

SSEH1101: LECTURE NOTES:

Articulations and Movements:

Types of Joints:

- The bones of the human body unite at the joints (form an articulation)
- Joints are categorised according to the amount of movement they permit:
 - ⇒ Synarthroses: no movement
 - ⇒ Amphiarthroses: slightly moveable
 - ⇒ Diarthroses: freely moveable (AKA Synovial Joints)
 - Plane joints-flat bones glide across each other eg. carpal bones of wrist
 - Hinge joints-movements around an axis in a single plane
 - Pivot joints-rotates about its own axis-pronation and supination
 - Condylloid-one part convex and one concave, involved in flexion, extension, adduction and abduction eg. metacarpal meets proximal phalange
 - Saddle-2 hooks-90° rotation to one another, able to flex and extend, eg. trapezium and first metacarpal
 - Ball and socket-circumduction, flexion, extension, adduction and abduction, rotate

Features of Synovial Joints:

- Synovial fluid
- Synovial membrane-produces synovial fluid
- Articular cartilage-lined where surfaces coming together-spreads load
- Joint cavity/capsule-joint completely surrounded-fibrous, continuous with periosteum of both bones-enclosed space (cavity in centre=filled with synovial fluid-produced by synovial membrane-pumps fluid into joint under pressure (eg. swelling of injured knee)-fluid provides lubricant and nutrients for tissues inside capsule
- Bursa-sag of synovial membrane-produces synovial fluid on outside of capsule, allows tendons to glide on bone
- Extracapsular ligament-ability to repair-has bloody supply eg. tibial collateral ligament (broad) and fibular collateral ligament (rounded cord)
- Fat pad-dampening/shock-absorbance, essential fat
- Meniscus-cartilage ring-made of collagen fibres, helps joints to fit together, hold round surface onto flat surface
- Intracapsular ligament-eg. ACL and PCL (cross-over)-rely on synovial fluid for nourishment-no bloody supply-cannot repair themselves

Example-Knee Joint:

Name of ligament based on starting position on tibia (ACL and PCL)-PCL starts posteriorly on tibia but connects anteriorly to femur and ACL starts anteriorly on tibia and connects posteriorly to tibia

Movements of the Body:

- Flexion (decreases angle between 2 segments)/Extension (increased angle between 2 segments)/Hyper-extension
- Dorsi Flexion (flex foot)/ Plantar Flexion (point toes)
- Abduction/ Adduction
- Circumduction-combination of abduction, flexion, adduction and extension-making a circle with hand or leg-no rotation involved
- Rotation
- Medial (inward) rotation and Lateral (outward) rotation
- Pronation (palm down, radius and ulna=crossed over)/ Supination (palm face up, radius and ulna=parallel)-only forearm
- Inversion (ball of foot face inwards (medially)/ Eversion (ball of foot face outwards (laterally))
- Protraction (forward or sideways in particular plane-away from midline)/ Retraction (towards midline)
- Elevation (↑)/ Depression (↓)
- Opposition-bringing thumb to the tips of the other fingers

Describing Movements:

- Eg. flexion of the forearm (or forearm flexion)
- (movement) + (segment)
- Flexion of the forearm (about the elbow) but not flexion of the elbow

Biomechanics of Bone (Bone Remodelling)

Bone Structure:

- The two conflicting roles of bones
 1. Weight support
 2. Yet, lightness in construction
- ⇒ Tubular construction of compact bone in the shaft
- ⇒ Light, cancellous bone at the ends
- ⇒ Efficient arrangement of struts and ties in cancellous bone to minimise weight

General Mechanical Principles:

- Stress-Strain curves/Load-Deformation Curve
- Elastic Region-below yield point-does not compromise therefore can return to original configuration (elastic band)
- Plastic Region-past yield point-tissue compromised therefore when the load is removed=does not return to original configuration (plasticine)
- Failure point