Presentation On Study of Ergonomics

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Concept

- The term ergonomics is derived from the Greek words i.e. ***ergon*** **[work] and** ***nomos*** **[natural laws]**

- Ergonomics is the **scientific discipline** concerned with **designing** according to human needs, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

- The study of the design of work in relation to the **physiological** and **psychological** capabilities of people (matching the work place to the worker.)

Overview

- 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.

Five aspects of ergonomics

- Safety .
- Comfort .
- Ease of use.
- Productivity/performance.
- Aesthetics.

Domains

- **Physical ergonomics:**

  Concerned with human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity.

- **Cognitive ergonimics :**

  Concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.

- **Organizational ergonomics:**

  Concerned with the optimization of sociotechnical systems, including their organizational structures, policies, and processes.

Applications

- Ergonomics in the workplace
- Engineering psychology
- Macroergonomics
- Seating Ergonomics
- Organizations

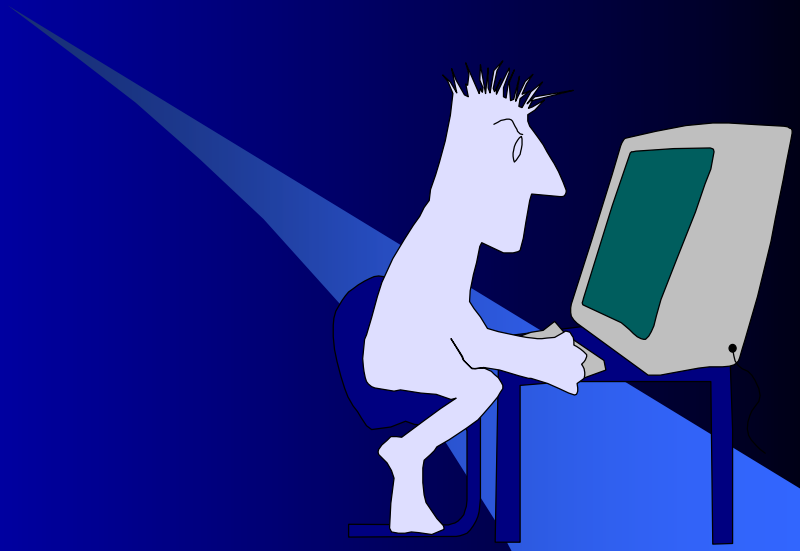
Ergonomic Related Injuries

- CTD's (cumulative trauma disorders)
- RSI's (repetitive stress injuries)
- RMI's (repetitive motion injuries)
- MSD's (musculoskeletal disorders)

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

Risk Factors and Causes

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



Ergonomic Solutions

- *Office Ergonomics:-*

  By applying ergonomic principles to the office setting, risk factors are minimized.

  The workstation must be adjusted to promote a neutral position while a person works.

- *Industrial Ergonomics*

  By applying ergonomic principles in industrial settings, a safer, healthier and more productive work environment can be developed.

  Employees and employers need to know how to minimize risk factors by choosing the best tools and work techniques for a given task.

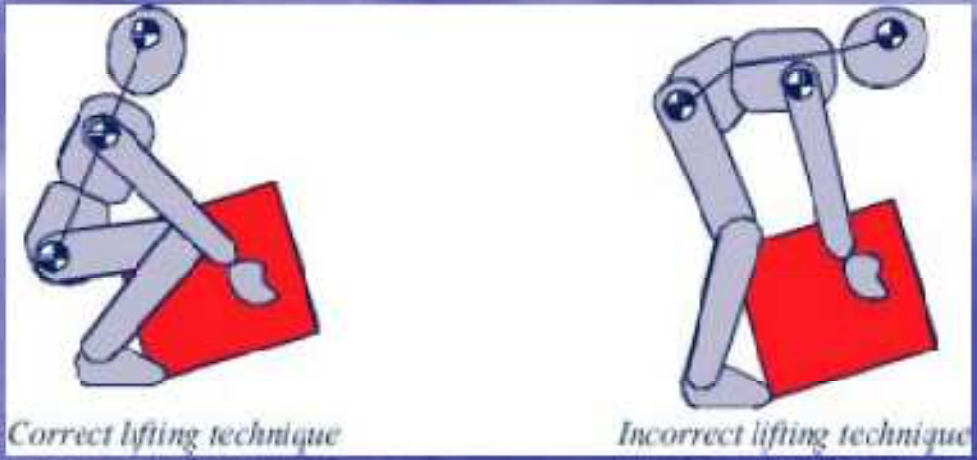
Adjusting the Workstation

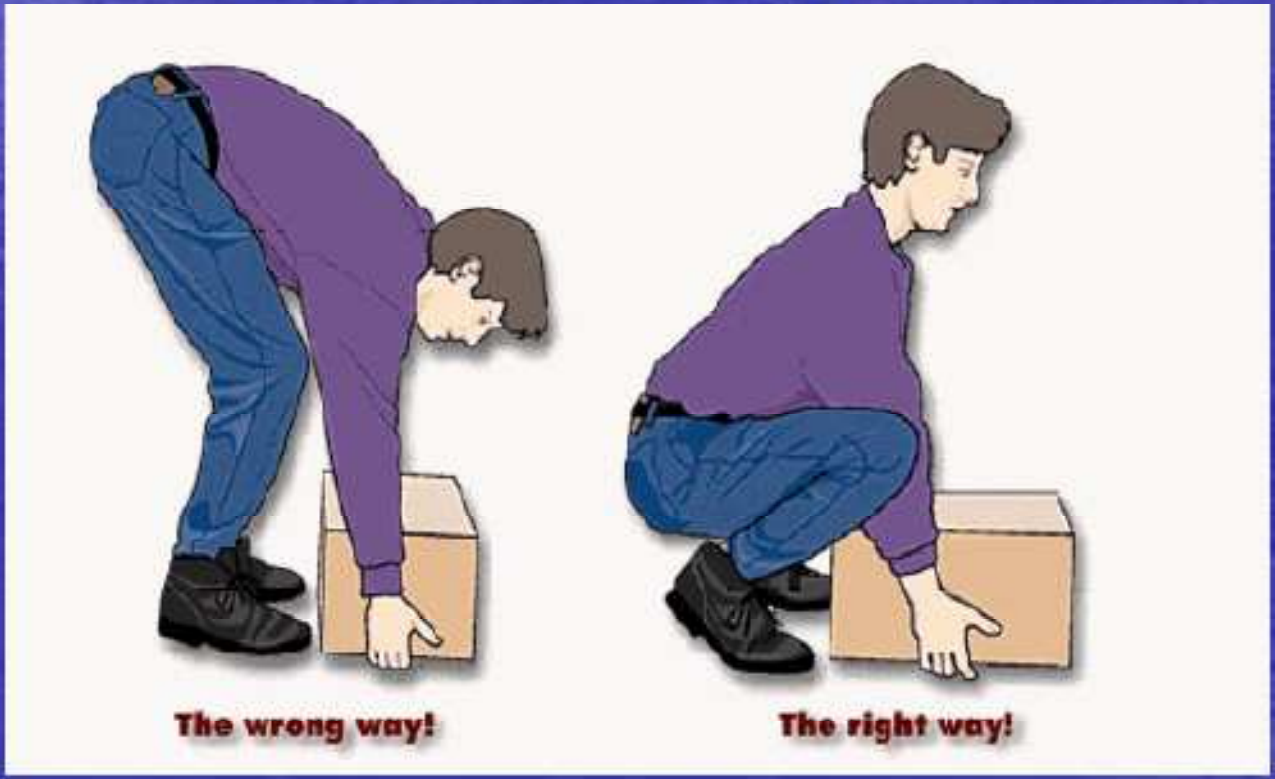
- Adjust the Chair.
- Adjust reach requirements.
- Adjust focal requirements

Improve Posture and Habits

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

Correct & Incorrect Techniques





Arrange the work area

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

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.

Controls :-

- Engineering Controls
- Administrative Controls
- Personal Protective Equipment

Engineering Controls

- Appropriate initial design of the work station or work area.
- Improving the design of the existing work area or equipment.
- Providing necessary equipment and accessories.
- Adjusting the work station layout and equipment.

Administrative Controls

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

Industrial Application – I
Interior Design of Automobiles

1. Steering Wheel:

- Earlier Solid awkward Disk.
- Now centre is removed, Steering is larger and padded for more comfortable grip.
- Drivers can easily see the instruments on dash board.

2. Seats :

- Earlier Small up right Seats
- Now larger, contoured, adjustable to various postures and body sizes.
- Seal belts, adjustable headrests.
- Not only comfortable but also safer

Industrial Application – II
Information Design (Cognitive Ergonomics)

- Cognitive ergonomists study the way the human brain processes information. Using this knowledge and the principles of graphic design.
- They develop **signs, maps, instruction manuals**, and even computer programs and Internet sites that are easy to use, or *intuitive*.
- Best Example is seen in **public transportation buildings**, such as airports or train stations. These buildings are often large, complex, and difficult to navigate.
- easy-to-understand navigation aids, such as **signs and maps, Color-coded subway maps** are used to help people to find their ways

Industrial Application – III
Machine Controls & Displays

- ***3 Kinds of displays:***
  Pictorial, Qualitative, Quantitative.
- Graphical Principles are used.
- Display Design on basis clear definition of the task
- Quantitative Displays - used when nos are essential to the task
- ***3 Sensory Channels:***
  Visual, Auditory & Kinaesthetic.
- Max. Speed, Min Attn: Kinaesthetic Displays
- Maximum Attn: Auditory Displays
- Maximum Precision & agreement : Visual Displays

The Benefits of an Ergonomic Program

- Decreased injuries,illnesses, and workers' compensation costs.
- Increased efficiency at work.
- Increased physical well being.
- Decreased absenteeism and turnover.
- Increase in employee morale.

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!!!**

Thank You !

Ergonomic Statistics

- 90% of all office workers use personal computers.
- In 1997 work related musculoskeletal disorders reached 275,000 cases.
- Carpal Tunnel Syndrome comprises 13% of all workplace injuries.
- Women outnumber men 3:1 sustaining Carpal Tunnel Syndrome.
- WMSD's account for $20 billion in direct costs each year and $100 billion in indirect costs.

SCOPE OF ERGONOMIC INJURIES

- CUMULATIVE TRAUMA DISORDERS (CTDS) are health disorders arising from repeated biomechanical stress.

- CTD involves damage to the tendons, tendon sheaths, related bones,

  muscles, and nerves of: Hands, wrists, elbows, shoulders, neck, back.

REASONS

- Generally injuries result from working incorrectly
  - Bad workstation design
  - Not adjusting the machines/stands properly
- Employees try to do things their bodies can't
  - Work too fast, hard, long or in a bad posture
  - Pick up an object that is too heavy
  - Don't use proper lifting or cutting technique

What areas of the body are most often affected?

- **Hands**
- **Arms**
- **Backs**
- **Shoulders**

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.

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.

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

- Environmental conditions such as extreme heat or cold can place stress on tissues.
- Extreme cold constricts blood vessels and reduces sensitivity and coordination of body parts.
- Excessive heat can result in increased fatigue and heat stress.

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.

Industrial Application -IV

Ergonomic design makes consumer products safer, easier to use, and more reliable. In many manufacturing industries, ergonomists work with designers to develop products that fit the bodies and meet the expectations of the people who will use them.

An ergonomically designed toothbrush, for example, has a broad handle for easy grip, a bent neck for easier access to back teeth, and a bristle head shaped for better tooth surface contact.

The shaving razor has undergone a similar design revolution. The bent-handled, easy-grip models popular today are more comfortable to use and have a better shaving performance than the straight-edged razors of days gone by.

Industrial Application –V
Office Chair

- Office workers usually complain of getting bad back pains, sore shoulders and arms, stiff neck, and tired legs from sitting in an office chair for prolonged hours every day .

- The main reason for these problems is the fact that sitting is a static posture that can truly affect the overall condition of the back, neck, arms, shoulders, and legs.

- Sitting can stress these parts of the body especially since the tendency to slouch over and down in an office chair is very natural. Improper sitting posture, however, can add large amounts of pressure to the spinal ligaments and strain the back muscles.

Continued…

Solutions

Evolving from the traditional office chairs, revolutionary styles of Ergonomic chairs are out in the market with the goal to promote good posture, support, and comfort.

Types of Ergonomic Chairs Used:

- Kneeling Ergonomic Office Chair
- Recliner Ergonomic Office Chair
- Saddle Ergonomic Office Chair
- Exercise Ball Ergonomic Chair