Joint Mechanics

PSK 4U
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Some info…

- Remember: joints are points of contact between two bones aka: articulations.
- Classified according to their structure and their function (type/extent of movement).
- Type of joint determines range and direction of movement.
- There are three structural classifications which each correspond to a functional classification.
Structural Classification

- Fibrous joints: bound tightly by connective tissue, no movement (sutures of skull)
- (Fibro)Cartilaginous joints: body of one bone connects to body of another via cartilage, some movement (intervertebral discs)
- Synovial Joints: most movement, where we will spend the most time
More on fibrous joints

- **Sutures**: bone articulations in the skull
- **Syndemoses**: bones connected by ligaments (tiobiofibular ligament, interosseus membrane in forearm)
- **Gomphoses**: peg-in/socket (only teeth and alveoli in lungs)
More on cartilaginous joints

- Synchondrosis: characterized by hyaline cartilage uniting bones, usually involves growth plates; also: costal cartilage $\rightarrow$ sternum
- Symphyses: fibrocartilage uniting bones (pubic symphysis), intervertebral discs
Synovial Joint Terms you need to know…

- **Articulating cartilage**: you should know this already
- **Joint capsule**: consists of the synovial membrane (allows nutrients to pass through) and fibrous capsule (keeps synovial fluid from leaking)
- **Fluid**: lubricates joint, nourishes cartilage
- **Joint Cavity**: fluid-filled space btw bony articulating surfaces
- **Bursae**: small flattened fluid sacs located at friction points
- **Intrinsic Ligaments**: connective tissue that thickens and reinforces joint capsule
- **Extrinsic Ligaments**: separate from joint capsule, attach bones
Synovial Joint

Accessory structures of complex synovial joints, as seen in a diagrammatic view of a sagittal section of the knee.

- Patella
- Synovial membrane
- Joint capsule
- Joint cavity
- Articular cartilage
- Tendon of the quadriceps muscles
- Femur
- Tibia

**Accessory Structures**
- Bursa
- Fat pad
- Meniscus
- Extracapsular ligament
- Intracapsular ligament
Tendons at joint sites

- Regular (dense) connective tissue
- Work in conjunction with ligaments (and vice-versa)
- Three simple types of connections:
  1. Muscle $\rightarrow$ bone
  2. Muscle $\rightarrow$ muscle
  3. Bone $\rightarrow$ bone (this is our focus here)
Ligaments at joint sites

- Connect two bones at an articulation
- Reinforce joints
- Made of tissue very similar to tendons
Gliding Joints

- AKA Plane or Arthrodial joints: connect flat or minimally curved bone surfaces. Ex: between carpals, between tarsals (below)
Hinge Joints

- The convex articulation of one bone fits into the concave articulation of another.
- Movement is in one plane. Ex: interphalangeal joints, elbow, knee
Pivot (trochoid) Joints

- Allows rotation in one plane, making it “uni-axial”
- The atlantoaxial joint is an example because it allows you to shake your head.
Ellipsoid Joints

- Allow movement in two planes and rotation
- Ex: wrist
- What corresponds in the foot / leg?
Saddle Joints

- Allow movement in two planes but do not allow rotation
- Ex: carpo-metacarpal articulation in the thumb.
Ball and Socket (spheroidal) Joints

- Allows movement around three axes and in three planes
- Hip and shoulder are examples of this type of joint.
What’s next?

- Tomorrow: work on the golden ratio growth and performance lab
- Quiz on Thursday: Anatomy 3 (arm, wrist, hand)
- Smoothie lab: this week? Discuss…