Skeletal System: Articulations
(Chapter 9)

Lecture Materials

for

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Primary Sources for figures and content:


Articulation = joint; site where two or more bones meet
-function: connect bones together but provide mobility in skeleton

**Anatomical/Structural Classification of Joints:**
(based on connecting material)
1. **Fibrous:** bones joined by fibrous CT with no space
2. **Cartilaginous:** bones joined by pad or bridge of cartilage
3. **Synovial:** bones separated by fluid-filled cavity, surrounded by CT

**Physiological/Functional Classification of Joints:**
(based on amount of movement)
1. Synarthrosis: immovable joint
   (fibrous or cartilaginous)
2. Amphiarthrosis: slightly moveable joint
   (fibrous or cartilaginous)
3. Diarthrosis: freely moveable joint
   (always synovial)

Increased mobility = decreased stability
Synarthroses: immovable, strength
1. Synostosis: fused bones
2. Suture: interlocked bones, sealed with dense CT
3. Gomphosis: tooth in alveolar socket, held by peridontal ligament
4. Synchondrosis: hyaline cartilage bridge between bones

Amphiarthroses: slightly moveable, strength with some mobility
1. Syndesmosis: bones connected by ligament ligament = band of dense regular CT
2. Symphysis: bones separated by pad of fibrocartilage
Diarthroses = Synovial Joint: great mobility, less strength and stability

Features (on handout)
Joint Injuries
Sprain - damage to ligament, some collagen torn, slow to heal
Bursitis - inflammation of a bursa due to trauma, infection, or repetitive motion

*synovial joints stabilized by articular capsule and accessory structures to restrict mobility: $\uparrow$mobility = $\downarrow$stability = $\uparrow$chance of dislocation

Luxation = dislocation; joint displacement, usually damages cartilage, ligaments, and capsule, pain receptors in all CT of the joint, except articular cartilage, to prevent actions

Subluxation = partial dislocation; displacement beyond usual anatomical limitation, “double jointed”
Movements at synovial joints

1. Linear movements
   - Gliding: slight movement in any direction

2. Angular movements: one plane of motion
   - Flexion: reduce angle in frontal plane
   - Extension: increase angle in frontal plane
   - Hyperextension: extension past anatomical position
   - Abduction: move away from longitudinal axis in sagittal plane
   - Adduction: move toward longitudinal axis in sagittal plane
   - Circumduction: move in loop without rotation

3. Rotational movements: turn on axis
   - Medial rotation: turn in toward body
   - Lateral rotation: turn out away from body
Special and Specific Motion:
- Inversion: turn sole inward
- Eversion: turn sole outward
- Dorsiflexion: lift toes
- Plantar flexion: lift heal
- Opposition: thumb across palm
- Pronation: medial rotation of radius
- Supination: lateral rotation of radius
- Protraction: move anterior
- Retraction: move posterior
- Elevation: move superior
- Depression: move inferior

Ranges of Motion
1. Monaxial: movement in 1 plane
2. Biaxial: movement in 2 planes
3. Triaxial: movement in 3 planes
4. Multiaxial: gliding joints, all directions
Types of Synovial Joints (handout)

1. Gliding/Plane Joint: flat surfaces, slide in any direction

2. Hinge Joint: cylindrical projection in trough-shaped surface

3. Pivot Joint: round projection in ring shaped depression
4. Ellipsoidal joint: oval facet in oval depression

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<th>Types of Synovial Joints</th>
<th>Movement</th>
<th>Examples</th>
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<td>Ellipsoidal joint</td>
<td>Biaxial</td>
<td>• Radiocarpal joint</td>
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<td></td>
<td></td>
<td>• Metacarpophalangeal joints 2-5</td>
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<tr>
<td></td>
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<td>• Metatarsophalangeal joints</td>
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5. Saddle joint: concave surface into convex surface

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<th>Saddle joint</th>
<th>Movement</th>
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<tr>
<td></td>
<td>Biaxial</td>
<td>• First carpometacarpal joint</td>
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6. Ball and socket joint: spherical head into cup-like socket

<table>
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<th>Ball-and-socket joint</th>
<th>Triaxial</th>
<th>• Shoulder joint</th>
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<tr>
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<td>• Hip joint</td>
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Age Related Changes:

**Rheumatism** = pain and stiffness of skeletal system

**Arthritis** = rheumatism of synovial joints, caused by damage to articular cartilage

- **osteoarthritis** = age 60+, cumulative wear and tear erodes cartilage
- **rheumatoid arthritis** = autoimmune attack, chronic inflammation and damage to joint

**Ankylosis** = ossification of the joint due to untreated RA

- **gouty arthritis** = crystals of uric acid from nucleic acid metabolism form in synovial fluid, damage cartilage