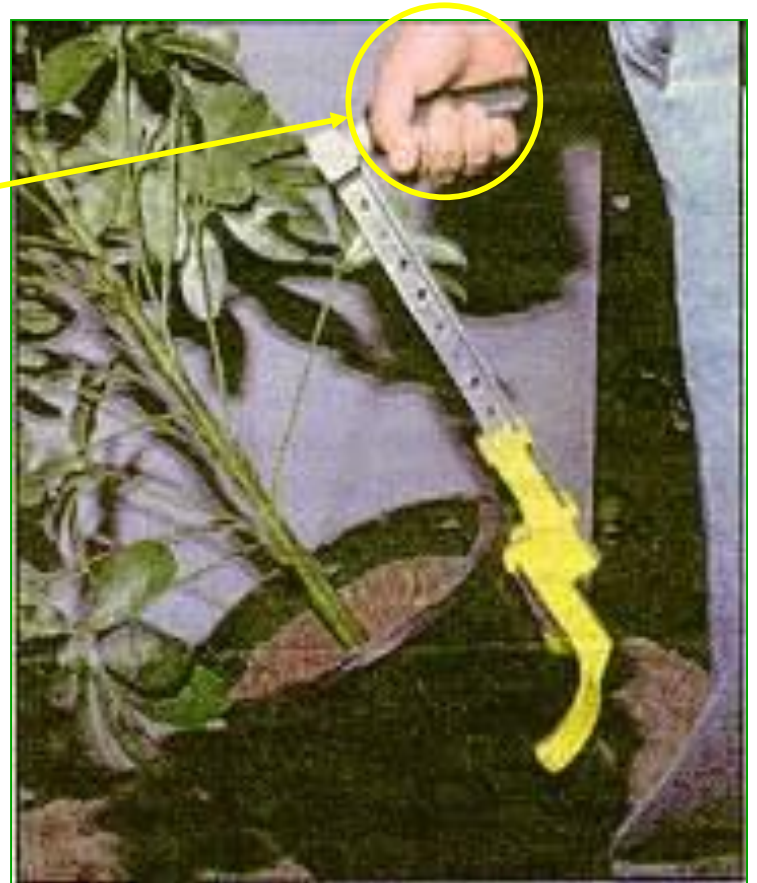
Ergonomics at Work - Reducing gripping

Use a clamp or vise to hold parts



Ergonomics at Work - Reducing pinching

Change pinching to gripping



Add-on handle also reduces bending to pick up pots

Hand Intensive Work – Bent Wrists

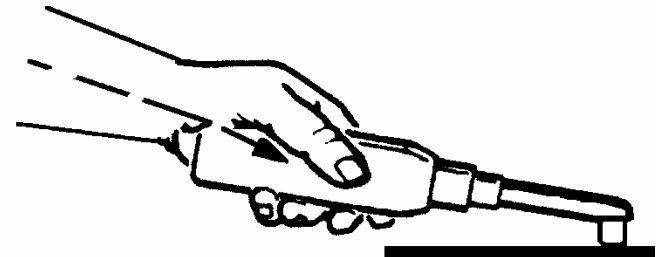
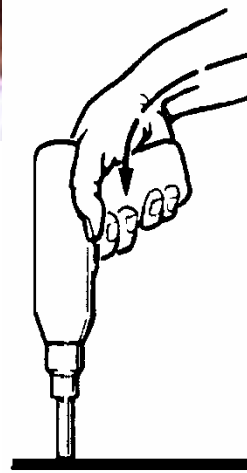


Bending your wrists decreases your grip strength and making wrist and elbow injuries more likely

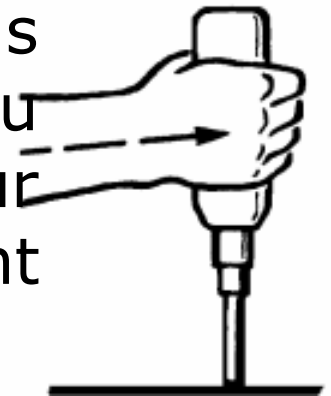
Tool use example



Working with
bent wrists
decreases grip
strength

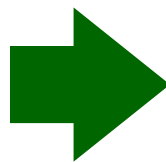


Use tools
that let you
keep your
wrist straight



Ergonomics at Work - Reducing bent wrists

Re-orient the work



Hand Intensive Work – Combination

Risk of injury
goes up as you
combine factors

Risk

**Repetition +
Gripping or Pinching +
Bent wrists**



**Repetition +
Gripping or Pinching**



Repetition

Intensive keying



While your fingers are moving rapidly, the rest of your body is essentially held in one position (intensive keying can be stressful for your whole body)

Reducing intensive keying

- ▣ Use macros for common functions
- ▣ 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



Vibration also tends to make the muscles tighten up. The tighter you grip the tool, the more vibration gets transmitted to your hands and arms, and this makes injury more likely.

Reducing vibration

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



Risk factors for WMSDs

Repeated impacts

Repeated impacts

Using the hand or knee as a hammer



Avoiding repeated impacts

Use tools instead of your hand or knee



What you can do:

- ▣ Recognize and report symptoms
- ▣ Get involved in ergonomics

What are some of the symptoms of WMSDs?

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

The important thing is not to ignore what your body is trying to tell you

Recognize and report symptoms

Report symptoms if:

- Pain is persistent, severe or worsening
- Pain **radiates**
- Symptoms include numbness or tingling
- Symptoms keep you from **sleeping at night**

Why is it important to report symptoms?

- ❑ Minor injuries can easily become chronic injuries and can sometimes lead to disability, even surgery
- ❑ Early treatment is more successful

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

Any Questions?
