The Science of Ergonomics

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If we want to change the response . . .

We need to change the circumstances!

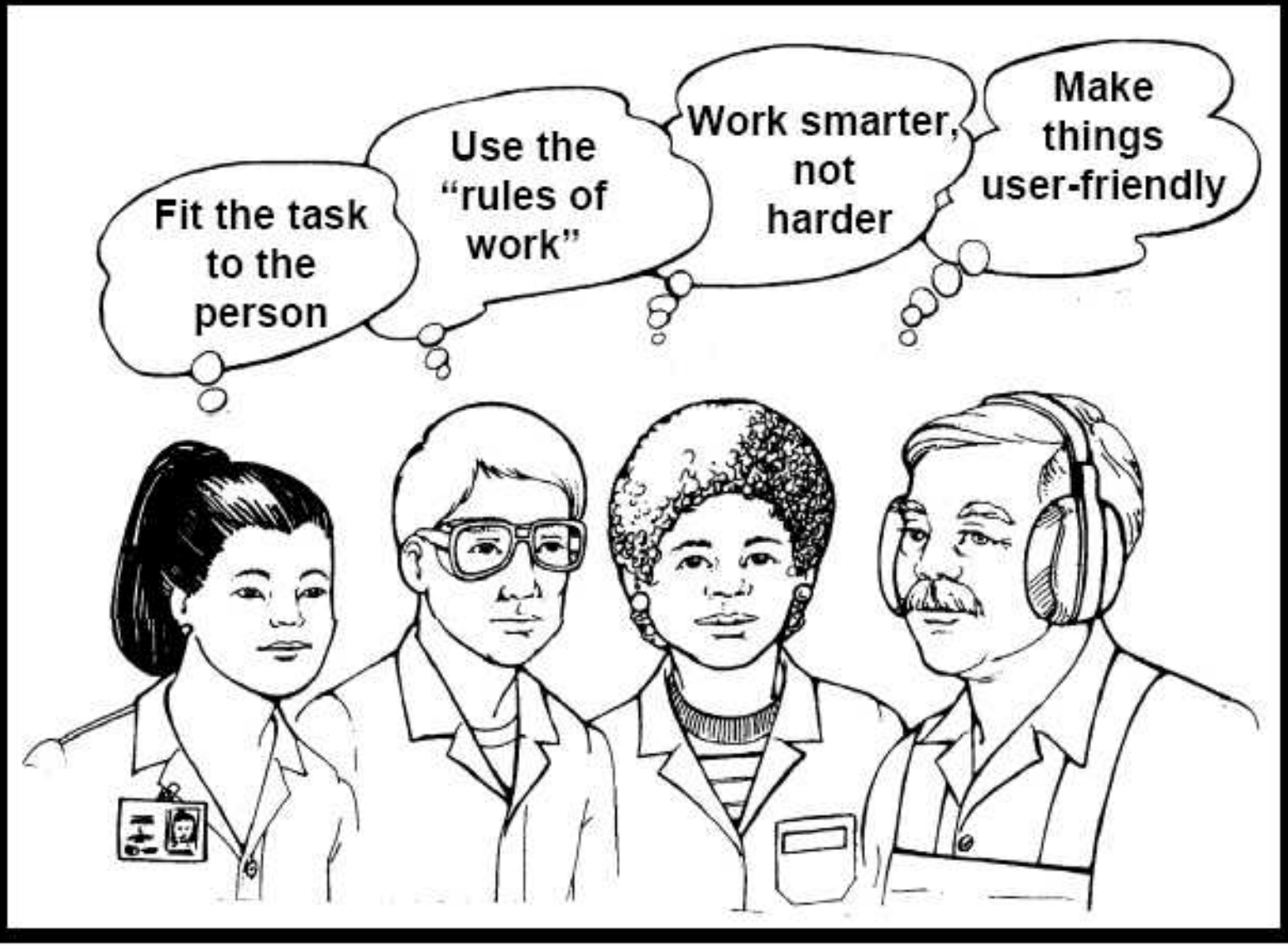
What will be discussed?

- What is Ergonomics?
- Ergonomic Statistics
- The benefits of an Ergonomic program
- Ergonomic related injuries and their causes
- Identifying Ergonomic Risk Factors
- Office Ergonomics
- Industrial Ergonomics
- Control Strategies to minimize risk
- What you can do to prevent injury?

What is Ergonomics?

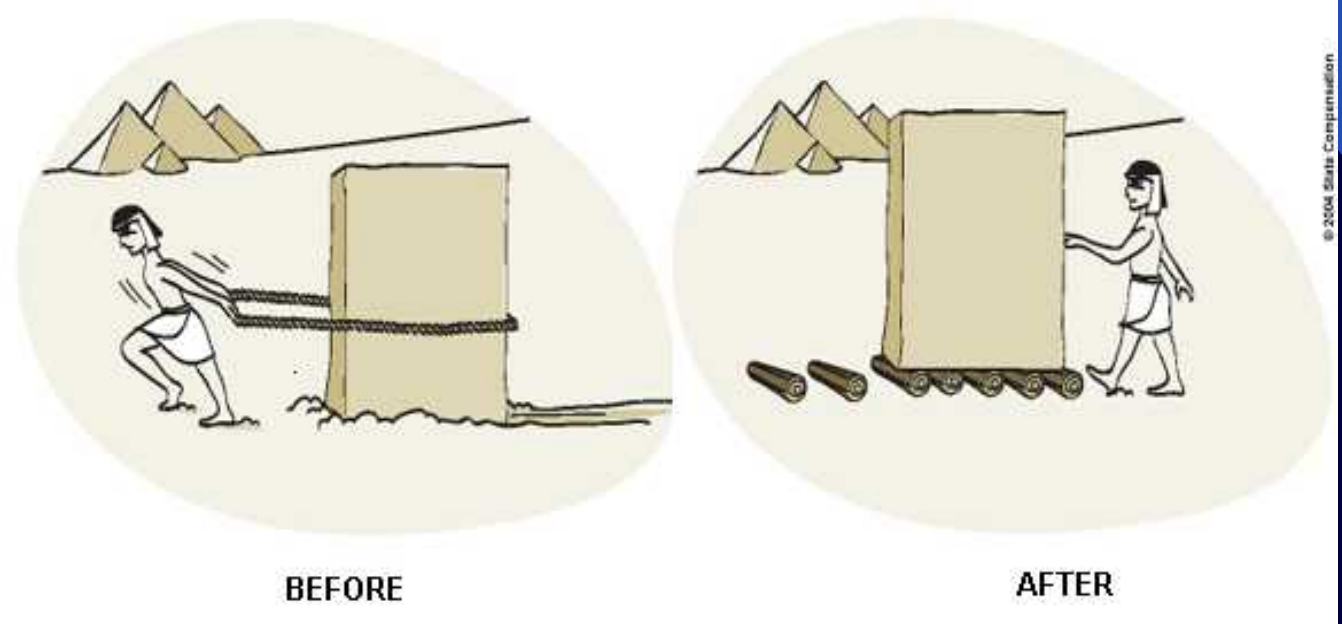
- Ergonomics is the science of fitting workplace conditions and job demands to the capabilities of employees. (U.S. Dept.of Health)
- Ergonomic principles are used to improve the “fit” between the worker and the workplace.
- A practical approach to Ergonomics considers the match between the person, the equipment they use, the work processes and the work environment.
- A persons capabilities, physical attributes and work habits must be recognized to improve ergonomic factors in the workplace.

What is Ergonomics?



Ergonomics Defined

- Early 1700's, Ramazzini's study of ill-effects of poor posture & poorly designed tools on the health of workers.



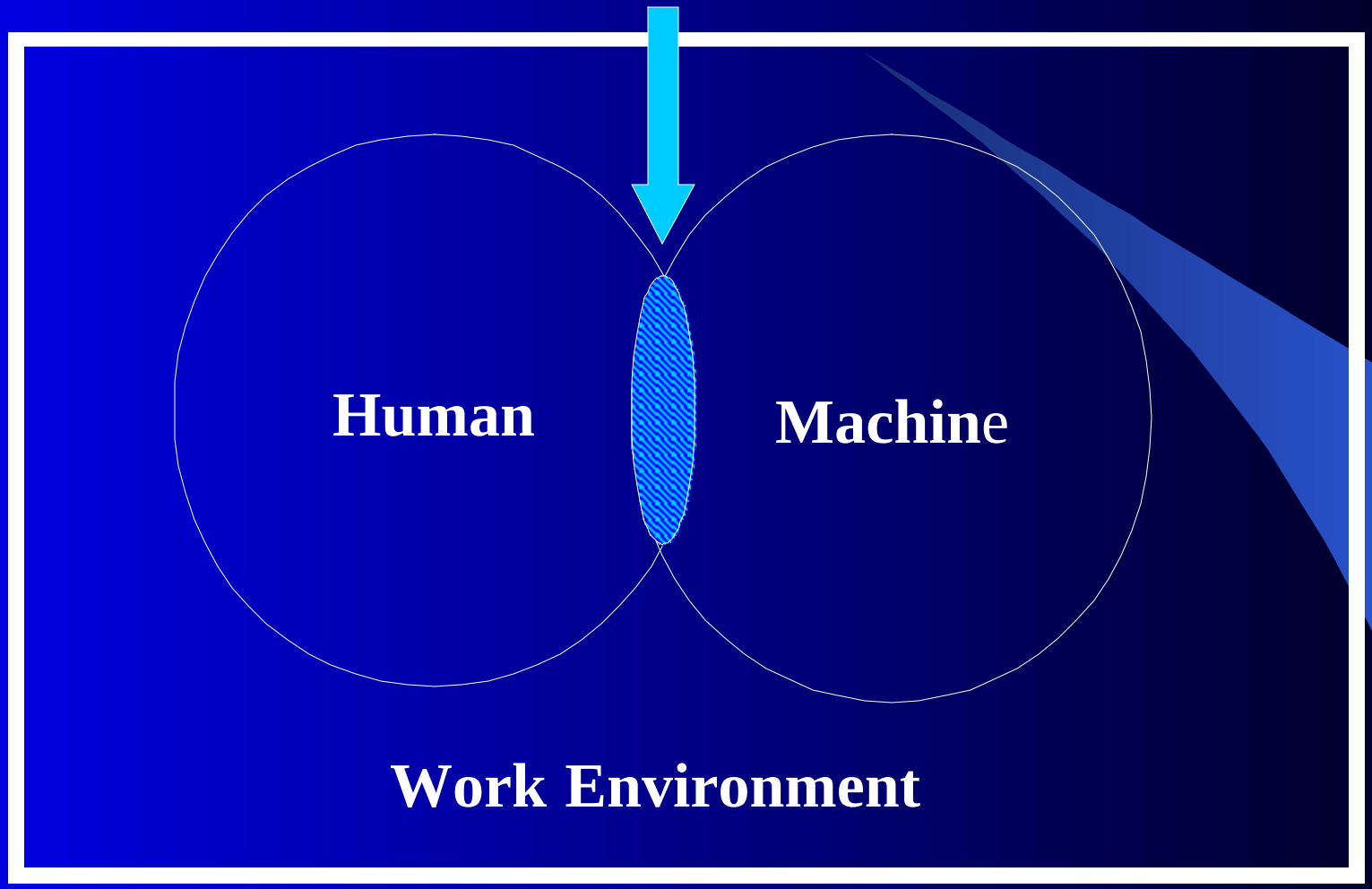
Greek Words: "Ergon = work, Nomikos = law"

Ergonomics: Study of Laws of work

What Is Ergonomics?

Ergonomics is fitting the job to the person.

Ergonomics



Utmost Goal: "Humanization" of Work

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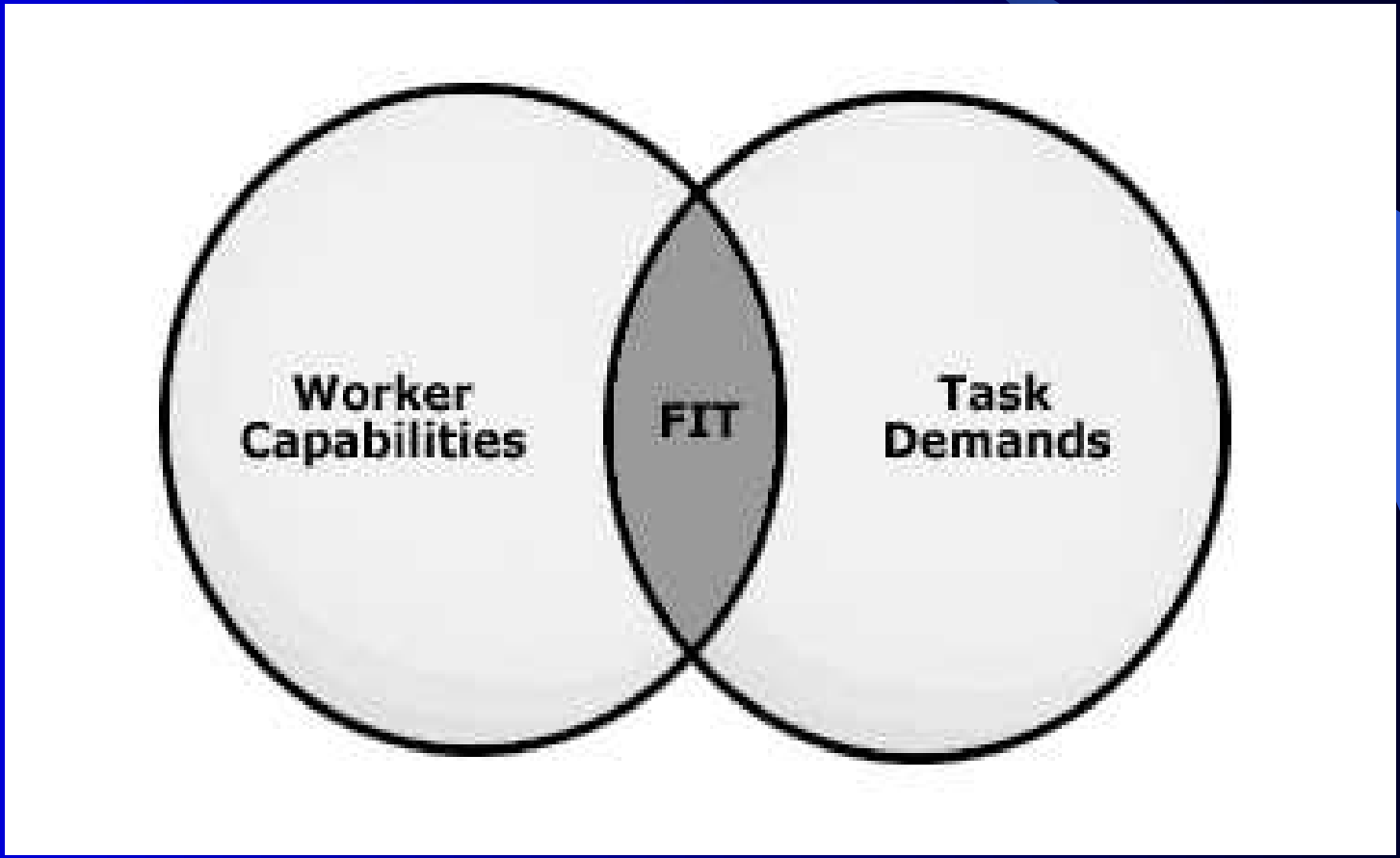
Design with "E & E": Ease and Efficiency

The Basics of Ergonomics



INDUSTRIAL WORKERS

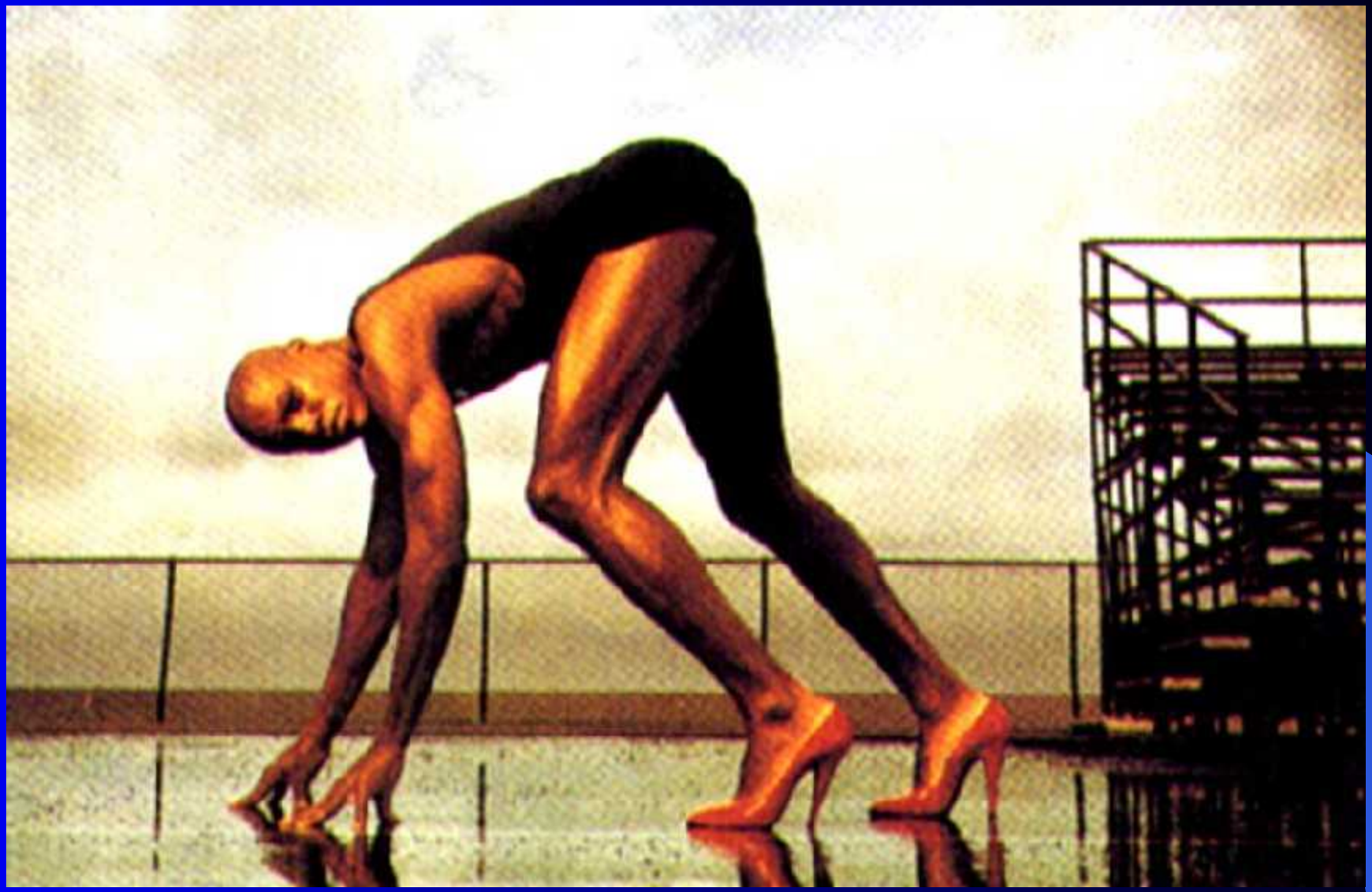
ATHLETE

SKILL

WILL

COACHING

GREAT EQUIPMENT



Applications of Ergonomics

Anatomy
Orthopedics
Physiology
Medicine
Psychology
Sociology

Anthropometry
Biomechanics
Work Physiology
Industrial Hygiene
Management
Labor Relations

Industrial Engineering
Bio-Engineering
Systems Engineering
Safety Engineering
Military Engineering
Computer-Aided Design

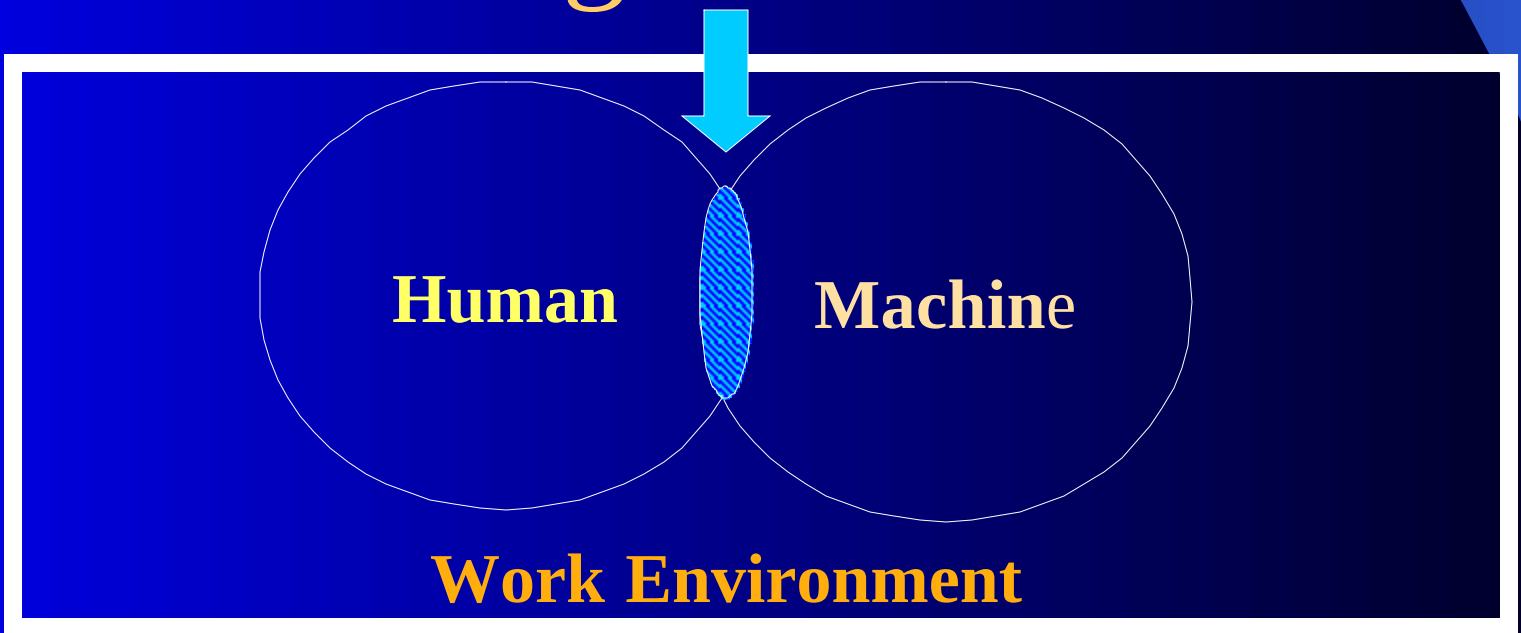
Where Does Ergonomics Fit In?

Physical Hazards ✓

Chemical Hazards ✓

Biological Hazards ✓

Ergonomics



The benefits of an ergonomic program

- Decreased injuries & illnesses .
- Increased efficiency at work.
- Increased physical well being.
- Decreased absenteeism.

Ergonomic related injuries

- May be called:
  - CTD's (cumulative trauma disorders)
  - RSI's (repetitive stress injuries)
  - RMI's (repetitive motion injuries)

  - Which are all considered:

MSD's (musculoskeletal disorders)

    - MSD's can affect muscles, tendons, nerves, joints and spinal disks.

Common types of MSD's

- Tendonitis
- Carpal Tunnel Syndrome
- Tennis Elbow
- Neck and Back injuries
- Strains/Sprains
- Bursitis
- Thoracic Outlet Syndrome
- Trigger finger

Risk factors and causes of MSD's

- Repetition
- Force
- Awkward Posture
- Static Posture
- Contact Stress
- Temperature Extremes
- Vibration
- Psycho Social

Identifying Risk Factors

- Conditions or circumstances that increase the chances of developing a MSD.
- The likelihood of developing an injury is dependent on the frequency and duration of exposure to risk factors.
- Both occupational and personal risk factors can affect an individuals well being at home or work.

Repetition

- Occurs when the same or similar movements are performed frequently.
- Repetition can also occur when different tasks are performed if those tasks have the same movements.
- Injury may result from repetition when the tissues do not have adequate time to recover.

Force

- Force is the amount of physical effort required by a person to do a task or maintain control of tools or equipment.
- A pinch grip produces 3-5 times more force on the tendons in the wrist than a grip with the whole hand.
- With excessive force the muscles are contracting much harder than normal, this can lead to stress on the muscles, tendons and joints.

Awkward Posture

- Is a deviation from the “neutral” body position.
- A “neutral” body position is safest and most efficient position in which to work.
- Awkward posture puts stress on muscles, tendons and joints.

Static Posture

- Static posture occurs when one position is held for a prolonged period of time.
- The muscles will become fatigued from a lack of blood flow during a static posture.
- This fatigue can lead to discomfort and even injury.

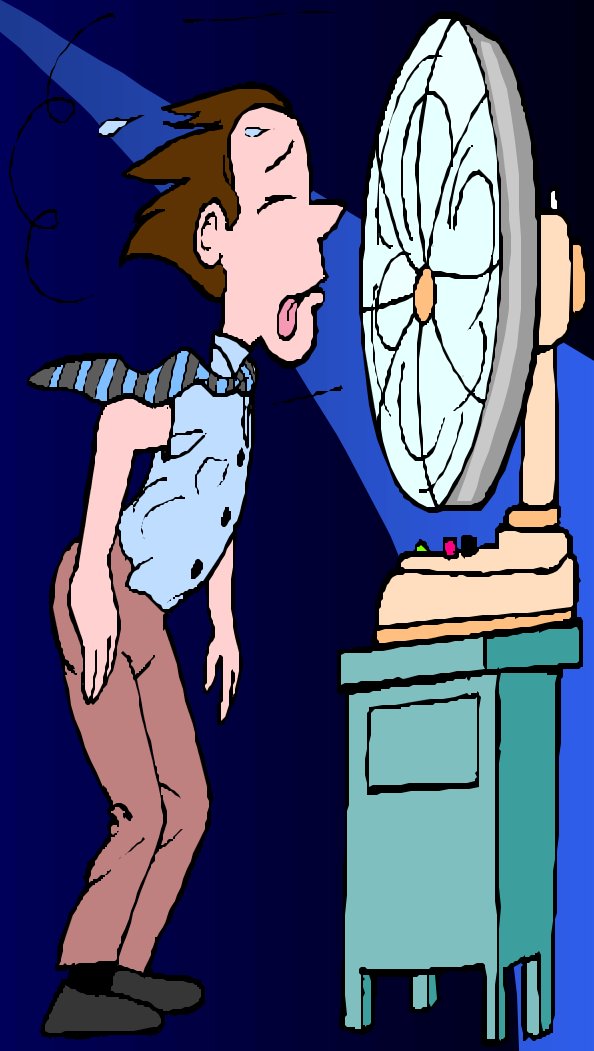
Contact Stress

- Contact stress is caused by any sharp or hard object putting localized pressure on a part of the body.
- Contact stress will irritate local tissues and interfere with circulation and nerve function.

Temperature Extremes

- Extreme cold constricts blood vessels and reduces sensitivity and coordination of body parts.

- Excessive heat can result in increased fatigue and heat stress.



Vibration

- Exposure to vibration can occur while using power tools or while driving equipment.
- Vibration from power tools can place stress on the tissues of the fingers, hand and arms.
- Whole body vibration from driving puts stress on the spinal tissues.

Psycho-social Issues

- Stress, boredom, job dissatisfaction and anxiety can contribute to the possibility of developing a MSD.
- Psycho-social issues can create increased muscle tension and reduce a person's awareness of work technique.

Office Ergonomics

- By applying ergonomic principles to the office setting, risk factors are minimized, productivity is increased, and overall workplace quality is improved.
- The workstation must be adjusted to promote a neutral position while a person works.
- When adjusting a workstation, keep in mind that all of the equipment interacts. Making one adjustment may alter another.

Adjusting the Workstation

- Adjust the Chair.
- Adjust reach requirements.
- Adjust focal requirements.

Correct the Environment

- Check lighting, noise and temperature.
- Check work pace and stress levels.
- Check work processes.

Improve Posture and Habits

- Modify wrist/hand motions
- Improve neck and back postures
- Consider personal preferences

Summary — Neutral Postures

Head up

Shoulders relaxed

Elbows at sides

Wrists in neutral

Back with S-curve

Adjustable Platforms

Arrange the work area

- Consider the base of support.
- Place equipment and materials where appropriate.

Choose the appropriate tools

- Check the fit.
- Make sure the tools match the task.

Correct the environment

- Adjust lighting, noise and temperature when possible.
- Check work pace.
- Check work processes.

Improve work techniques and habits

- Improve postures.
- Check work techniques.

Control Strategies

- The next step is to develop and implement control strategies to increase quality and productivity.
- Once the risk factors and their causes are identified, control strategies can be implemented based on needs.

Administrative Controls

- Training workers in work methods.
- Varying or rotating work tasks.
- Limiting extended work hours.
- Providing mini-breaks.

What you can do to prevent injury?

- Develop an Ergonomics program.
- Take proper breaks.
- Health and Fitness.
- Be aware of your hobbies away from work.

When Ergonomics are improved in the workplace:

- We work smarter, not harder.
- Quality, comfort and safety make us more productive and happy people.
- Stay Healthy and Safe, Take action!!!

Summary of Ergonomic Principles:

- Position and support body in neutral
- Work in reach zone
- Provide correct tools, equipment and facilities
- Promote effective work processes
- Promote Health and Wellness

Basic Message to Everyone:

If you think you may have a problem

Get it checked out

Thank you for your attention!