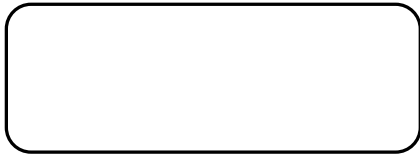


Overview Of Joint Movements



Joints Are Articulations

- One bone articulating with another
- Not all joints are created equally
- Three major categories
- Fibrous, Cartilaginous, and Synovial
- examples

Fibrous Joints

- Examples are synarthroses or joints that do not move
- United by dense, fibrous connective tissue
- E.g., sutures of the skull

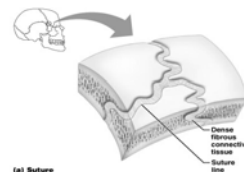
Cartilaginous Joints

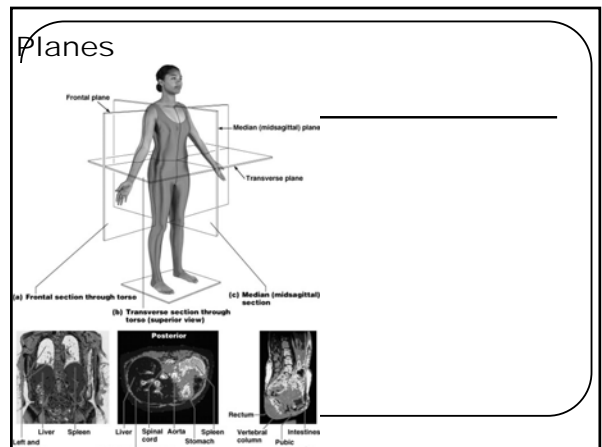
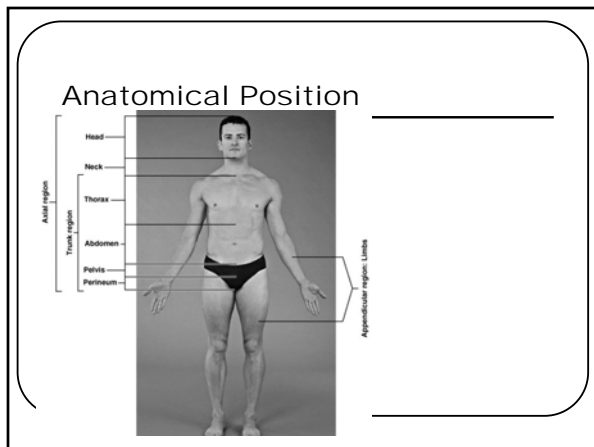
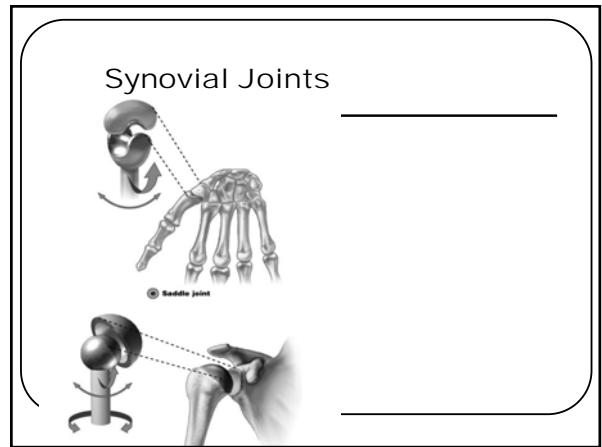
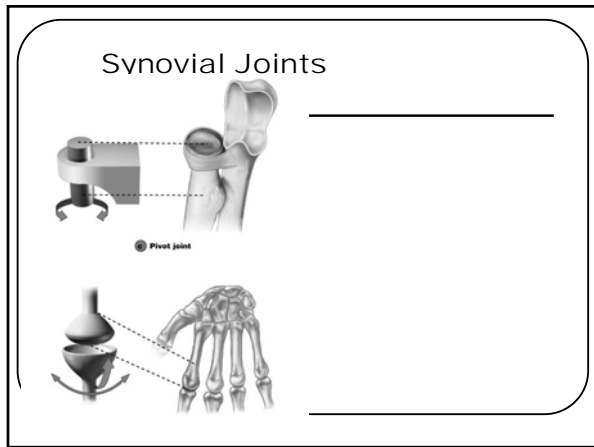
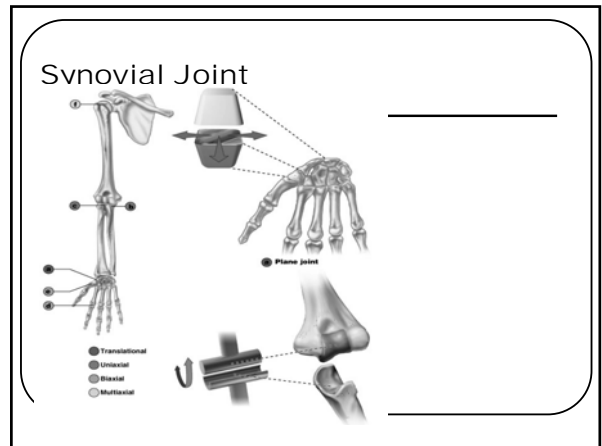
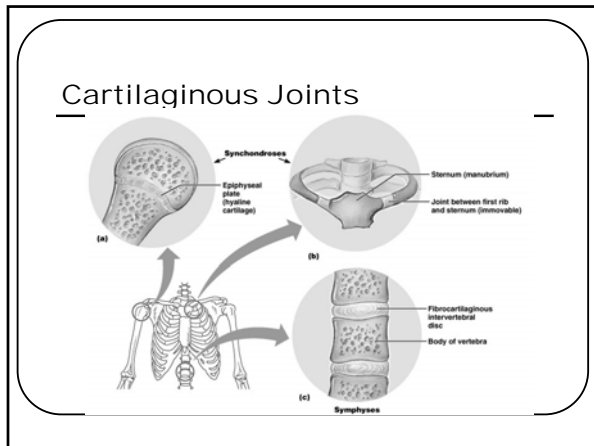
- Amphiarthroses, joints that move slightly
- Characterized by no joint capsule
- Held together by cartilage
- Generally contain a fibrocartilaginous disc
- Motion limited
- E.G., intervertebral discs
- Pubic symphysis

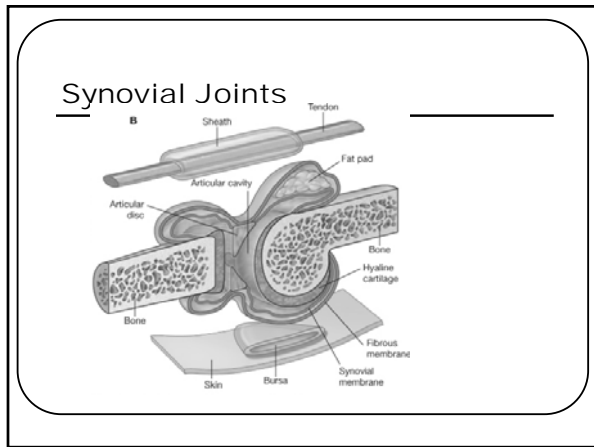
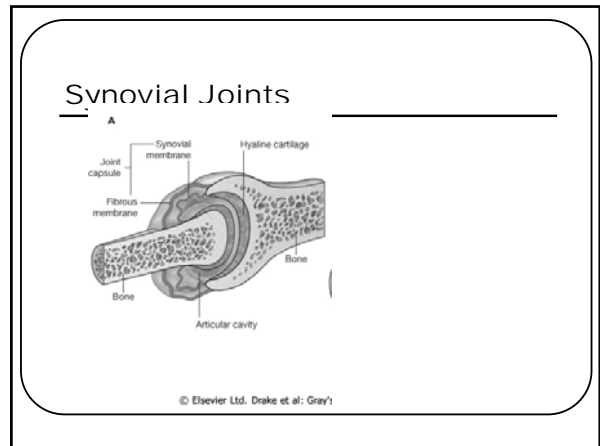
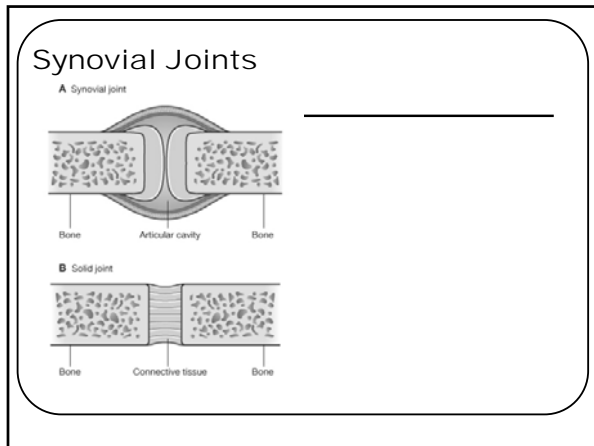
Synovial Joints

- Freely Moveable
- Motion dictated by the shape of the bones in the joint and by supporting soft tissue, e.g., muscle attachments and joint capsules (ligaments)
- Movements are described traditionally by the actual direction the bones move, called Osteokinematic Motion and the axis about which they move

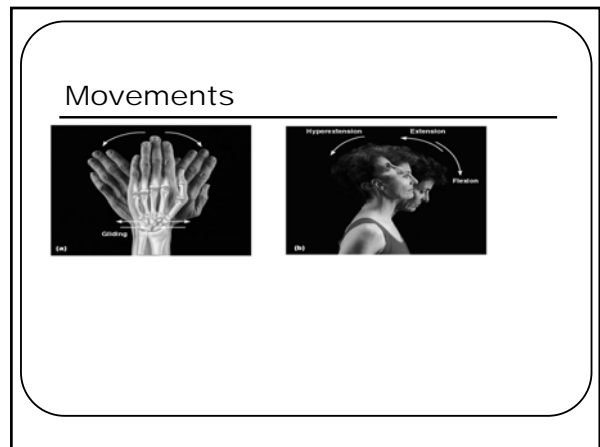
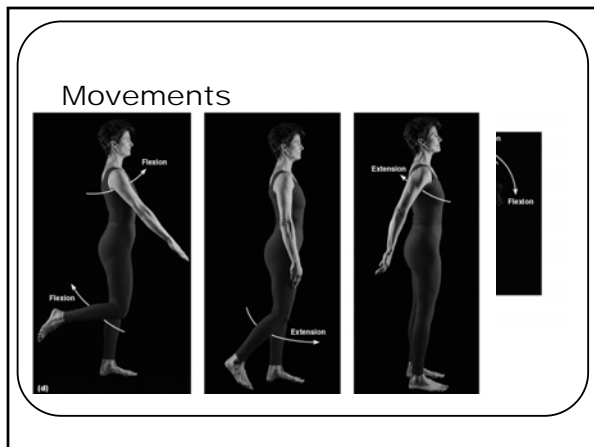
Fibrous Joints



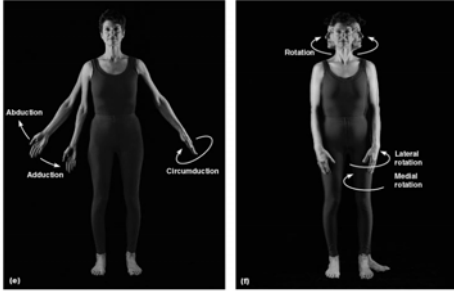




- ### Synovial Joints
- Flexion/Extension = movement in the sagittal plane about a frontal axis
 - Abduction/Adduction = movement in the frontal plane about a sagittal (A-P) axis
 - Internal/External Rotation = movement in the transverse plane about a longitudinal axis
 - Out of True Plane



Movement



Directional Terms

Table 1.1: Orientation and Directional Terms (1 of 3)

Term	Definition	Example
Superior (cranial)	Toward the head end or upper part of a structure or the body; above	The head is superior to the abdomen
Inferior (caudal)	Away from the head end or toward the lower part of a structure or the body; below	The navel is inferior to the chin
Anterior (ventral)*	Toward or at the front of the body; in front of	The breastbone is anterior to the spine
Posterior (dorsal)*	Toward or at the back of the body; behind	The heart is posterior to the breastbone

Directional Terms

Table 1.1: Orientation and Directional Terms (2 of 3)

Term	Definition	Example
Medial	Toward or at the midline of the body; on the inner side of	The heart is medial to the arm
Lateral	Away from the midline of the body; on the outer side of	The arms are lateral to the chest
Intermediate	Between a more medial and a more lateral structure	The collarbone is intermediate between the breastbone and shoulder
Proximal	Closer to the origin of the body part or the point of attachment of a limb to the body trunk	The elbow is proximal to the wrist

Synovial Joints

- Joints that move in one plane are called uniaxial and are said to allow one degree of freedom – i.e., IP joints of fingers, humero-ulnar
- Two plane joints are biaxial with two degrees of freedom – i.e., MP joint in hand
- Three plane joints are multiaxial with three degrees of freedom – i.e., glenohumeral joint

Types of Synovial Joints

- Hinge – uniaxial – 1 degree of freedom – IP
- Condylloid/ellipsoid – 2 DOF – MP, Radiocarpal
- Ball in socket – 3 DOF – glenohumeral, hip
- Gliding or plane – small, 3 DOF – limited ROM but in all directions – a-c joint, intercarpals, facet joints of spine
- Saddle – rare, 3 DOF – carpometacarpal joint of the thumb
- Pivot – 1 DOF – rotation – atlas/axis – superior and inferior radio-ulnar

Directional Terms

Distal	Farther from the origin of a body part or the point of attachment of a limb to the body trunk	The knee is distal to the thigh
Superficial (external)	Toward or at the body surface	The skin is superficial to the skeletal muscles
Deep (internal)	Away from the body surface; more internal	The lungs are deep to the skin

Synovial Joints

- We must consider the movement within the joint itself as it may be different than that of the bone (the **osteokinematic**)
- This type of motion is called **Arthrokinematic**, meaning the motion of the joint
- E.G., the glenohumeral joint – as one flexes or abducts the joint, the head of the humerus will glide inferiorly in the glenoid fossa

Synovial Joints

- All joints that move are technically called rotary as one bone in some way will rotate on another
- The moving bone rotates about an imaginary axis called the joint axis
- The resulting motion of the large bone is the osteokinematic motion we described
- We refer to the linkage of joints as a kinematic chain. When the end of the chain is against an object, the chain is closed
- When it is not opposed by the ground or an object is open
- Example, using the quads to 1) squat or 2) extend in free space

Moving the joints

- Active motion is produced by muscle contractions
- Muscles can move the same joint in a variety of ways depending on what is being stabilized
- Normally, we describe a muscles functions based upon its insertion moving towards the origin when contraction takes place – e.g., elbow flexion
- Muscle can work in reverse if the distal end is fixed. For example, in doing a chin up, the same muscles are working but the forearm is fixed or held steady and the origin of the elbow flexors moves towards insertion – called **Reverse Action**

Moving the joints

- During normal muscle contractions, the muscle fibers shorten during the activity – called concentric
- If a muscle lengthens during the contraction as when you perform a squat, is called eccentric (sometimes called negative)
- Generally, eccentric contractions are antigravity
- Another example – the back muscles when you bend forward

Moving the joints

- Muscles may be uni, bi or multiarticular – depending on how many joints they cross from their origin to insertion
- Remember that if a muscle or its tendon passes over a joint it has to act on it unless somehow stabilized not to do so
- Example, biceps brachii, flexor digitorum superficialis, rectus femoris and so on
- Muscles CAN NOT act maximally over all joints at same time – become insufficient.

End Points

- When a joint, under normal circumstances, can go no further in its motion, it is said to have reached its End Point
- Soft
- Hard
- Pathological