

PRINCIPLES OF ERGONOMICS

“Train the Trainer”

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Overview

1. Definition
2. Components of a Work Station
3. Risk Factors
4. Assessment Process
5. Trouble Shooting
6. MSDs
7. Posture

Defining Ergonomics

- Webster:
 - er·go·nom·ics (ûr'gə-nŏm'iks): an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely.
- Literal definition:
 - Ergon (work) + Nomos (rules or habits) = “The rules of work”

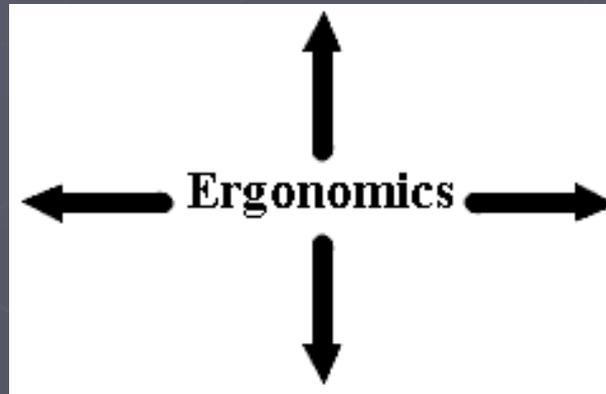
Defining Ergonomics

- The practice of adapting products and processes to human characteristics and capabilities in order to improve people's well-being and optimize productivity.
- Simplest Definition: “Fitting the job to the worker”

People
physical size
work habits
physical condition
individual attributes

Psychosocial
administration philosophy
employee responsibility
job satisfaction
stress
incentive pay
quotas

Furniture
chairs
work surfaces
technology/equipment
adjustability



Environment
lighting
air quality
temperature
space
noise

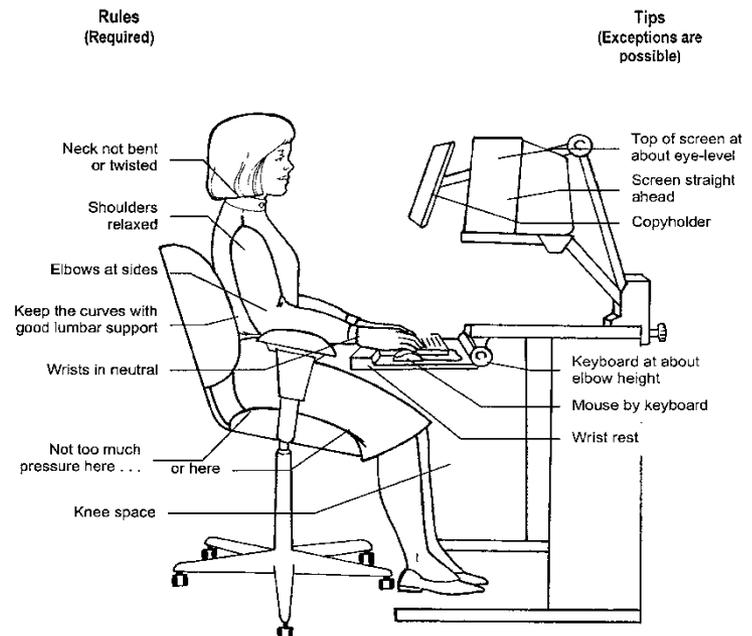
Tasks
tools and equipment
work pace
job requirements



Components of a Work Station

- Chair
- Work surface
- Keyboard/Mouse
- Monitor
- Telephone
- Environment
- Accessories

Putting It All Together



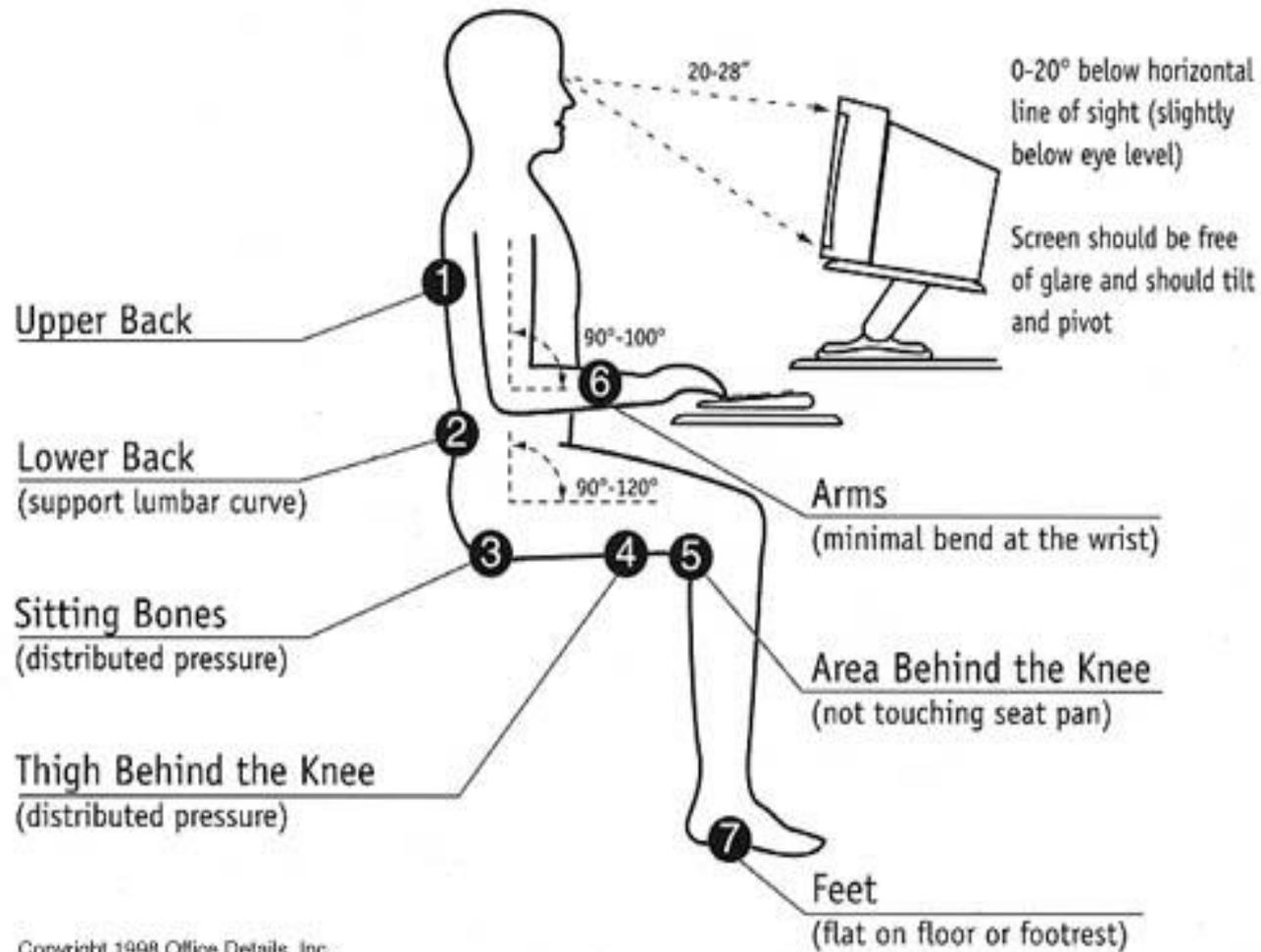
REMEMBER
There is no one posture that is "correct" for an eight-hour day — the body needs change and movement.

Chair Adjustments

- **Seat Height**
 - Able to reach the floor comfortable with both feet flat on the floor
- **Seat Angle**
 - Slightly forward tilt
- **Seat Depth**
 - Allow a width of three fingers between calf and seat pan

Chair Adjustments

- **Backrest Height**
 - Back support hits the lumbar region
- **Backrest Angle**
 - Allows for 90° - 120° hip flexion
- **Armrests**
 - Must be adjustable
 - Must be used correctly

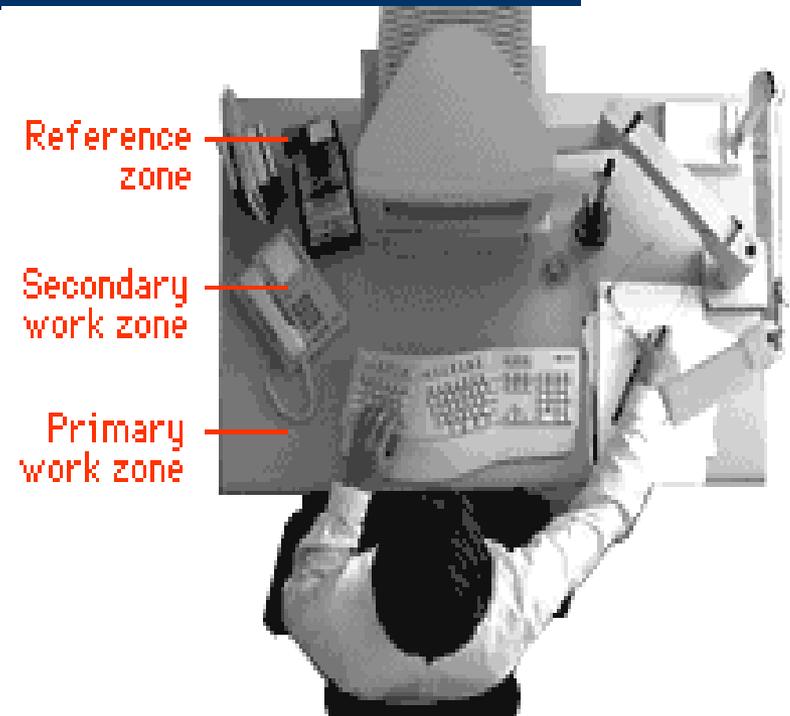


Work Surface

- What can be adjusted?
 1. Height
 - Should be adjusted to the proper chair position.
 - Allows for ergonomic positioning.
 2. Arrangement
 - Primary, secondary, reference zone

Workstation Set-up

- **Primary Work Zone**
 - the distance from elbow to hand
- **Secondary Work Zone**
 - within arm's reach
- **Reference Zone**
 - greater than an arm's reach



Keyboard/Mouse

- For most employees these should be situated in the primary work space
- Arrange directly in front of monitor
- How to correctly use the mouse and keyboard.

Monitor

- Distance
 - General rule of thumb is approx. an arms length away. (18-30 in.)
- Height
 - Eye level should be at the top 1/3 of monitor.
 - Bifocals – need to have monitor as low as you can.

Monitor

- Location
 - Directly in front of the keyboard.
- Angle
 - Approx. 10° - 20°
- Font
 - Size
 - Clarity/Resolution
 - Color Schemes - light colored font on dark background.

Telephone

- Depending on employee, the phone will normally be placed either in the primary or secondary work space.
- Headsets:
 - General Rule - More than 1½ hrs of use per day = Mandatory
 - Built-up hand set attachments do not do enough.

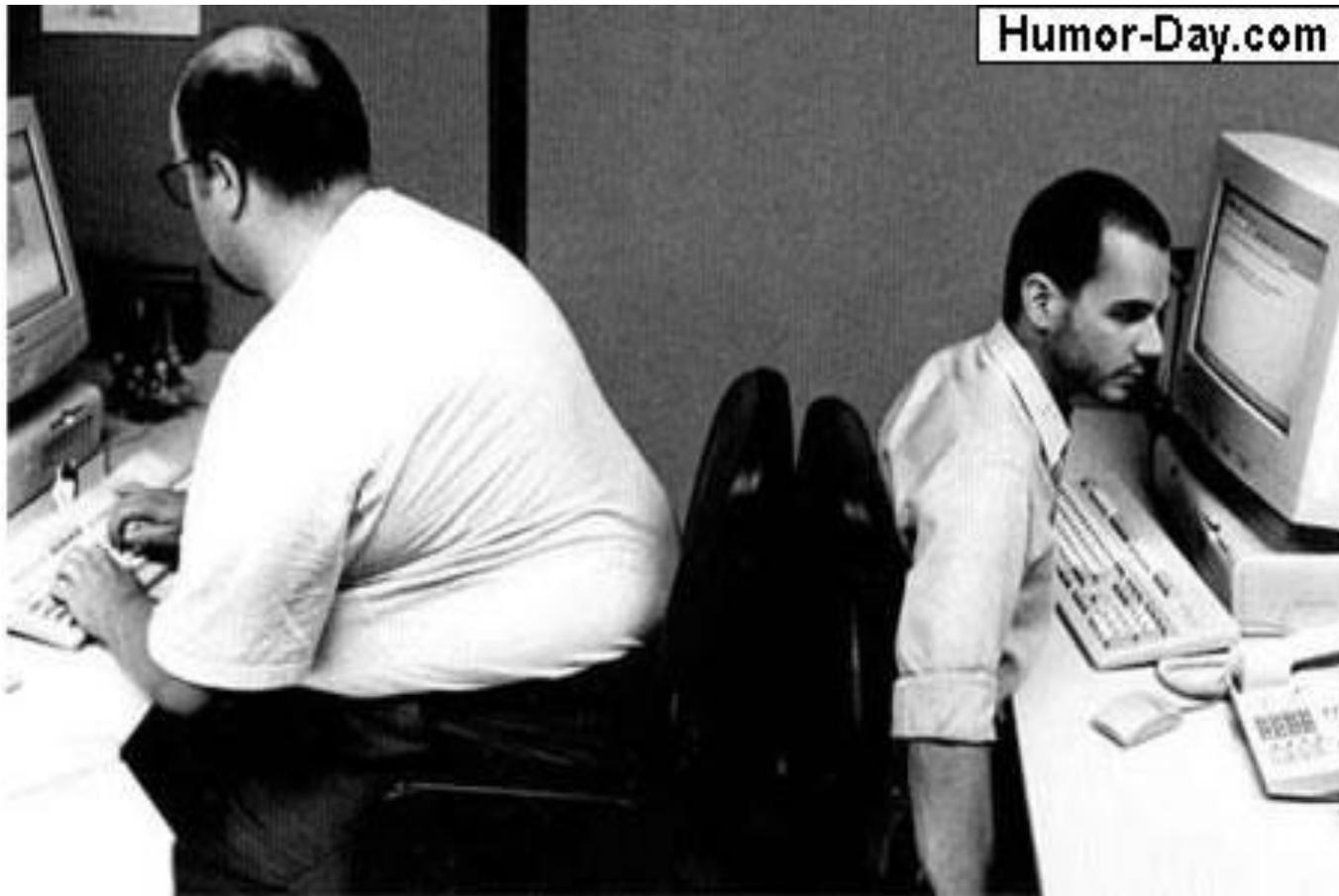
Environment – Every day nuisances

- Lighting
- Air Quality
- Temperature
- Space
- Noise
 - Neighbors, Fax, Copier, Telephone, etc.

Accessories

- Document Holders
- Footrests
- Keyboard Trays
- Glare Screens

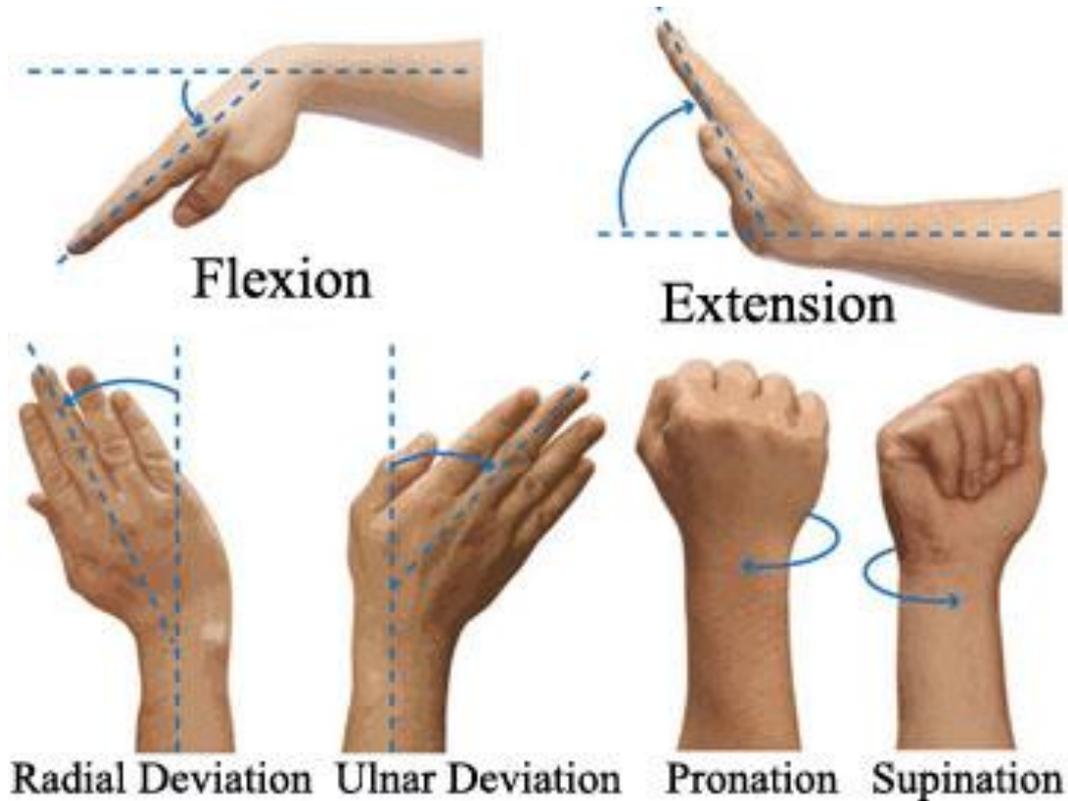
Do we need an ergo intervention?



Common Risk Factors

- Awkward Positioning
- Force
- Repetition/Frequency
- Temperature
- Vibration

Wrist Positioning



Assessment Process

1. Gather information
2. Evaluate how the existing set-up looks.
3. Adjust what is already there.
4. Make your adjustments/recommendations
5. Follow up/Re-evaluate (2 weeks)
6. If still deficient...try new adjustments and consider introducing equipment.
7. Follow Up!!

Gather Information (Interview)

- Questions to consider:
 - What are your job tasks?
 - How often do you do these tasks each day?
 - How long have you noticed this pain?
 - When does it hurt most...end of day, busier days, towards the end of the week, etc.?

Gather Information

- Do you take regular breaks?
- What irritates it the most?
- What specifically hurts?
- Point to what hurts
- What do you think the issue is?
- What do you think will help?

Assessment Process...

- Observe the employee
 - Watch them work
 - Encourage them to work as they “normally” would.
 - How do they interact with their environment?
 - *Look for postural issues and bad habits

Assessment Process

- Evaluate the existing set-up
 - Use checklists if available (initial assessments)
 - What is already present and what can we adjust?
 - The workstation components
 - The process
 - The worker

Assessment Process...

- Adjust what is adjustable
 - Who will be responsible for making adjustments?
- Make your recommendations
- Document
 - Stick to only the facts. What was said, measurements, what was observed?
 - Name, date, specific report of discomfort, observations, recommendations, plan of action, and follow up needs.

Follow Up

- When? Varies, depending on the situation.
- Re-evaluate
- Still areas of concern?
 - If so...is there anything else already present that can be adjusted?
 - May need to look at introducing some type of ergonomic equipment.
 - Explain why...train how to use...use it yourself

Sample Documentation

_____ contacted me on 10/20/08 after seeing _____, a hand therapist at _____ . _____ has been having difficulty bilaterally with tendonitis in her wrists every since being pregnant. In looking at her workstation, I noted that her mouse is positioned in a way that causes her to reach forward with her shoulder and she is also anchoring her wrist down causing her to remain in a static wrist extension for prolonged periods of time. I moved her mouse so it is at the edge of her desk, reducing/eliminating shoulder flexion and I placed a piece of dycem underneath her mouse pad to eliminate any sliding. I also demonstrated the proper way to hold and use the mouse so that it involves the entire arm movement and keeps her wrist in a neutral position vs. anchoring at the wrist. I replaced her split keyboard with a regular one because her keyboard seemed too large for her. She still needs to reach laterally a good distance to get to her mouse so I ordered a keyboard with the number pad on the left side which will allow her to keep her mouse much closer to her side, reducing her lateral reach. I will follow up with _____ in one week and install the keyboard as soon as it arrives. **rw**















What is reasonable?

- 100% Fix???
 - How about 15% – 20%
- Can we fix nerve and/or muscle damage?
- Will ergonomics make you...
 - lose weight?
 - take breaks?
 - sit up straight?
 - become younger?

What are other factors?

- ✓ Posture
- ✓ Attitude
- Sleep Postures
- Hobbies/Sports
- Age
- Gender
- Driving
- Psychological Impact
- Obesity/Exercise & Fitness
- Lifestyles
- Smoking
- Personal Habits

Attitude of employees

- Interactions with co-workers
- Job Satisfaction
 - Unhappy attitude causes discomfort
- Work Culture
- Time Pressures (Stress)
 - No time for stretching, breaks, lunch
- Performance Measures

Other things to consider

- Longer work hours (is it really 40 hour work weeks?)
- Smaller workstations
- Productivity/Quotas
- Technology - faxing from desks, emailing, etc.
- Aging Workforce (people working later in life)

Trouble Shooting

Why do we hurt???

- Poor posture
- Lack of movement
 - Frequent “micro” breaks
 - Prolonged poor posture can decrease productivity by as much as 50%
 - Stand to sit ratio of 70:30
 - 60 second break every hour

Common Themes??

- **Poor Posture**
- **Failure to take breaks**
 - **We need to continuously stress the importance of each employee taking a personal responsibility for themselves.**

Upper Extremity Musculoskeletal Disorders (MSDs)

- Also referred to as:
 - CTD (Cumulative Trauma Disorder)
 - RSI (Repetitive Stress Injury)
 - RMI (Repetitive Motion Injury)
 - Overuse Syndrome
 - Musculoskeletal Injuries

MSDs

- What are they?
 - Soft tissue ailments to the upper extremities, most commonly caused by overuse
 - Soft tissue: refers to any tissue that connects, supports, or surrounds other structures (bones, joints) and organs.
 - Examples: muscles, tendons, cartilage, ligaments, nerves, fat cells, etc.

Common MSDs

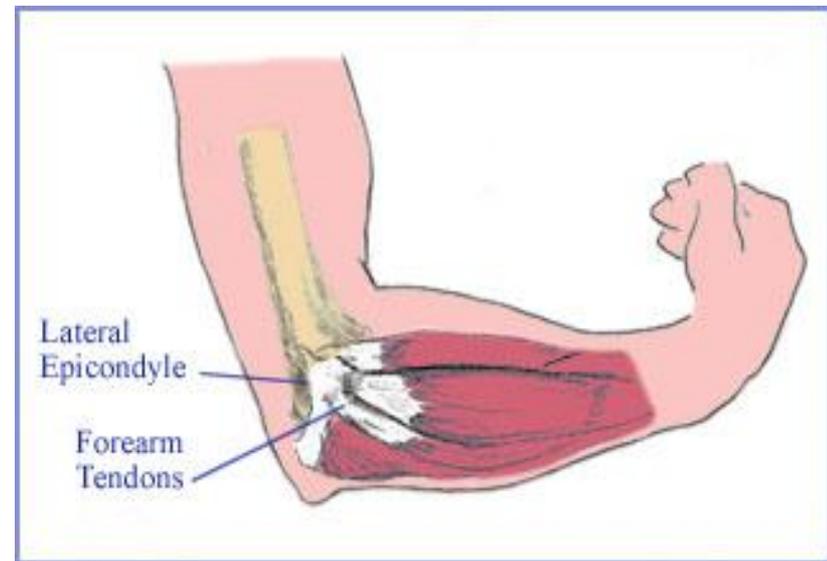
- Medial Epicondylitis
- Lateral Epicondylitis
- Tendonitis
- Carpal Tunnel Syndrome
- Ulnar Nerve Impingement
- Shoulder Tendonitis, Bursitis, Impingement
- Rotator Cuff Tear
- Thoracic Outlet Syndrome
- DeQuervain's Tendonitis

Tendonitis

- Literally means inflammation of the tendon.
- Tendons connect your muscles to your bone.
- Common cause is overuse, when muscles are being asked to do higher levels of activity they are not accustomed to doing.

Lateral Epicondylitis

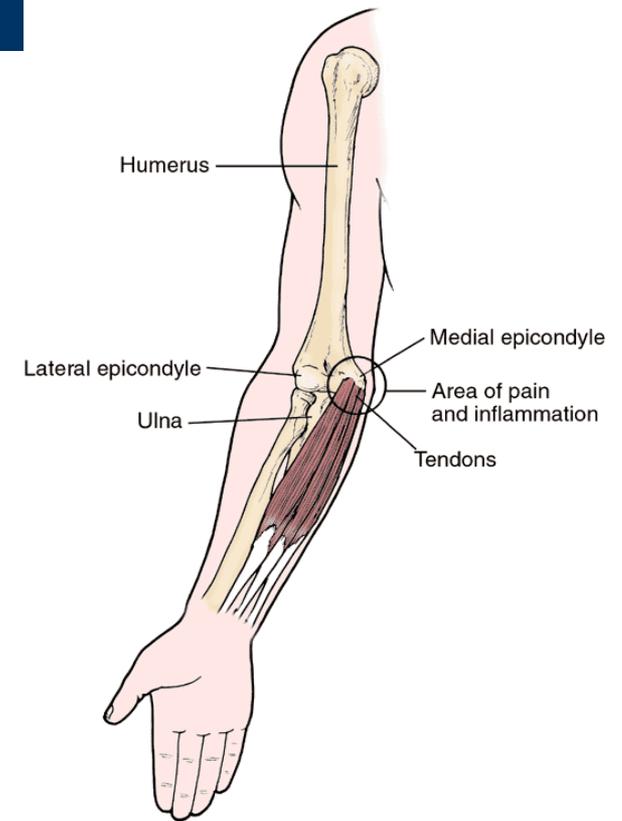
- More commonly known as “Tennis Elbow”
- Pain in the lateral aspect of the elbow where the muscles connect to the bone.
- Treatment



Medial Epicondylitis

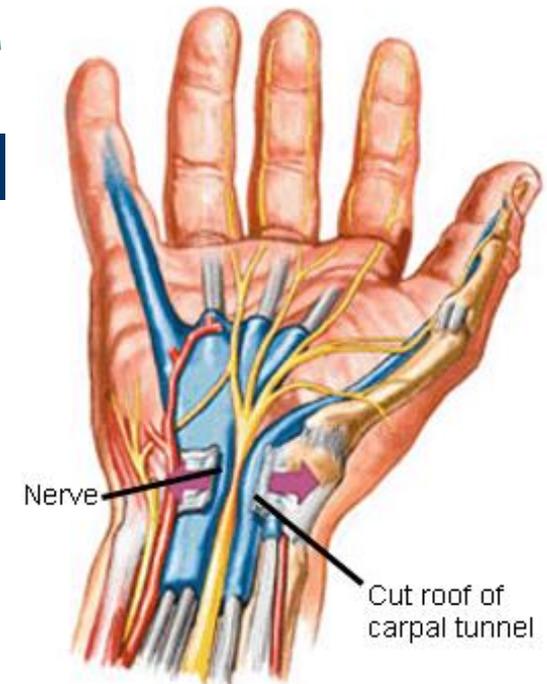
- Also known as “Golfer’s Elbow”
- Same as Lat. Epi., only the pain is on the inside of the elbow around the bony prominence.
- Treatment

Medial Epicondylitis (Golfer's Elbow)



Carpal Tunnel Syndrome

- A disorder in which the median nerve is compressed at the wrist
- Causes numbness and tingling. Usually on the thumb side fingers.
- Treatment



Carpal tunnel release surgery decreases pressure on the nerve to relieve pain and numbness.



Figure 9. The median nerve, which is involved in carpal tunnel syndrome, gives sensation to the thumb, index, long and half of the ring fingers on the palm side. Tingling in this area is rarely a symptom of ulnar nerve entrapment.

Ulnar Nerve Impingement

- Occurs when the Ulnar Nerve becomes compressed and cannot function properly
- Numbness and tingling in the ring finger and little finger.

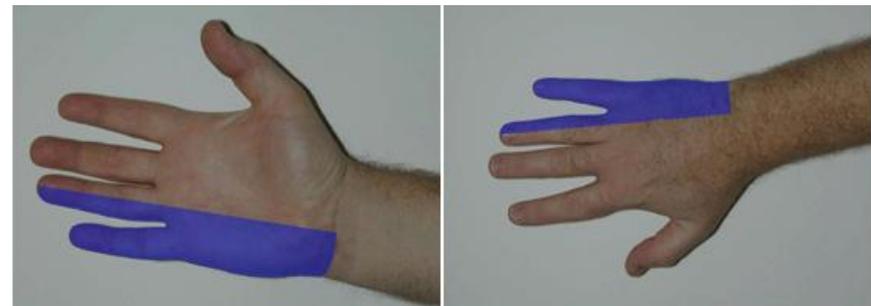
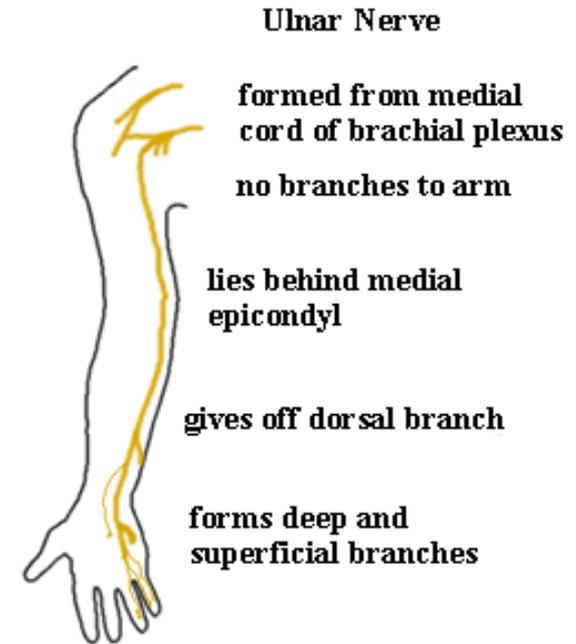


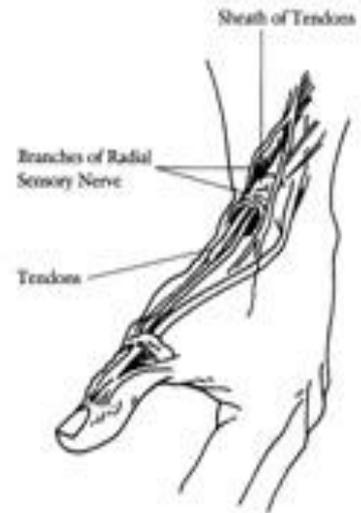
Figure 2: The ulnar nerve gives sensation to the small and half of the ring fingers on both the palm and back side of the hand.

DeQuervain's Tendonitis

- A condition caused by irritation or swelling of the tendons found along the thumb side of the wrist.
- Pain over the thumb side of the wrist is the main symptom.

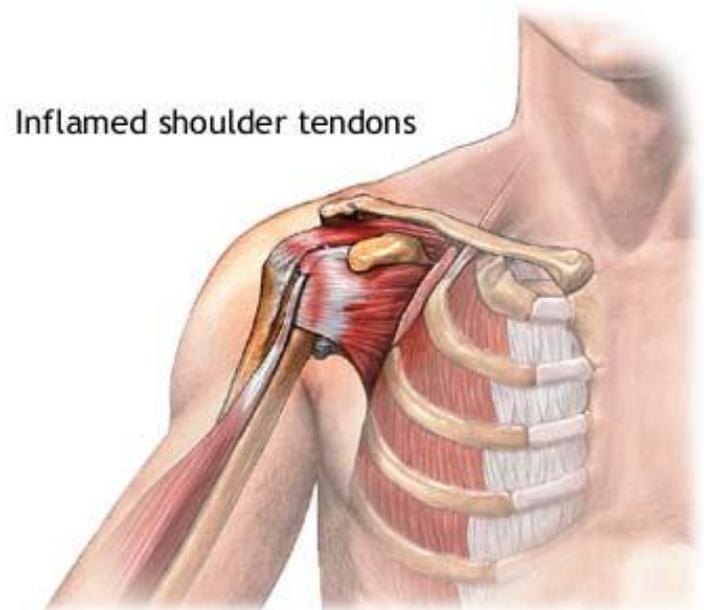
Figure 1

Swelling about the tendons to the base of the thumb results in painful motion.



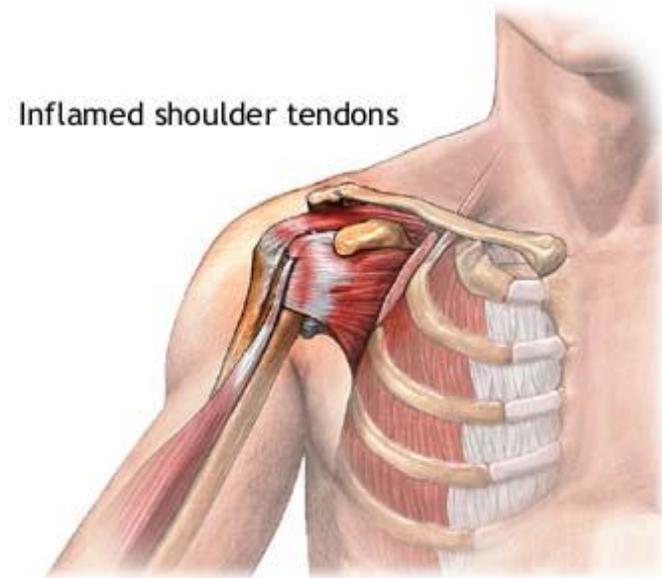
Shoulder Disorders

- Tendons of the rotator cuff make contact with the acromion and they become swollen. This is simply called tendinitis.



Shoulder Disorders

- If the swollen tendon gets trapped and pinched under the acromion. This is known as an impingement.
- Bursitis: fluid-filled sacs called “bursa” become inflamed.



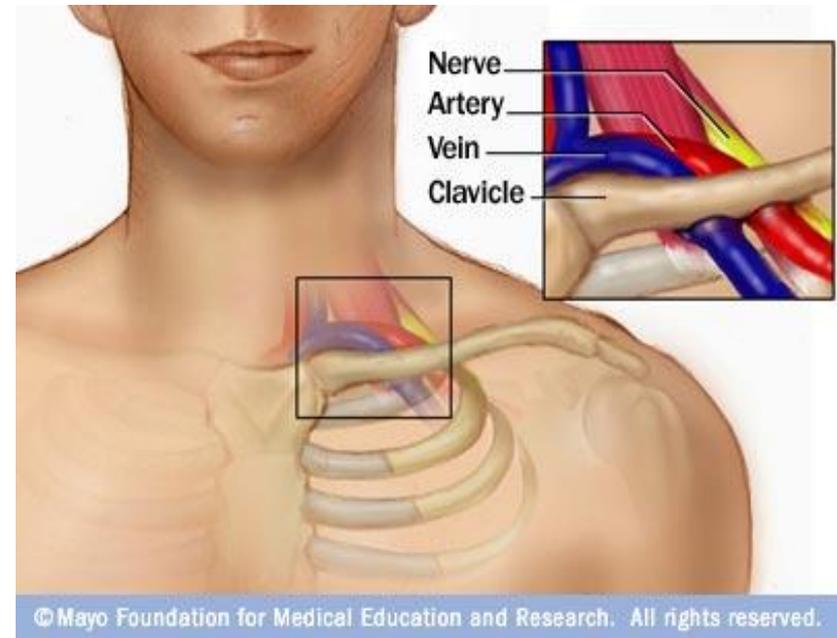
Rotator Cuff Tear

- A tear in the tendon
 - Chronic: over time, RC tendinitis eventually wears a hole through the tendon.
 - Acute: a sudden motion or lift causing a “pop” in the shoulder.

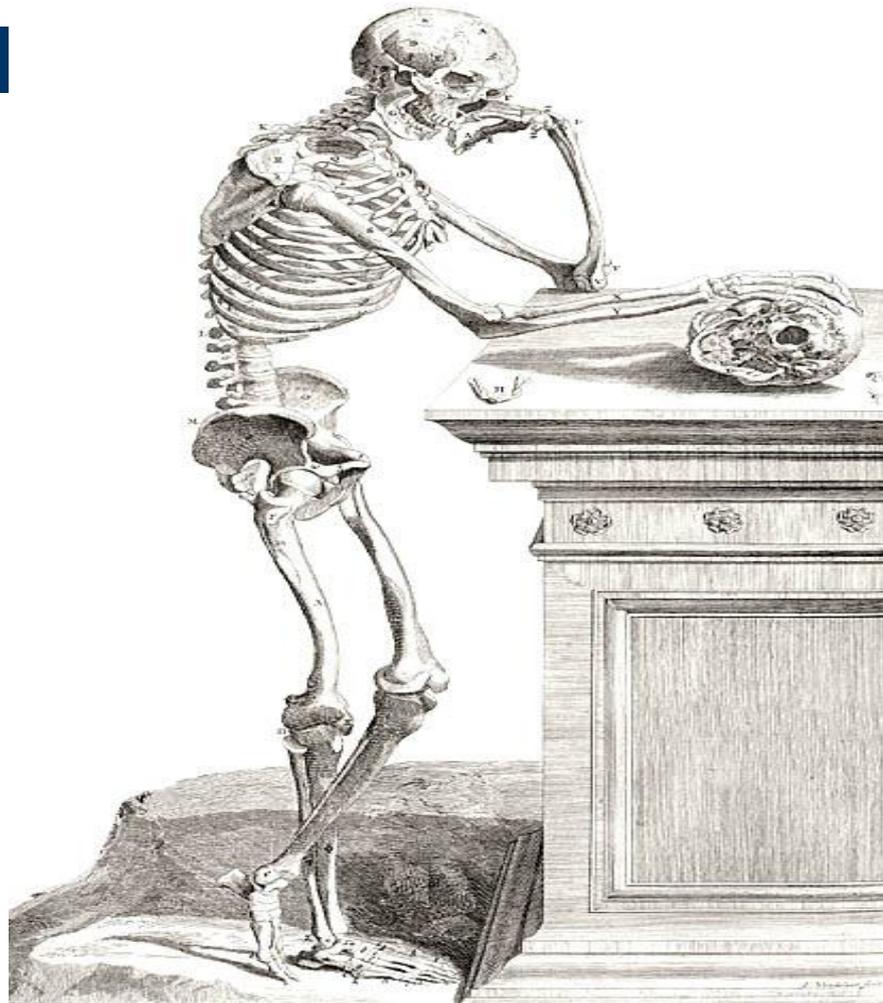


Thoracic Outlet Syndrome

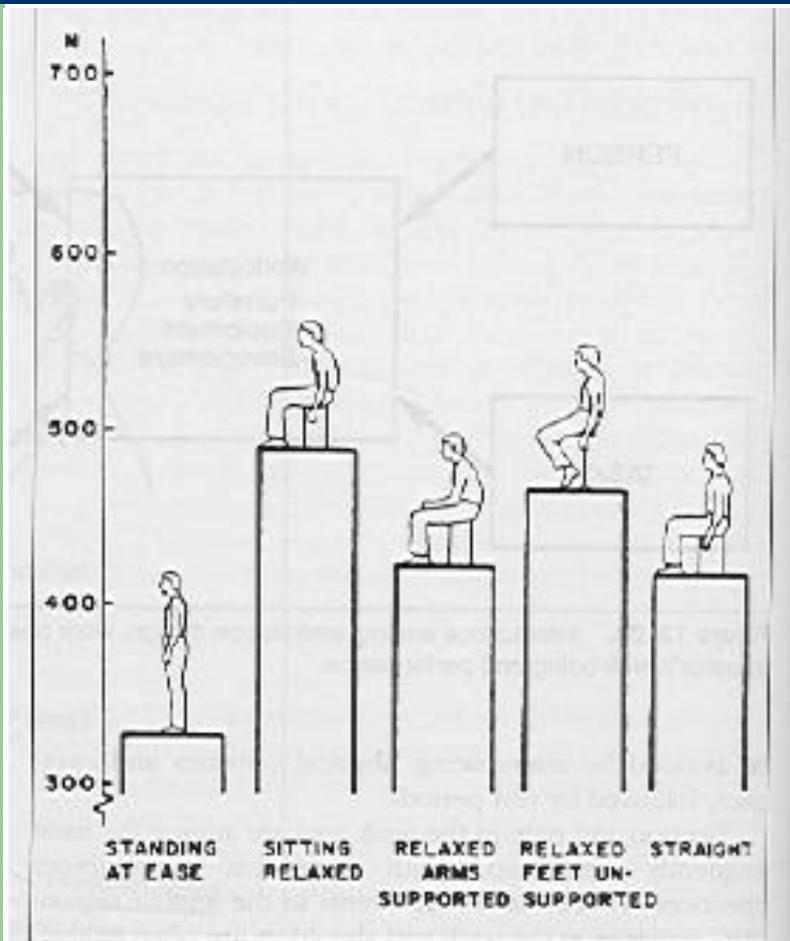
- The small space between your collarbone (clavicle) and your first rib.
- Caused by pressure on the nerves and/or blood vessels that pass through the thoracic outlet.
- Symptoms...



Posture, Posture, Posture...



Effects of Sitting



- Sitting can as much as double the load on your lower back
- Becomes increasingly worse with poor posture, prolonged sitting, overweight, etc..

Modified from Chaffin & Anderson

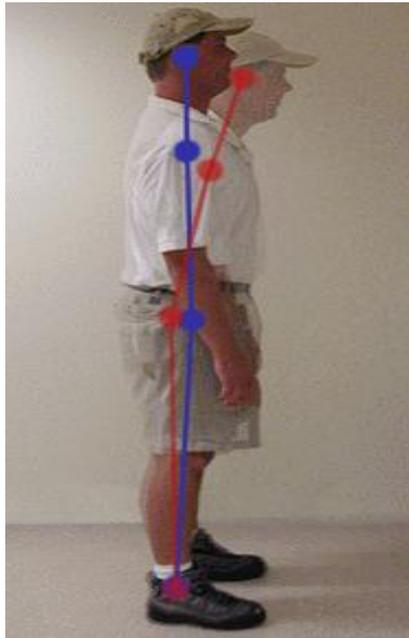
What was always Mother's Advice???

- Sit up straight!!!
- Guess what...she was absolutely right!
 - Decreases the load on your spine
 - Helps the organs of your body function more efficiently
 - It promotes movement efficiency and endurance and contributes to an overall feeling of well-being

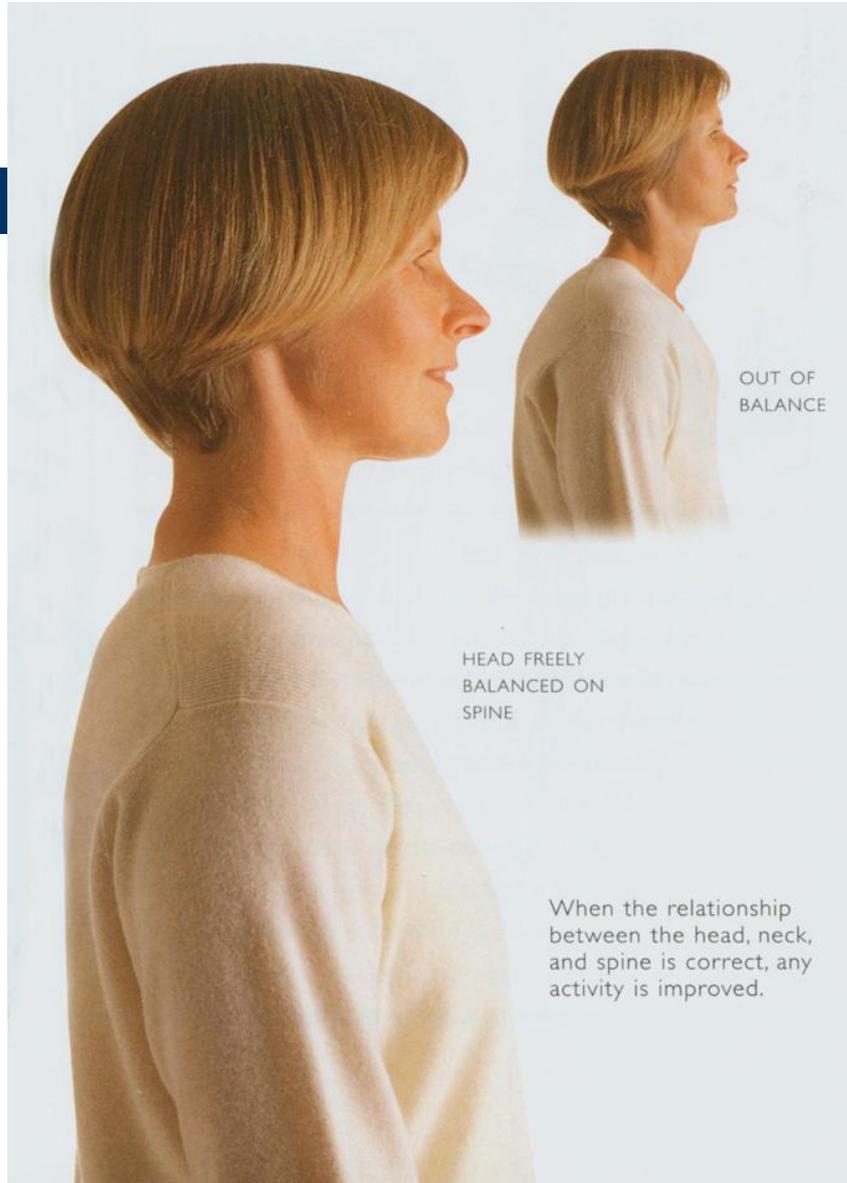
Lifelong misuse of our bodies

- We trick our bodies into thinking we are comfortable.
- No longer using our core muscle groups.
 - Results in muscles weakening (atrophy)
- May lead to:
 - Fatigue
 - Muscle strain
 - Pain

What is Proper Posture?



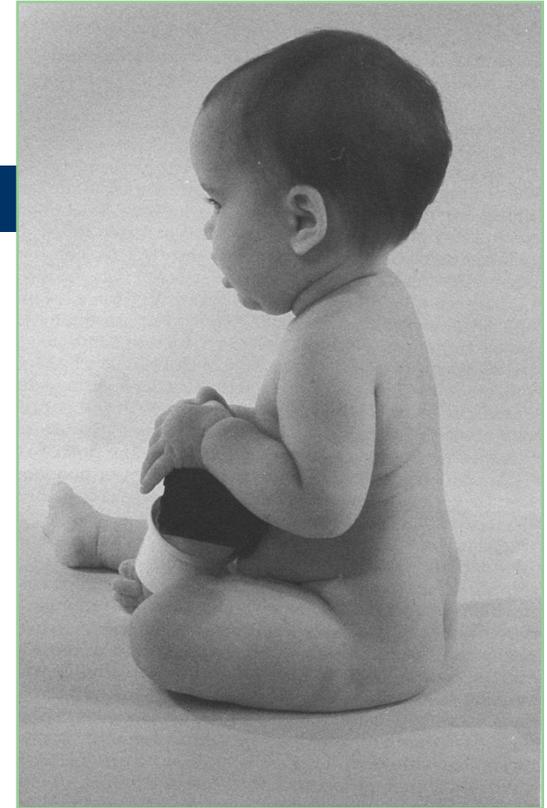
- Head, trunk, arms and legs are aligned with one another
- Look around, how many people demonstrate good posture?



OUT OF
BALANCE

HEAD FREELY
BALANCED ON
SPINE

When the relationship
between the head, neck,
and spine is correct, any
activity is improved.



At what age do you
think kids start to
develop poor posture?

“Ergonomic” Equipment Gadgets, Gizmos, and Other Stuff

- Wrist Rests
 - Pros
 - Maintain neutral wrist positioning
 - Reduce weight throughout shoulders
 - Softens the surface under the wrists
 - Cons
 - Promotes anchoring at the wrist
 - Contact point on the wrist

“Ergo” Equipment

- Keyboard Trays
 - Pros
 - May adjust the keyboard height and angle to custom fit the users needs
 - Allows for more posture changes
 - Cons
 - May decrease knee clearance
 - May force longer reaches for other things

“Ergo” Equipment

- Alternative Mice/Keyboards
 - Pros
 - Allows you to use different muscle groups
 - Reduce/Eliminate awkward postures of the arms or wrists
 - Reduce/Eliminate movement at the wrist
 - No evidence that trackballs help/hinder

Alternative Mice/Keyboards

- Cons
 - Difficulty adapting, leading to reduced production
 - Its always a trade-off
 - May be using more/different/smaller muscle groups

Conclusion

- Ergonomics is a very important part of avoiding injury, but, by itself, it is not effective.

Conclusion

- This is not rocket science!! Once the basic principles of ergonomics are understood, much of it is common sense.
- Don't be afraid to try new things.

