

The Muscular System



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Introduction

- The human body has more than 600 individual muscles
- Muscles cause bones and supported structures to move by alternating between contraction and relaxation



Functions of Muscles

- Muscle has the ability to contract, permitting muscles to perform various functions
 - Functions:
 - Movement
 - Stability
 - Control of body openings and passages
 - Heat production



Characteristics of Muscles

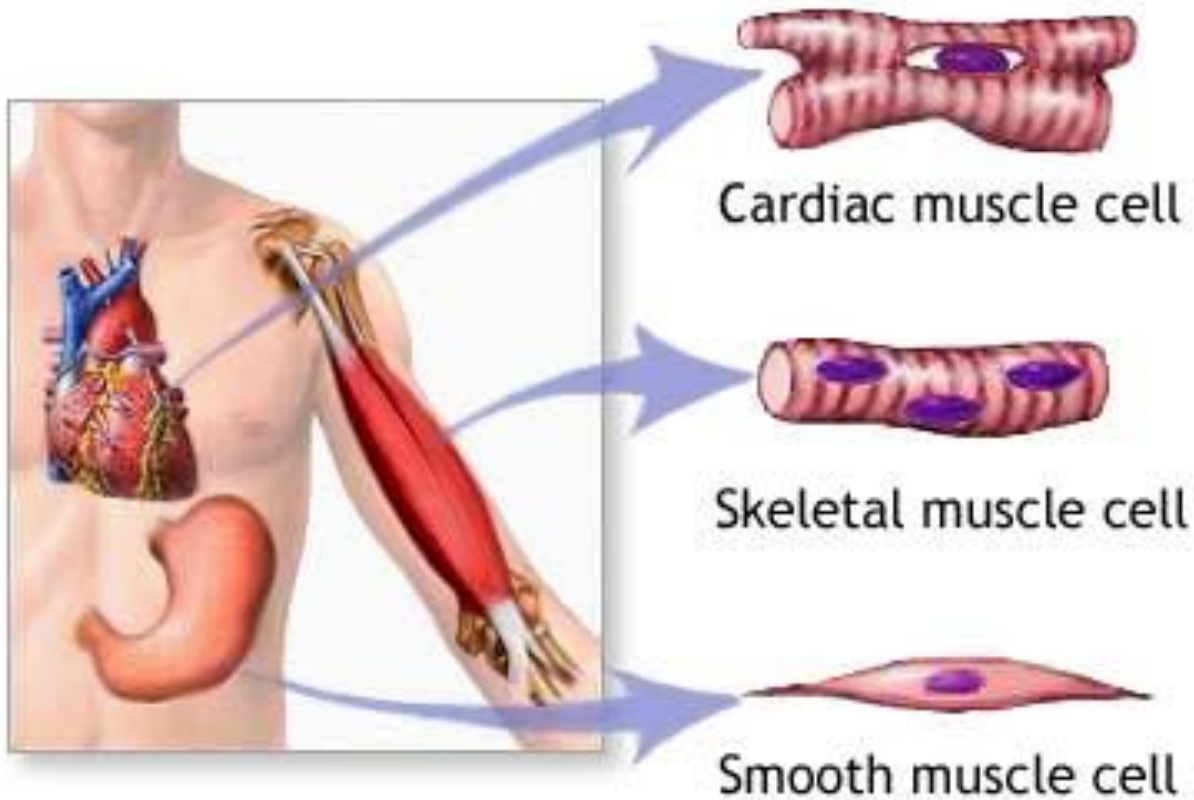
- Muscle cells are elongated (muscle cell = muscle fiber)
- Contraction of a muscle is due to movement of ***myofilaments*** (protein fibers)
- All muscles share some terminology
 - Prefix *myo* refers to muscle
 - Prefix *mys* refers to muscle



Types of Muscles

- 3 basic muscle types are found in the body
 - Skeletal muscle
 - Cardiac muscle
 - Smooth muscle

Types of Muscles









Comparison of Types of Muscle

Table

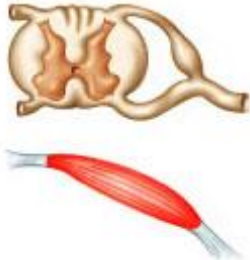
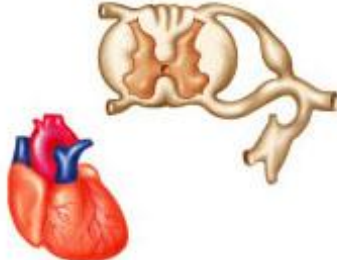




6.1

Comparison of Skeletal, Cardiac, and Smooth Muscles

Characteristic	Skeletal	Cardiac	Smooth
Body location	 <p>Attached to bones or, for some facial muscles, to skin</p>	 <p>Walls of the heart</p>	 <p>Mostly in walls of hollow visceral organs (other than the heart)</p>
Cell shape and appearance	 <p>Single, very long, cylindrical, multinucleate cells with very obvious striations</p>	 <p>Branching chains of cells; uninucleate, striations</p>	 <p>Single, fusiform, uninucleate; no striations</p>

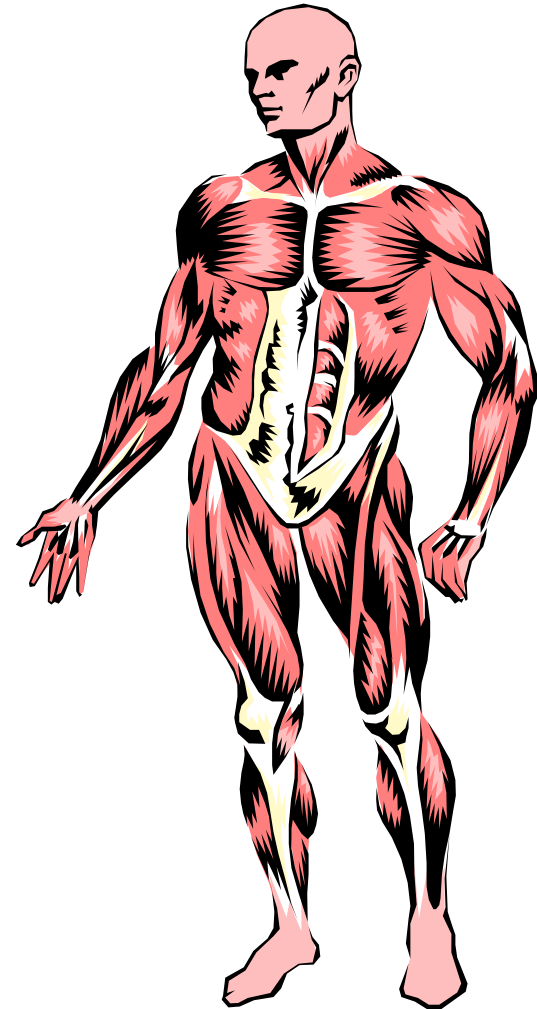
Types of Muscle, cont.

Table 6.1 Comparison of Skeletal, Cardiac, and Smooth Muscles

Characteristic	Skeletal	Cardiac	Smooth
Regulation of contraction	 <p>Voluntary; via nervous system controls</p>	 <p>Involuntary; the heart has a pacemaker; also nervous system controls; hormones</p>	 <p>Involuntary; nervous system controls; hormones, chemicals, stretch</p>
Speed of contraction	 <p>Slow to fast</p>	 <p>Slow</p>	 <p>Very slow</p>
Rhythmic	No	Yes	Yes in some

Skeletal Muscles

- The major components of the muscular system





Structure of Skeletal Muscles:

Connective tissue coverings

○ *Fascia*

- Covers entire skeletal muscles
- Separates them from each other

○ *Tendon*

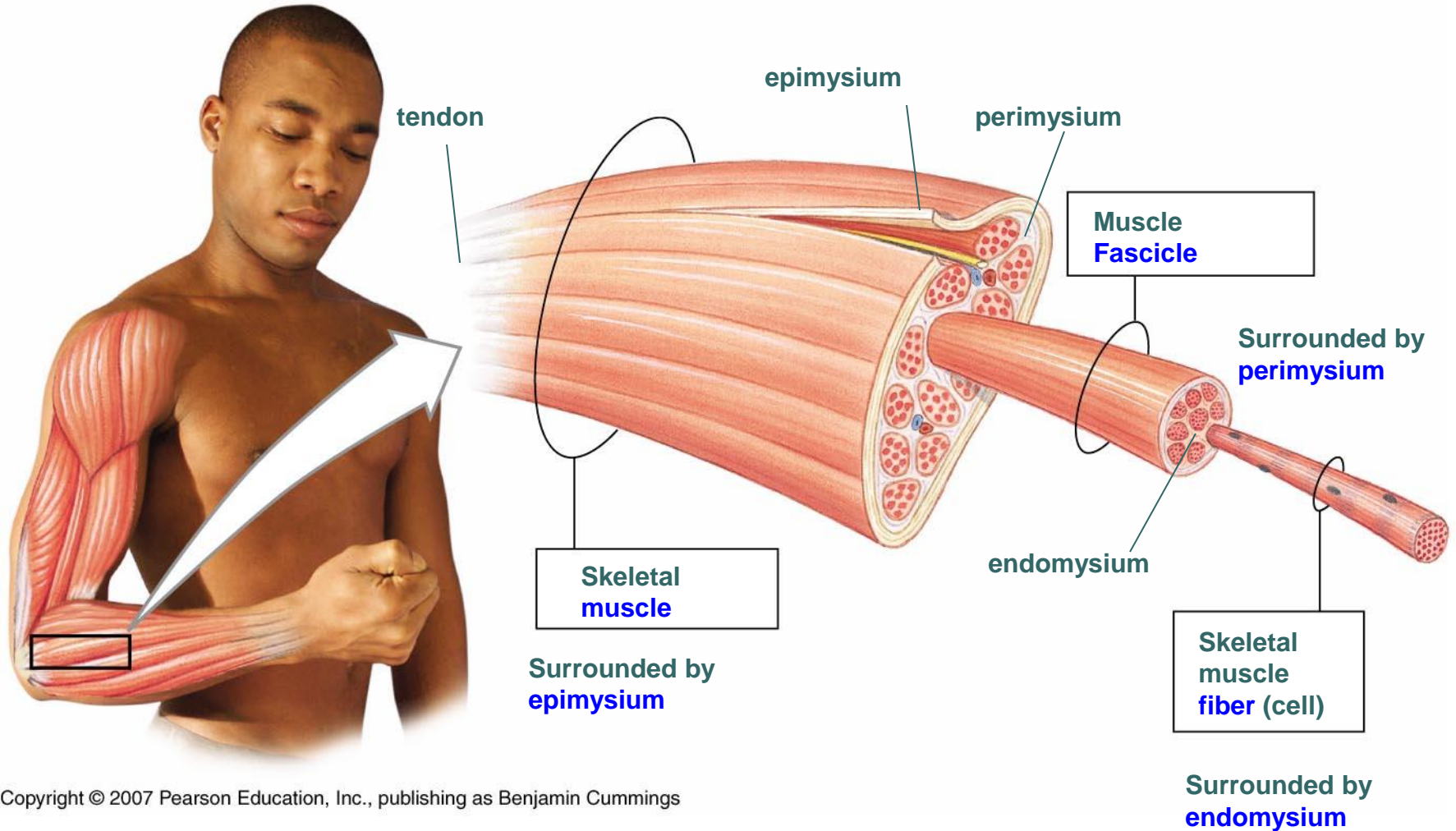
- A tough, cord-like structure made of fibrous connective tissue
- Connects muscles to bones

○ *Aponeurosis*

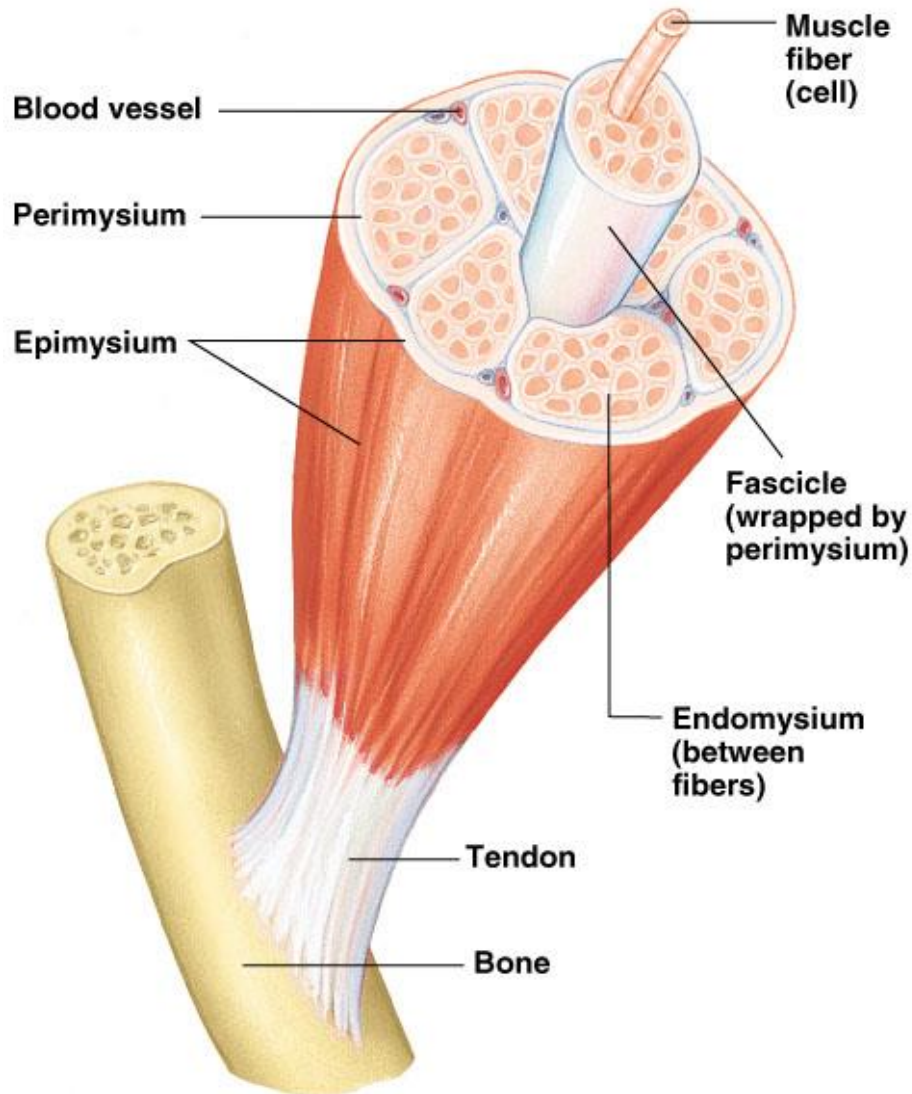
- A tough, sheet-like structure made of fibrous connective tissue
- Attaches muscles to other muscles



Anatomy of skeletal muscles



Anatomy of a Muscle Cell



○ *Epimysium*

- A thin covering that is just below the fascia of a muscle and surrounds the entire muscle

○ *Perimysium*

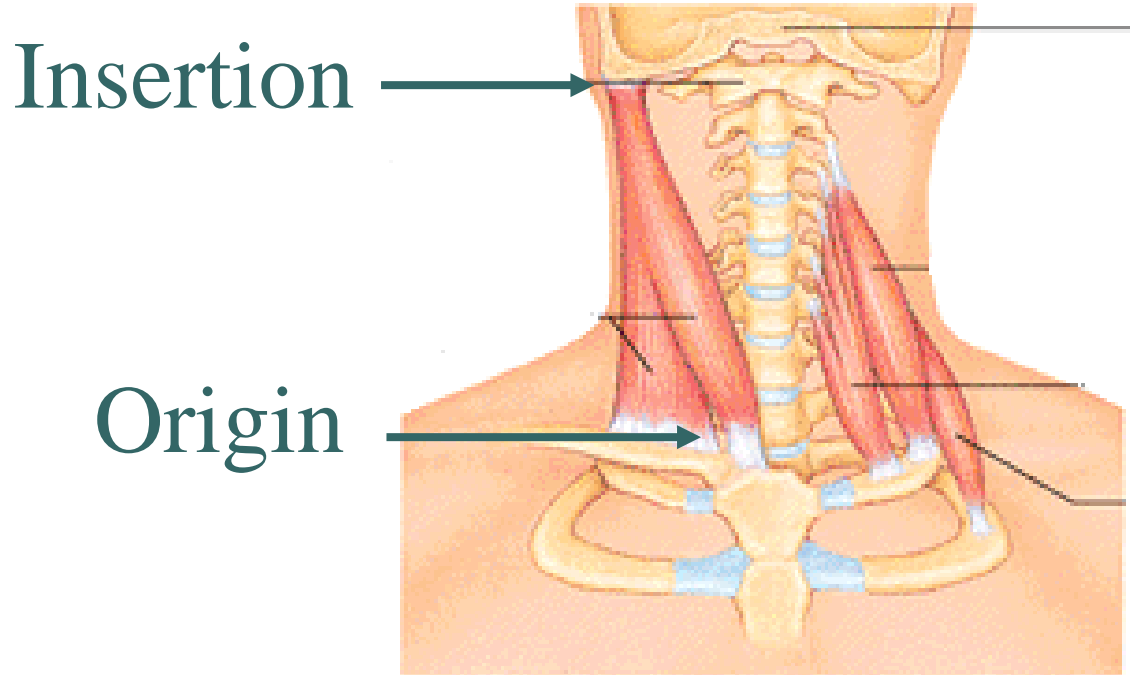
- Connective tissue that divides a muscle into sections called *fascicles*

○ *Endomysium*

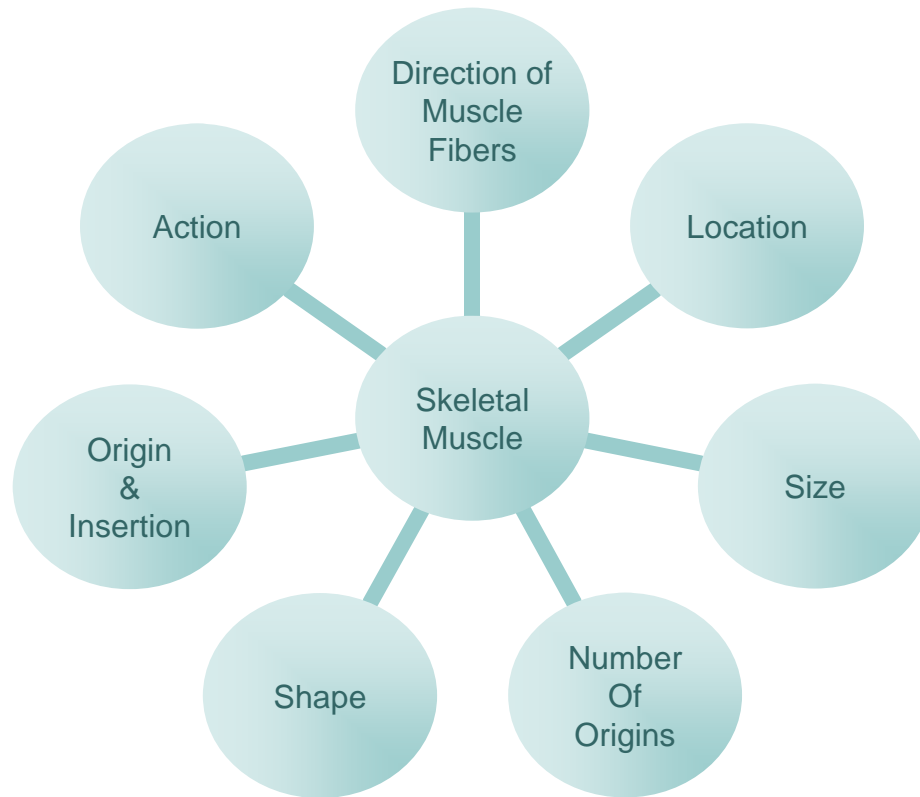
- Covering of connective tissue that surrounds individual muscle cells

How are muscles attached to bone?

- **Origin** - attachment site that doesn't move during muscle contraction
- **Insertion** - attachment site that moves
- Muscles are always attached to at least 2 points

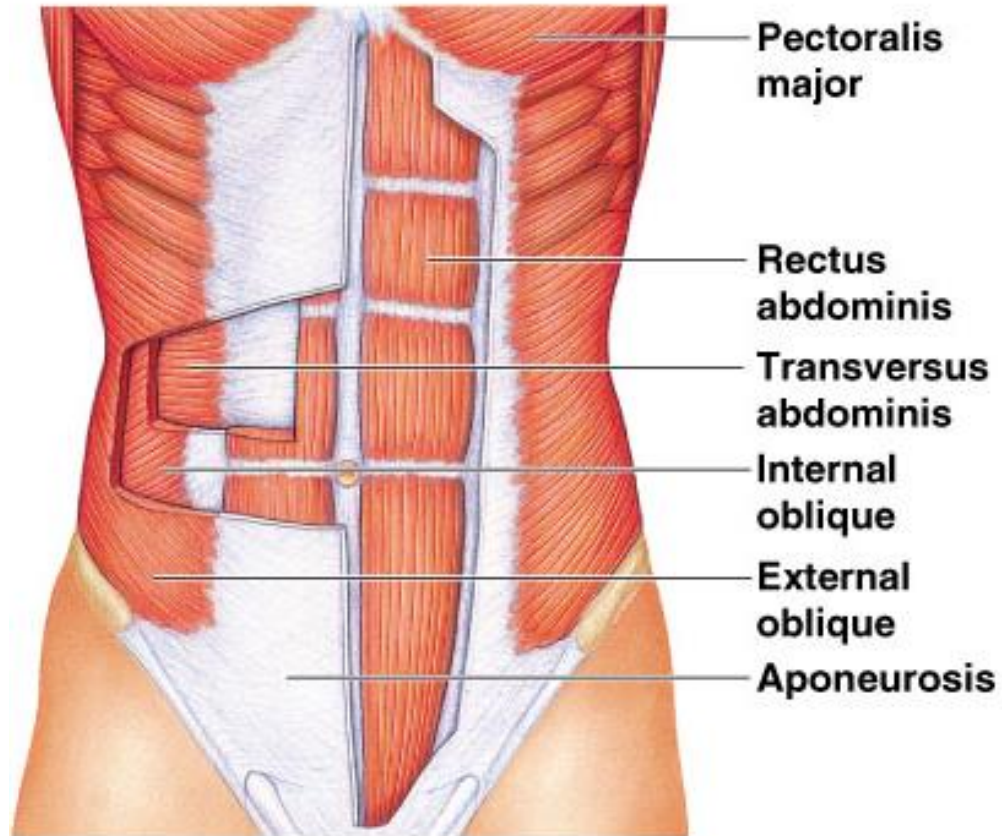


Naming Skeletal Muscles



Direction of Muscle Fibers

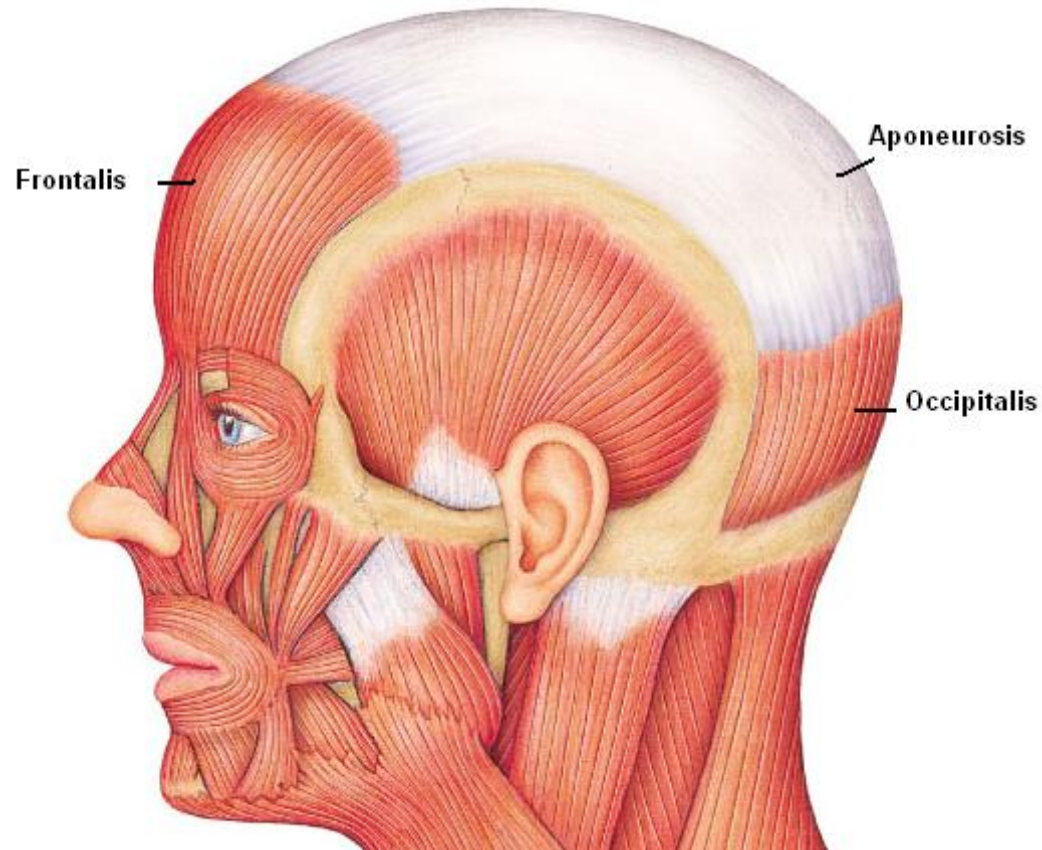
- Relative to the Midline
- **RECTUS** = parallel to the midline
 - *Rectus Abdominus*
- **TRANSVERSE** = perpendicular to midline
 - *Transversus Abdominus*
- **OBLIQUE** = diagonal to midline
 - *External Oblique*



Location

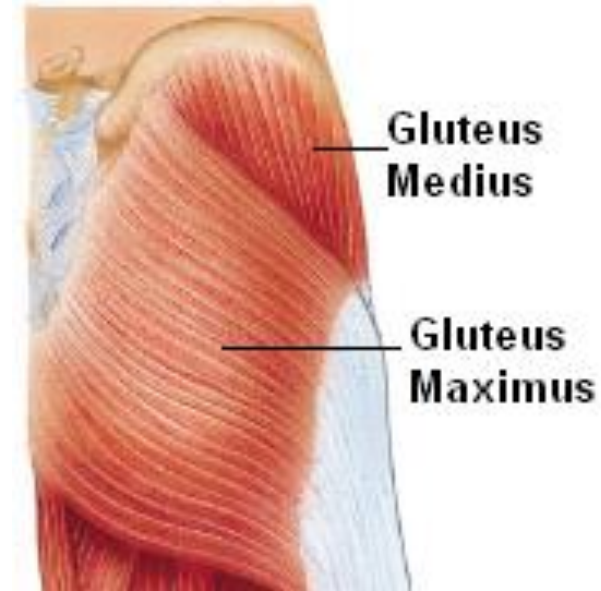
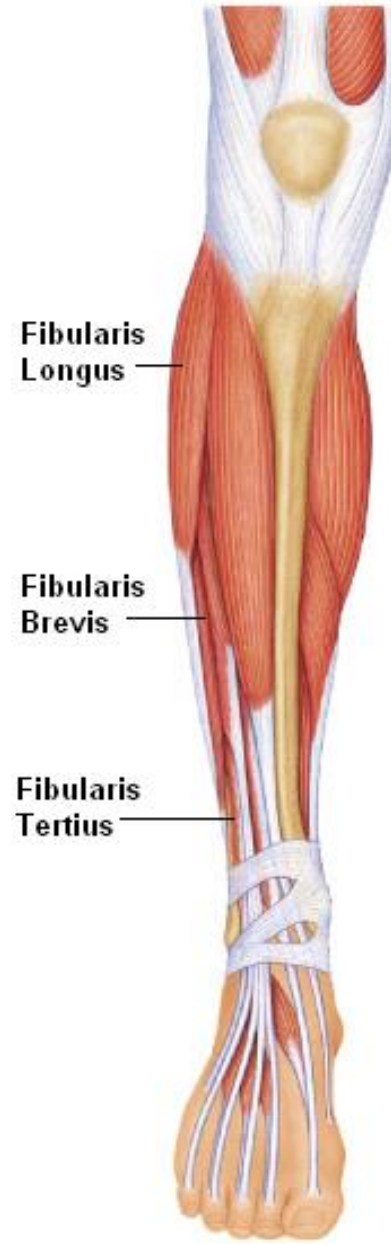
- Structure near which muscle is found

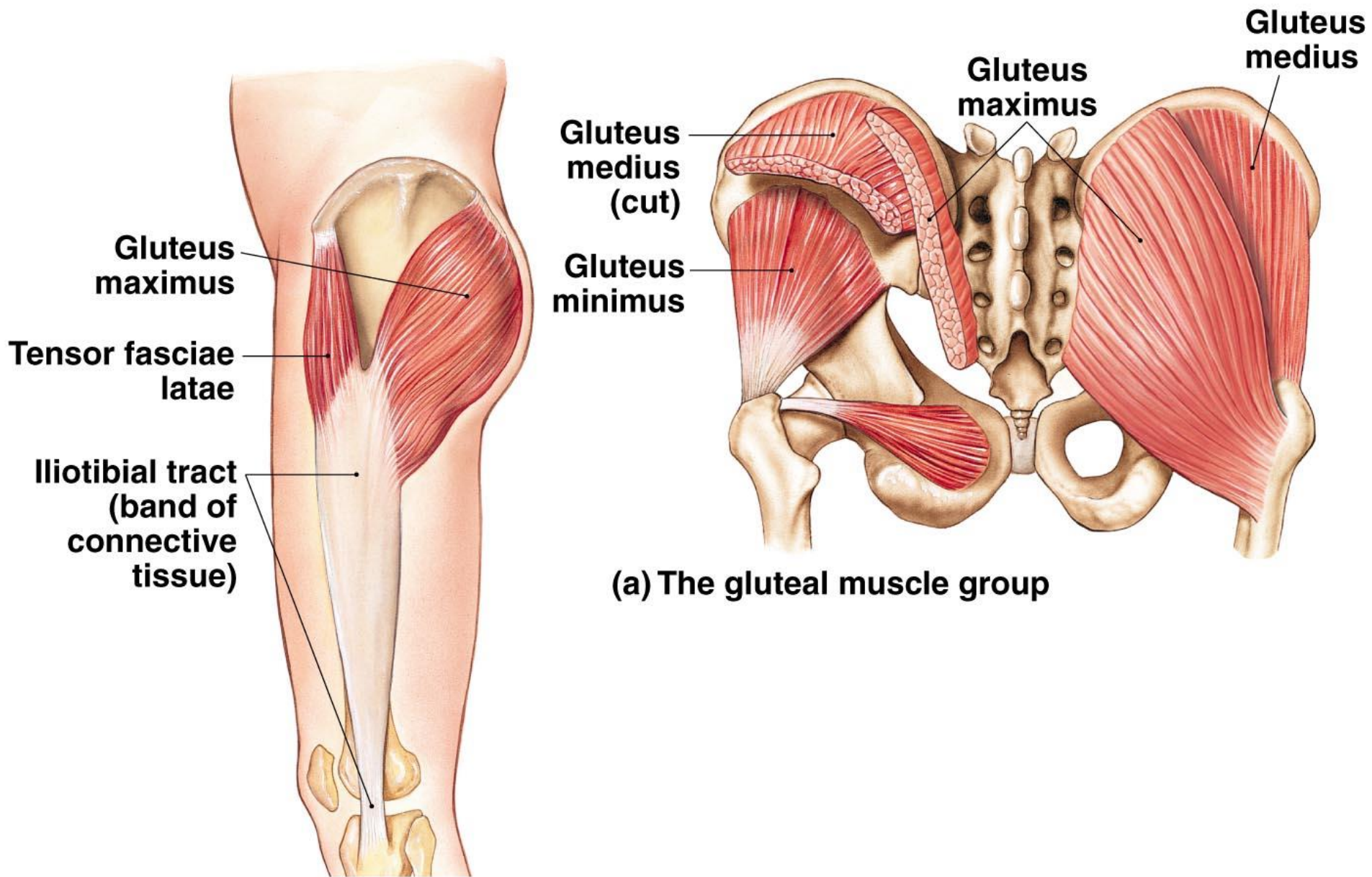
- **FRONTALIS** = near FRONTAL bone
- **OCCIPITALIS** = near OCCIPITAL bone



Size

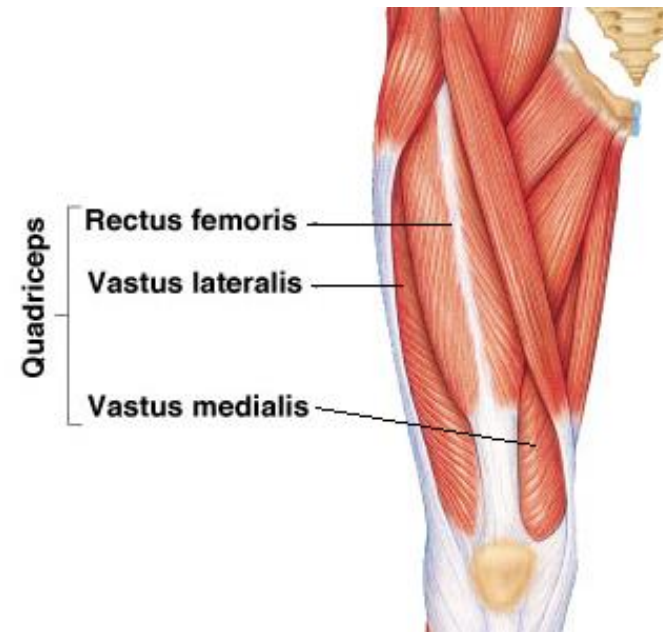
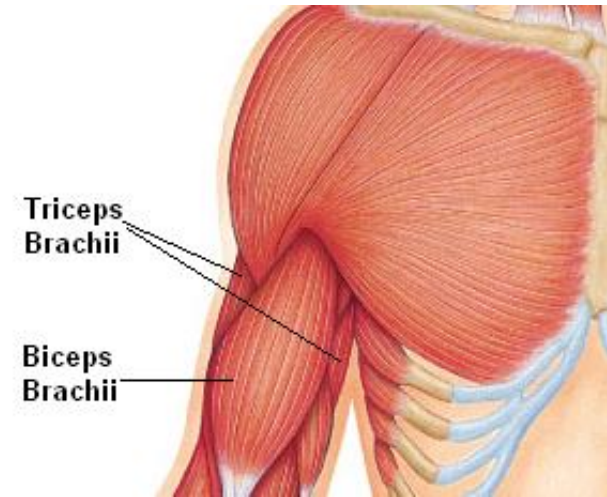
- Relative Size of Muscle
- **MAXIMUS** = largest
 - *Gluteus Maximus*
- **MEDIUS** = middle
 - *Gluteus Medius*
- **MINIMUS** = smallest
 - *Gluteus Minimus*
- **LONGUS** = longest
 - *Fibularis Longus*
- **BREVIS** = short
 - *Fibularis Brevis*
- **TERTIUS** = shortest
 - *Fibularis Tertius*





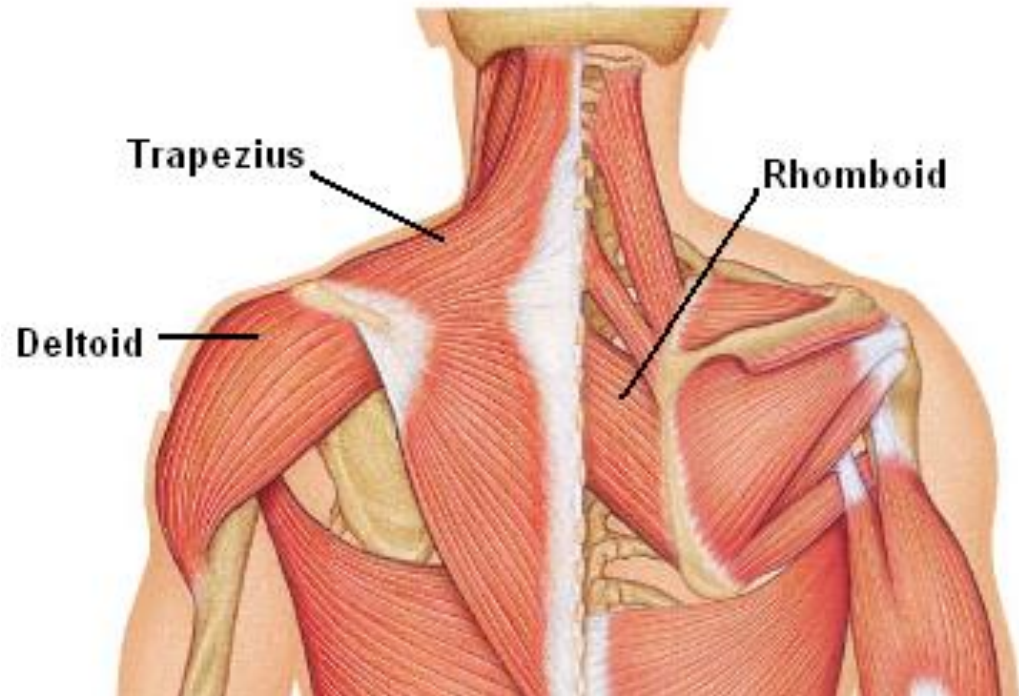
Number of Origins

- Number of tendons of origin
- **BICEPS** = Two
 - *Biceps Brachii*
 - *Biceps Femoris*
- **TRICEPS** = Three
 - *Triceps Brachii*
- **QUADRICEPS** = Four
 - *Quadriceps Femoris*



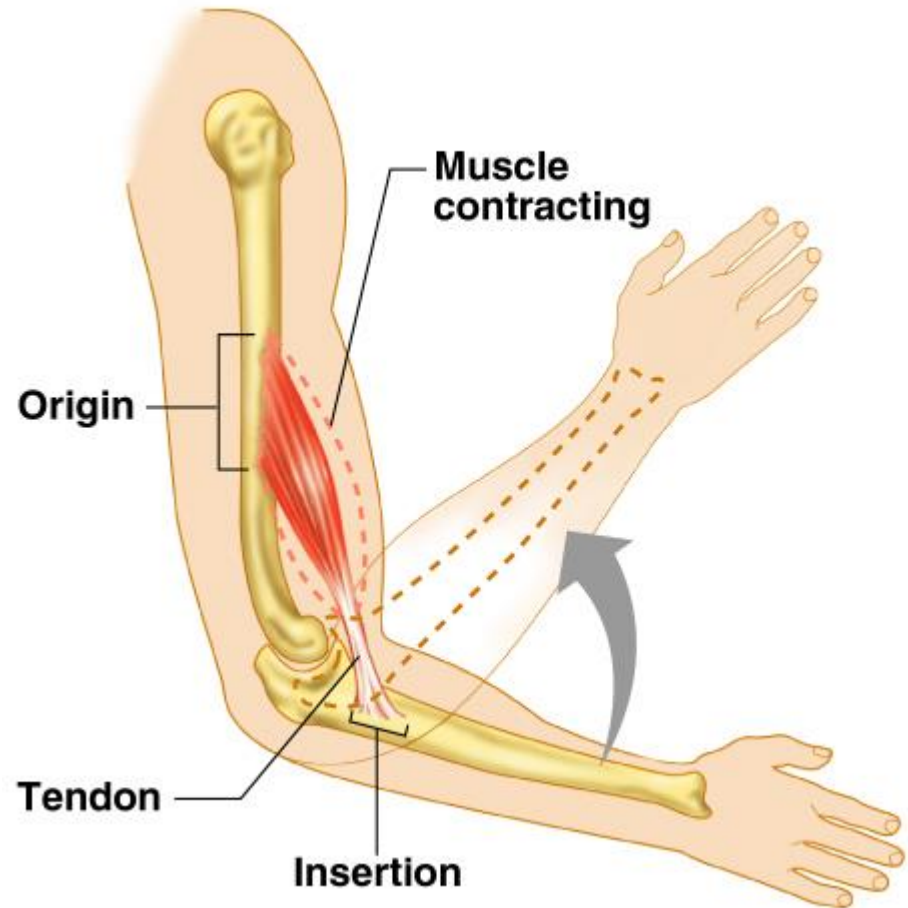
Shape

- Relative Shape of the Muscle
- **DELTOID** = triangular shape Δ
- **TRAPEZIUS** = trapezoid shape \diamond



Origin & Insertion

- **Origin** – attachment to an immovable bone
- **Insertion** – attachment to a movable bone
- During contraction, the muscle insertion moves toward the origin





Actions of Skeletal Muscles

Flexion – bending a body part

Extension – straightening a body part

Hyperextension – extending a body part past the normal anatomical position

Dorsiflexion – pointing the toes up

Plantar flexion – pointing the toes down

Abduction – moving a body part away from the anatomical position

Adduction – moving a body part toward the anatomical position



Actions of Skeletal Muscles

Circumduction – moving a body part in a circle

Pronation – turning the palm of the hand down

Supination – turning the palm of the hand up

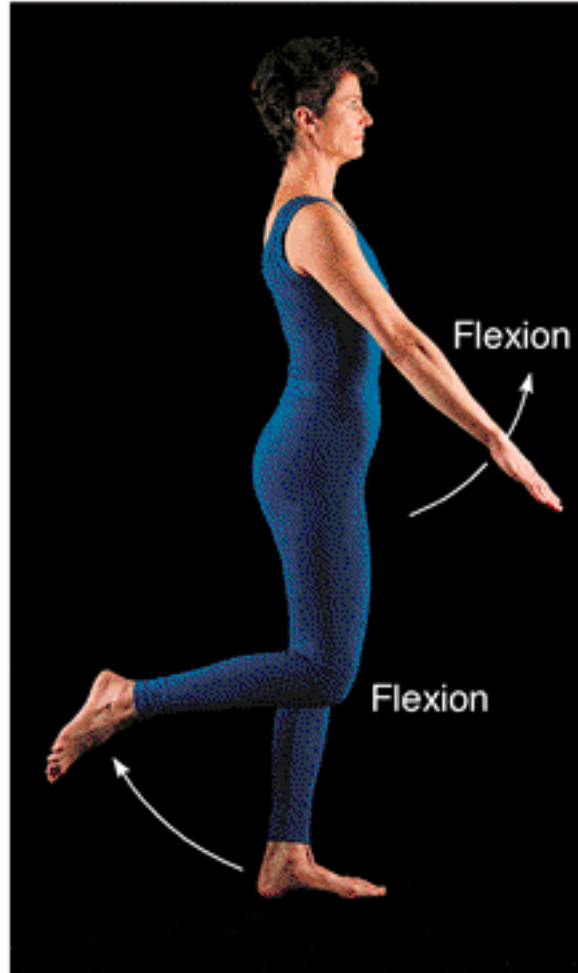
Inversion – turning the sole of the foot medially

Eversion – turning the sole of the foot laterally

Retraction – moving a body part posteriorly

Protraction – moving a body part anteriorly

Flexion



Extension

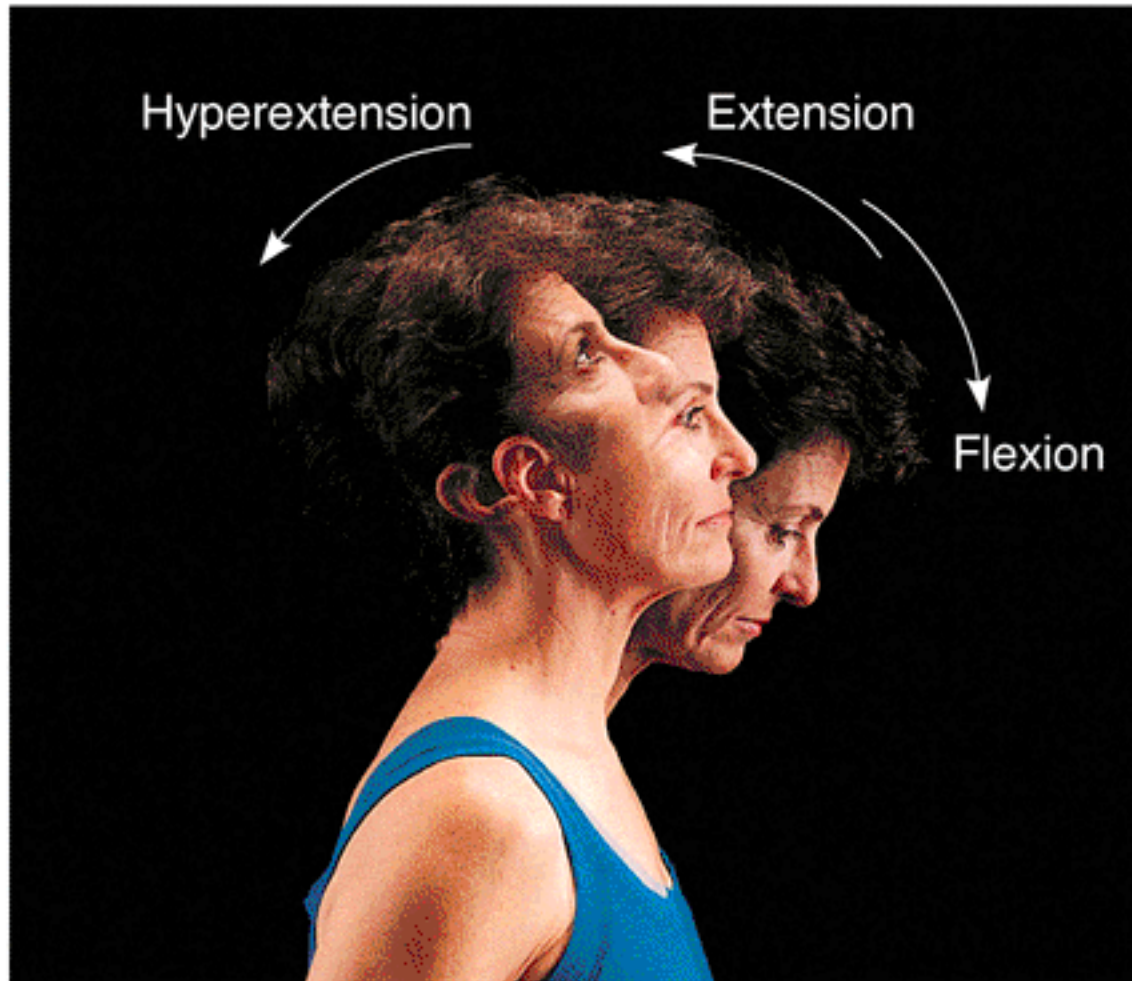


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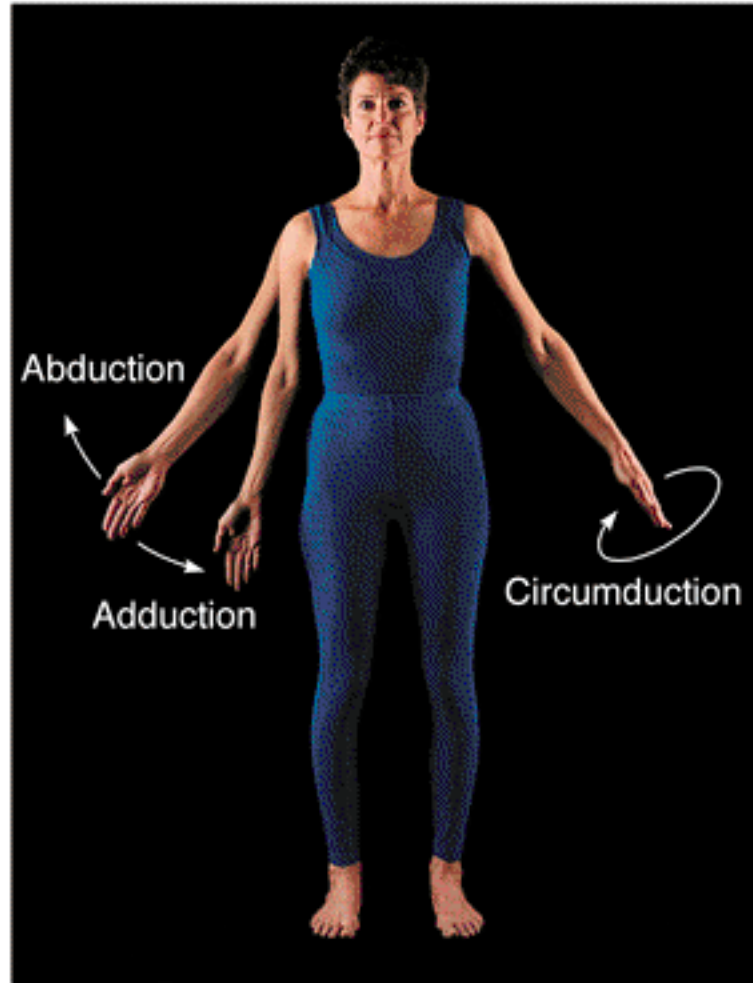


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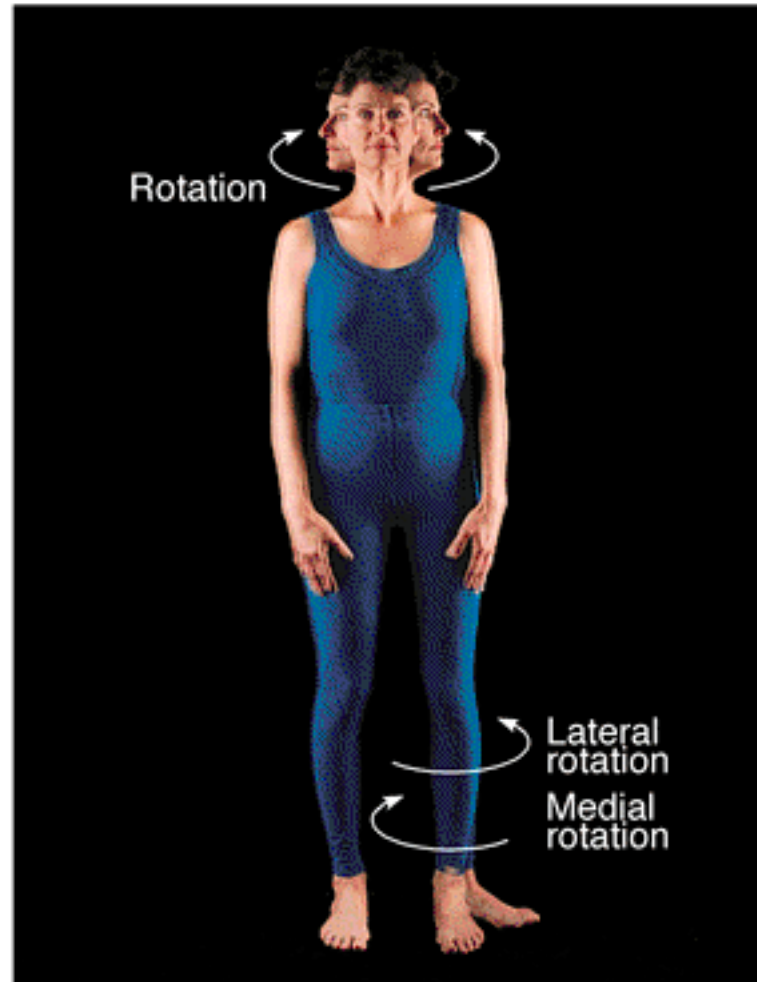
Hyperextension

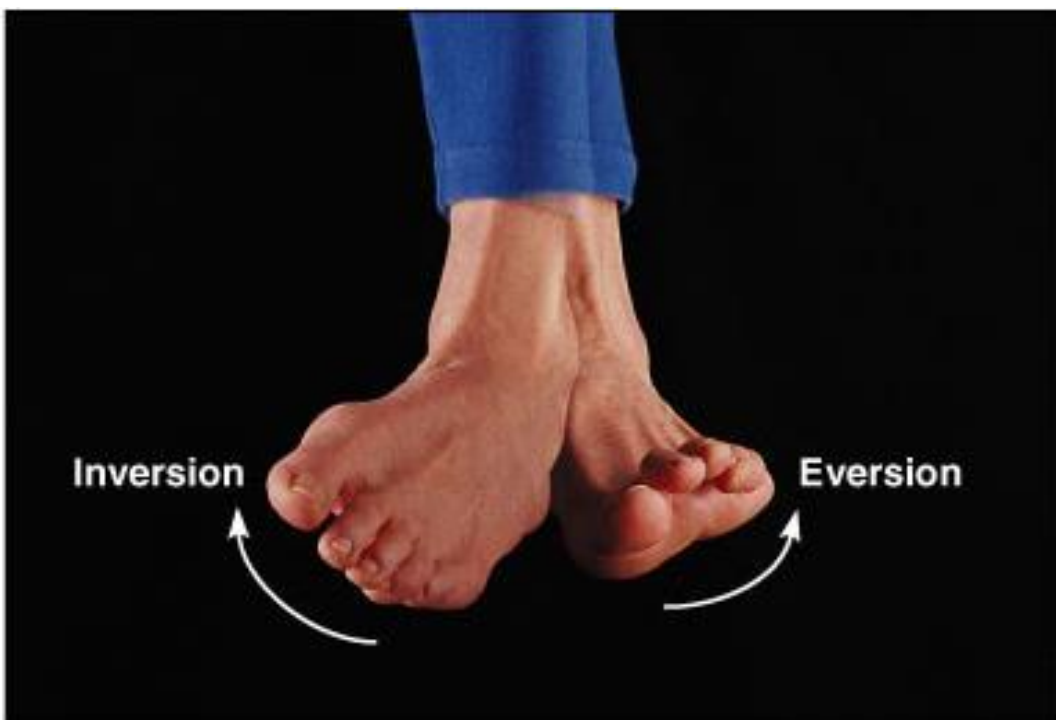


Abduction, Adduction & Circumduction



Rotation





(b) Inversion

(c) Eversion

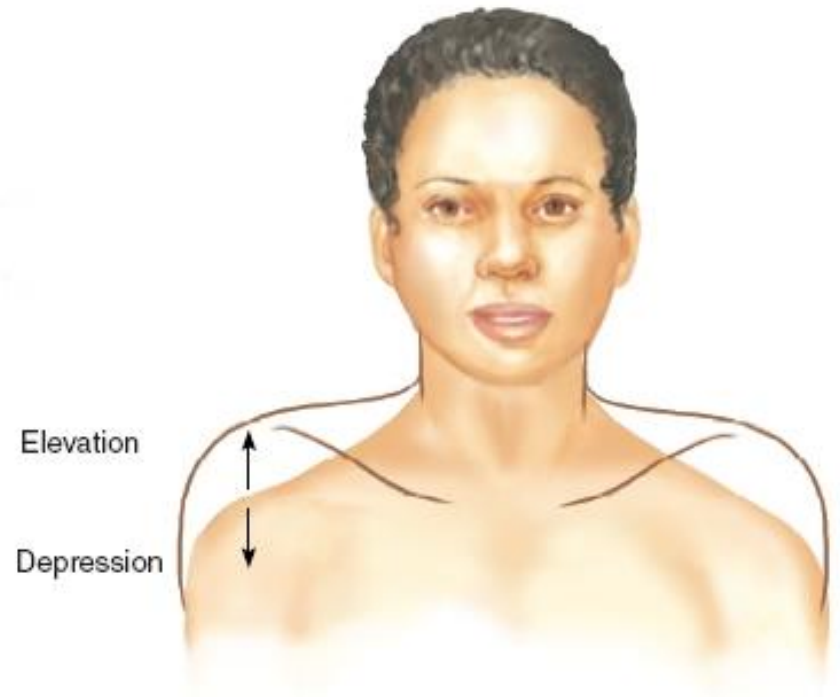
● ● ● | Actions of Skeletal Muscles

Elevation – lifting a body part

- elevating the shoulders

Depression – lowering a body part

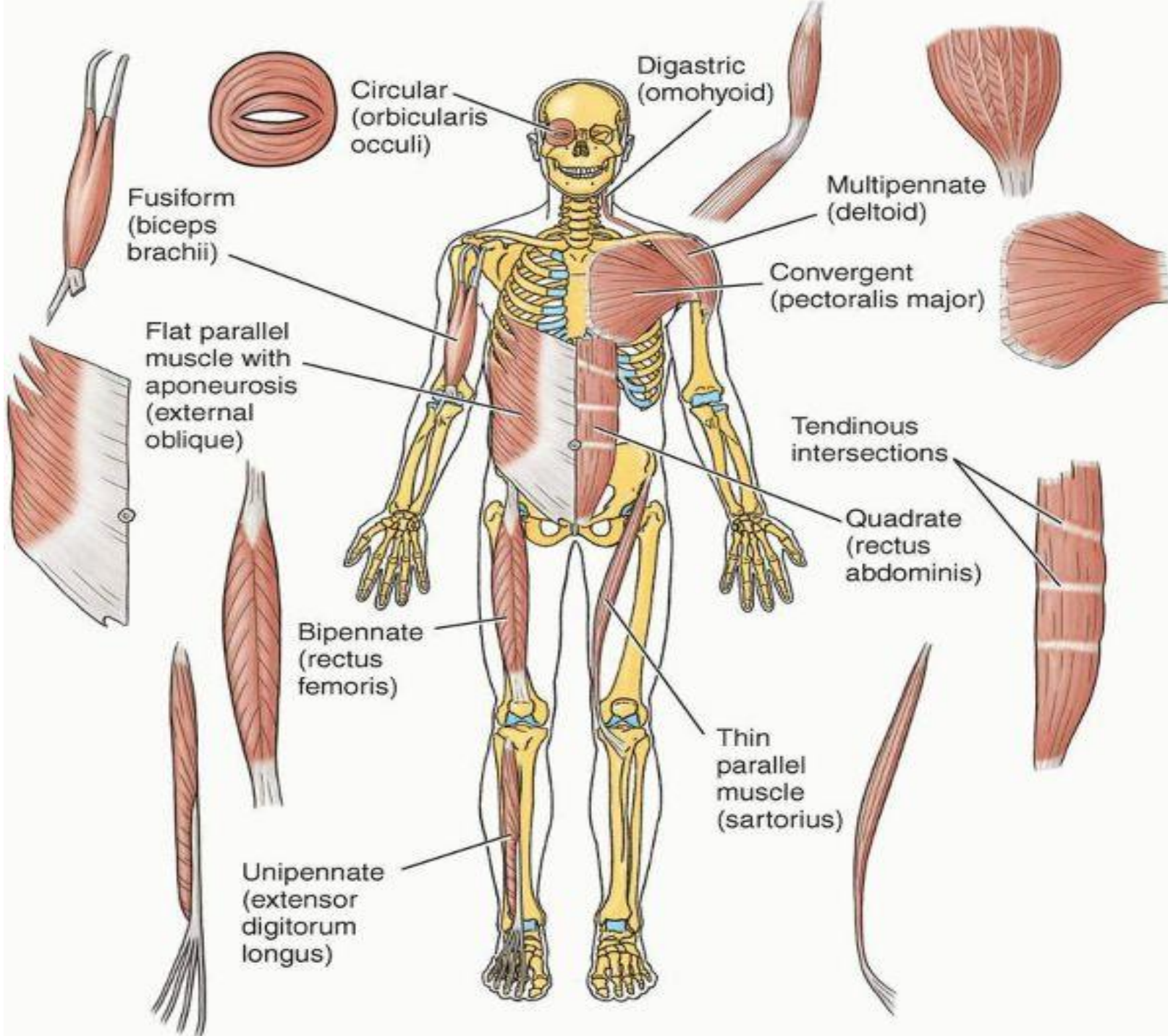
- lowering the shoulders





Arrangements of Muscle Fibers

1. Circular - fibers arranged in circle around an opening
sphincters
2. Convergent- base is much wider than insertion
triangular shape
3. Parallel - fibers arranged parallel to long axis of muscle
4. Fusiform - modified parallel, spindle shaped muscle
5. Pennate - fasciculi arranged like barbs of feather
Unipennate, Bipennate, Multipennate



End of Muscular System

