

The Ministry of Health Care and Social Development
The Volgograd State Medical University
The Chair of hygiene and ecology

Fundamentals of the physiology of work.

**The extend of strain and intensity of
work its effects on the functional state
and health of person.**

**Prevention of
Fatigue.**

Physiology of labour is a branch of hygiene which studies the changes of the functional state of the human body under the influence of human activities. Its aim is to work out preventive measures against fatigue, and to support health and optimum functioning of the human body.

EXTENT OF STRAIN OF WORK is one of characteristics of the production process which reflects the physical load on the musculoskeletal system and functional systems of the human body, for example, cardiovascular, respiratory system, promoting its activity.

EXTENT OF INTENSITY OF WORK is a characteristic of the production process which reflects mainly the load on the central nervous system, sense organs and emotional state of the person.

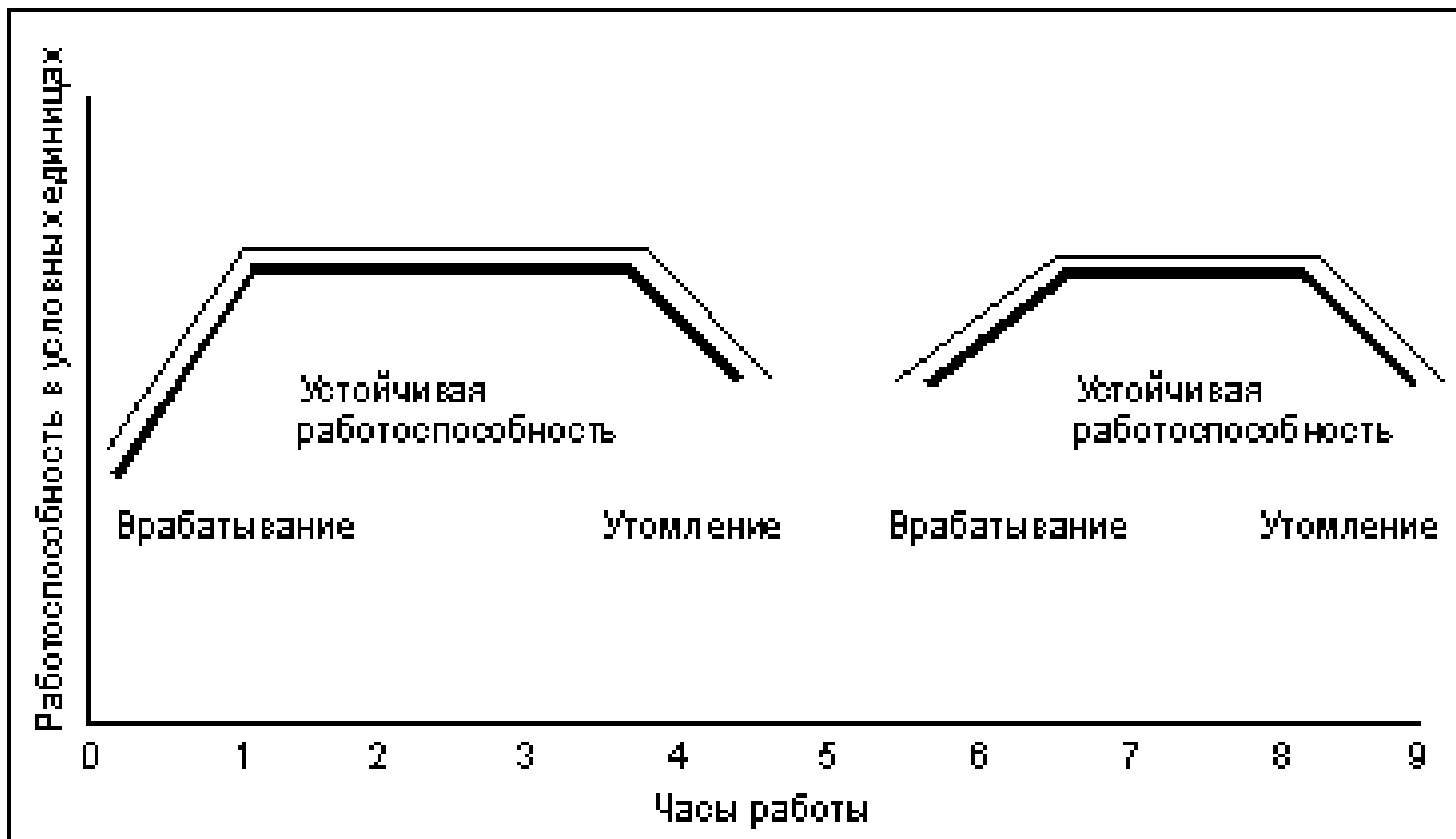
The extent of strain of production process

- Physical dynamic load
- Net mass of weight lifted and/or moved (kg)
- Stereotype work movements (amount of movements per shift)
- Static load
- Position at work
- Inclination of the human body;
- Movements in space (km).

The extent of intensity of production process

- intellectual load
- sensory load
- emotional load
- monotonous load
- work regimen

Work capacity and productivity



1 - The introductory stage

- At this stage the work capacity and productivity of people increases continuously. It lasts from 30 minutes to 1.5.

2 - The stage of high and stable work capacity

- It usually lasts from 1, 5 to 3 hours.

3 - The stage of reduced work capacity and productivity

- It usually occurs in the first part of the day, before lunch breaks, and in the second part of the day before you leave from work.

4 - A short-term period of increased work capacity and productivity

- usually occurs at the end of the working day. This short-term period is called a "end rush". It is due to the emotional and nerve stress and, therefore it is characterized more frequently by quantitative rather than qualitative increase of the work capacity and productivity.

A new tendency has been observed in the prevention of fatigue in the recent years

It is a complex discipline which is based on a number of sciences aimed at adapting the work to a person. Its aim is to increase the work capacity and productivity of people, to save the human health, and to maintain safety and comfort at work.

Ergonomics uses the knowledge in physiology and psychology in designing the machines and other equipment, organization and laying-out of the working places.

What is Ergonomics?

‘**Ergonomics**’ is derived from
two Greek words

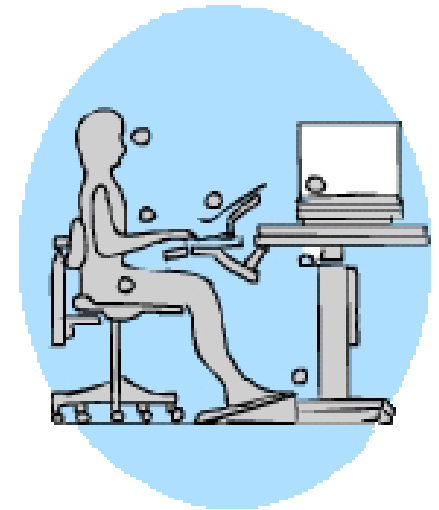
Ergon meaning *work*

and

Nomos meaning *principles or laws*

Ergonomics = The Science of Work

Ergonomics is not a new science, although the term has become more common lately. The phrase was first coined in 1857.



Common Definitions

“Ergonomics is essentially fitting the workplace to the worker. The better the fit the higher the level of safety and worker efficiency.” 1990

“Ergonomics removes barriers to quality, productivity and human performance by fitting products, tasks, and environment to people.” *ErgoWeb.com*

Good ergonomic design makes the most efficient use of worker capabilities while ensuring that job demands do not exceed those capabilities.

What are the benefits of ergonomics?

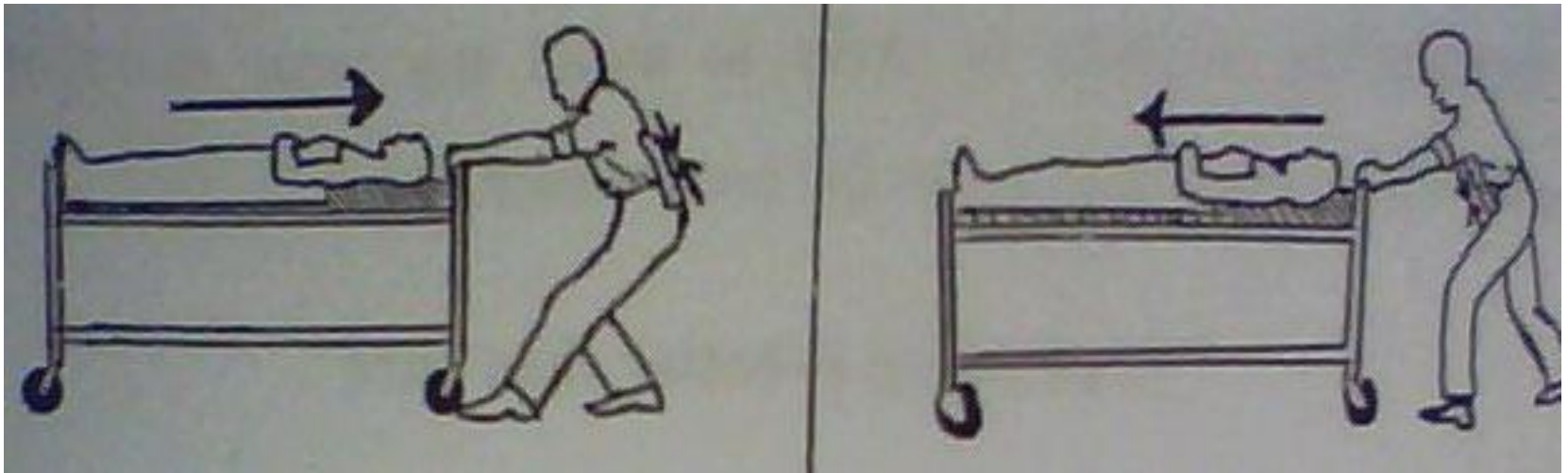
- Reduction of work-related injuries
- Increased worker productivity
- Increased work quality
- Reduced absenteeism
- Increased morale

**YOU JUST
FEEL
BETTER**



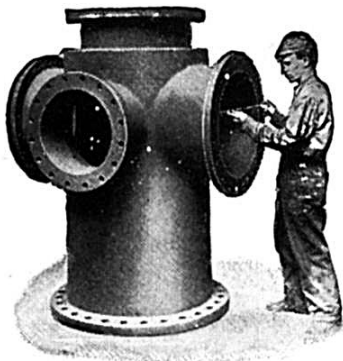
Pushing is preferred than pulling

- the required force is small



What are the consequences of poor Ergonomics?

- **Why are we hearing about ergonomics now?** Are there new hazards at work? No!
 - Consequences of poor workplace design were first documented in the 17th century.
- **Have you ever heard of these?**
 - **Historic Occupational Disorders** - house-maid's knee, washer woman's thumb, writer's cramp, clergyman's knee, nun's bursitis, dustman's shoulder, tailor's ankle



Do these historic occupational disorders still exist?

- They are part of a broad category of injuries and disorders called **Musculoskeletal Disorders (MSDs)**. MSDs are not usually caused by acute trauma, but occur slowly over time due to repetitive injuries to the soft tissues (muscles, tendons, ligaments, joints, cartilage) and nervous system
- MSDs can happen to anyone from office workers and industrial employees to athletes and hobbyists

Do these historic occupational disorders still exist?

- Work-Related Musculoskeletal Disorders (WMSDs) are MSDs that are caused or made worse by work methods and environment.
- They occur when the physical capabilities of the worker do not match the physical requirements of the job
- Common MSDs:
 - Tendonitis, Epicondylitis (Tennis or Golfer's Elbow), Bursitis, Trigger Finger, Carpal Tunnel Syndrome, Back Strain

Work-Related Musculoskeletal Disorders

- Repetitive Strain or Stress Injury (RSI)
- Repetitive Motion Injury (RMI)
- Cumulative Trauma Disorder (CTD)
- Overuse Syndrome
- Activity-related Pain Syndrome

Ergonomics can help prevent MSDs that are caused or aggravated by working conditions

What characteristics of your job put you at risk for MSDs?

Prolonged, repeated or extreme exposure to multiple WMSD risk factors can cause damage to a worker's body.

Risk Factors include:

- Repetition
- Awkward Postures
- Static Postures
- Excessive Force
- Compression
- Inadequate Recovery
- High velocity or acceleration of movement
- Cold Temperatures

Repetition = Performing the same motion or group of motions excessively

Examples of Repetition

- Repeating the same motion every few seconds or repeating a cycle of motions involving the same body parts more than twice per minute for more than 2 consecutive hours in a row
- Using a tool or an input device, such as a keyboard in a steady manner for more than 4 hours total in a work day



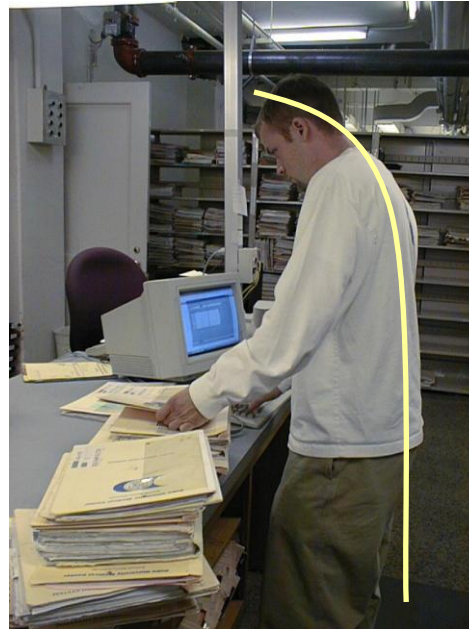
Excessive repetition of movements can irritate tendons and increase pressure on nerves

Awkward Postures = Postures outside of neutral



Neutral is the optimal position of each joint that provides the most strength and control

Awkward or unsupported postures that stretch physical limits, can compress nerves and irritate tendons



Before: Lab technician tilts his neck forward to view the screen into a non-neutral posture. He also bends over resting on his forearms to write on the documents.

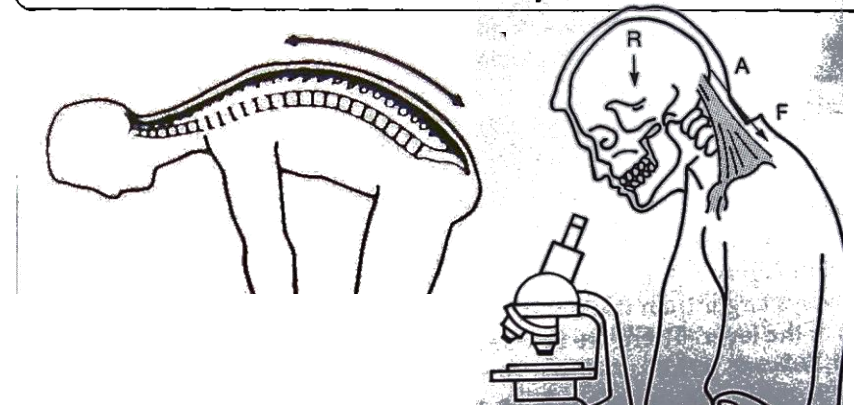
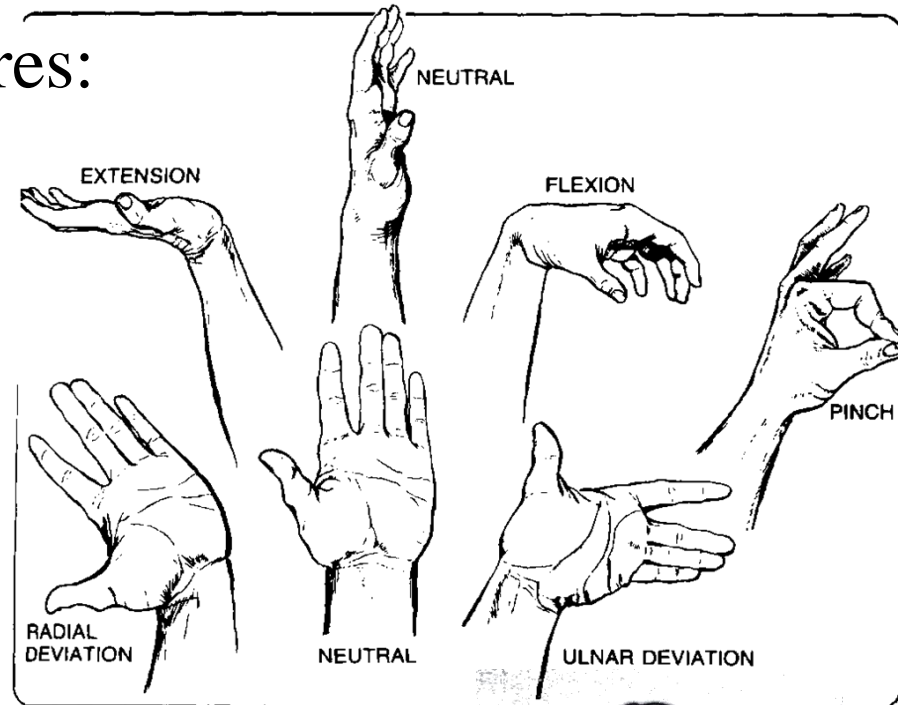


Ergonomic Improvement: Sailor easily views the screen from a neutral posture. The workstation adjusts to accommodate different working heights and users. When standing, work should be about elbow height.

Awkward Postures = Postures outside of neutral

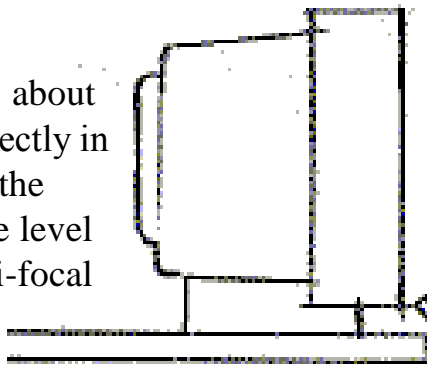
Examples of Awkward Postures:

- Repeatedly raising or working with the hand(s) above the head or the elbow(s) above the shoulder(s) for more than 2 hours per day
- Kneeling or squatting for more than 2 hours total per day
- Working with the back, neck or wrist bent or twisted for more than 2 hours per day
- Sitting with feet unsupported



Neutral Posture for Computer Use

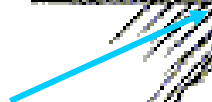
Position the monitor about an arm's length away directly in front of you. The top of the screen no higher than eye level (Unless the user wears bi-focal glasses)



Use a document holder **close to the monitor** rather than laying papers flat



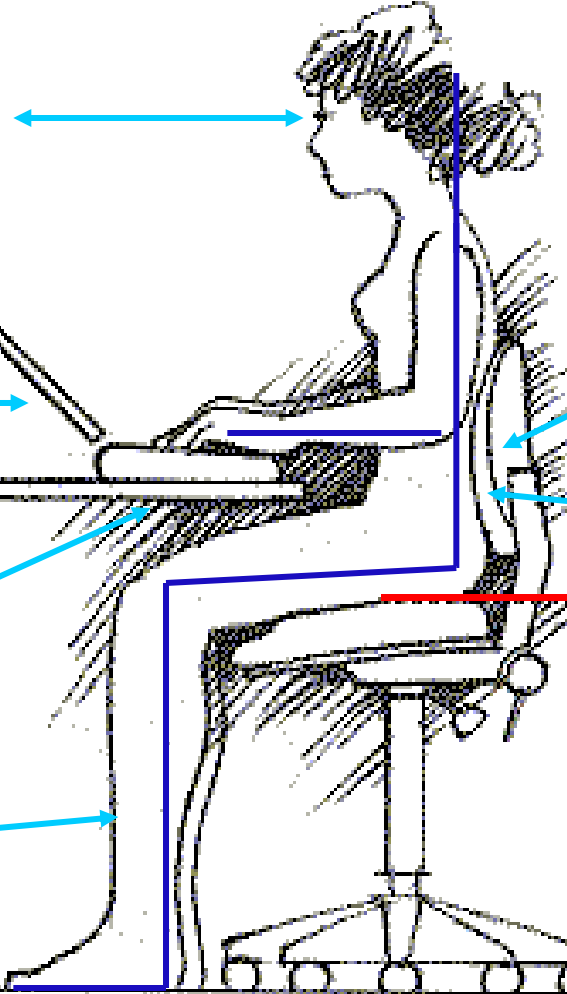
Mouse should be next to keyboard both at a height equivalent to the user's seated elbow height



Knees comfortably bent with feet resting on the floor. If the chair is raised so the keyboard height equals elbow height, use a footrest.



Adjust the seat height so upper arms hang vertically, elbows bent about 90 degrees, shoulders relaxed and wrists fairly straight



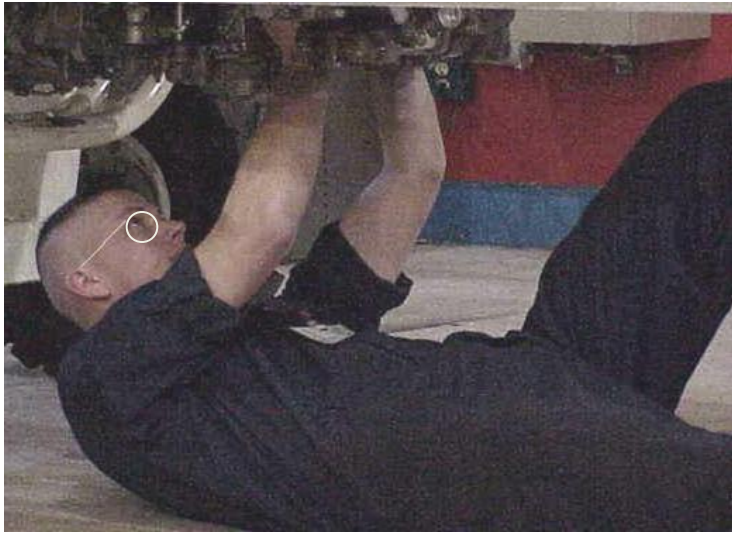
Adjust the back rest to provide firm support to the small of the back



Static Postures =

Holding the same position or using the same muscles for extended periods of time

Static postures, or positions that a worker must hold for long periods of time, can restrict blood flow and damage muscles



Before: Mechanic maintains a static posture holding arms and hands elevated while repairing aircraft



Ergonomic Improvement: Creeper supports mechanic and brings him closer to the task

Force = A strong physical exertion

Exertion = the tension produced by muscles and transmitted through tendons

Excessive muscle tension can contract muscles to their maximum capability which can lead to fatigue and possible damage to the muscles and other tissues.

Before: Three sailors climb on refuse bin to dump laundry cart full of waste. They risk back strain and lacerations while tipping cart over to empty it.



Ergonomic Improvement: One worker easily dumps waste in half the time.

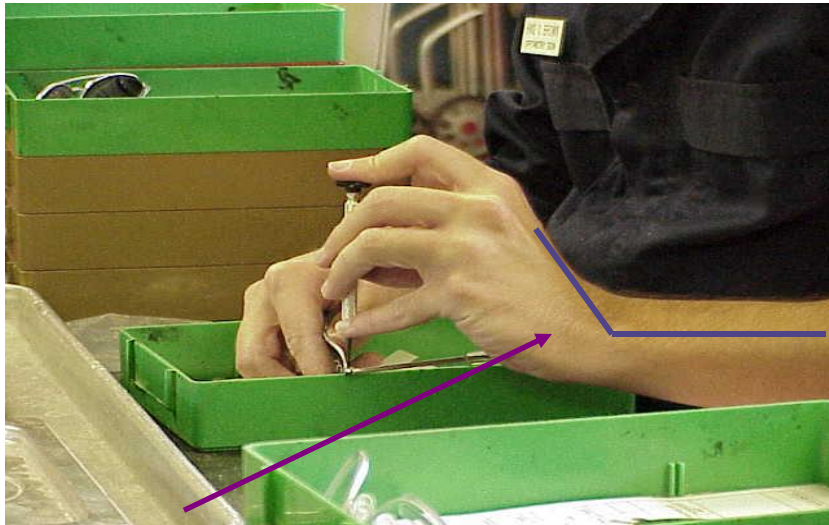


Ergonomic Lifting Device



Compression = soft tissue is compressed between the bone and a hard or sharp object

Compression, from grasping or contacting edges like tool handles, can concentrate force on small areas of the body, reduce blood flow and nerve transmission and damage tendons and tendon sheaths



Before: Worker rests his wrists on the sharp tray edges. His wrist is extended into a non-neutral posture.



Ergonomic Improvement: Worker rests her wrists and forearms on a padded surface. Wrist and forearms are in a neutral position.

Compression = soft tissue is compressed between the bone and a hard or sharp object

Compression, from grasping or contacting edges like tool handles, can concentrate force on small areas of the body, reduce blood flow and nerve transmission and damage tendons and tendon sheaths

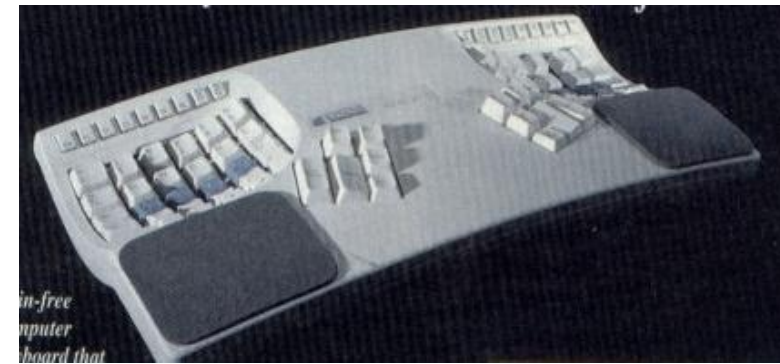


Before: Tool handles are small and angular requiring the worker to grasp tightly against sharp edges

Ergonomic Improvement: Tool handle is formed to fit the worker's hand which requires less grip strength or force and a more user-friendly tool



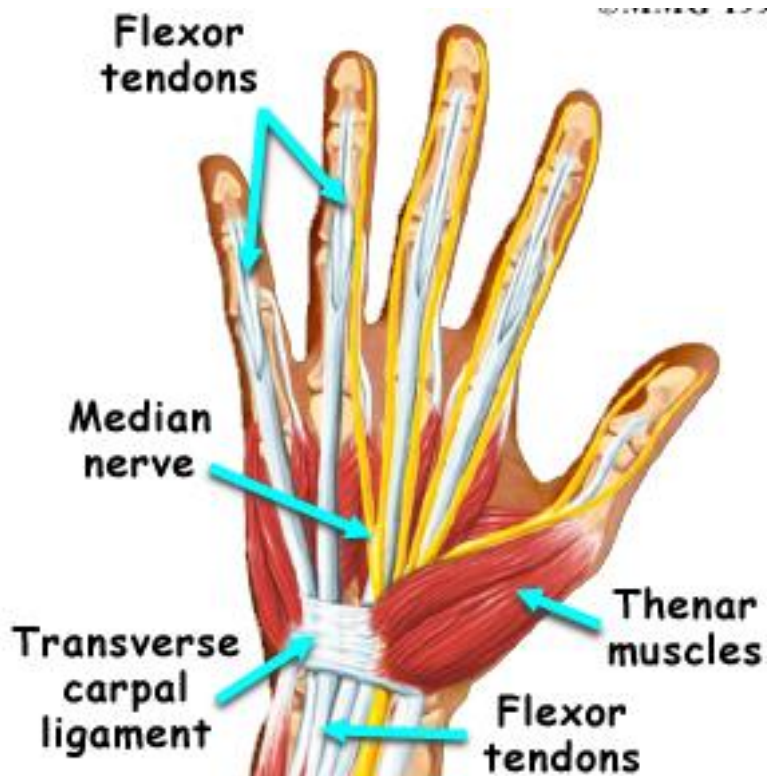
KEYBOARD STYLES



**A variety of styles are available.
Choose one that is comfortable for you.**

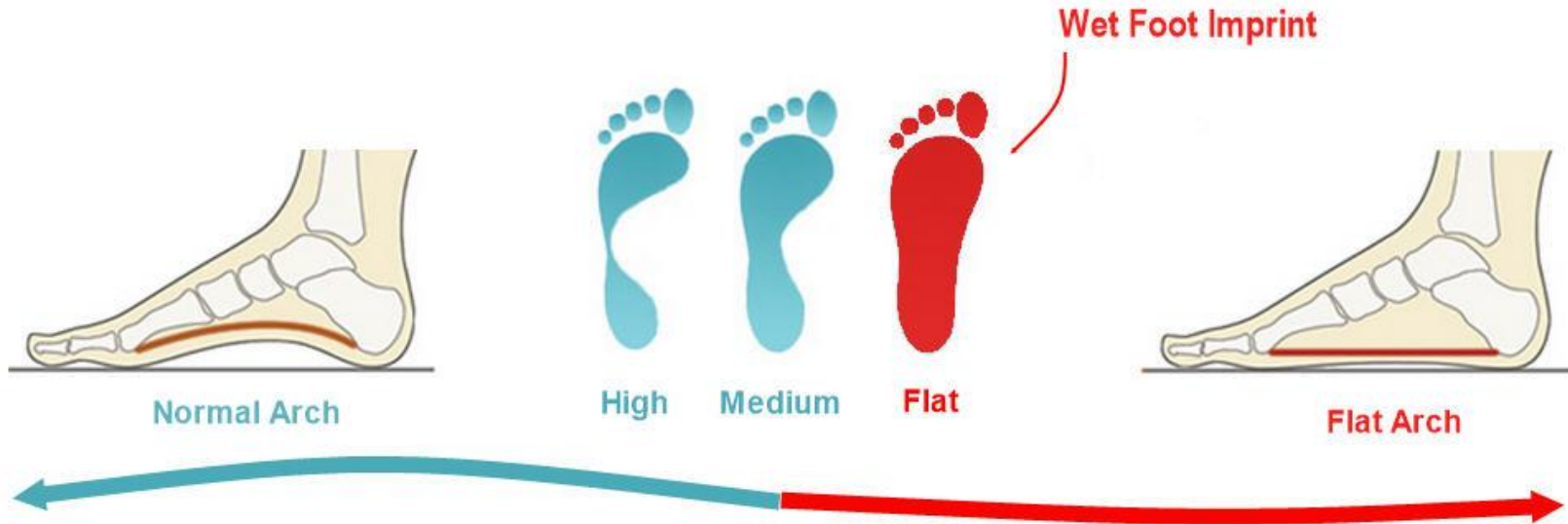
CARPAL TUNNEL SYNDROME

The median nerve does not work properly due to pressure on the nerve as it runs through an opening called the carpal tunnel

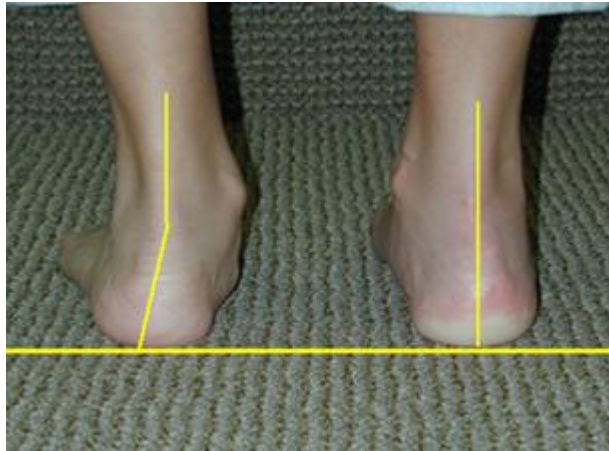


Numbness is usually first symptom.

Pain & tingling, can go up the arm to the shoulder and neck, causing waking to pain in middle of night



Where is your arch?



- Exercise- strengthen those muscles
- “Special” Shoes- the foot can fix itself
- Arch Supports/Orthotics



Comfort Shoes



What is Fatigue?

- **FATIGUE** is a temporary, reversible reduction of functional abilities of a person (or work capability) caused by performing work in certain working conditions
- Fatigue Is a Complex State Characterized by a Lack of Alertness and Reduced Mental and Physical Performance
- *Misconception:* Fatigue Is **Not** Just Falling Asleep.



Causes of Fatigue

Fatigue can be the result of a variety of factors:

- the body's natural rhythms
- work schedule
- type of task
- work environment
- non work-related issues

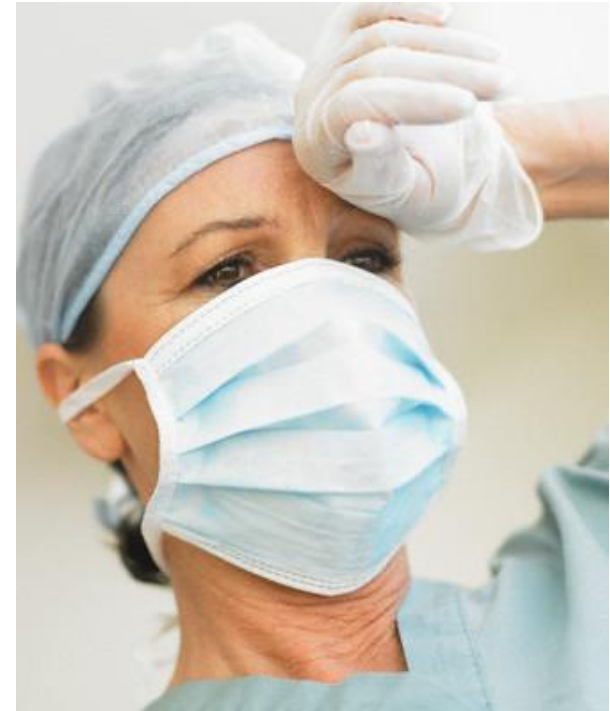
Fatigue Signs and Symptoms

- Withdrawn Behavior
- Depressed
- Moody
- Quick to Anger
- No Sense of Humor
- Lack of Interest
- Always Tired



Emotional Burnout

- a state of emotional, mental, and physical exhaustion caused by excessive and prolonged stress.
- It occurs when you feel overwhelmed and unable to meet constant demands.
- As the stress continues, you begin to lose the interest or motivation.
- **OVERFATIGUE** is a long or **irreversible** reduction of work capability (pathological state) resulting from fatigue accumulated in the human body under the influence of poor working conditions.

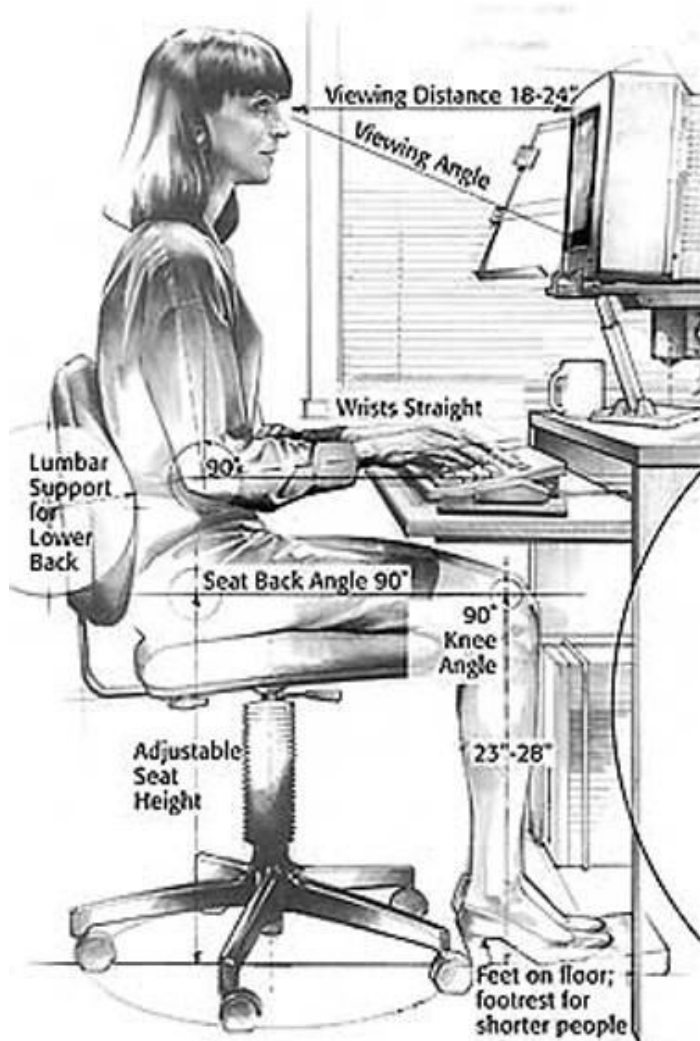


Rational work and rest schedule

- **Regulated breaks** in work are effective provided they are held at the first stages of fatigue and do not interfere with the introductory stage. The time for additional breaks and their duration depend upon the type of work. The duration of the breaks can vary from 5 to 10 minutes to 15-30 minutes. The more intense the activity, the longer the duration of the break and the earlier the break is made.



Well organized working place



Background Music

- There is much discussion about the effects of music on productivity. Do you feel like listening to music while you are studying or working can increase your focus or does it just become a distraction? Does it depend on the individual or is there some sort of watermark or guideline that can help us use music to increase productivity?



Music in industry

- A series of experiments has investigated the relationship between the playing of background music during the performance of repetitive work and efficiency in performing such a task. The results give strong support to the contention.



The music industry

- has proof that you should listen to music while you work.
- The results seemed to be greater productivity.
- However a summary of recent research shows while some background music can increase worker satisfaction and productivity, **music with lyrics** could have significant negative effects on concentration and attention.



The study concluded that music without lyrics is preferable, as lyrics are likely to reduce worker attention and performance.

Art as a Therapy

- It soothes the mind, helps individuals recover from excessive and prolonged stress, burnout.

