# Musculoskeletal System Assessment

**Prof. Suhair Al-Ghabeesh**

# Objectives:

- Structure and Function
- Subjective Data—Health History Questions
- Objective Data—The Physical Exam
- Abnormal Findings

# Structure and Function

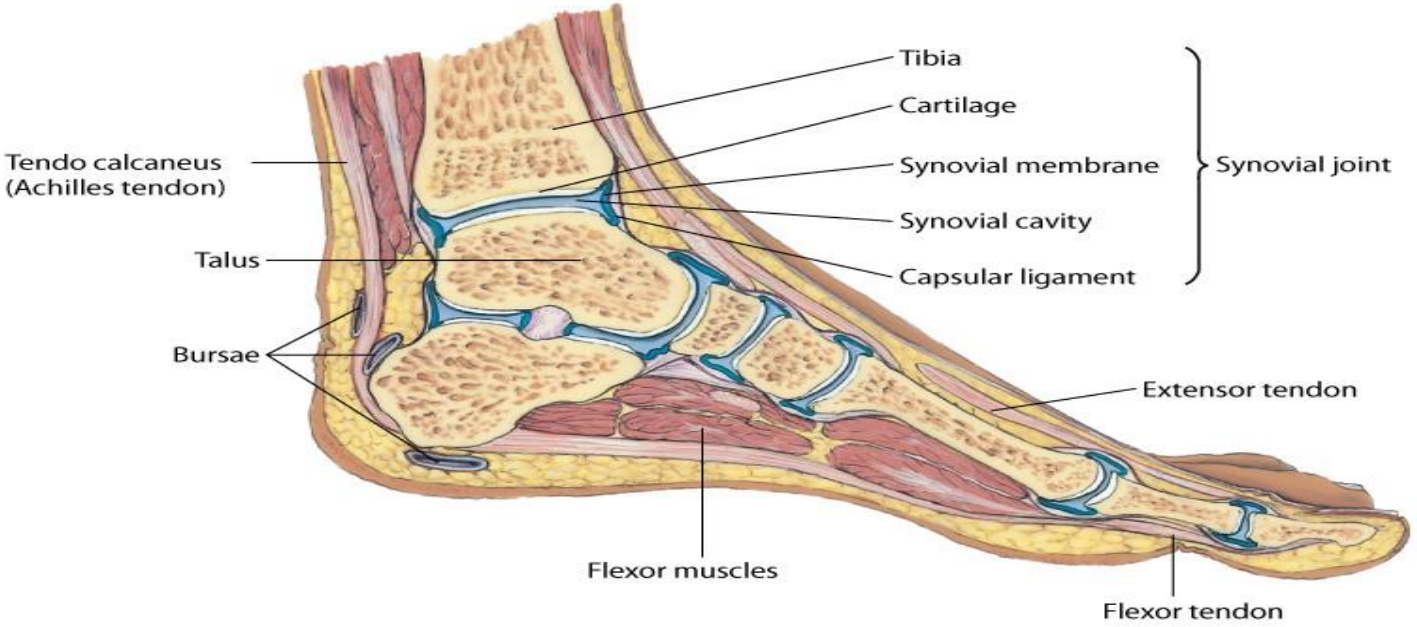
- The musculoskeletal system: bones, joints, muscles.
- Joints are the functional units of musculoskeletal system.
  - Bones (206 bones)
  - Muscles (40 – 50% of body weight)
  - Cartilages
  - Ligaments (connect bone to bone)
  - Tendons (connect bone to muscle)

# Functions of musculoskeletal system

- Provide support to stand erect
- Allow for movement and mobility
- Protection of inner vital organs
- Production of blood cells and platelets in bone marrow (Hematopoiesis)
- Reservoir for storage of essential minerals like calcium and phosphorus

# Musculoskeletal components

- **Joints**
  - Nonsynovial or synovial joints:
  - Nonsynovial joints are united by fibrous tissue or cartilage and are immovable (sutures in the skull) or only slightly movable (vertebrae)
  - synovial joints: freely movable



# Musculoskeletal components

- **Joints**

- Cartilage: present in synovial joints and cover the surface of opposing bones. It is avascular and nourished from synovial fluid during joint movement. It is a very stable connective tissue with a slow cell turnover. It cushions the bones and gives smooth surface to facilitate movement.
- Ligament: are fibrous band running directly from one bone to another bone that strengthen the joint and prevent movement in undesirable directions.
- Bursa: is an enclosed sac filled with viscous synovial fluid. It is located in areas of potential frictions. It helps muscles and tendons skate smoothly over bone.

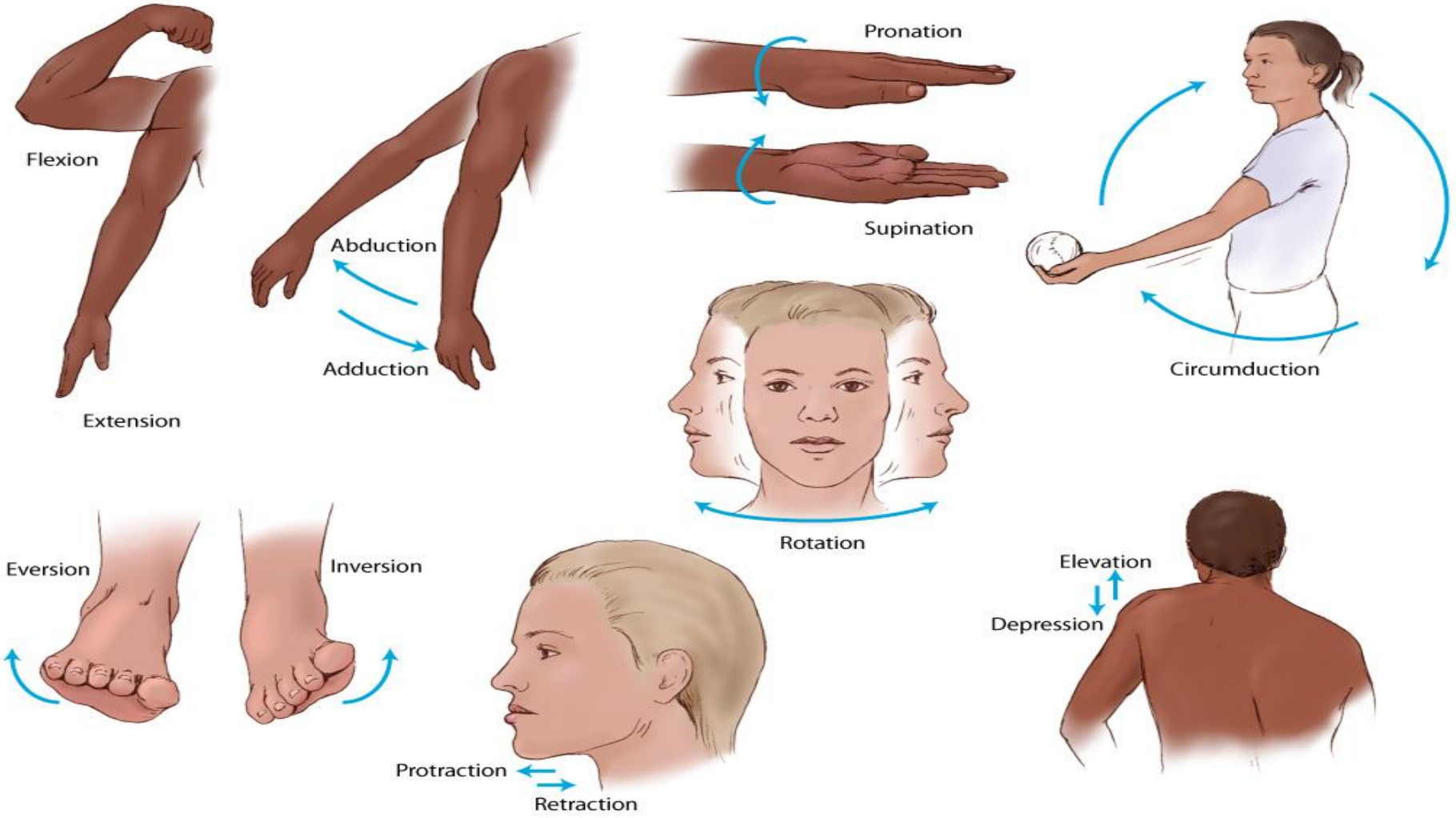
# Musculoskeletal components

- **Muscles:** Maintain posture, allow movement

3 types:

- Skeletal (Striated)
- Smooth (Involuntary)
- Cardiac
- Skeletal muscles movements: flexion, extension, abduction, adduction, pronation, supination, circumduction, ….etc

# Skeletal Muscle Movements




SKELETAL MUSCLE MOVEMENTS

## Skeletal Muscles

- Voluntary muscles
- Attach to bones by tendons that cross joints
- Shortening of muscle moves joint

## Cardiac Muscle

- Found only in heart
- Automaticity
- Can initiate own contractions without external stimulation

## Smooth Muscles

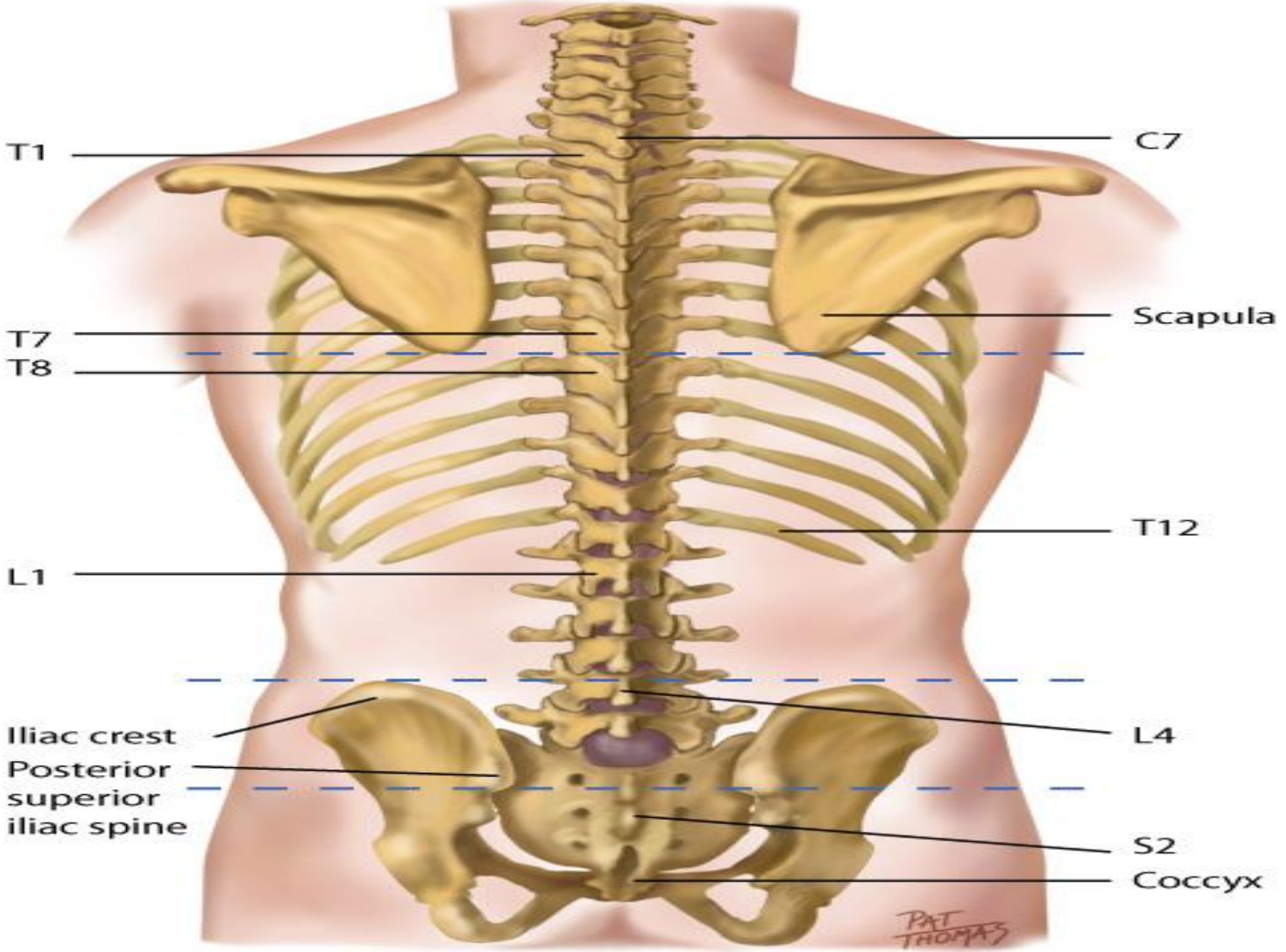
- Carry out involuntary movements
- Located in walls of:
  - GI tract
  - Respiratory tract
  - Blood vessels

## Skull

- Cranium
  - Frontal
  - Parietal
  - Temporal
  - Occipital
- Face
  - Mandible
  - Maxilla
  - Zygoma
  - Nasal bones

## Spinal Column

- Cervical: 7 vertebrae
- Thoracic: 12 vertebrae
- Lumbar: 5 vertebrae
- Sacrum: 5 vertebrae (fused)
- Coccyx: 3 - 4 vertebrae (fused)




LANDMARKS OF THE SPINE

# Thorax

- 12 pairs of ribs
- Sternum
- Protects heart, lungs

# Pelvis

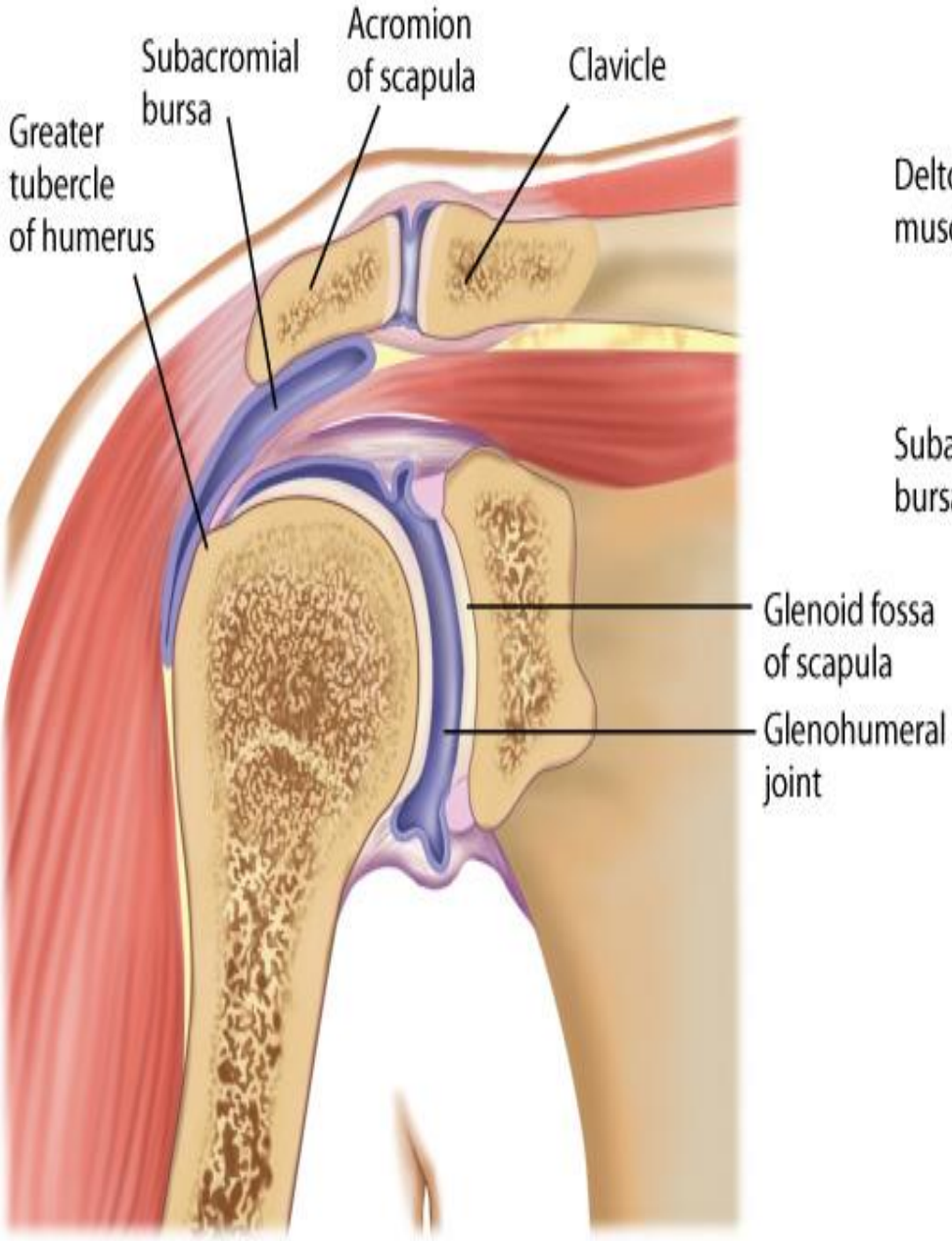
- Bony ring
- Two innominate bones, each made of 3 fused bones
  - Ilium
  - Ischium
  - Pubis

## Lower Extremity

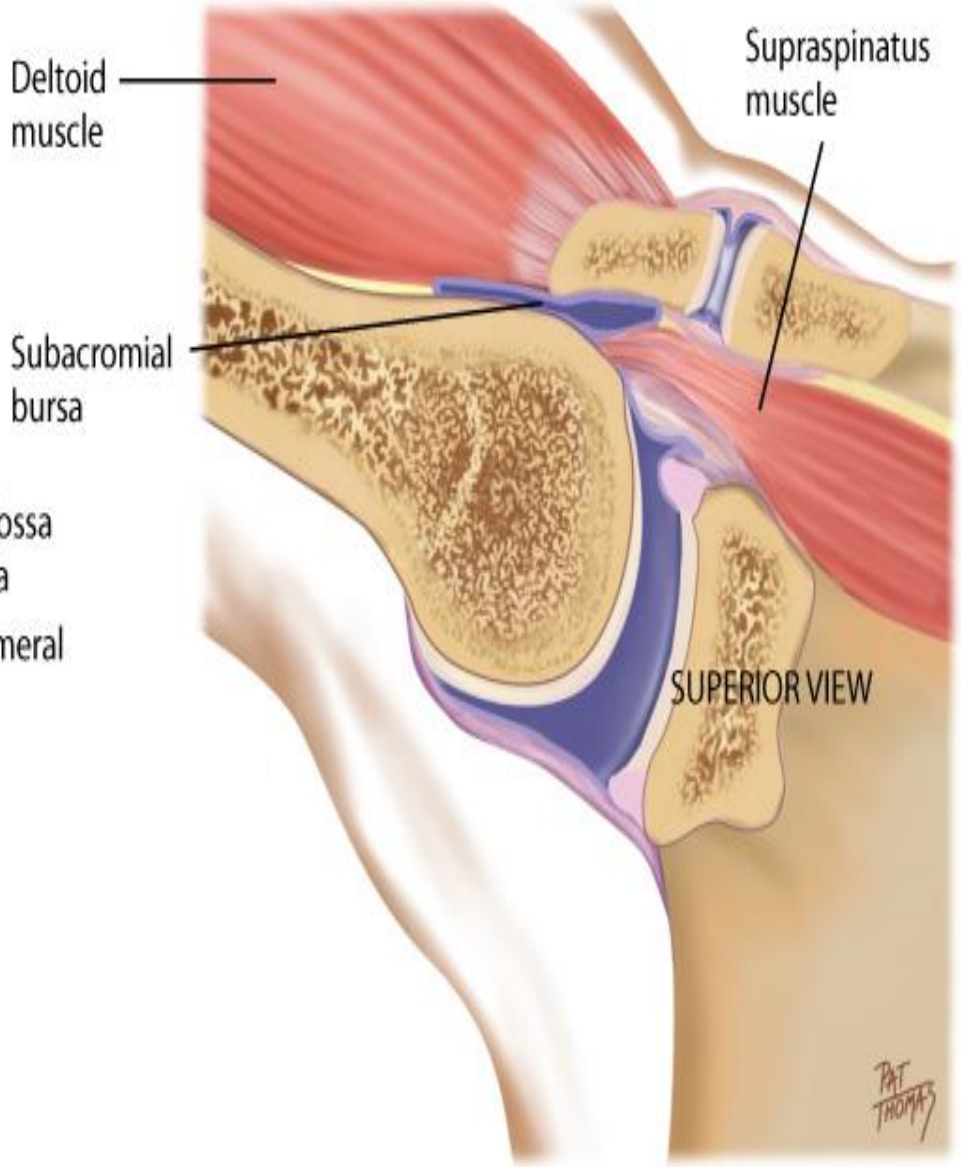
- Femur (largest bone in body)
- Patella (knee cap)
- Tibia (shin bone)
- Fibula
- Tarsals
- Metatarsals
- Phalanges

## Upper Extremity

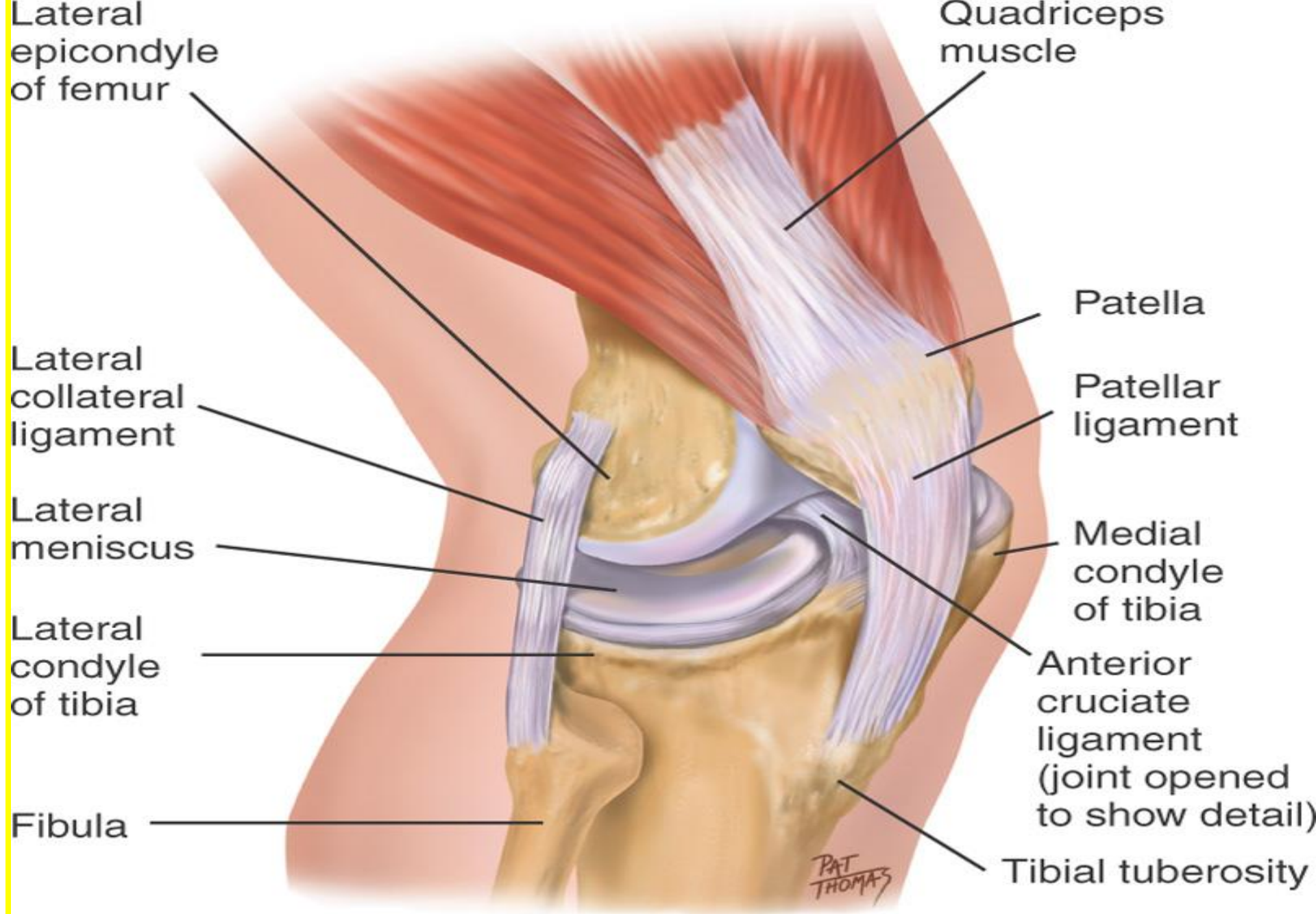
- Shoulder girdle
  - Scapula
  - Clavicle
- Humerus
- Radius
- Ulna
- Carpals
- Metacarpals
- Phalanges




SHOULDER JOINT




SHOULDER WITH ARM ELEVATED




LANDMARKS OF THE RIGHT KNEE JOINT

# Musculoskeletal System Assessment

- Health History
  - Subjective Data -Chief Complaints – pain, altered sensation, limited motion
  - Family history, personal history, dietary history, socioeconomic status
  - Medications ; Current health problems – obesity
- Objective Data - Physical Exam
- Special Assessment Techniques
  - Ballottement
  - Bulge Sign
  - Phalen
  - Tinel's

# Subjective Data

- Joints
  - Problems, pain
    - Stiffness, edema, heat, redness, limited ROM, ADL, Movement, rest, medication, chills, fever, recent sore throat, trauma, repetitive activity
- Muscles
  - Problems, pain, cramping, weakness location
  - Any calf pain?
    - Associated with walking? Relief with rest? Fever, chills
- Bones
  - Bone or back pain
    - Is pain affected by movement? Location, radiating pain, numbness & tingling, limping
  - Hx accidents or trauma

# Subjective Data

- Functional assessment (ADL)
  - Do joint (muscle, bone) problems limit ADLs?
    - Bathing, Toileting, Dressing, Grooming, Eating, Mobility, Communicating
- Self-care behaviors
  - Heavy lifting, repetitive motion, chronic joint stress
  - Exercise program
  - Medications
    - NSAIDs, muscle relaxants, analgesics
  - If chronic disability, effect on interaction with family, friends, & view of self

# Preparation

- Screening
  - Inspection & palpation of joints integrated with each body region
  - Observation of ROM

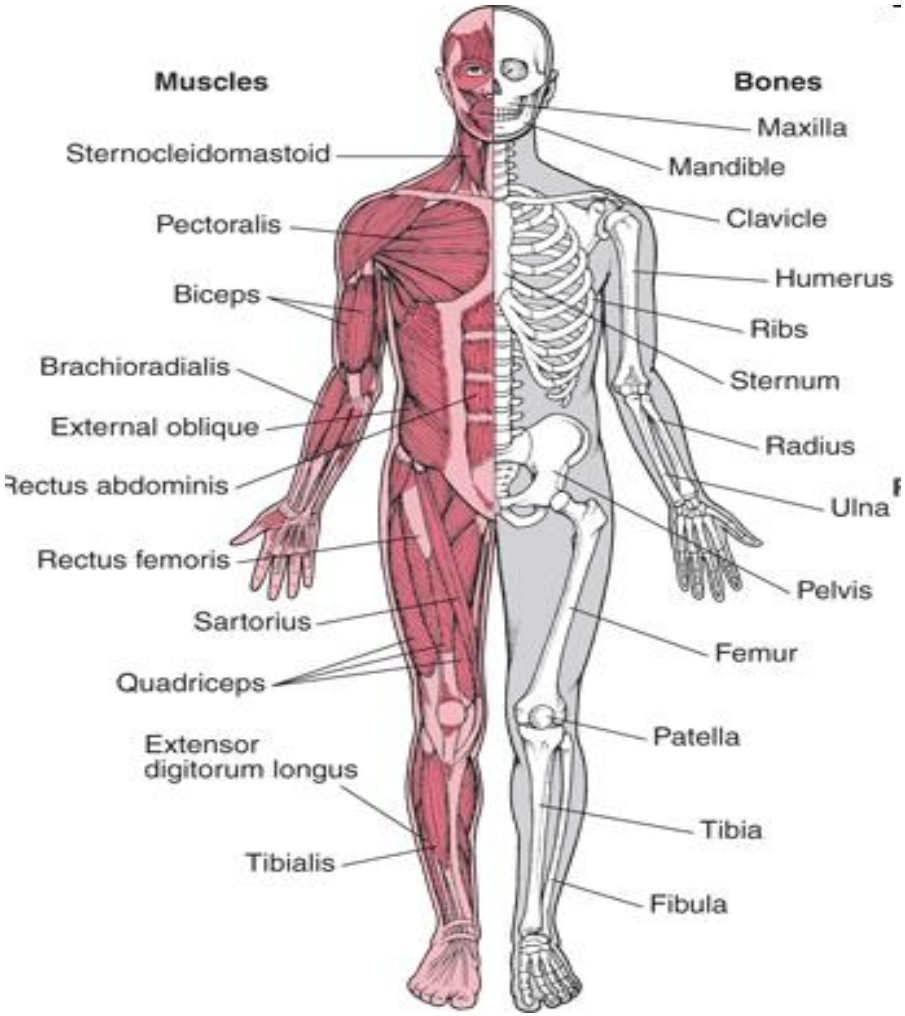
# Preparation

- Make person comfortable
- Drape for full visualization of body part without exposing client
- Orderly approach
  - Head-to-toe
  - Proximal to distal
- Joint to be examined should be supported at rest
- Avoid rough manipulation
  - Use firm support, gentle movement, gentle return to relaxed state
- Compare corresponding paired joints
  - √ symmetry structure & function
  - √ normal parameters for the joint

# Objective Data

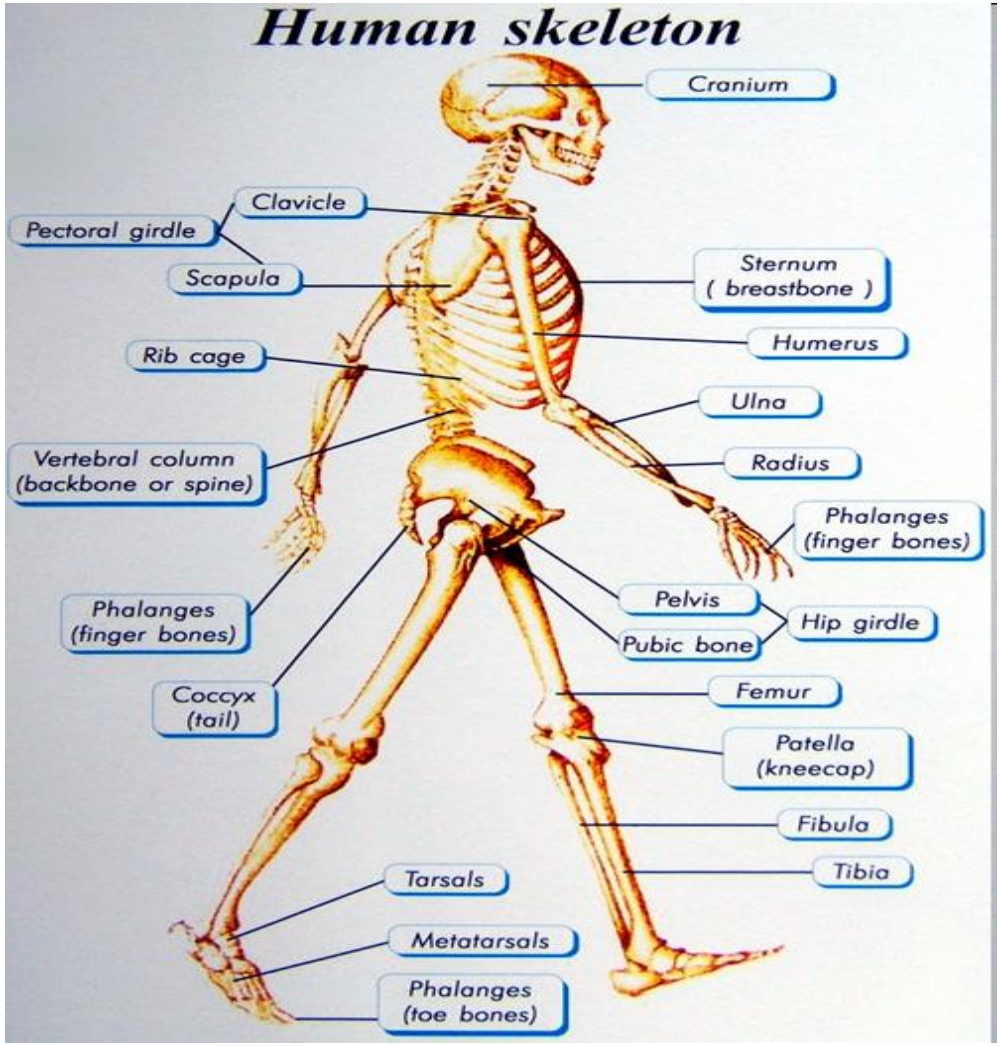
- Inspection
  - Note joint size & contour
  - Inspect skin over joints for color, swelling, masses, or deformity
- Palpation
  - Palpate each joint
    - Skin temperature, muscles, bony articulations, joint capsule
    - Note heat, tenderness, edema,  or masses
    - *Normal:* joints nontender, no swelling
      - *Synovial membrane normally nonpalpable, if thickened → "doughy" or "boggy"*

# Physical Exam




- Inspection
  - Full Rom of all joints
  - Symmetry
    - Alike on both sides
  - Posture
    - Spinal curvatures
  - gait
  - body build
  - muscle configuration
    - Muscle atrophy, asymmetry, strength
  - skin condition

# Palpation




- Skin temperature
- Tenderness
- Swelling
- Crepitation

# Objective Data

- Temporomandibular joint
  - Inspect area anterior to ear while seated
  - Place tips of 1st two fingers in front of ear & drop to depressed area over joint
  - Ask client to perform active ROM
    - Open mouth maximally
    - Partially open mouth
    - Protrude lower jaw & move it side to side
    - *Normal:* smooth motion of mandible, audible click or snap may occur
    - *Abnormal:* swelling, crepitus, pain

# Objective Data

- Temporomandibular joint
  - Assess muscle strength
    - Palpate contracted temporalis & masseter muscles as person clenches teeth
      - Compare (R) & (L) sides
        - Size, firmness, strength
    - Ask person to perform these movements against resistance
      - Move jaw forward & laterally
      - Open mouth

# Temporomandibular Joint

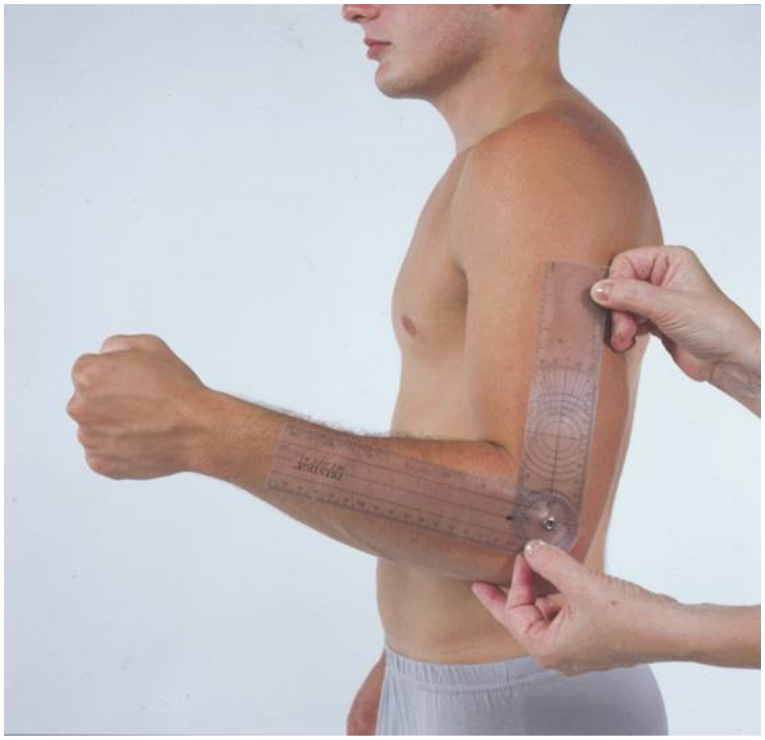


# Objective Data

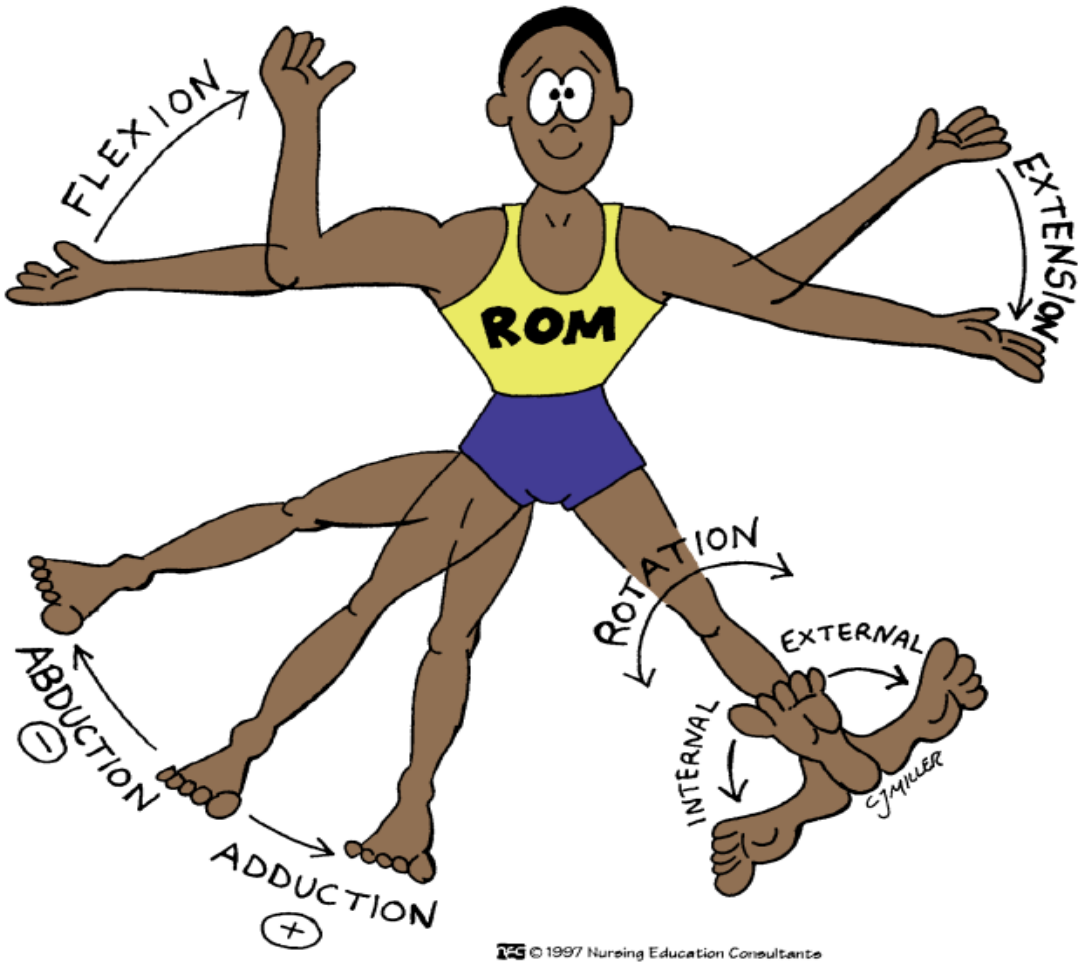
- Range of motion (ROM)
  - Ask for *active ROM* while stabilizing body area proximal to area moved
    - Know joint type & normal ROM
    - *Normal:* no tenderness, pain, or crepitation
      - *Discrete crack during motion normal*
  - If limitation, gently attempt *passive ROM*
    - Anchor joint with 1 hand while other hand slowly moves it to its limit
    - Normal ranges for active & passive ROM should be same

# Goniometer

- used to measure joint angles precisely

# RANGE OF MOTION



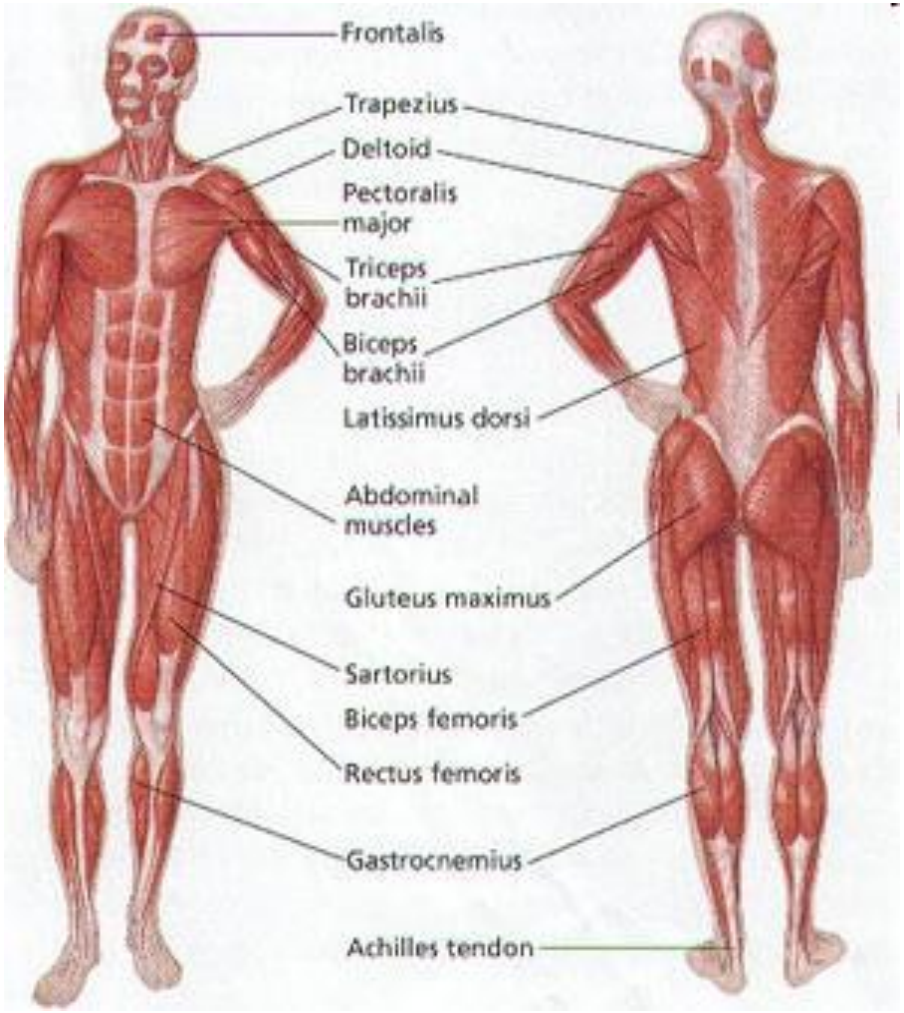
# Review Structure & Function: Skeletal Muscle Movements

- ***Flexion:*** **bending a limb at a joint**
- *Extension:* straightening a limb at a joint
- ***Abduction:*** **moving a limb away from midline**
- *Adduction:* moving a limb toward midline
- ***Pronation:*** **turning forearm so palm is down**
- *Supination:* turning forearm so palm is up
- ***Circumduction:*** **moving arm in a circle around the shoulder**
- *Inversion:* moving sole of foot inward at ankle
- ***Eversion:*** **moving sole of foot**
- *Rotation:* moving head around a central axis
- ***Protraction:*** **moving a body part forward & parallel to the ground**
- *Retraction:* moving a body part backward & parallel to the ground
- ***Elevation:*** **raising a body part**
- *Depression:* lowering a body part

# Objective Data

- Muscle testing
  - Test strength of prime mover muscle groups for each joint
  - Repeat motions elicited for active ROM
    - Ask person to flex & hold as you apply opposing force
    - *Normal:* strength = bilaterally  fully resist your opposing force
    - May use grading system from 0 to 5

# Muscle strength testing




- Resistance to force
- Compare with opposite side
- Muscle strength scale
  - Scale of “5” is the best

# Objective Data

- Cervical spine
  - Inspect head & neck alignment
    - Spine should be straight, head erect
  - Palpate spinous processes, sternomastoid, trapezius, & paravertebral muscles
    - Should be firm, no spasm or tenderness

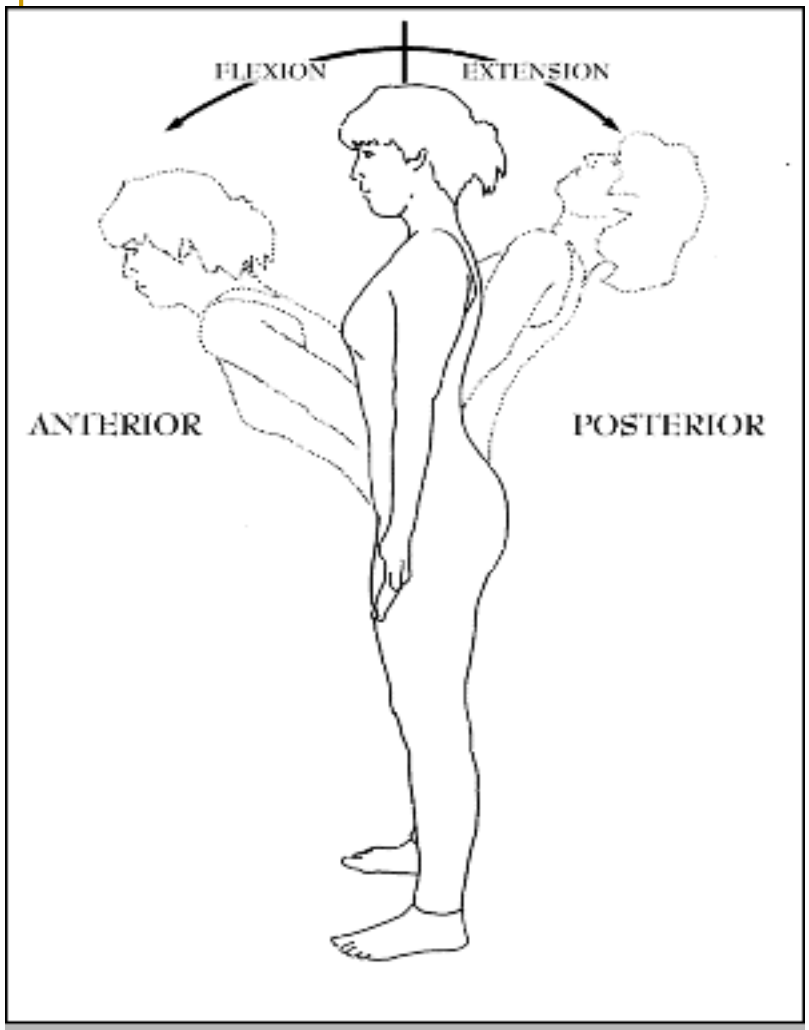



**Figure 2** Flexion and Extension at the Lumbar region from the Neutral anatomical position.

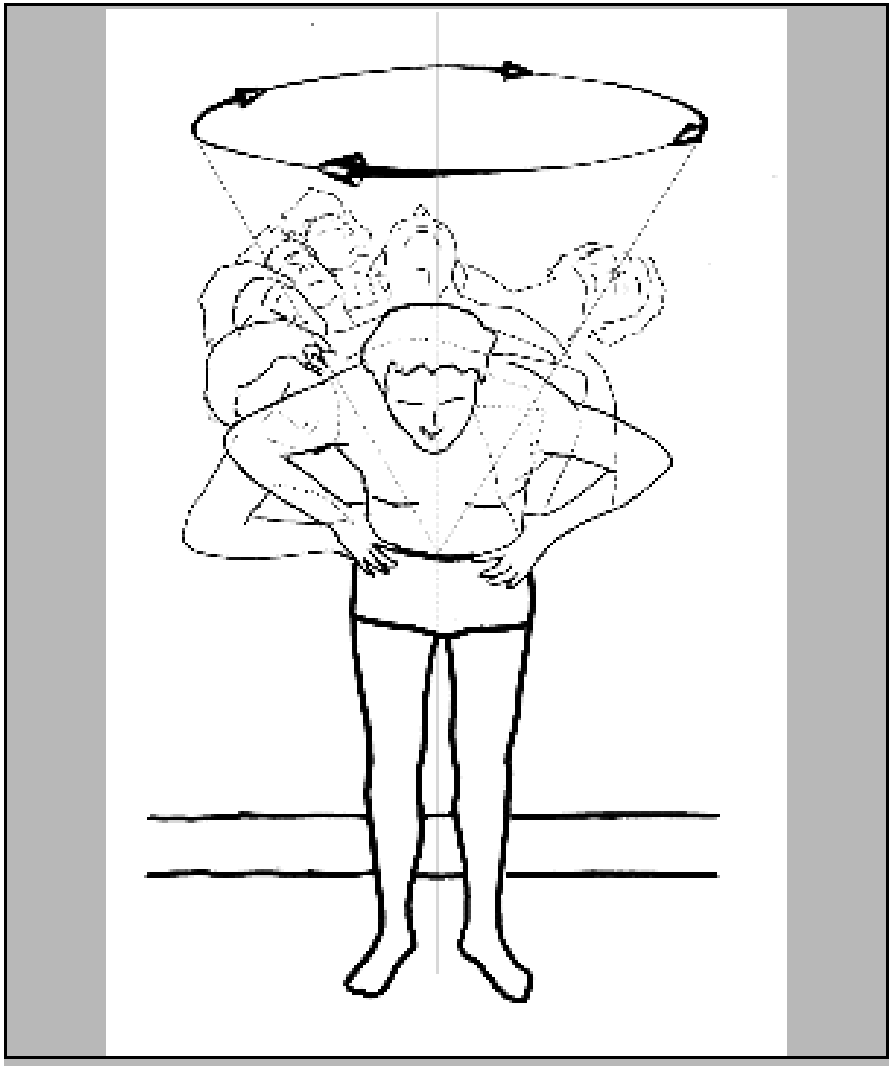
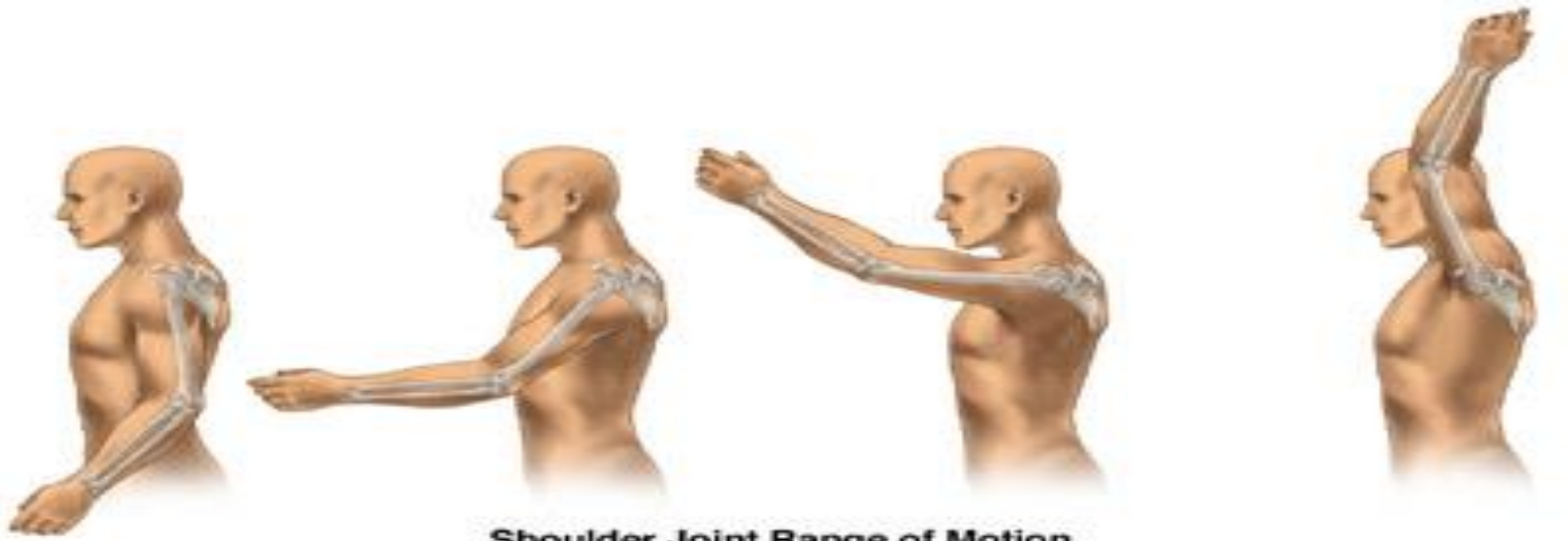


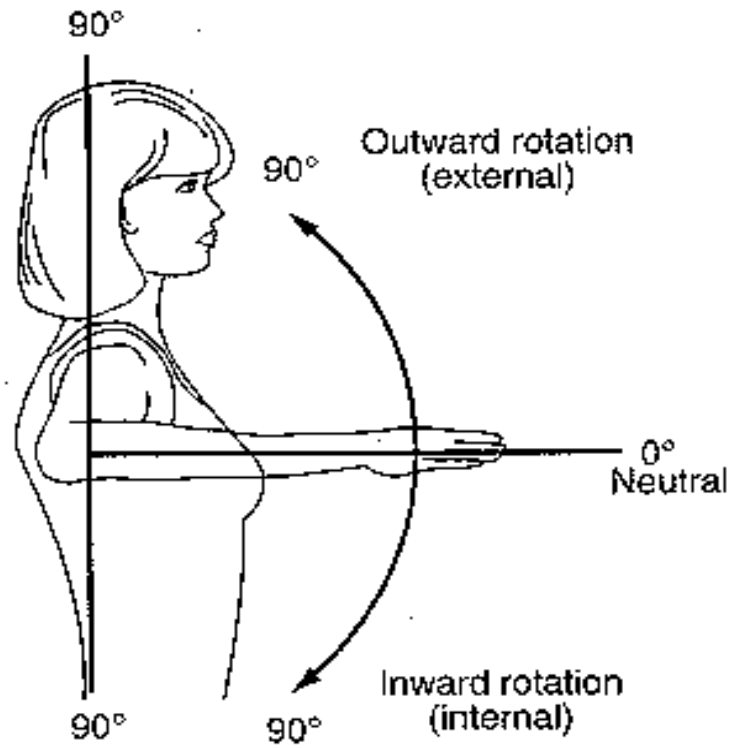
**Figure 3** Circumduction at the Lumbar region.

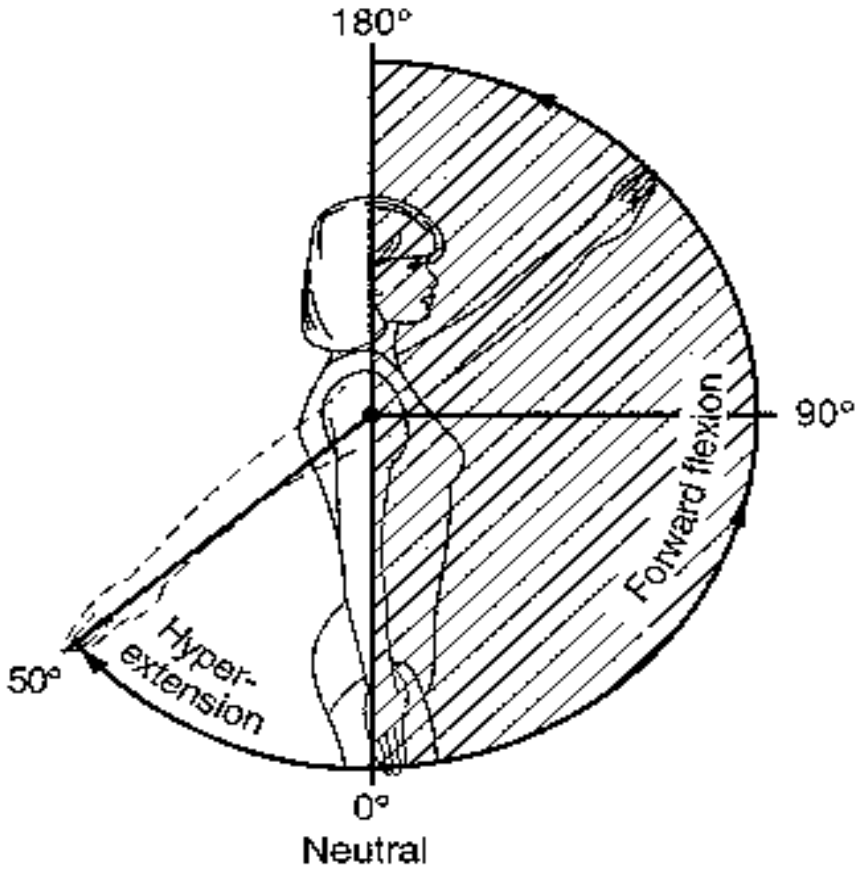


Shoulder Joint Range of Motion

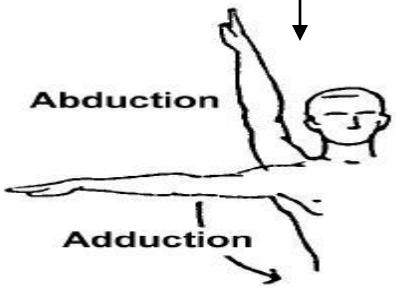

## ROM - Neck

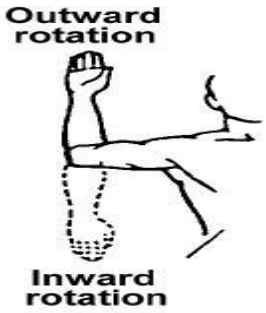
# Medial & Lateral Rotation of the Shoulder

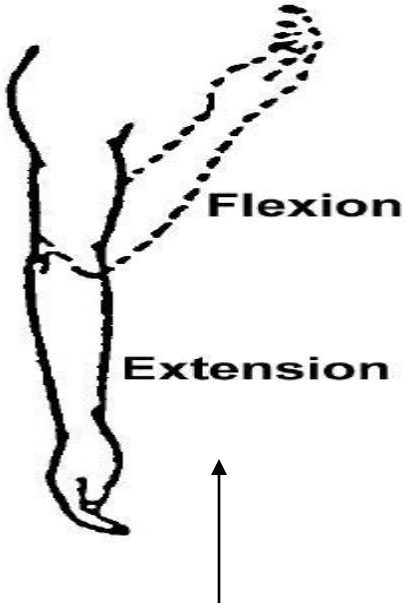


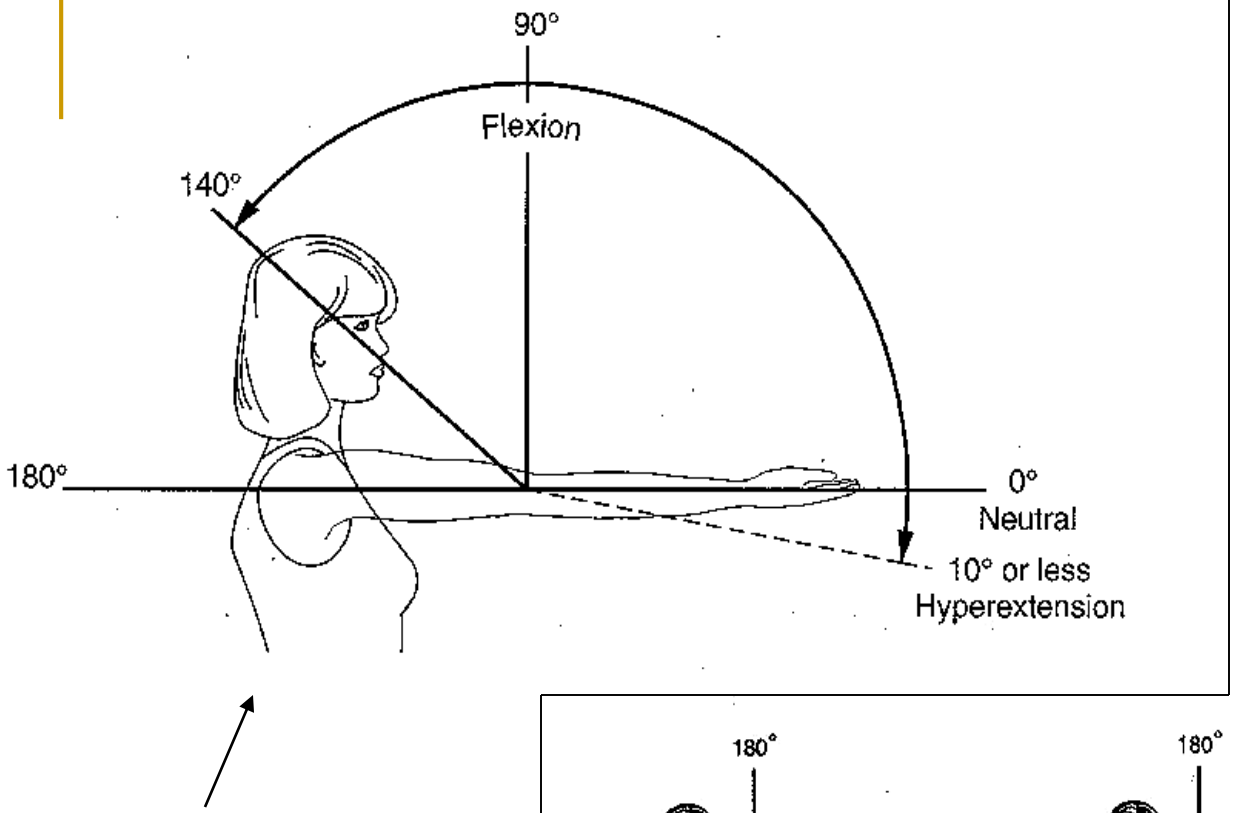
# ROM - Shoulder

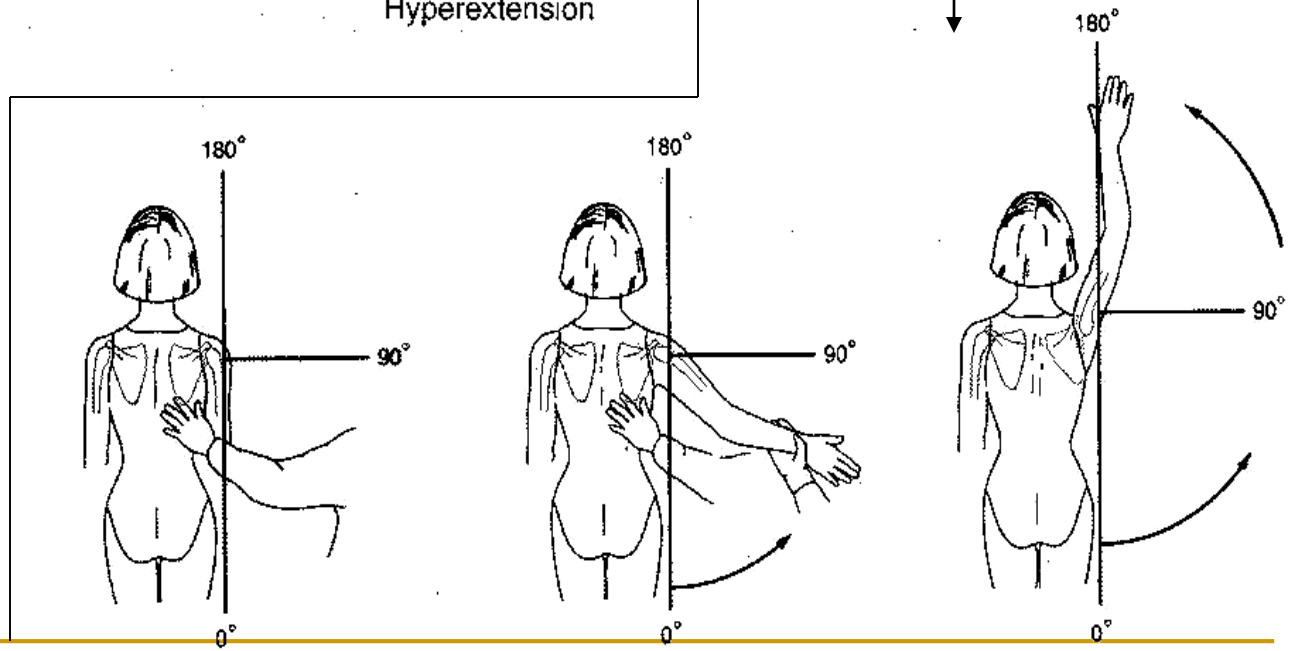




# ROM - Elbow




## Elbow Joint Motions

## Scapula Movements



# ROM - Thumb

Abduction
Adduction
Extension

Opposition to little finger

Flexion

Extension
Flexion

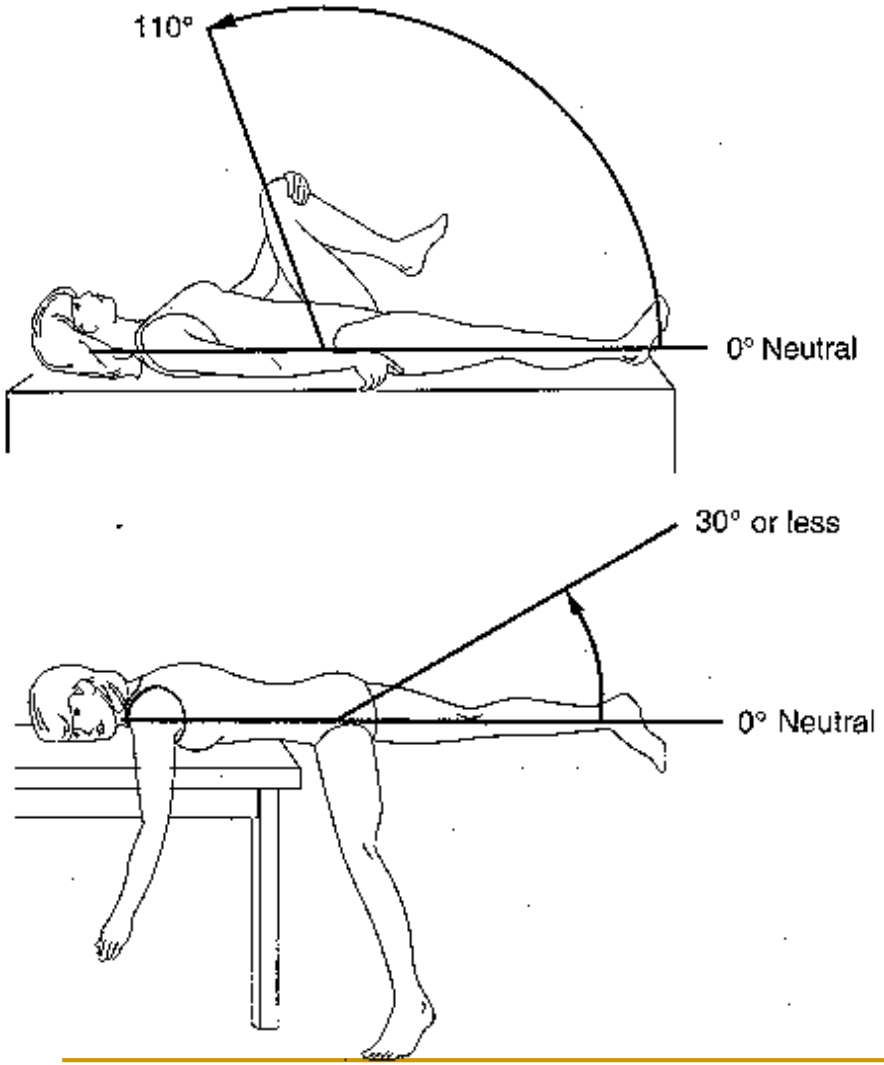
# ROM - Fingers

Abduction

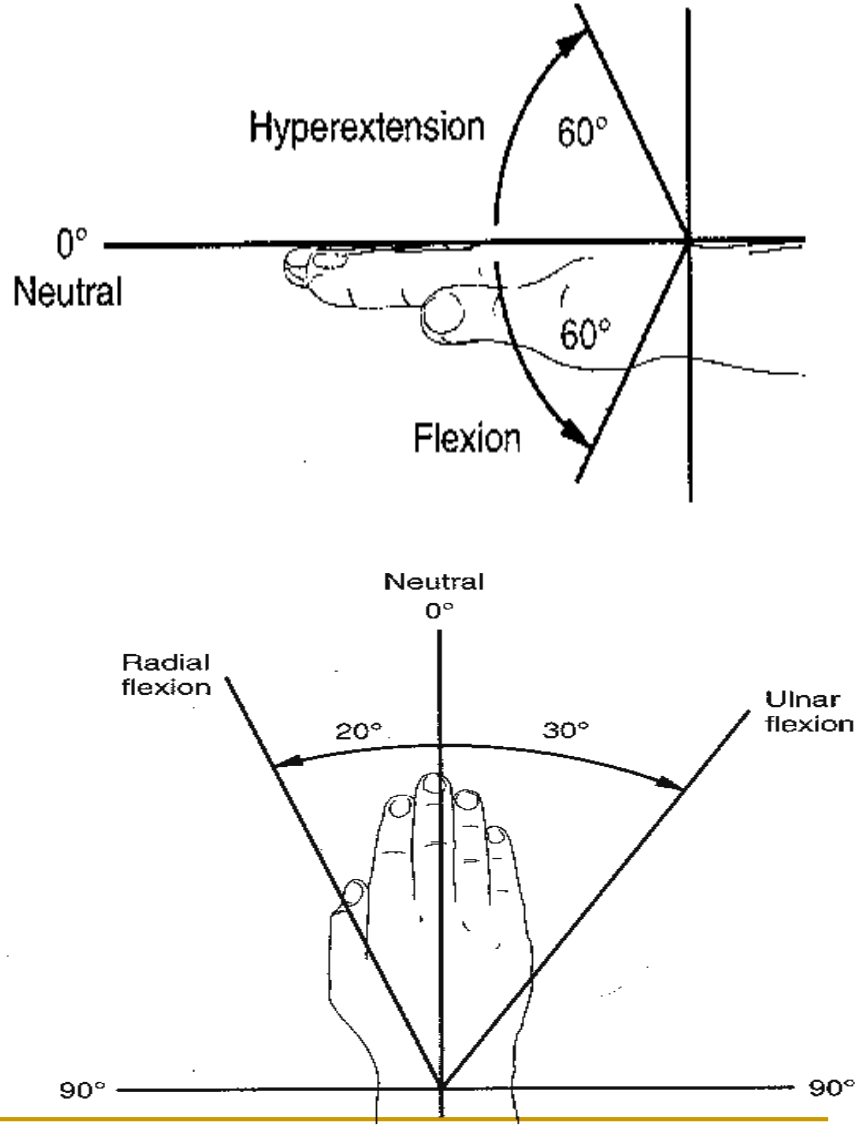
Adduction


# ROM - Hip

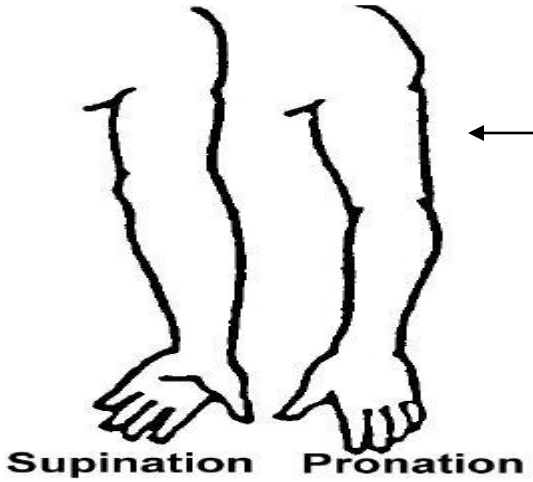
# Hip Join Motions

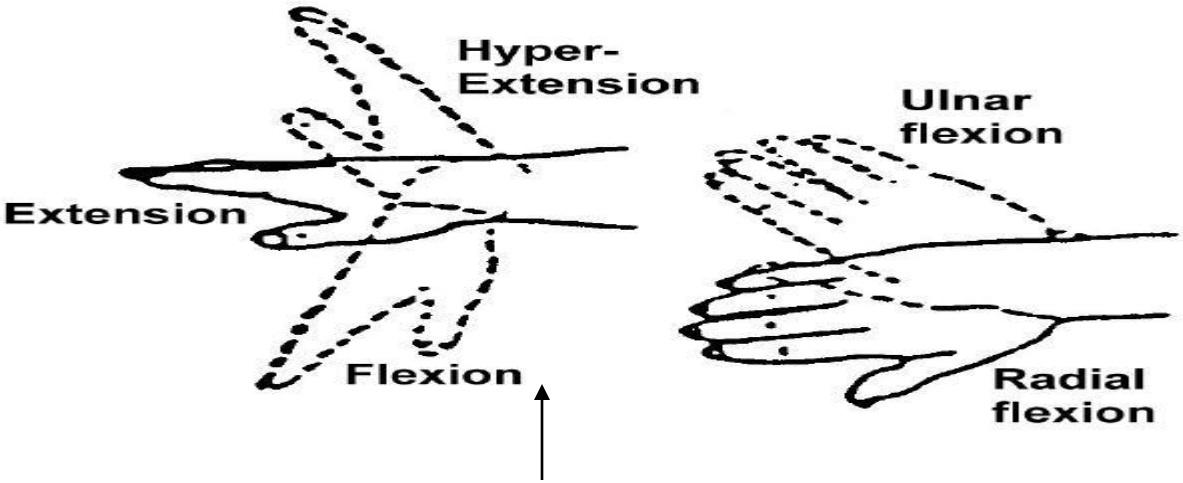



# Wrist Joint Motions



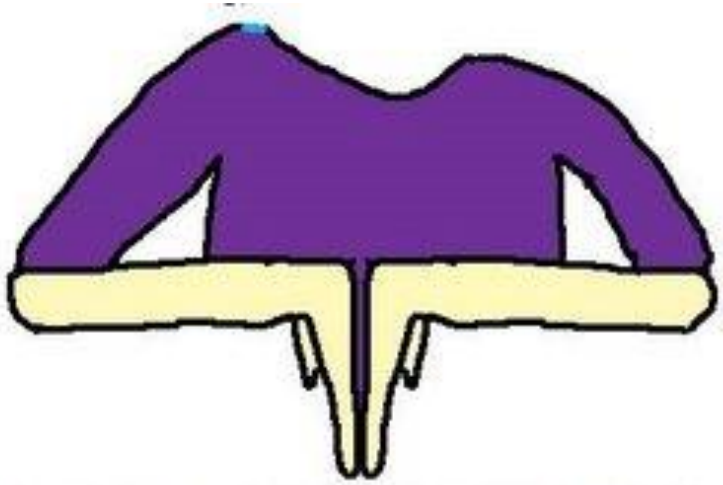
## ROM Forearm




## ROM- Wrist

# Phalen sign



Phalen's Test - flexed at wrists, hands back to back - left for 1 min, should produce symptoms of tingling or numbness or electrical like pain running along the median nerve sensory distribution.

PHALEN'S SIGN +VE

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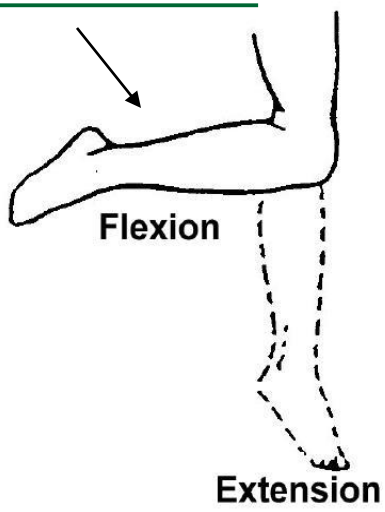
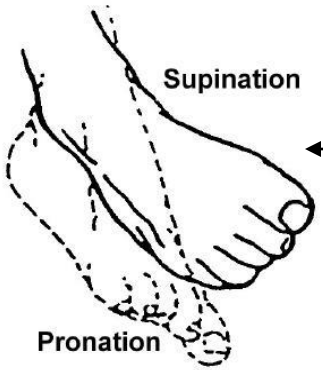
Tinel's Tap Test - Once or twice, ideally once first, to see if the symtoms mentioned above are re-iterated - this is more painful supposedly - and so just one tap is enough if they have a problem, and if they don't, well, one tap, wait, then another, and again another...judge carefully, don't tap constantly. TINEL'S SIGN +ve

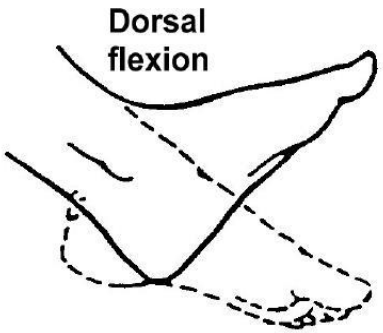
# Tinel's sign

## ROM - Knee

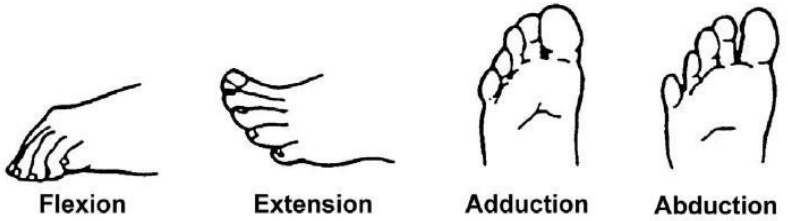



## ROM Foot



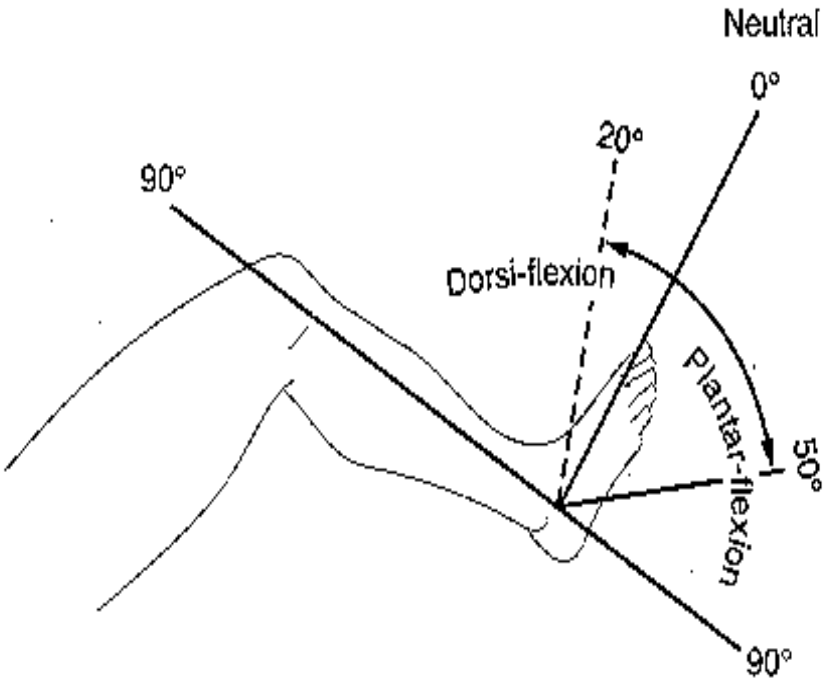




## ROM - Ankle

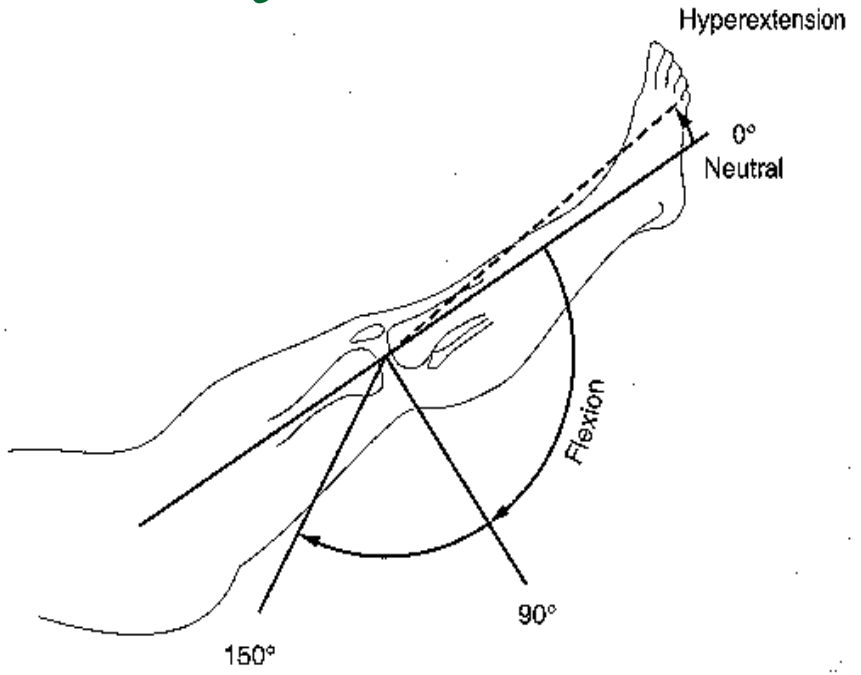



## ROM - Toes

# Ankle Joint Motions



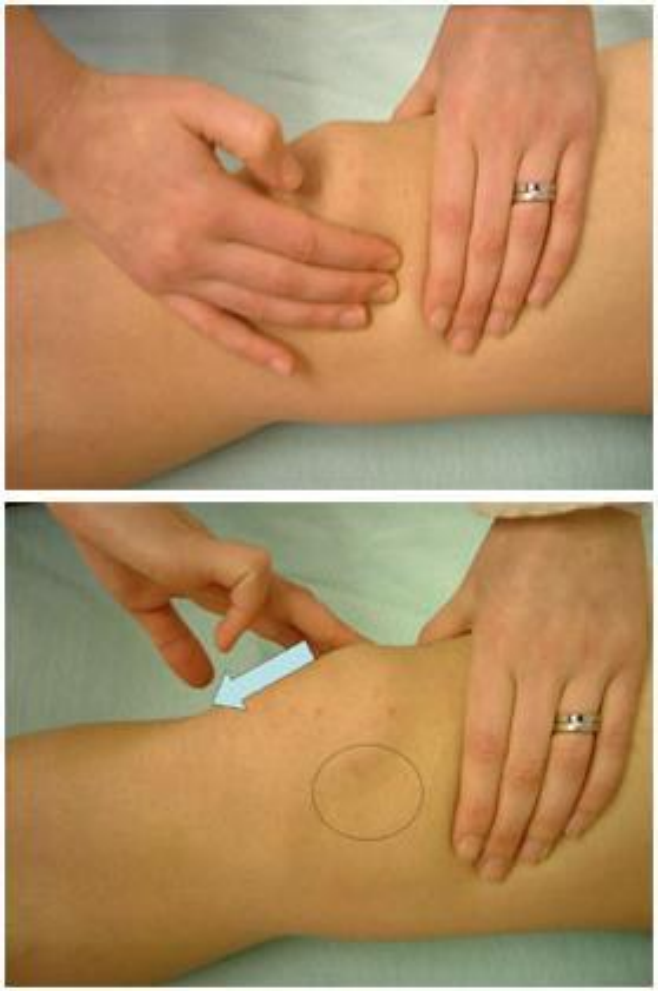

# Knee Joint Motions





A.D.A.M.

# Bulge Sign



# Ballottement Test

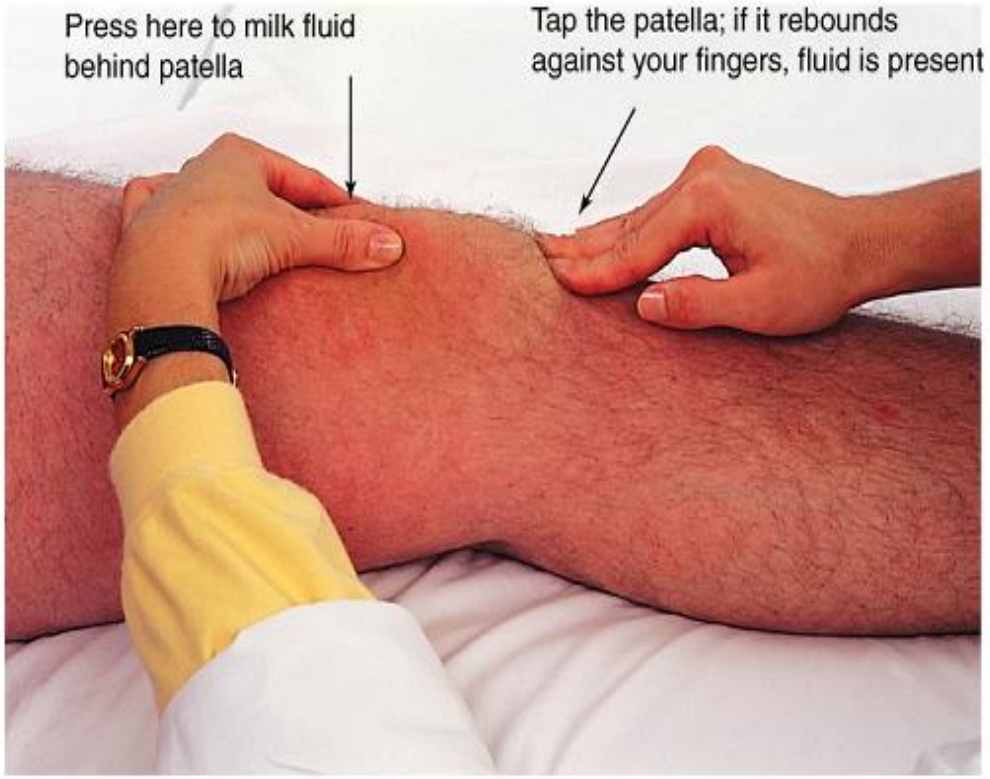
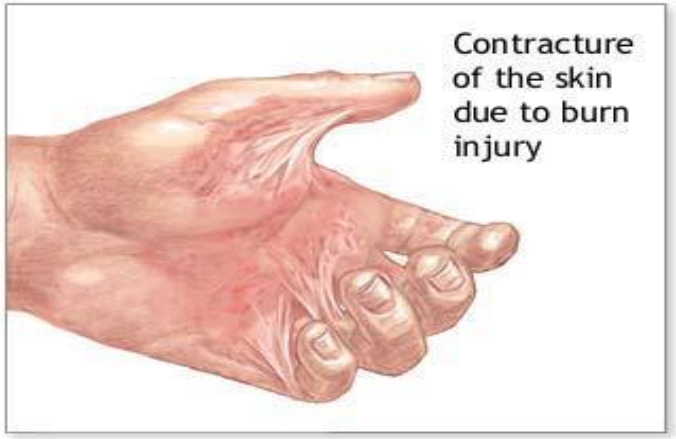


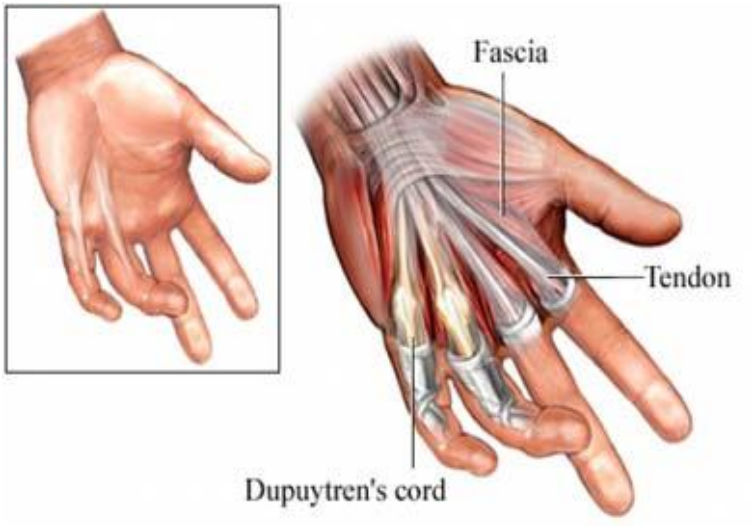

**Figure 66-4a** (A) Technique for ballottement test to detect fluid in the knee (B). Photo from Weber, J. W., & Kelley, J. (2003). Health assessment in nursing (2nd ed.). Philadelphia: Lippincott Williams & Wilkins.

# Common Abnormalities

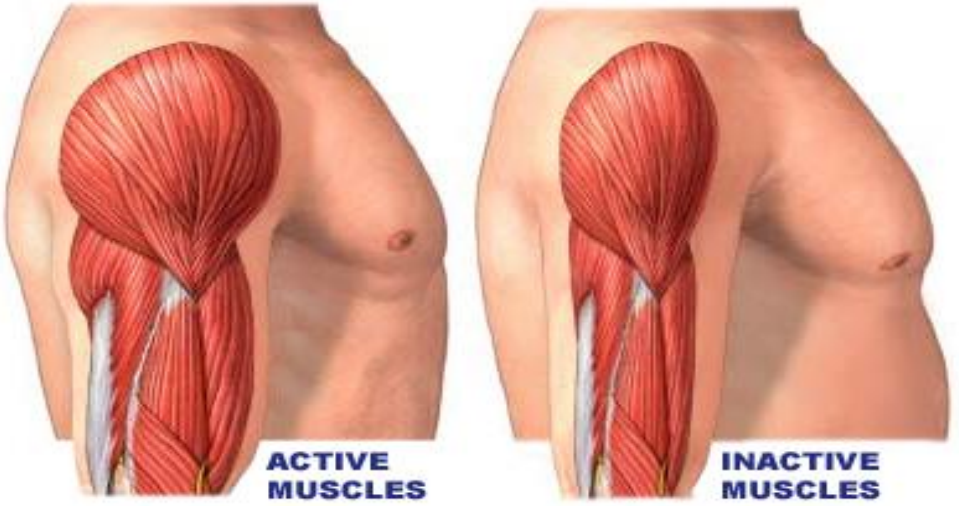
- Ankylosis
  - Scarring within a joint leading to stiffness or fixation
- Atrophy
  - Wasting of the muscle
  - Decrease in size
  - Flabby appearance
  - Decreased function and muscle tone
- Contracture
  - Resistance to movement of muscle or joint, fibrosis of soft tissue

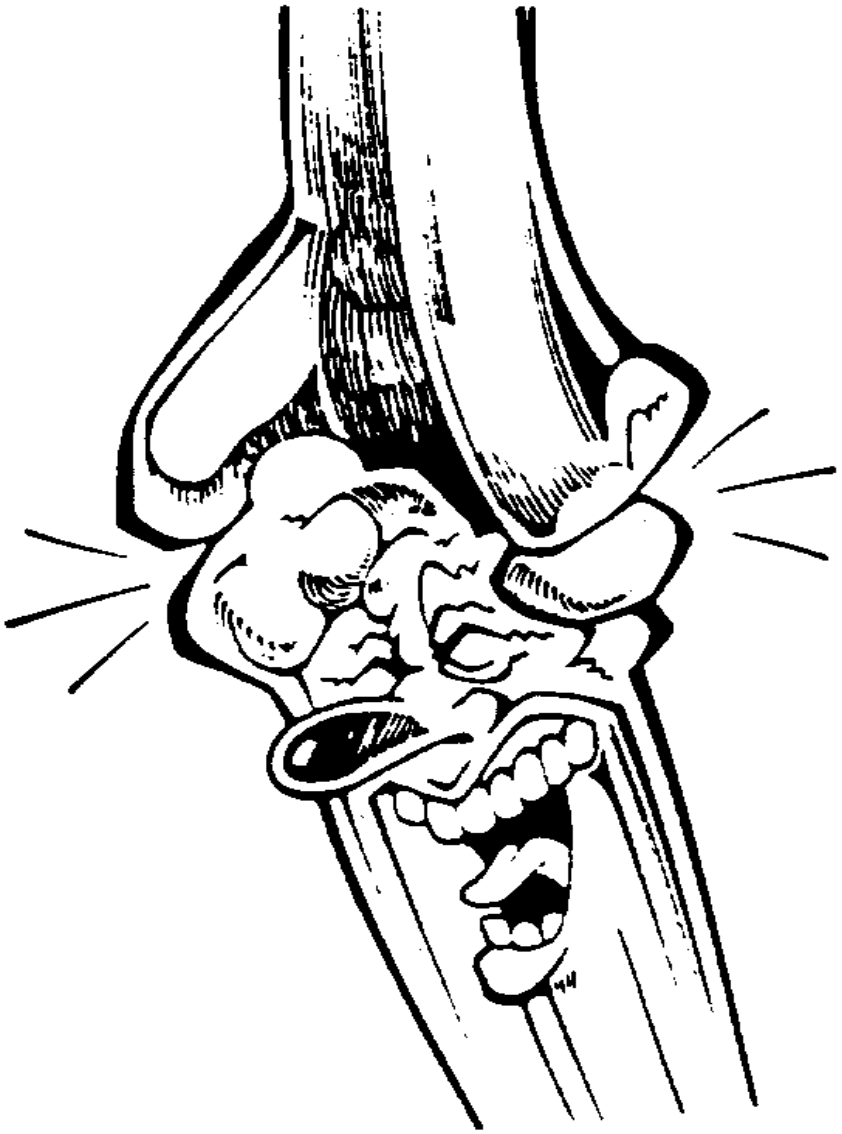
# Contracture




# Atrophy

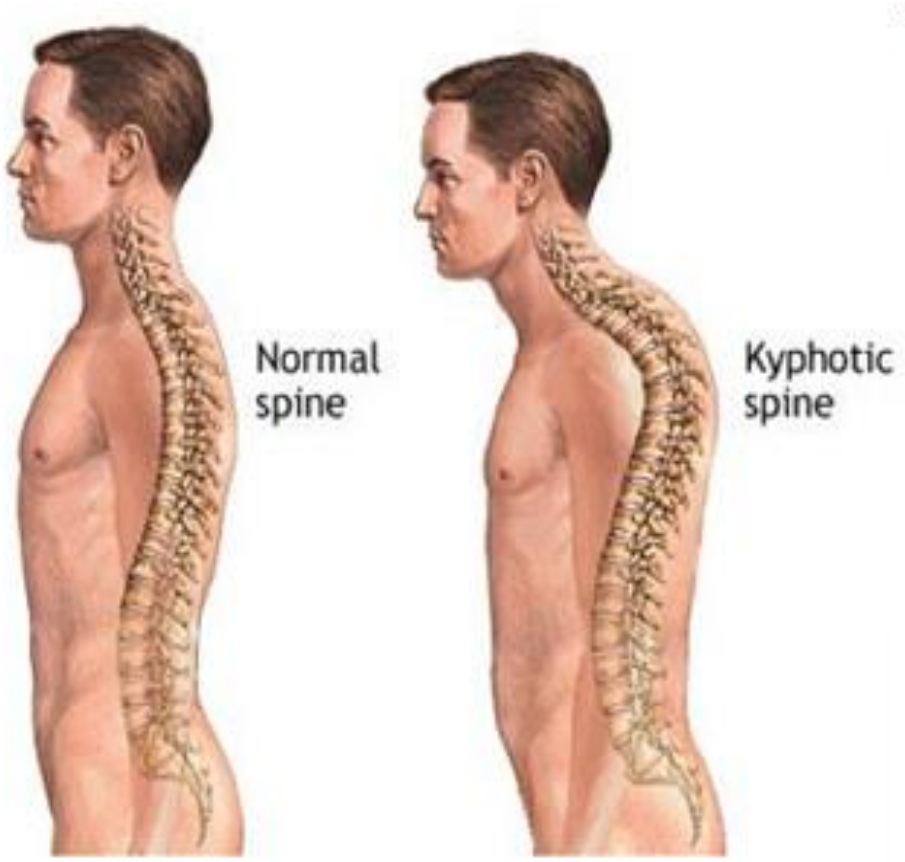




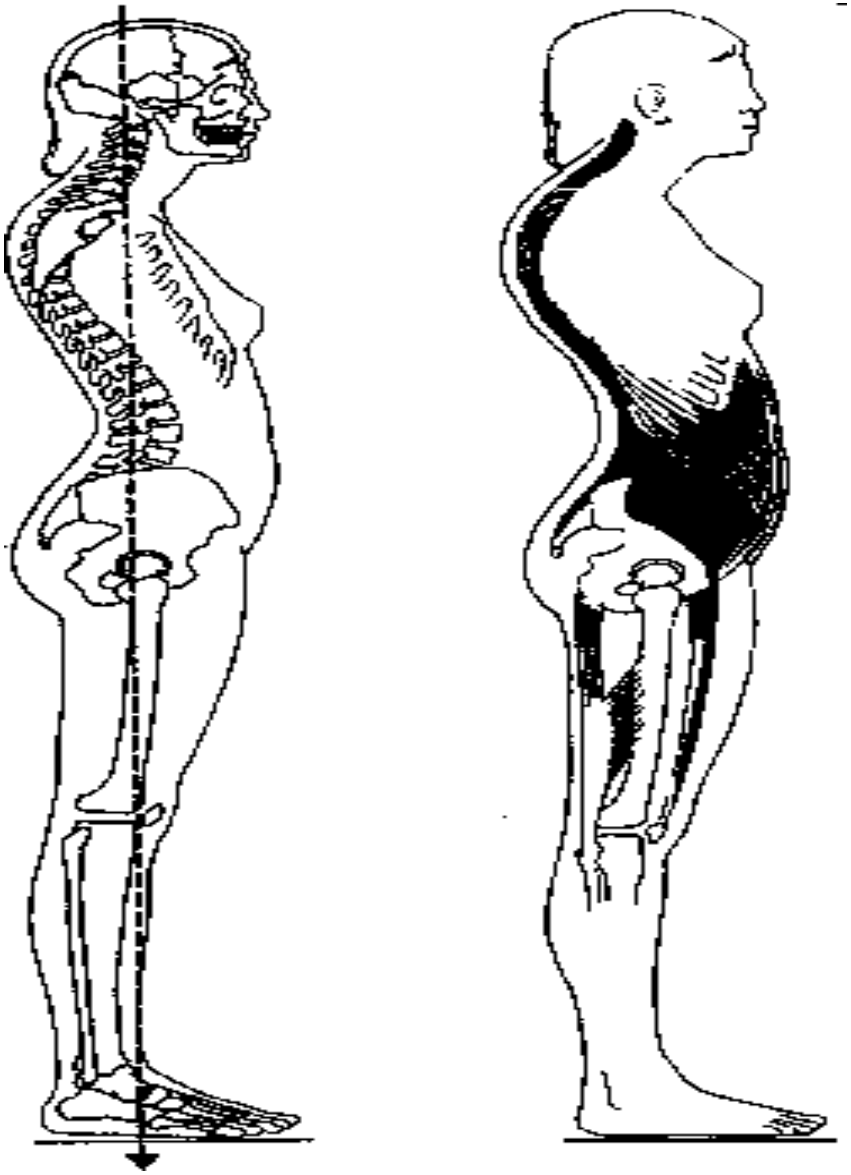
- Crepitus
  - Crackling sound or grating sensation from friction between two bones
- Kyphosis
  - Round back forward bending of spine


Scoliosis

Lateral curvature lf the spine




Kyphosis



- Lordosis
  - Anteriorposterior curvature with concavity in posterior direction

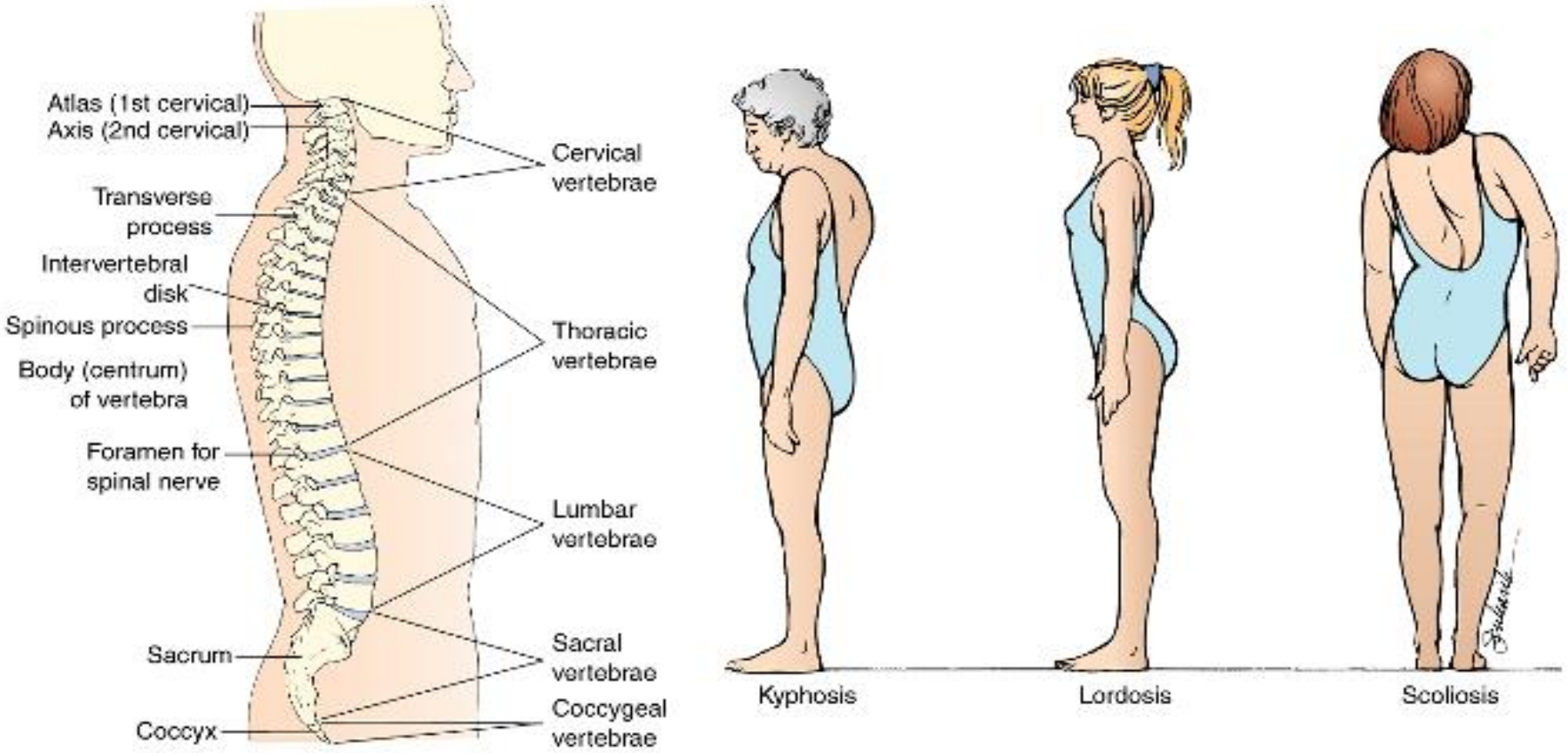



**Figure 66-3** A normal spine and three abnormalities. (A) Kyphosis: an increased convexity or roundness of the spine's thoracic curve. (B) Lordosis: swayback; exaggeration of the lumbar spine curve. (C) Scoliosis: a lateral curvature of the spine.

# Sample Charting

- SD:
  - States no joint pain, stiffness, swelling, or limitation. No muscle pain or weakness. No history of bone trauma or deformity. Able to manage all ADL with no physical limitation. Occupation involves no musculoskeletal risk factors. Exercise pattern is walking 1 mile 5 times a week.
- OD:
  - Joints and muscles symmetric: no swelling, masses, deformity, normal spinal curvature. No tenderness to palpation, no heat, swelling, or masses. Full ROM, movement smooth, no crepitance, no tenderness. Muscle strength – able to maintain flexion against resistance without tenderness.

# Thank you for listening