Lecture 8
Articulations

Articulation (Joint):

- Arthro & Artic = Joint
- Region where bones interact

AKA: Joint

✓ ALL bones EXCEPT ONE interact in a joint

* Hyoid Bone
• 2 Types of “Bone–Bone” Interaction

1. **Direct** Bone–Bone contact

   - Sacrum

2. **Indirect** Bone–Bone contact
   - Bones separated by:
     a. Cartilage
     b. Fibrous Connective Tissue
     c. Synovial Fluid

**Structural Joint design determines**

1. **Degree** of Joint Motion:
   - Immovable to freely moveable
b. **Type** of Joint Motion
   ✯ *ie: Rotation, flexion, gliding*

   ![Diagram of joint types]

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c. **Degree** of Joint Stability
   → **Anatomical Relationship.**
      ✯ *Joint Mobility & Stability are inversely related*

   ![Diagram of anatomical relationship]

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**Joint Classification (2 Types):**

1. **Structural:** “*How is the joint built?*
   • Defined by: Material present between the bones

2. **Functional:** “*How does the joint move?*
   • Defined by: Degree of Motion
**Joint Classification (2 Types):**

![Diagram of joint classifications]

- **Structural:**
  - **fibrous**
  - **cartilaginous**
  - **synovial**

- **Functional:**
  - **synarthroses**
  - **amphiartroses**
  - **diarthroses**

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**Structural Classifications**

**a. Bony Fusion:** Osseous tissue grows together

- **Space between bones:** NONE

  - Complete fusion
    - Frontal bone

- **Degree of motion:** NONE

  - NO Motion = Very Stable

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**b. Fibrous Joint:** Fibrous connective tissue joins bones

- **Space between bones:**
  - Filled Dense Irregular CT Proper

- **Degree of motion:** Immovable to moveable

  - NO mobility = Stable; Little Mobility = Moderately stable
c. **Cartilaginous Joint**: Cartilage joins bones
   - **Space between bones**: Filled with cartilage
   - **Degree of motion**: Immovable to *Slightly* moveable
     - Little mobility = Moderately Stable

   ![Cartilaginous Joint Diagram]

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d. **Synovial Joint**: Joint space between bones
   - **Space between bones**: Filled w/ synovial fluid
     - **Joint Cavity**
   - **Degree of motion**: HIGHLY MOVEABLE
     - HIGH degree of mobility = Low stability

   ![Synovial Joint Diagram]

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2. **Functional Classification**:

   a. **Synarthrosis**:
      
      *syn* = “together”  
      *arthr* = “joint”
      
      - **Mobility**: None
      - **Structural Classification**:
        1. **Fibrous** (Cranial Sutures)
        2. **Cartilaginous** (Epiphyseal Plate)
        3. **Bony Fusion** (Sacrum)
b. Amphiarthrosis:
   *amphi* = “both sides”
   - Mobility: *Slightly Movable*
   - Structural Classifications:
     a. Fibrous
     b. Cartilaginous

Tibia & fibula

Vertebrae

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c. Diarthrosis:
   *dia* = “through”
   - Mobility: *Highly Movable*
   - Structural Classification:
     ✯ ONLY – Synovial Joints

Hip Joint

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Joint Motions
1. Linear Motion: Gliding

* One plane of motion

2. Angular Motion:

* Changes in longitudinal position
  a. Flexion/Extension: Sagittal Plane
     ~ Flexion: “Bending”
        Decreasing angle between bones
     ~ Extension: “Straightening”
        Increasing angle between bones

~ Hyperextension: Extension beyond Standard anatomical position
   NOT abnormal

Flexion, extension, Hyperextension
b. Abduction/ADDuction: Frontal Plane

- Abduction: Movement away from midline
- ADDuction: Movement toward midline

c. Circumduction: Combination of Flexion/Extension & Abduction / ADDuction

3. Rotation: Spin (Pivot) along longitudinal axis
   a. Medial Rotation:
      Anterior surface rotates toward midline
   b. Lateral Rotation:
      Anterior surface rotates away from midline
1. **Elevation & Depression**: Superior & inferior bone movement

2. **Protraction & Retraction**: Anterior & posterior bone movement

3. **Inversion & Eversion**: “Used for Feet”
   - **Inversion**: Inward rotation of foot
   - **Eversion**: Outward rotation of foot

4. **Pronation & Supination**: Forearm, Foot, body
   - **Body Position**:
     - **Supine**: Functional surface face up
     - **Prone**: Functional surface face down

  a. **Pronation & Supination**: Forearm
     - **Pronation**: Posterior rotation of hand without moving the shoulder
     - **Supination**: Anterior rotation of hand without moving the shoulder
b. Pronation & Supination: Foot position (not motion)

- **Pronation**: Ankles lean inward / sole of foot faces out
- **Supination**: Ankles lean outward / sole of foot faces inward
Pronated or Supinated foot strike?

Gait Analysis
- Hip to Knee Angle Increased
- Knee More Internally Rotated
- Etc.

Pronated or Supinated foot strike?

Eversion / Inversion: Movement

Ankle Sprains
- Inversion
- Normal
- Eversion

Sprained Medial Ligament
Sprained Lateral Ligament
5. **Dorsiflexion & Plantar Flexion**: Foot
   - **Dorsiflexion**: Upward Movement of foot
   - **Plantar Flexion**: Downward Movement of foot

Classification of Synovial Joints:
- Plane Joint
- Saddle Joint
- Hinge Joint
- Pivot Joint
- Ball-and-Socket Joint
- Ellipsoid Joint

1. **Plane (Gliding) Joint**
   - **Movement**: Linear Motion
     - Sternum & Clavicle, Tarsals, Ribs & Vertebrae, Carpals

(a) Gliding joint
2. Hinge Joint: "Joint Opens and Closes"

- **Movement**: Flexion / Extension

3. Pivot Joint:

- **Movement**: Medial / lateral rotation
  - ∗ Axis & Atlas: Radius & Ulna

4. Ellipsoidal (Condyloid) Joint:

- **Articulating surface**: Rounded surface articulates w/ a depression
- **Movement**:
  - → Flexion / Extension
  - → Adduction / Abduction
  - → Circumduction

  - ∗ Wrist: Radius & Carpels, Phalanges & Metacarpals, Occipital condyles and atlas
5. **Saddle Joint: Thumb**
- **Articulating surface**: Saddle-Shaped
- **Movement**:
  - Flexion / Extension
  - Adduction / Abduction
  - Circumduction

![Carpal & pollex]

6. **Ball & Socket Joint**:
- **Articulating surface**: Round surface & depression
- **Movement**:
  - Flexion / Extension
  - Adduction / Abduction
  - Circumduction
  - Rotation

![Shoulder & Hip]