Joints Lecture (Script)

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A **joint** is any point where two bones meet or interact with each other. Joints are also known as articulations. Throughout our lives, the way that bones interact with each other can change. There are 4 major classifications of joints, based on their structure: **bony, fibrous, cartilaginous**, and **synovial**.

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Bony joints occur when 2 bones fuse and become one bone. When describing the range of motion allowed at a bony joint, the term used is **synostosis**, which means no movement occurs between the bones. We see this in the mandible and frontal bones. Both bones start out as two separate bones in infancy, but fuse into one solid bone. As we reach adulthood, the first rib fuses with the sternum, and the epiphyses of long bones fuse with their diaphysis.

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Fibrous joints are bones bound by short collagen fibers. These fibers allow very little movement; this is called a **synarthrosis**.

There are three kinds of fibrous joints:

1. **Suture**: the joint between cranial bones.

2. **Gomphosis**: the joint between a tooth and the mandible or maxilla.

3. **Syndesmosis**: a slightly more movable joint. Its fibers are a little longer, which allows for slight movement. The fibers hold two bones next to each other like with the ulna and radius or the tibia and fibula

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Cartilaginous joints are ones in which the two bones are linked by cartilage. This provides for a moderate amount of movement, which is called **amphiarthrosis**.

There are two types of cartilaginous joints, based on the type of cartilage used:

1. **Synchondrosis**: the bones are bound by **hyaline cartilage**. Examples are the joints in children between the diaphysis and epiphysis and between the 1st rib and sternum.

2. **Symphysis**: the bones are bound by a thick layer of **fibrocartilage**. The pubic symphysis and intervertebral discs are examples.

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Synovial joints are quite common in the body. They involve a fluid-filled cavity that connects the bones. Because of this fluid between them, the joint is freely movable (**diarthrosis**). These joints have a bit more complexity to them.

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Synovial joints have a narrow space between the bones called the **joint cavity**. This space is filled with **synovial fluid** that lubricates the joint and reduces friction. The joint cavity is surrounded by a **joint capsule**; this includes an outer **fibrous capsule** that helps hold the joint together and retain the fluid, and an inner **synovial membrane** that produces the synovial fluid. In addition, each of the facing surfaces of the bones has **articular cartilage** (hyaline) to, again, reduce friction should the bones contact each other.

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Some other structures often related to synovial joints include:

Tendons: rope-like structures that attach muscles to bones

Ligaments: rope-like structures that attach bones to other bones

Bursa: fibrous sacs filled with synovial fluid that cushion bones and allow tendons to slide more easily over bones

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Two other structures that can occur at a synovial joint are:

1. **Articular disc**: fibrocartilage that extends across the joint cavity to create sectioned areas of the synovial fluid for a greater variety of movement. Examples include the temporomandibular joint, the ends of the clavicles, and the joints between the ulna and carpals.
2. **Meniscus**- fibrocartilage pad that covers parts of the tibia in the knee joint to absorb extra force.

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Depending on their structure, synovial joints can operate in a variety of axes or planes:

Multiaxial- the joint can move in three axes or planes

Biaxial- the joint can move in two axes or planes

Monaxial- the joint can move in one axis or plane

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Synovial joints come in 6 forms:

1. **Ball-and-socket joints** are multiaxial. Examples: hip and shoulder

2. **Condylar joints** are biaxial. Example: between the metacarpals and phalanges

3. **Saddle joints** are biaxial. Example: between the trapezoid and first metacarpal of the thumb

4. **Plane joints** are biaxial. Examples: between the carpals and between the tarsals

5. **Hinge joints** are monaxial. Examples: elbow and knee

6. **Pivot joints** are monaxial. Example: head of the radius with the ulna