

# Anatomy

## Lecture 6

### Joints

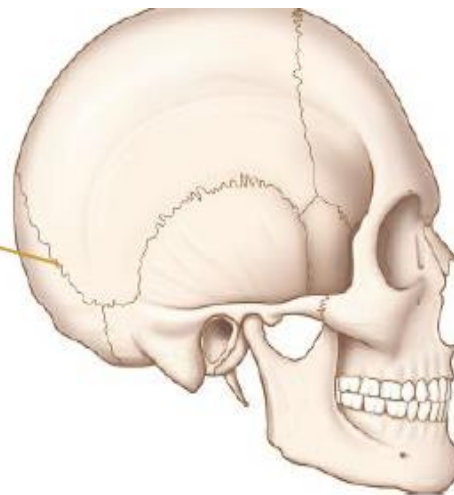
Joints—also called **articulations**—are points where bones meet. Some joints are completely immovable; others allow only limited movement. Most joints, however, permit considerable movement. Through the interaction of multiple interconnecting parts, these incredible structures allow the body to walk, run, dance, throw a ball, and even type on a computer.

Joints may be classified according to how movable they are: fixed, semi-movable, or freely movable. They may also be classified according to the material that binds them together. For example, fixed joints are bound by fibers and are called fibrous joints; semi-movable joints are joined by cartilage and are called cartilaginous joints; freely movable joints contain a fluid-filled joint capsule and are called synovial joints.

#### Fibrous Joints

**Fibrous joints**—also called **synarthroses**—result when collagen fibers from one bone penetrate the adjacent bone, anchoring the bones in place.

The adult skull's suture joints are fibrous joints: once growth is complete, the bones of the skull knit together securely, offering protection to the brain.



#### Cartilaginous Joints

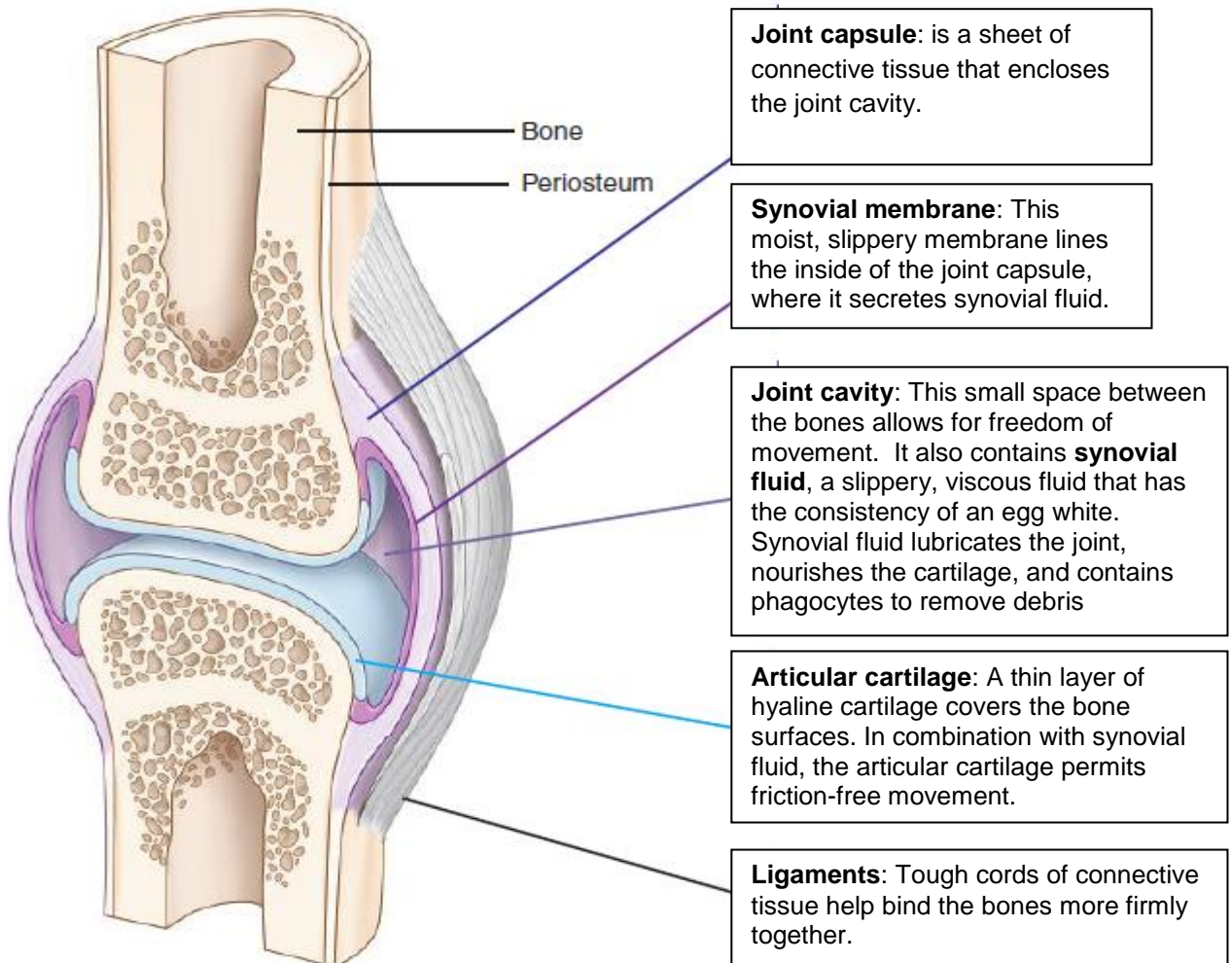
In **cartilaginous joints**, two bones are joined by cartilage. These joints—called **amphiarthroses**—are slightly movable.

Fibrocartilaginous pads (called intervertebral discs) reside between each vertebrae, making the vertebrae of the spine cartilaginous joints. These pads of cartilage absorb shock and allow for limited movement.



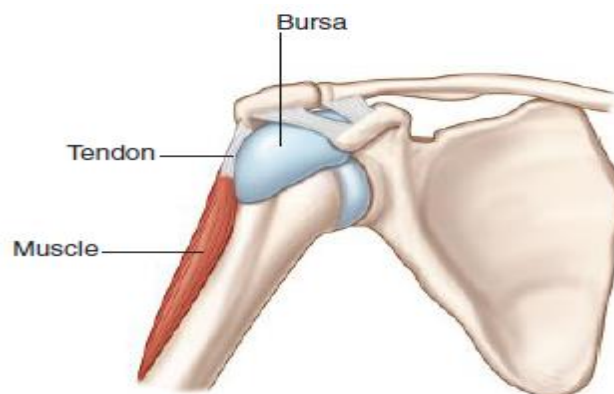
## Synovial Joints

**Synovial joints**—also called **diarthroses**—are freely movable. They're also the most numerous and versatile of all the body's joints. Every synovial joint contains the following structures:



### *Bursae in Synovial Joints*

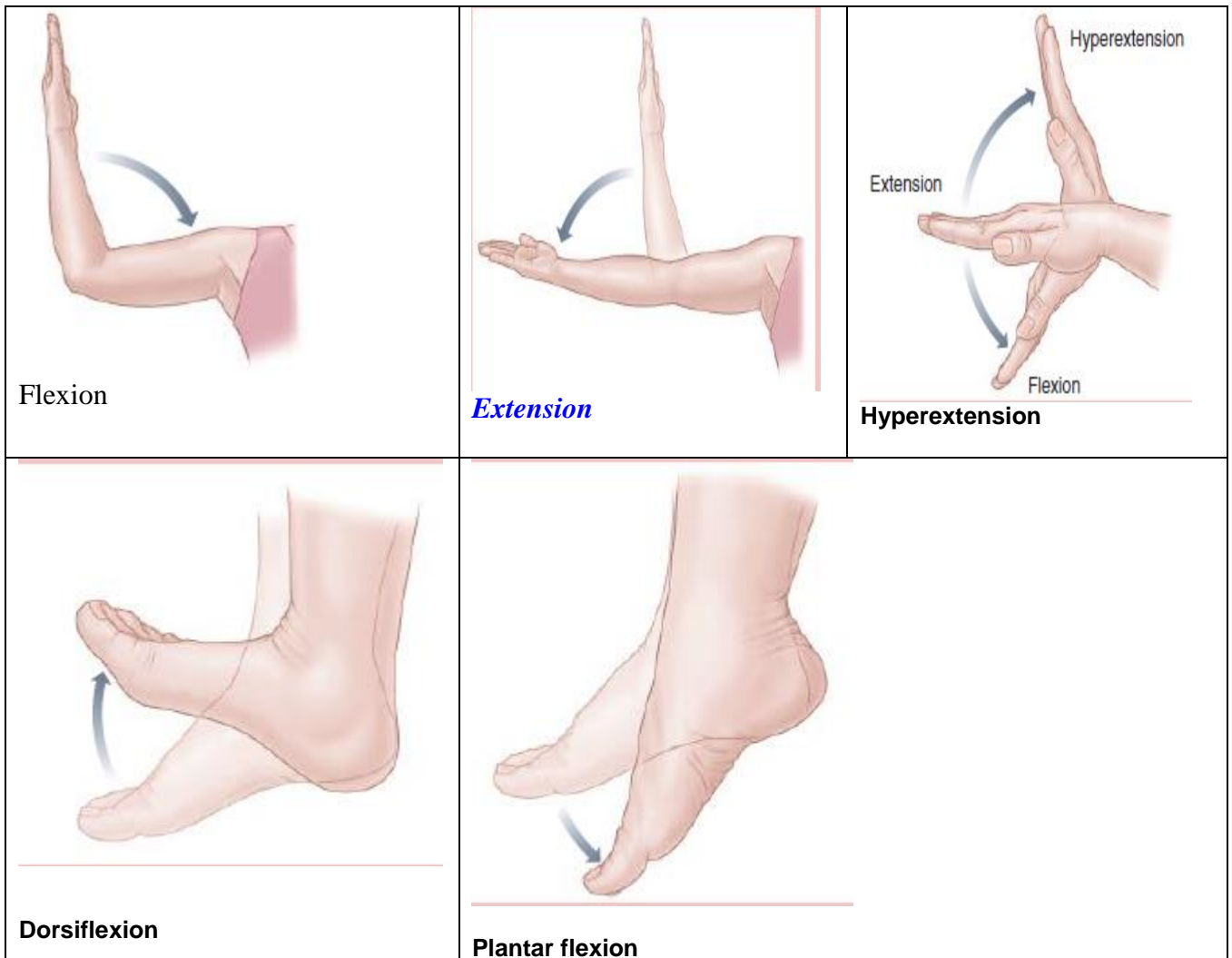
Some joints—such as the knee, shoulder, and elbow—contain small sacs filled with synovial fluid called **bursa** (plural: **bursae**). Residing in areas where muscles and tendons pass over bony prominences, the bursae facilitate movement and ease friction.



## Movements of Synovial Joints

The movements a joint can make depend upon the shape of the joint (as previously discussed) as well as the involvement of nearby muscles, tendons, and ligaments.

### *Flexion and Extension*



### **Abduction and Adduction**

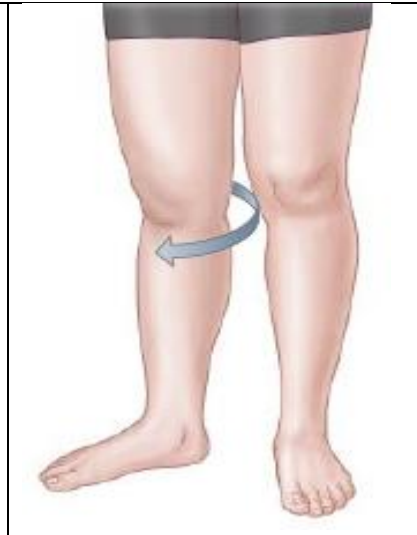




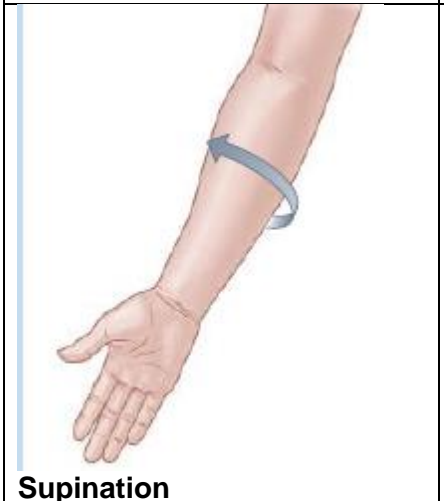
*Circumduction*



**Internal rotation**



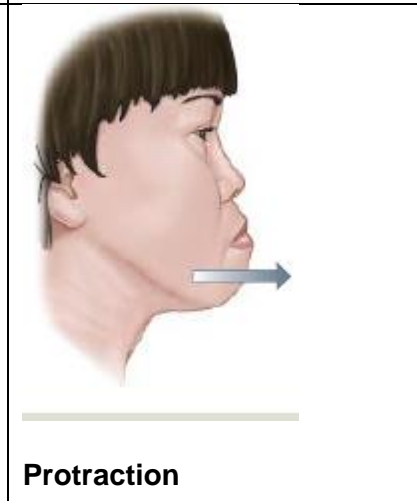
**External rotation**



**Supination**



**Inversion**



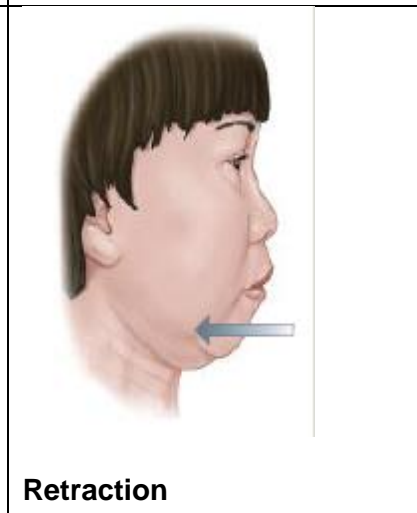
**Protraction**



**Pronation**



**Eversion**

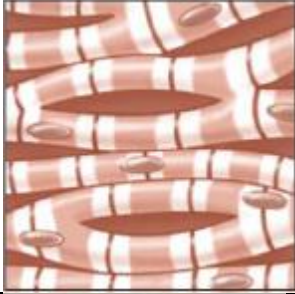
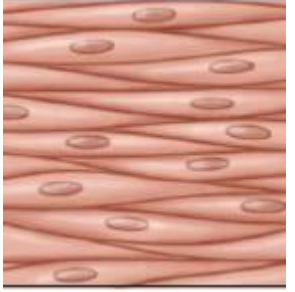



**Retraction**

## MUSCULAR SYSTEM

Muscles are a unique form of tissue that transform energy into motion. Everything your mind conceives is transmitted to your muscles to perform. The words you speak, the expression on your face, the motion of your fingers as you write or play an instrument are possible only because of muscular movement. Even more, muscles operate behind the scenes to propel blood through blood vessels, drive the flow of air into and out of the lungs, digest food, and produce body heat. Indeed, this sophisticated tissue helps sustain life.

The body contains three types of muscle: cardiac muscle, smooth muscle, and skeletal muscle.

<p><b>Cardiac Muscle</b></p> <ul style="list-style-type: none"><li>• Found only in the heart</li><li>• Consists of short, branching fibers that fit together at <b>intercalated discs</b></li><li>• Appears striped, or <b>striated</b>, when viewed under a microscope</li><li>• Is a type of <b>involuntary</b> muscle because it contracts automatically</li></ul>	
<p><b>Smooth Muscle</b></p> <ul style="list-style-type: none"><li>• Found in the digestive tract, blood vessels, bladder, airways, and uterus</li><li>• Does not appear striped when viewed under a microscope, so is called <b>nonstriated</b></li><li>• Known as involuntary muscle, because it contracts automatically (such as when the digestive tract processes food)</li></ul>	
<p><b>Skeletal Muscle</b></p> <ul style="list-style-type: none"><li>• Attached to bone and causes movement of the body</li><li>• Known as <b>voluntary</b> muscle because it can be contracted at will</li><li>• Appears markedly striated when examined with a microscope</li></ul>	

### Muscles of the Head and Neck

Muscles in this region are typically grouped according to their function: muscles of facial expression, muscles of chewing (called mastication) and swallowing, and muscles that move the head.

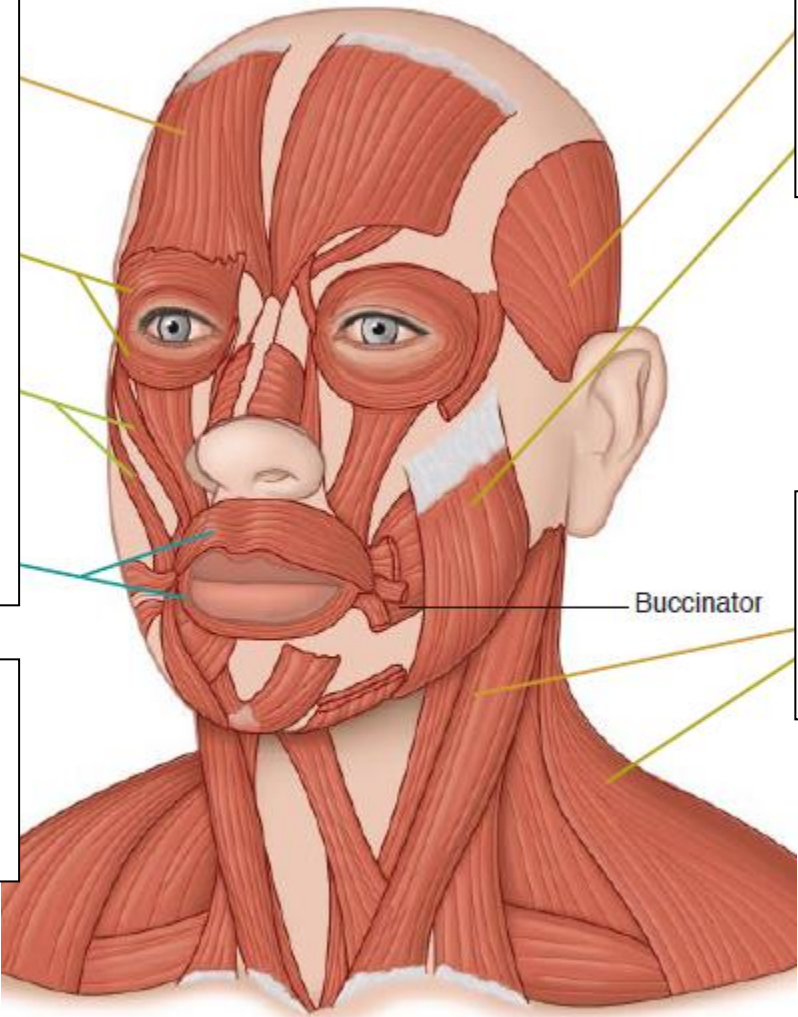
Of all the muscles of the face, the area around the mouth is the most complex. This makes sense considering that the mouth is the most expressive part of the face; the movement of the lips is also pivotal in the formation of words. Besides contributing to facial expression, the muscles of the face allow us to speak, chew, and perform other oral functions.

- Muscles of Facial Expression**
1. Frontalis
  2. Orbicularis oculi
  3. Zygomaticus
  4. Orbicularis oris

- Muscles of Chewing**
- Temporalis
  - Masseter

- Muscles That Move The Head**
1. Sternocleidomastoid
  2. Trapezius

**Buccinator (shown on the other side of the face):**  
Assists in smiling and blowing

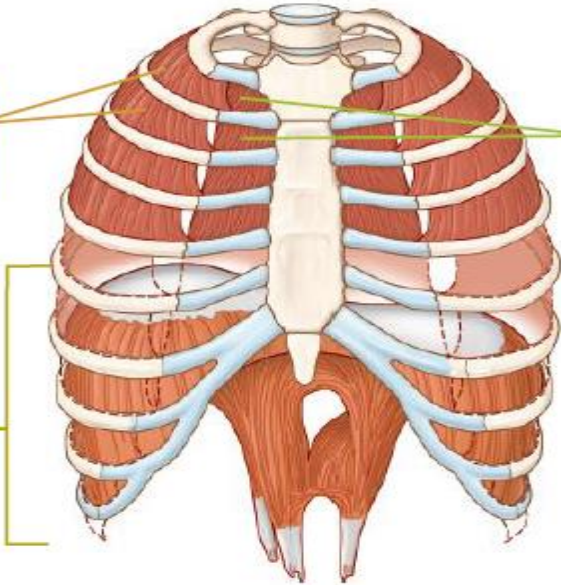


**Muscles Involved in Breathing**  
Muscles are the driving force behind our ability to breathe

**External intercostals**

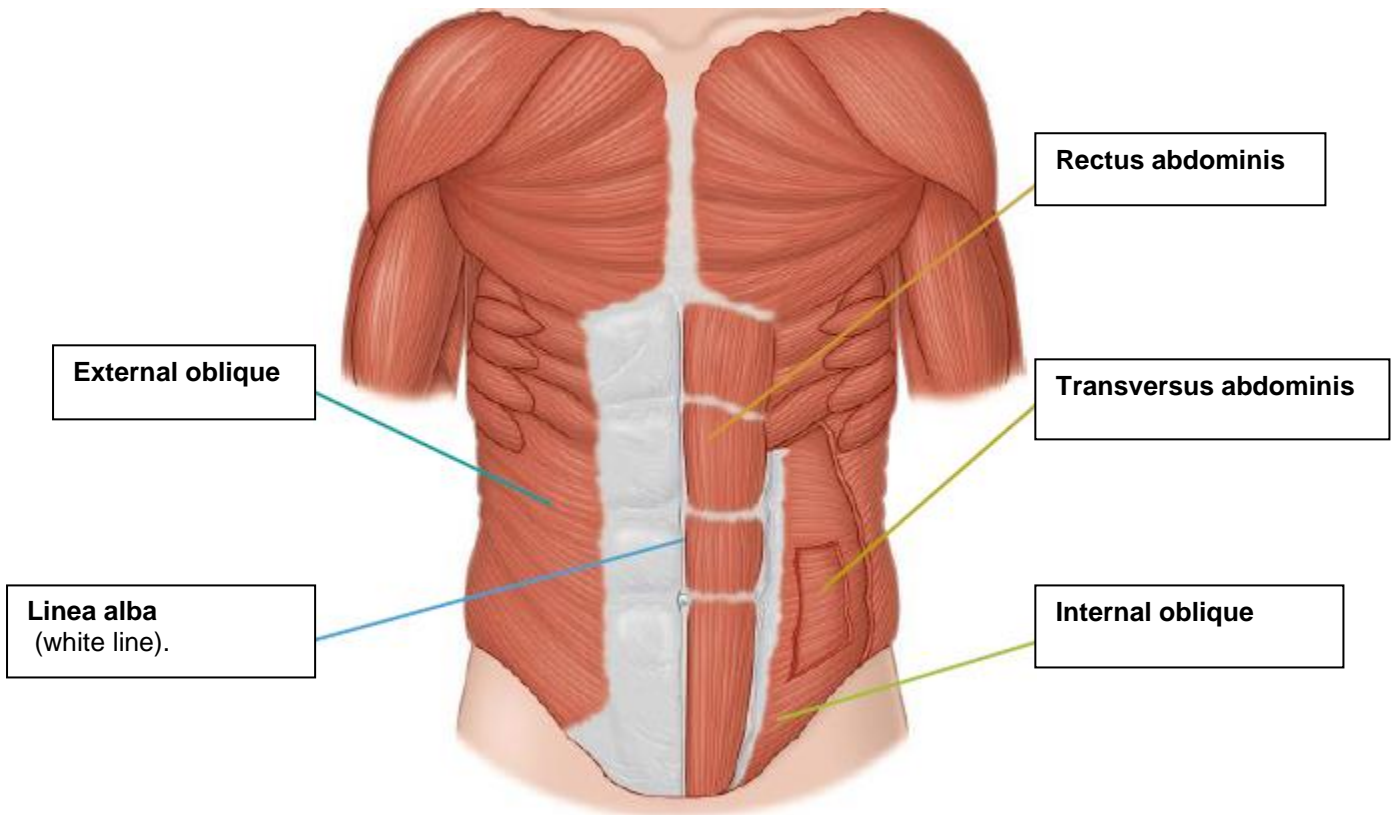
**Internal intercostals**

**Diaphragm**



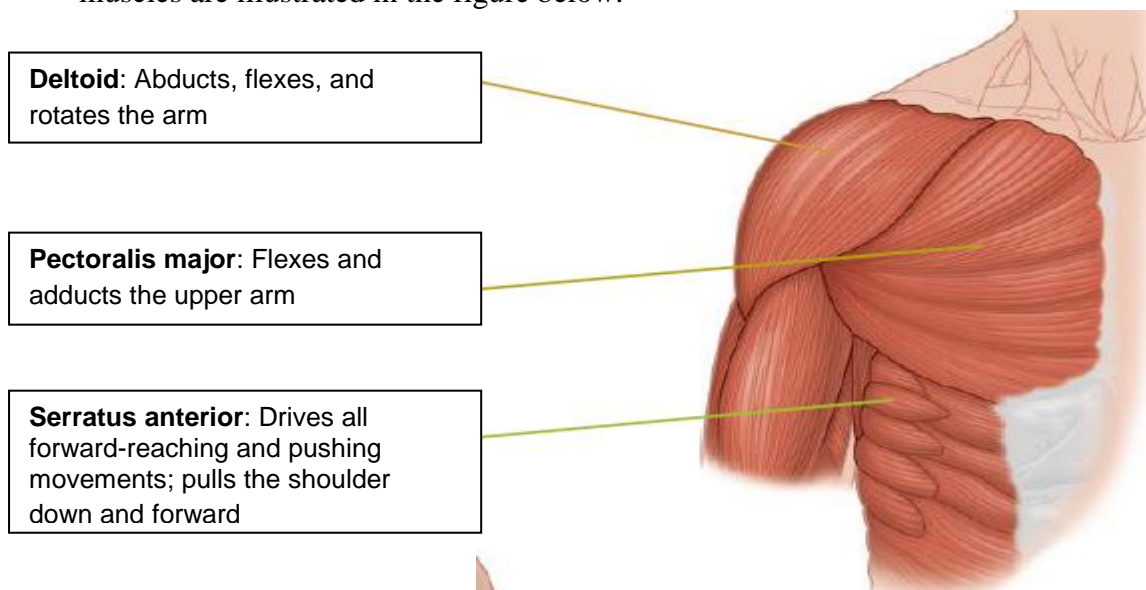
### ***Muscles Forming the Abdominal Wall***

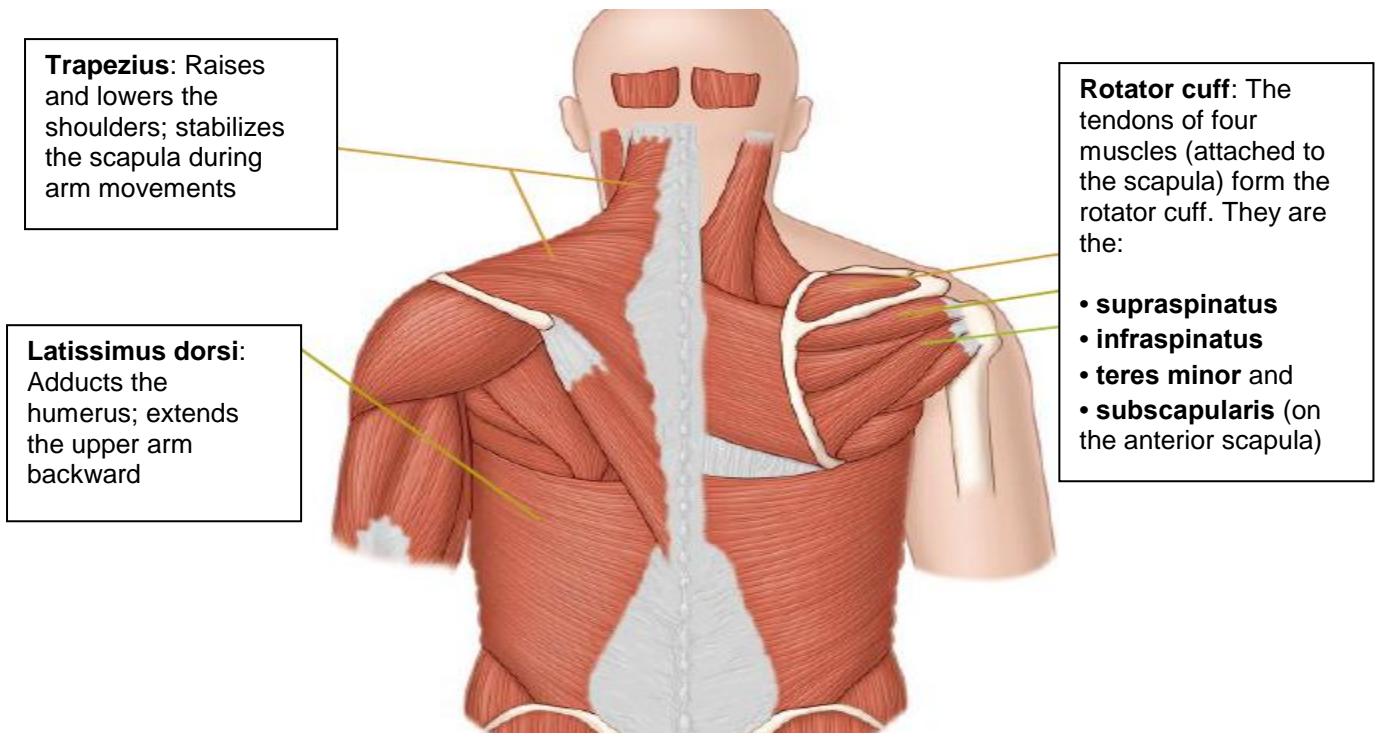
abdominal wall derives its strength from alternating layers of muscle. The muscle fibers in each of the three layers forming the abdominal wall run in different directions



### ***Muscles of the Shoulder and Upper Arm***

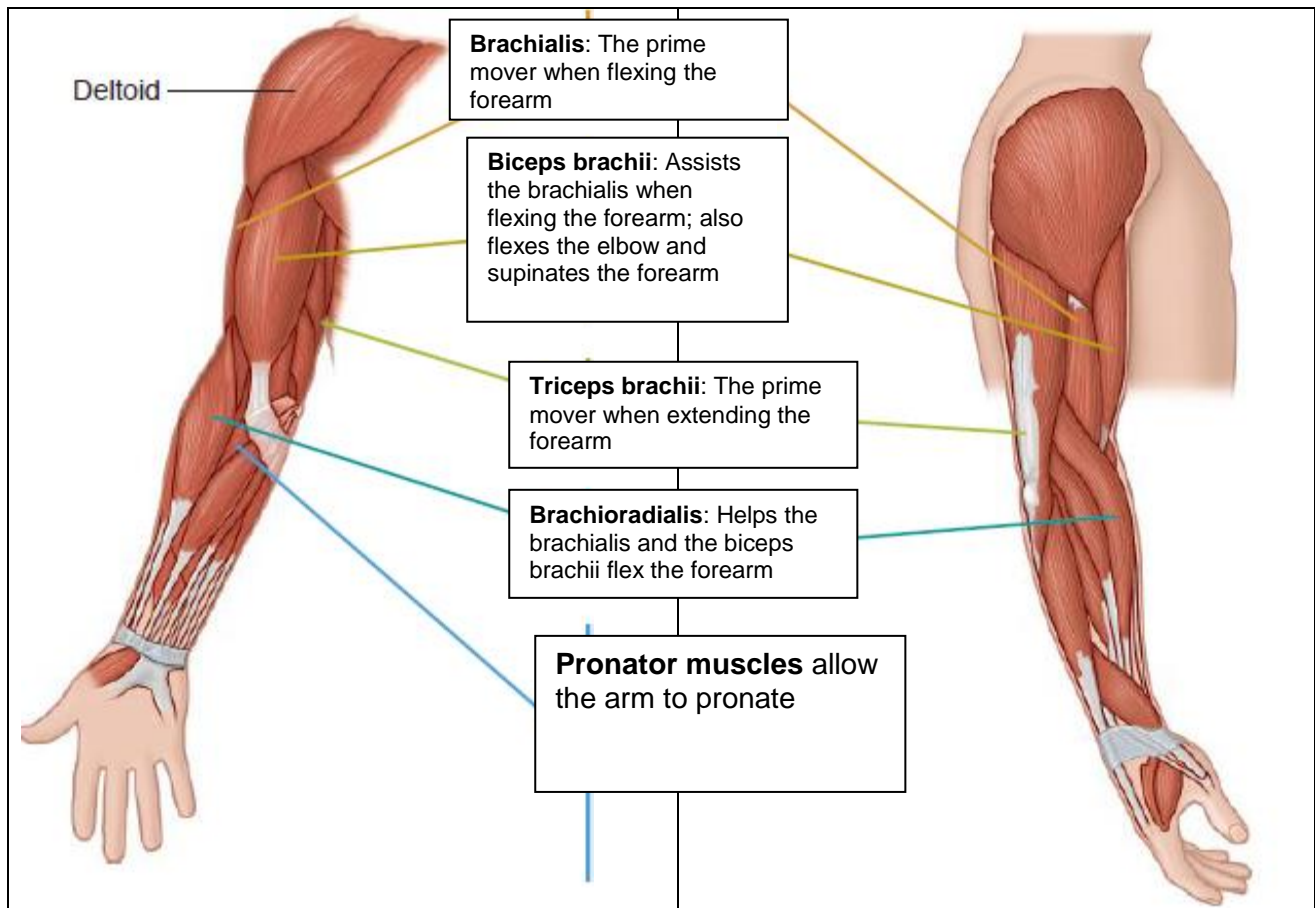
The shoulder and upper arm perform a wide variety of movements. Some movements—such as throwing a ball or swimming—require power and a full range of motion. Others, such as writing, depend upon more subtle movements. To make these motions possible, the shoulder draws on a complex variety of muscles. A few of those muscles are illustrated in the figure below.





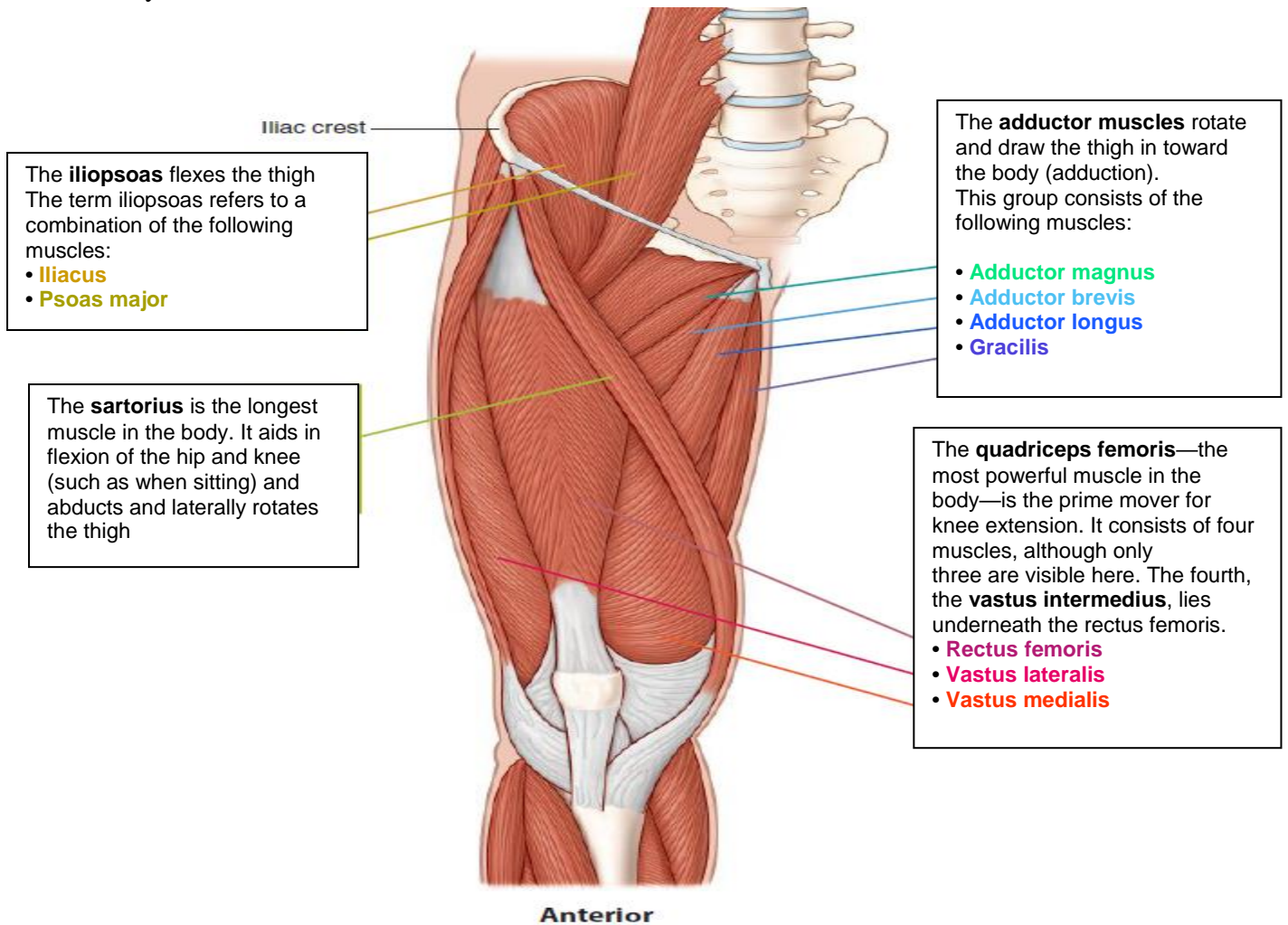
### Muscles That Move the Forearm

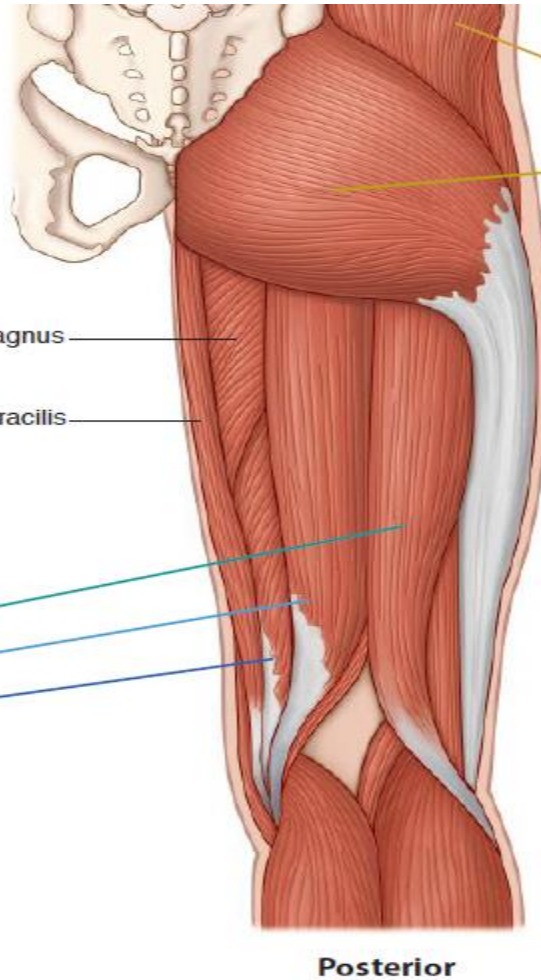
The muscles that flex and extend the forearm are located on the humerus.



## Muscles Acting on the Hip and Thigh

the legs are built for stability and power. The muscles of the hip and thigh enable the body to stand, walk, and maintain balance.





The gluteal muscles consist of the following three muscles:  
**Gluteus medius:** Abducts and rotates the thigh outward  
**Gluteus maximus:** The bulkiest muscle in the body; it produces the backswing of the leg when walking and provides most of the power for climbing stairs  
**Gluteus minimus:** This muscle lies beneath the other two gluteal muscles

The **hamstrings** are a group of muscles consisting of the following three muscles, all of which work to extend the thigh at the hip, flex the knee, and rotate the leg.

**Biceps femoris**  
**Semitendinosus**  
**Semimembranosus**

**Adductor magnus**  
**Gracilis**

### Muscles Acting on the Foot

Muscles in the lower leg are primarily responsible for moving the foot and ankle.



**Gastrocnemius**  
**Soleus**  
 Contraction of these muscles causes plantar flexion of the foot

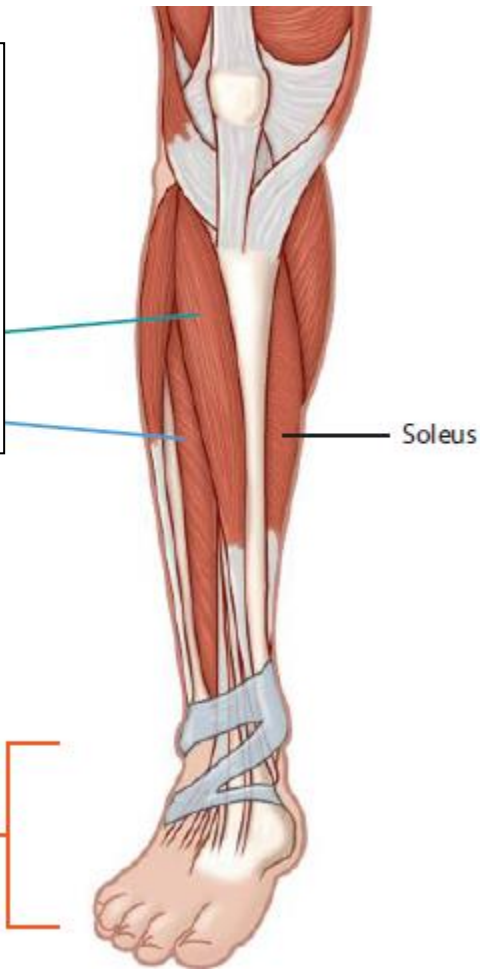
**calcaneal (Achilles) tendon.**  
 It inserts on the calcaneus (heel bone).

Muscles on the anterior of the lower leg also participate in moving the foot and ankle.

The extensor digitorum longus and the tibialis anterior dorsiflex the foot, keeping the toes from dragging the ground when walking. The extensor digitorum longus also extends the toes and turns the foot outward (eversion).

**Tibialis anterior**

**Extensor digitorum longus**



The muscles of the lower leg pull on tendons that attach to the bones of the foot. The foot also contains numerous smaller muscles that act to flex and extend the toes.