



Muscular System

- Muscles are responsible for all types of body movement
- 3 basic muscle types are found in the body
 - Skeletal muscle
 - Cardiac muscle
 - Smooth muscle









Characteristics of Muscles







- Muscle cells are elongated (muscle cell = muscle fiber)
- Contraction of muscles is due to the movement of microfilaments
- All muscles share some terminology
 - Prefix *myo* refers to muscle
 - Prefix *mys* refers to muscle
 - Prefix *sarco* refers to flesh

Comparison of Types of Muscle

Table 6.1 Comparison of Skeletal, Cardiac, and Smooth Muscles

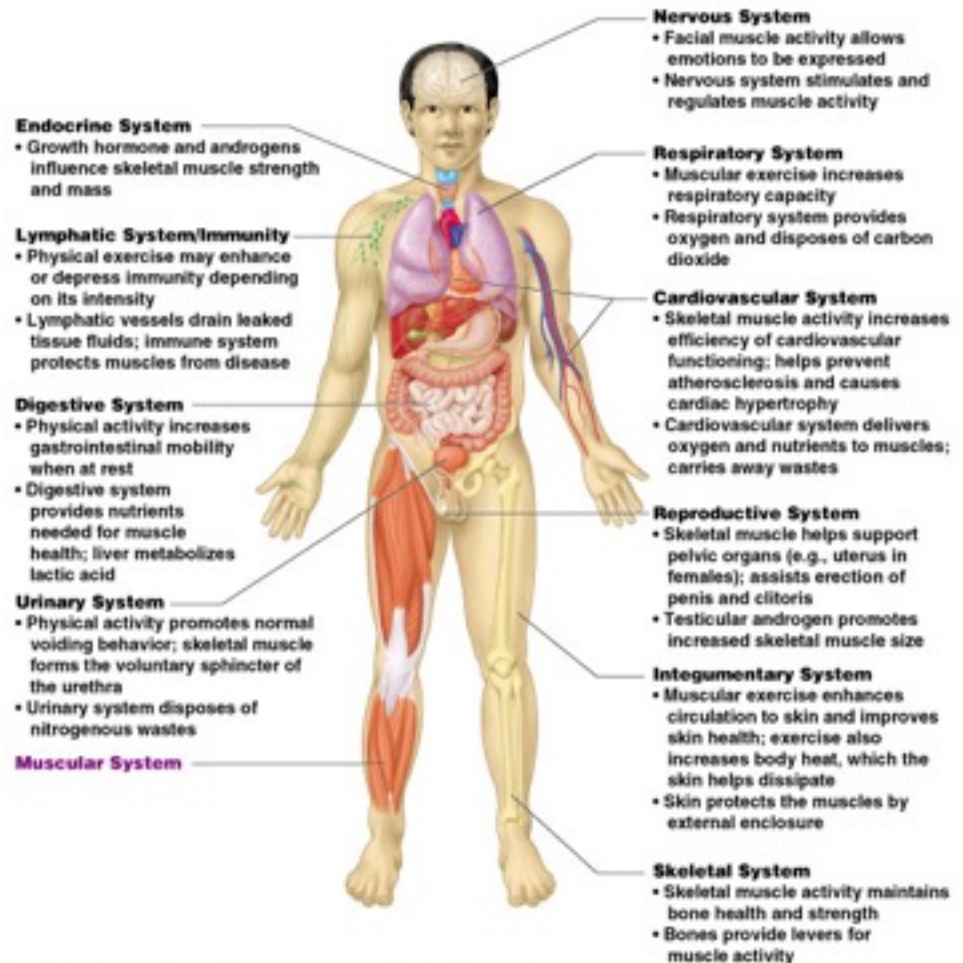
Characteristic	Skeletal	Cardiac	Smooth
Body location	 <p>Attached to bones or, for some facial muscles, to skin</p>	 <p>Walls of the heart</p>	 <p>Mostly in walls of hollow visceral organs (other than the heart)</p>
Cell shape and appearance	 <p>Single, very long, cylindrical, multinucleate cells with 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

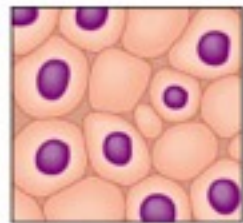
Skeletal Muscle Characteristics

- Most attach to bones by tendon
- Cells are multinucleate
- Striated—have visible banding
- Voluntary
- Cells surrounded & bundled by connective tissue

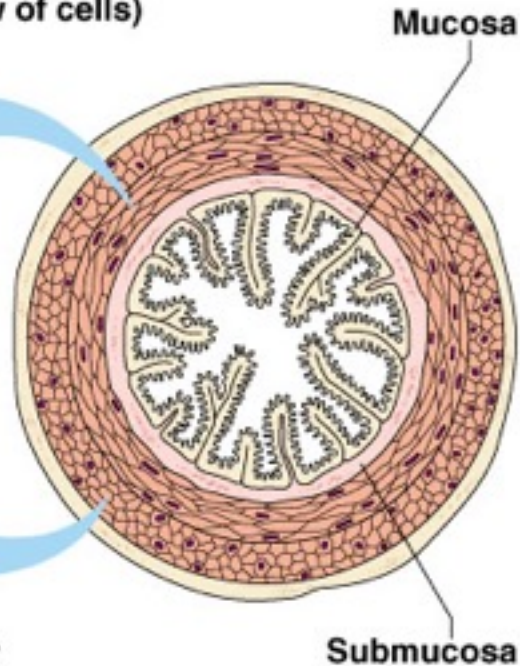


Smooth Muscle Characteristics

Circular layer of smooth muscle
(Longitudinal view of cells)



Longitudinal layer of smooth muscle
(Cross-sectional view of cells)

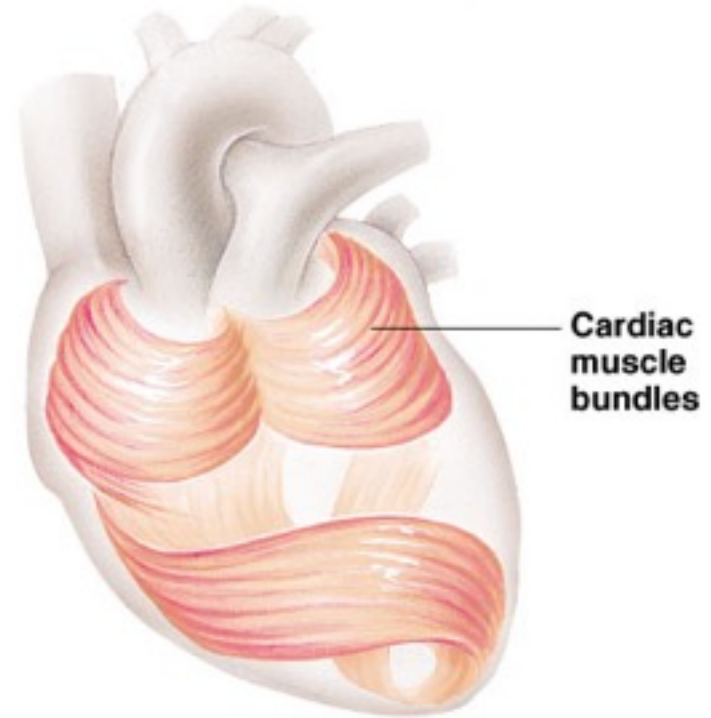


- Has no striations
- Spindle-shaped cells
- Single Nucleus
- Involuntary—no conscious control
- Found mainly in the walls of hollow organs

(a)

Characteristics of Cardiac Muscle

- Has striations
- Usually has a single nucleus
- Joined to another cardiac muscle cell
- Involuntary
- Found only in the heart



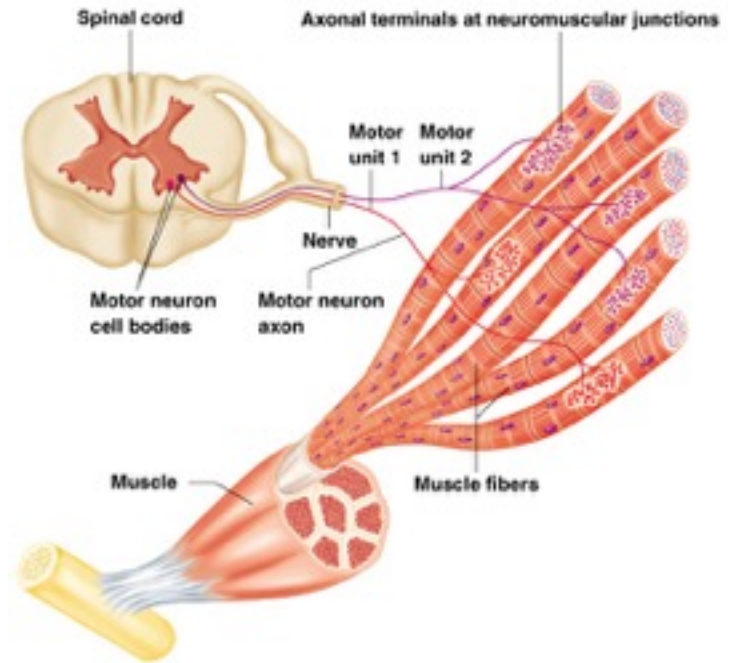
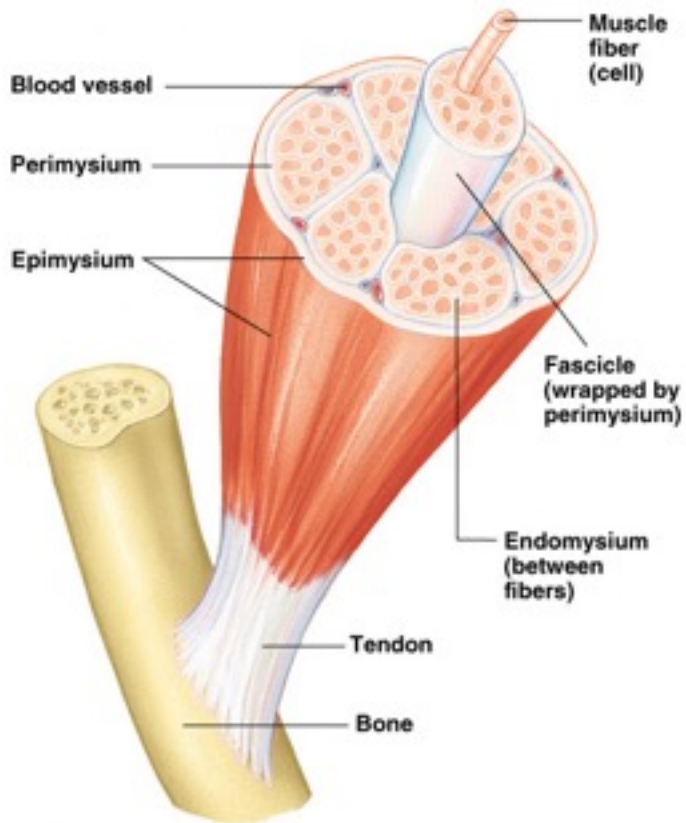
(b)



Skeletal Muscle

- Functions of Skeletal Muscle
 - Produce Movement
 - Maintain posture
 - Stabilize joints
 - Generate Heat
- Sites of Muscle Attachment
 - Bones
 - Cartilage
 - Connective tissue coverings
- Muscle Fibers blend into a connective tissue attachment
 - Tendon—cordlike structure
 - Aponeurosis—sheet-like structure
- Properties of Muscle
 - Irritability – ability to receive and respond to a stimulus
 - Contractibility – ability to shorten when an adequate stimulus is received
 - Extensibility – ability to lengthen when an adequate stimulus is received
 - Elasticity – ability to return to normal shape

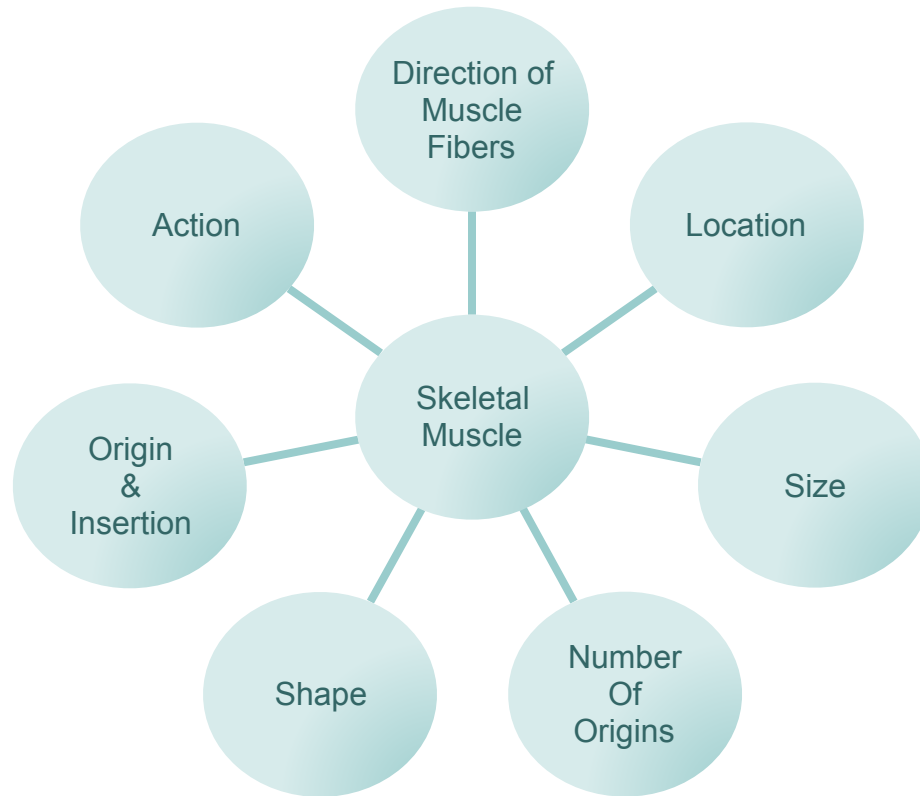
Anatomy of a Muscle Cell



(a)

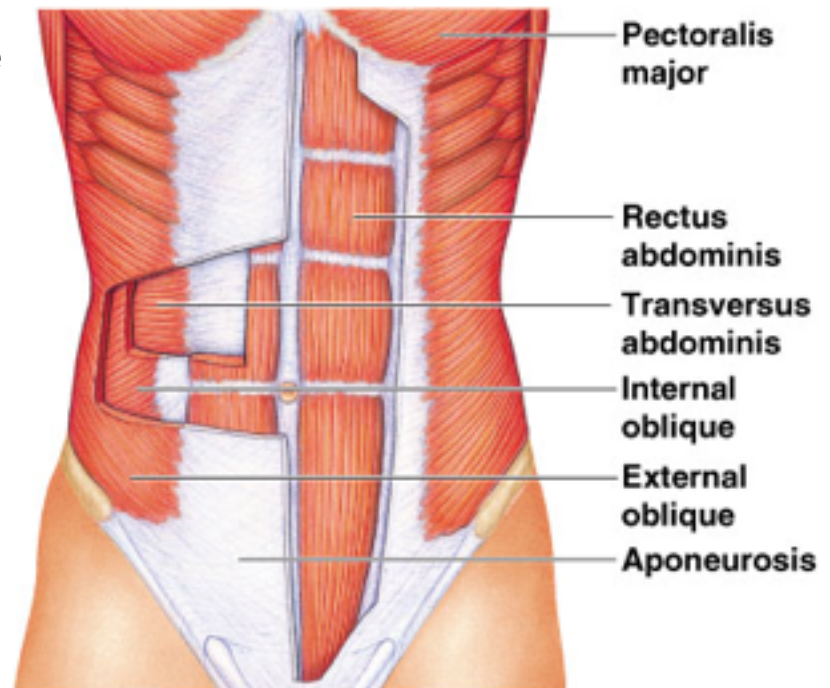
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Naming Skeletal Muscles

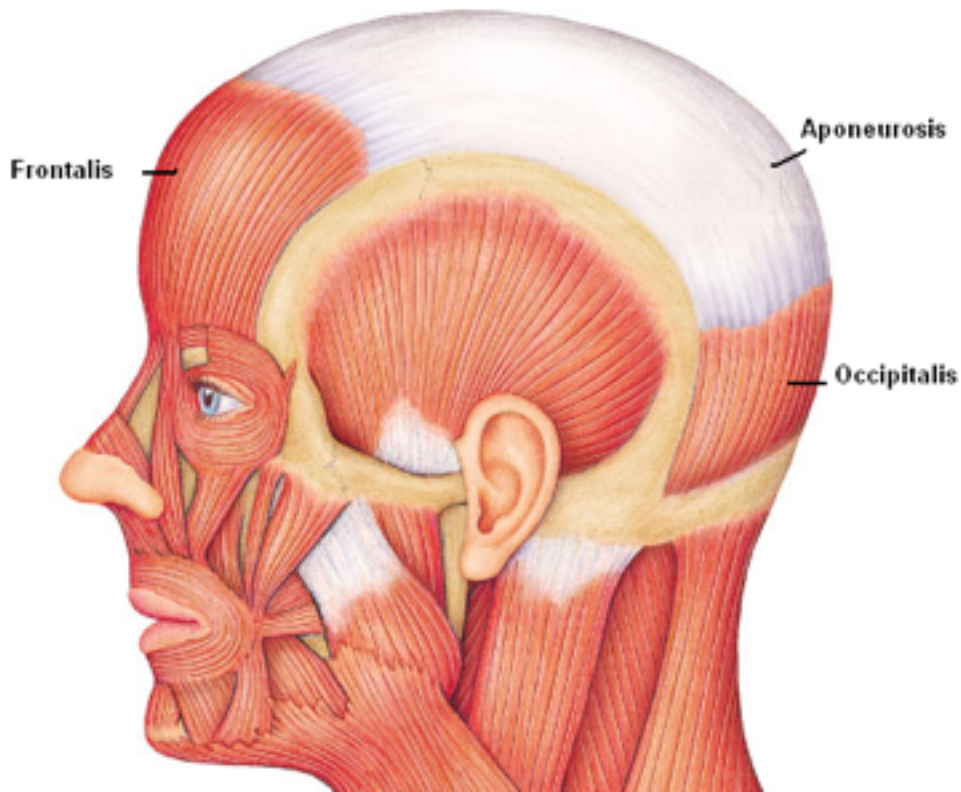


Direction of Muscle Fibers

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



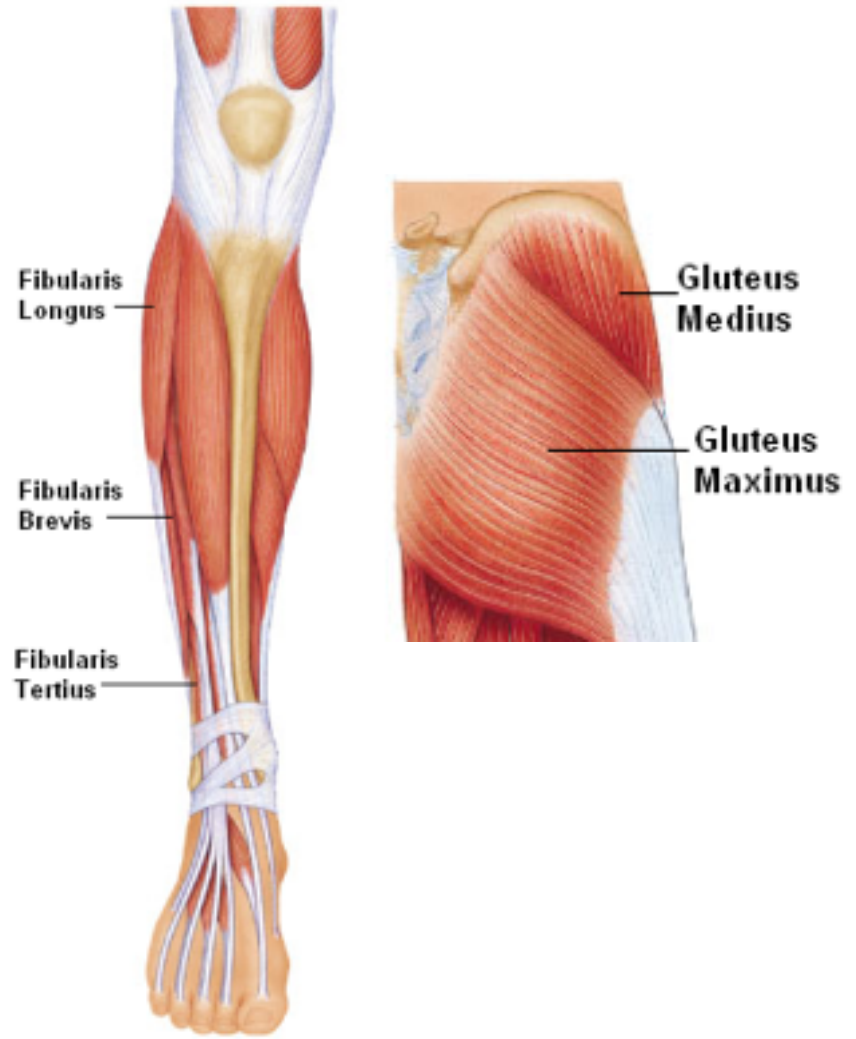
Location



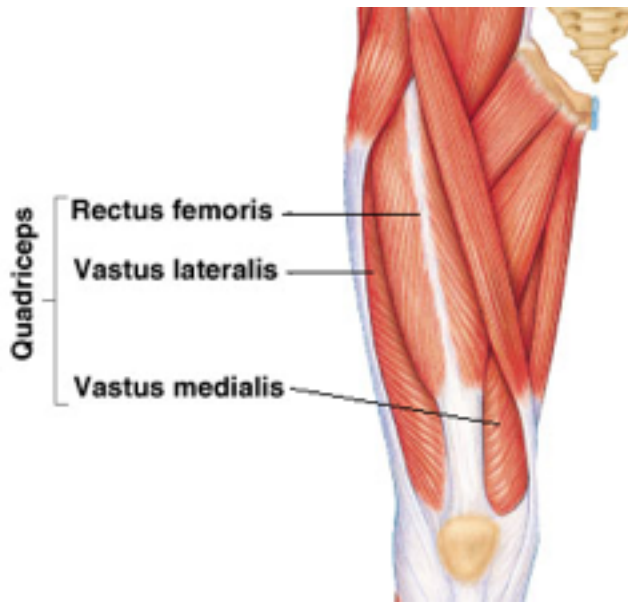
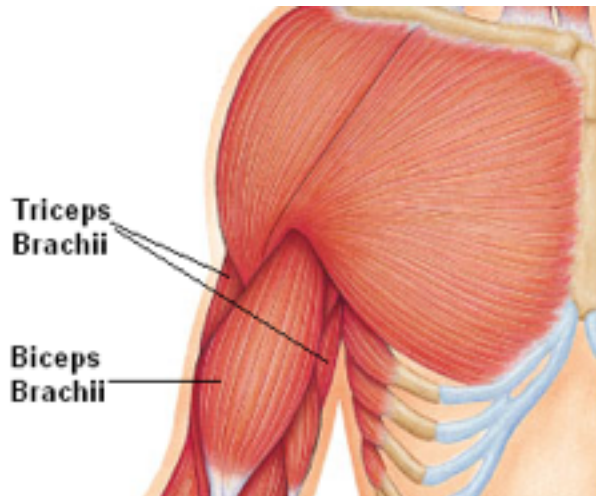
- Structure near which muscle is found
 - **FRONTALIS** = near FRONTAL bone
 - **OCCIPITALIS** = near OCCIPITAL bone

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*



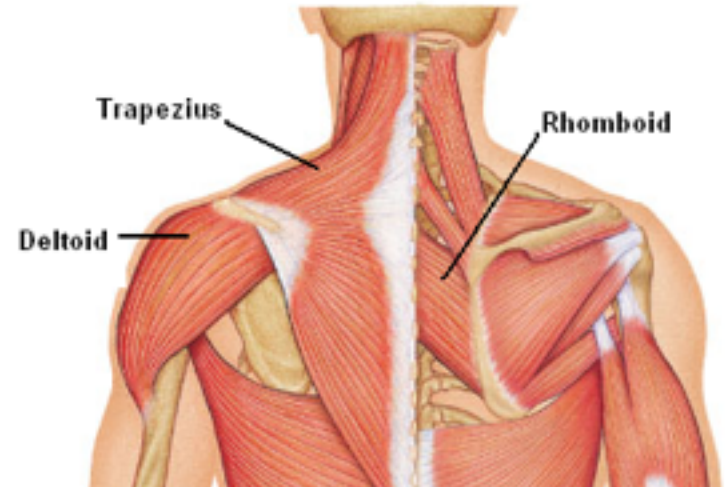
Number of Origins



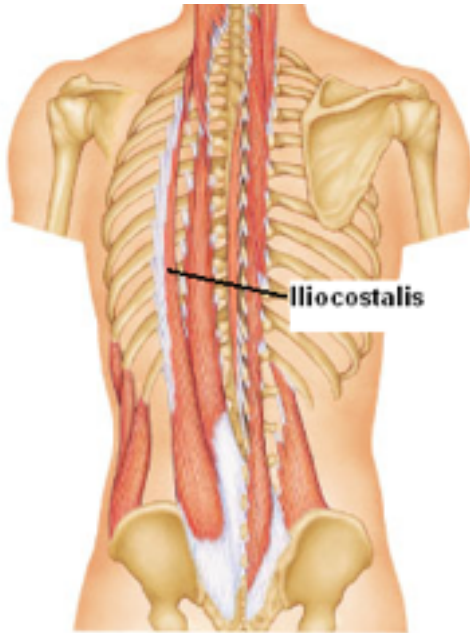
- Number of tendons of origin
- **BICEPS** = Two
 - *Biceps Brachii*
 - *Biceps Femoris*
- **TRICEPS** = Three
 - *Triceps Brachii*
- **QUADRICEPS** = Four
 - *Quadriceps Femoris*

Shape

- Relative Shape of the Muscle
- **DELTOID** = triangular shape Δ
- **TRAPEZIUS** = trapezoid shape \diamond
- **SERRATUS** = saw-toothed \approx
- **RHOMBOIDEUS** = rhomboid shape \hat{O}
- **TERES** = round \circ



Origin & Insertion



- Origin – attachment to an immovable bone
- Insertion – attachment to a movable bone
- **ILIO COSTALIS**= attaches to the ilium & ribs (costal = ribs)



Action

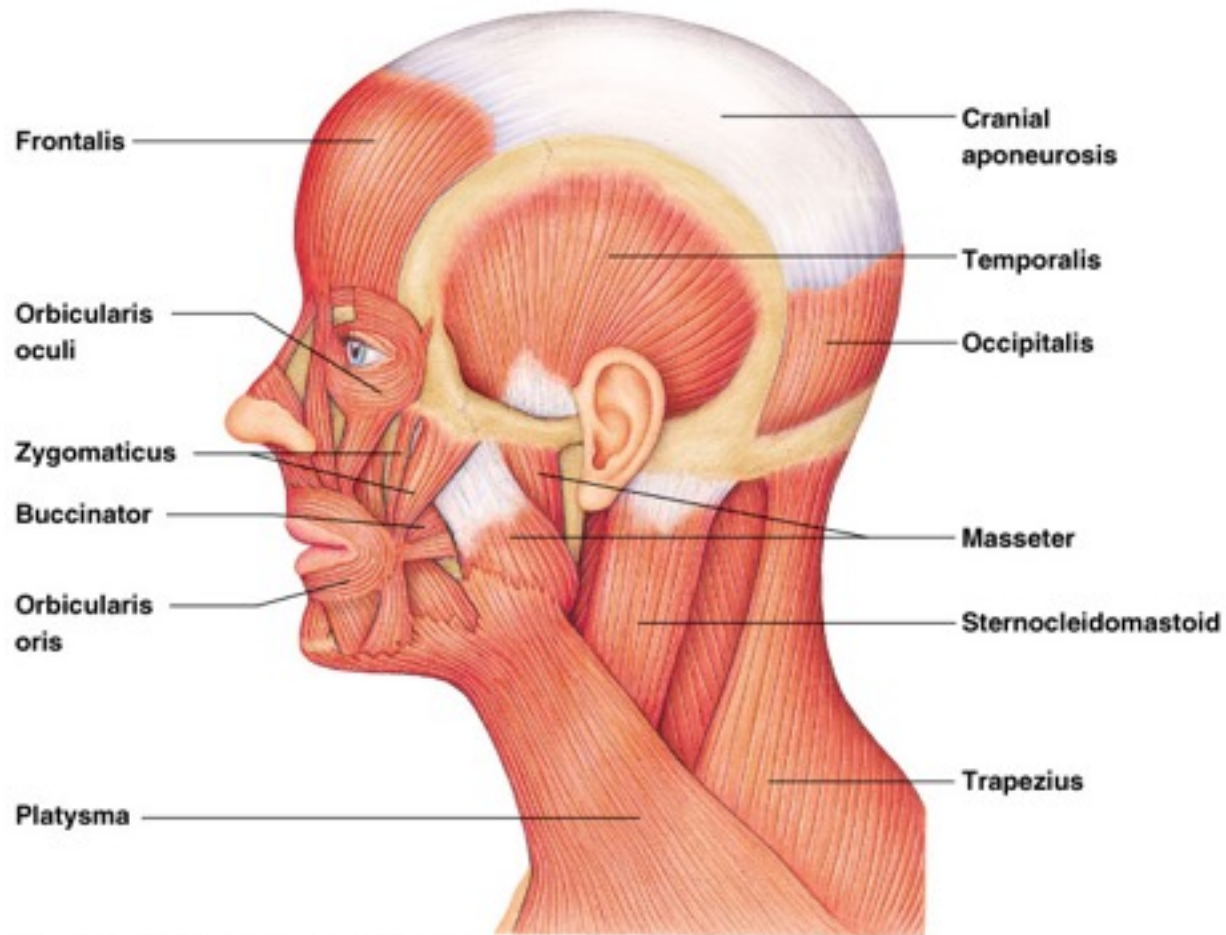
NAME	ACTION	EXAMPLE
FLEXOR	Decrease angle at a joint	<i>Flexor Carpi Radialis</i>
EXTENSOR	Increase angle at a joint	<i>Extensor Carpi Ulnaris</i>
ABDUCTOR	Move bone away from midline	<i>Abductor Pollicis Longus</i>
ADDUCTOR	Move bone toward midline	<i>Adductor Longus</i>
LEVATOR	Produce upward movement	<i>Levator Scapulae</i>
DEPRESSOR	Produce downward movement	<i>Depressor Labii Inferioris</i>
SUPINATOR	Turn palm upward/anterior	<i>Supinator</i>
PRONATOR	Turn palm downward/posterior	<i>Pronator Teres</i>



Types of Muscle--Actions

- Prime mover (Agonist) – muscle with the major responsibility for a certain movement
- Antagonist – muscle that opposes or reverses a prime mover
- Synergist – muscle that aids a prime mover in a movement and helps prevent rotation
- Fixator – stabilizes the origin of a prime mover

Head & Neck Muscles



Head & Neck Muscles

- Frontalis: elevate eyebrows 😞
- Orbicularis Oculi: close eyelid 😊
- Zygomaticus: draw angle of lip upward 😊
- Buccinator: draws cheeks against teeth
- Orbicularis Oris: closes mouth 😊
- Platysma: draws lower lip down & back 😞
- Cranial Aponeurosis: connects frontalis to occipitalis
- Temporalis: elevates mandible
- Occipitalis: draws scalp back
- Masseter: elevates mandible
- Sternocleidomastoid:
 - Flexes head
 - Draws head toward shoulder

Muscles of Mastication

- Masseter: elevates mandible
- Temporalis: elevates mandible
- Medial pterygoid: elevates mandible
- Lateral pterygoid: depresses mandible





Key Muscles of Facial Expression

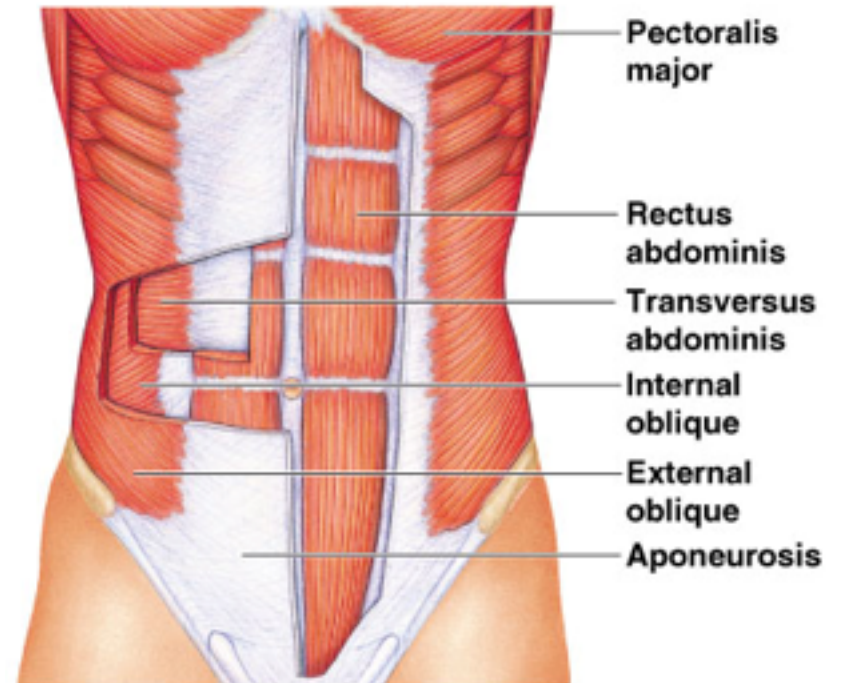
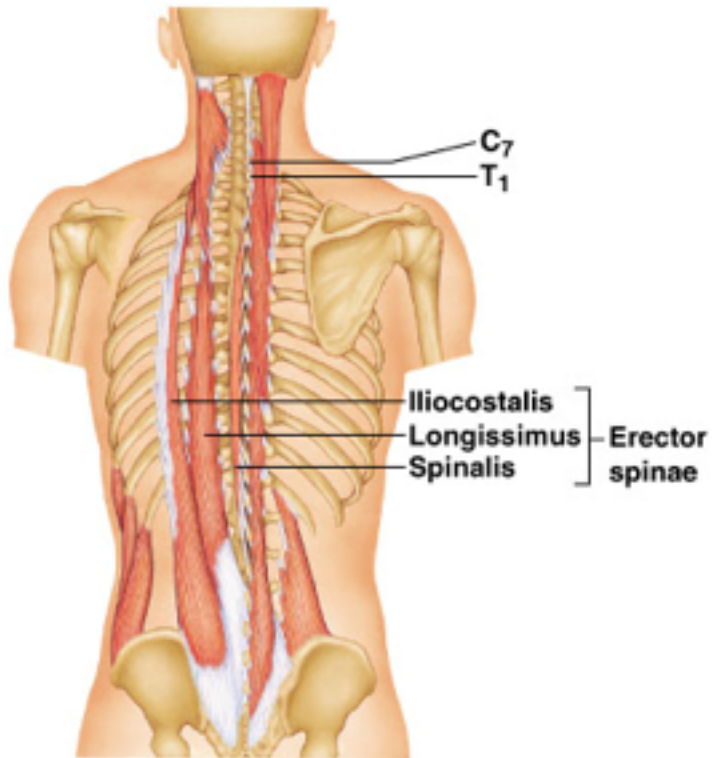
- Smiling Muscles

- Orbicularis Oculi
- Nasalis
- Levator Labii Superioris
- Levator Anguli Superioris
- Zygomaticus
- Risorius

- Frowning Muscles

- Frontalis
- Orbicularis Oris
- Depressor Anguli Oris
- Depressor Labii Inferioris
- Mentalis
- Platysma

Muscles of the Axial Skeleton



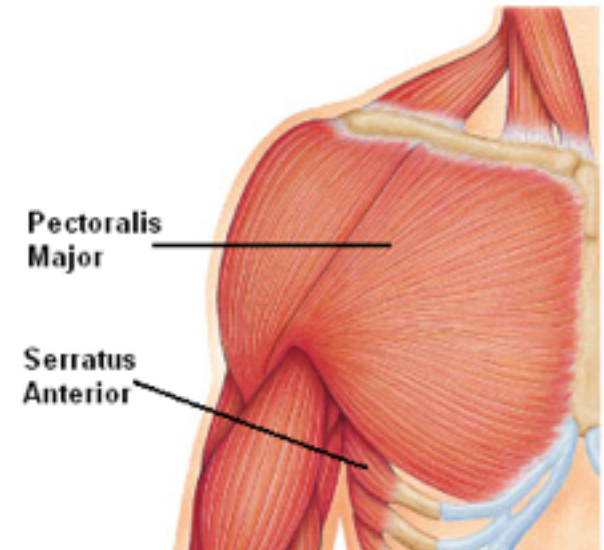
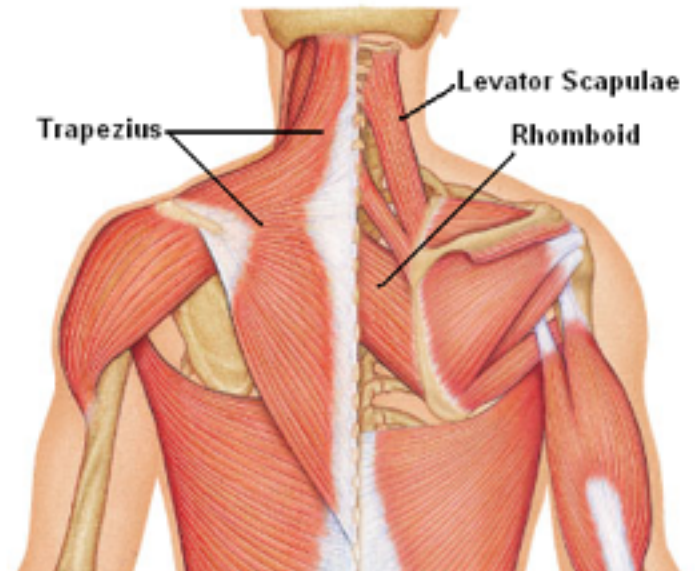


Muscles of the Axial Skeleton

- Intrinsic Muscles
 - Erector Spinae: maintain posture of back/extension
 - Spinalis
 - Longissimus
 - Iliocostalis
 - Oblique Muscles: rotation of the vertebrae
 - Semispinalis
 - Multifidus
 - Rotatores
- Muscles of Quiet Respiration
 - Diaphragm
 - External Intercostals
 - Internal Intercostals—deep breaths
- Abdominal Muscles
 - External Obliques
 - Internal Obliques
 - Transverse Abdominus
 - Rectus Abdominus
- Quadratus Lumborum

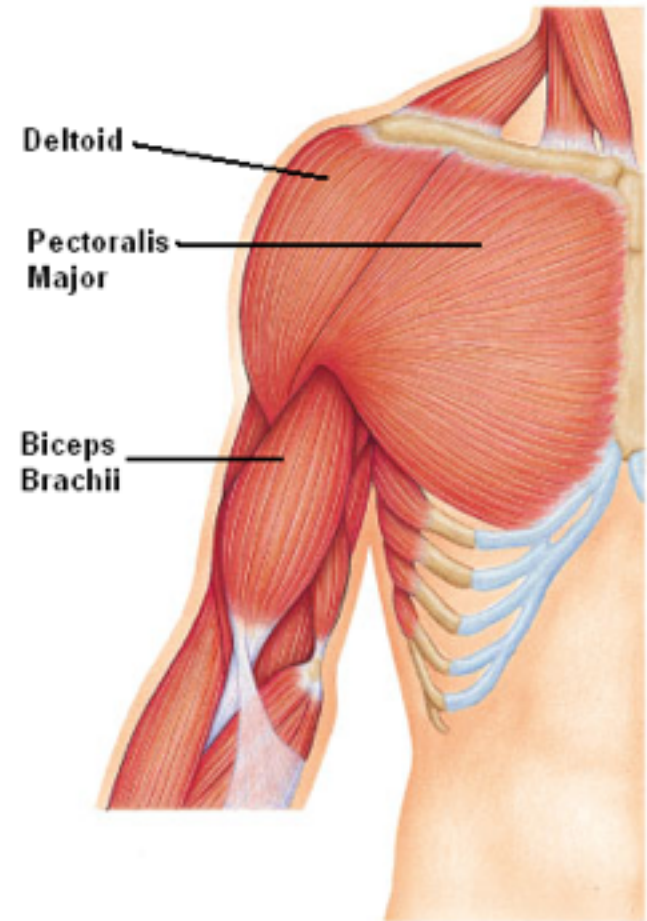
Muscles of Scapular Stabilization

- Trapezius:
 - Retraction (M)
 - Elevation (S)
 - Depression (I)
 - Upward Rotation (S, M)
- Rhomboid—retraction
- Levator Scapular—Elevation
- Pectoralis Major—Protraction
- Serratus Anterior—Protraction

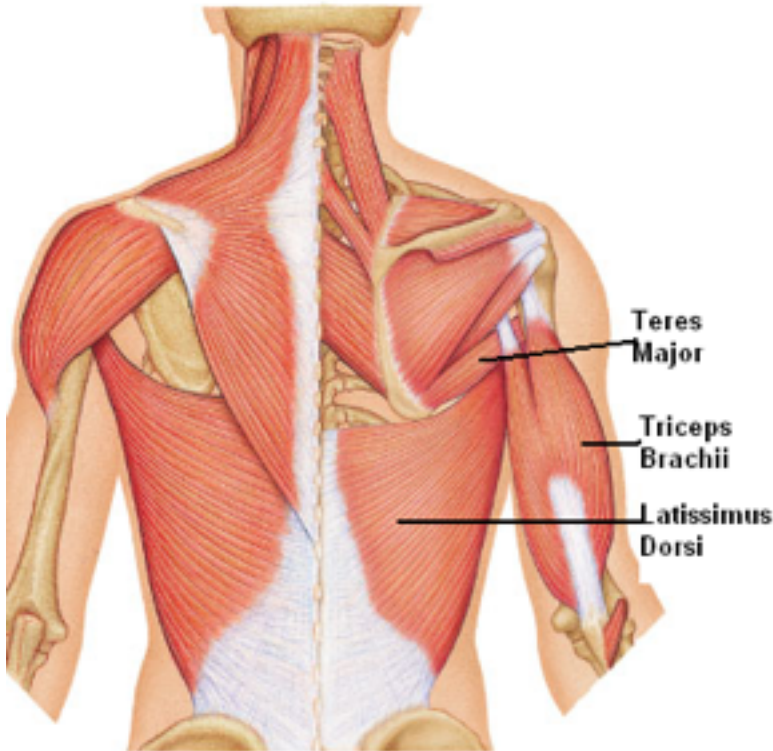


Anterior Muscles of Shoulder

- Deltoid
 - Flexion (A, M)/Extension (P, M)
 - Abduction (M)/Adduction (A)
 - Internal (A) /External Rotation (P)
- Pectoralis Major
 - Adduction
 - Flexion
 - Extension
 - Internal Rotation
- Biceps Brachii—Flexion

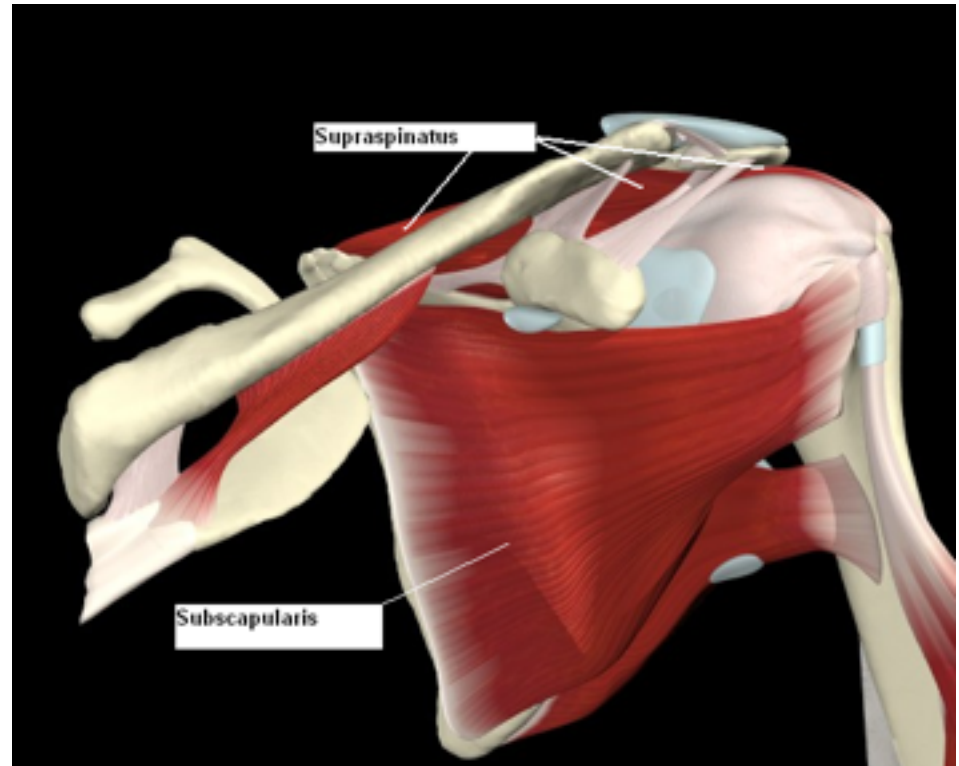
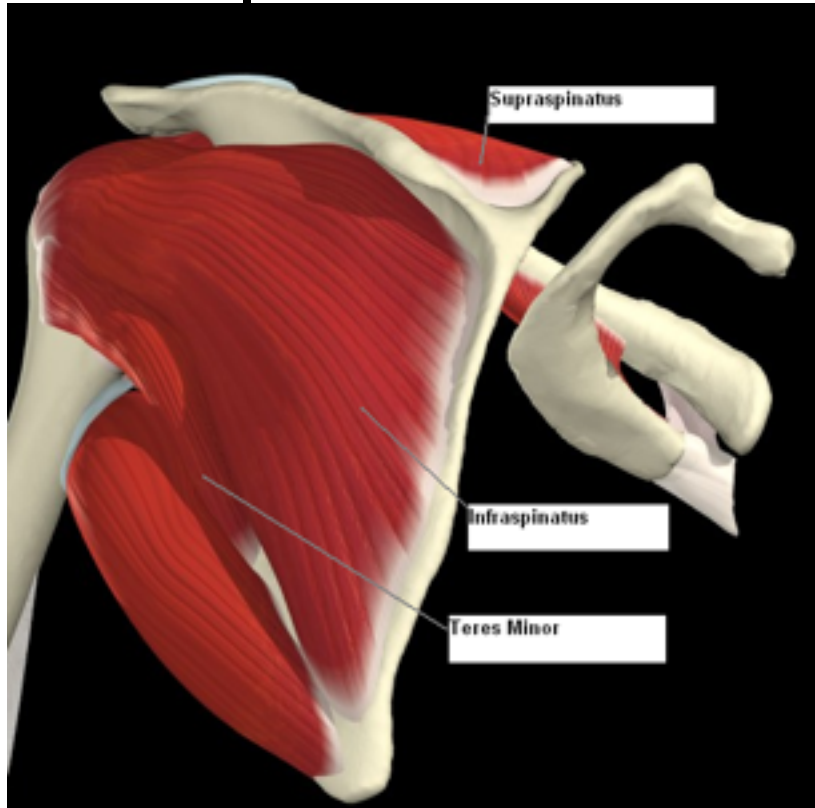


Posterior Muscles of Shoulder



- Teres Major
 - Adduction
 - Extension
 - Internal Rotation
- Latissimus Dorsi
 - Adduction
 - Extension
 - Internal Rotation
- Triceps Brachii
 - Adduction
 - Extension

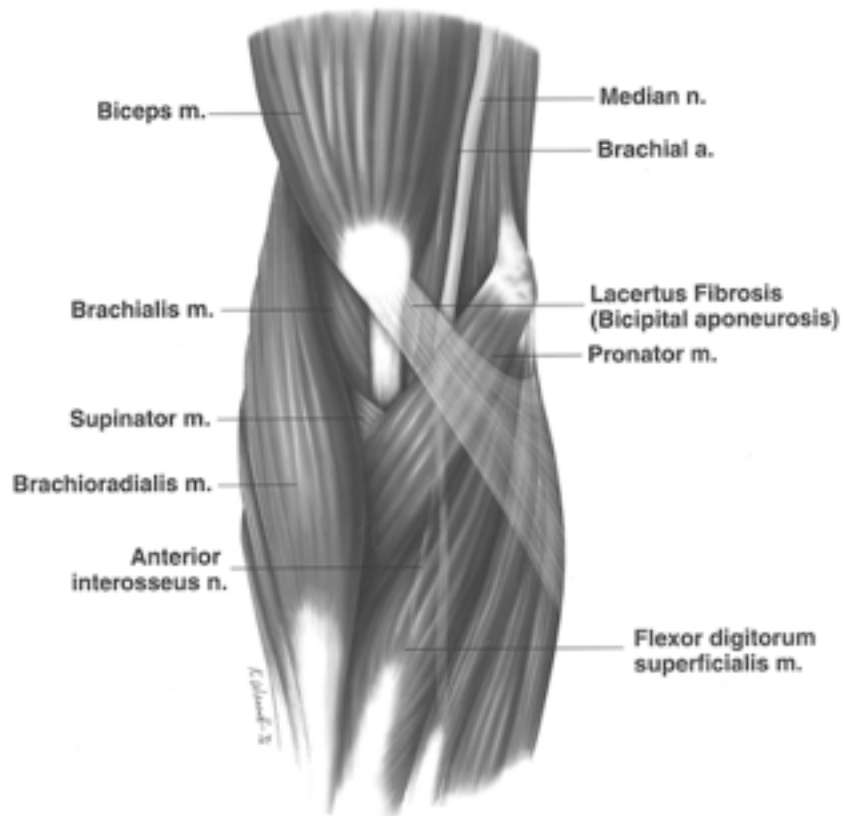
Rotator Cuff Muscles (SITS)



- Supraspinatus
 - Abduction
- Infraspinatus
 - External Rotation

- Teres Minor
 - External Rotation
- Subscapularis
 - Internal Rotation

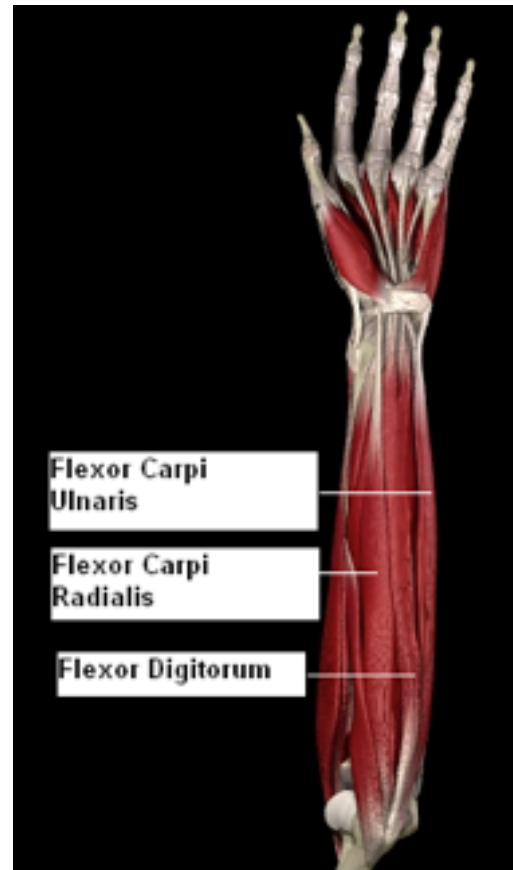
Muscles of the Elbow/ Forearm



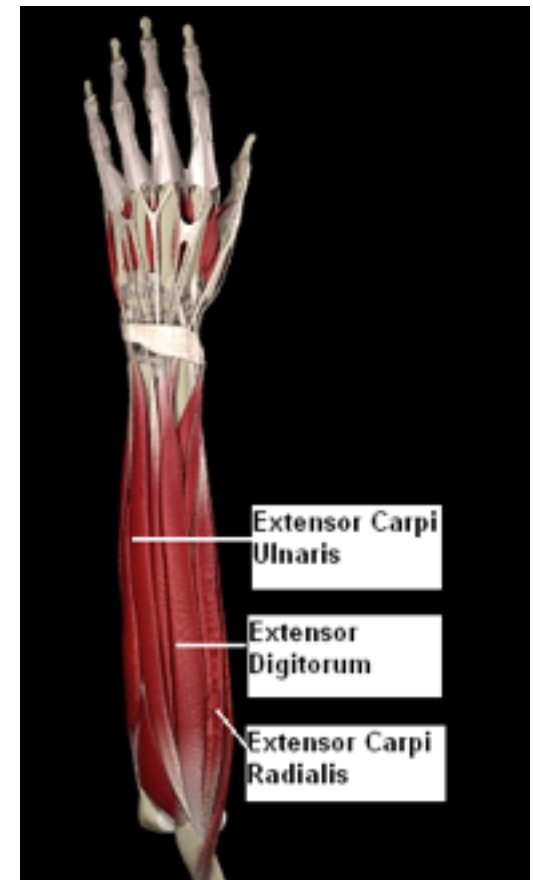
- Triceps Brachii—
Extension
- Bicep Brachii—
 - Flexion
 - Supination
- Brachialis—Flexion
- Brachioradialis—
 - Flexion
 - Pronation
- Pronator Teres
- Pronator Quadratus
- Supinator Longus

Muscles of the Wrist & Hand

- Flexor Carpi Ulnaris
- Flexor Carpi Radialis
- Flexor Digitorum
- Extensor Carpi Ulnaris
- Extensor Carpi Radialis
- Extensor Digitorum

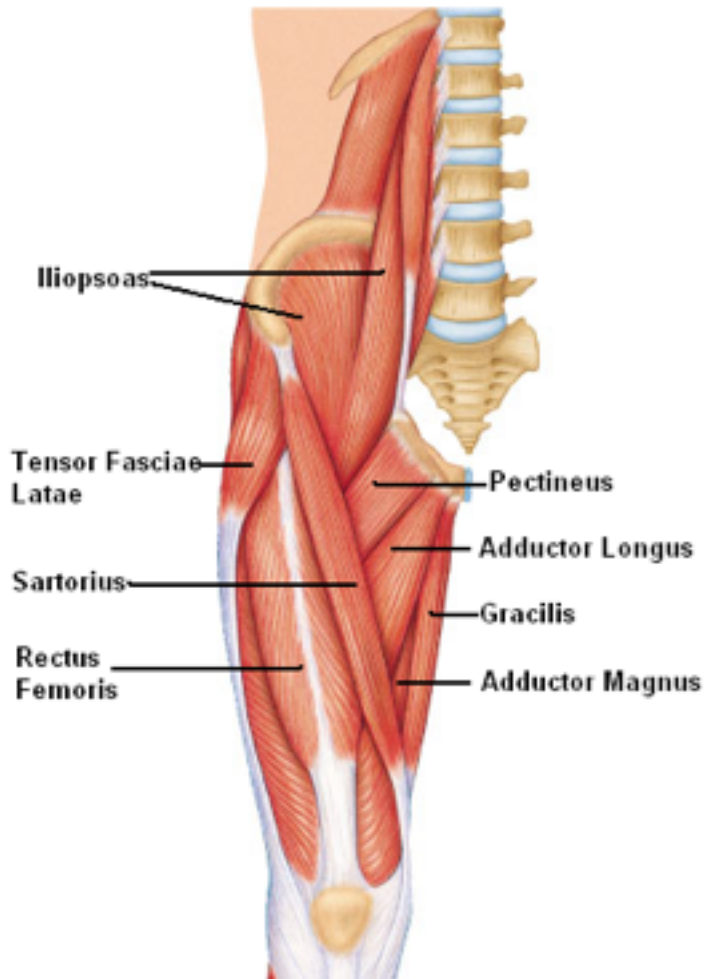


Anterior (Palmar) View



Posterior (Dorsal) View

Muscles Of Hip: Anterior Muscles

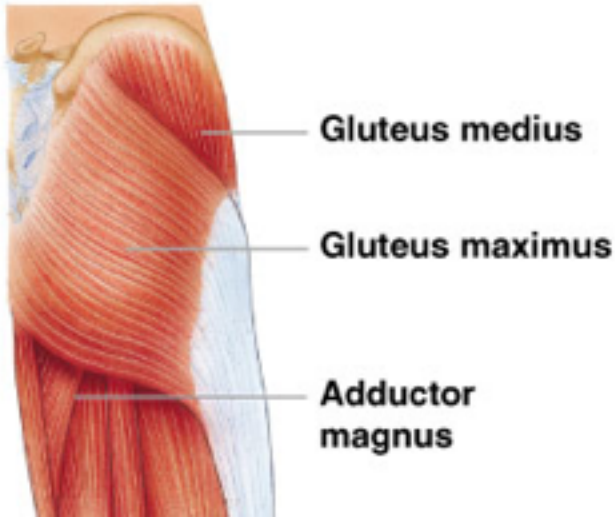




Muscles of Hip: Anterior Muscles

- Medial/Adductor Muscles:
 - Adductor Magnus
 - Adductor Longus
 - Adductor Brevis
 - Gracilis
- Anterior Muscles
 - Iliopsoas—Flexion
 - Pectineus—
 - Flexion
 - Adduction
 - Sartorius—
 - Flexion
 - Lateral Rotation

Muscles of Hip: Gluteal Muscles

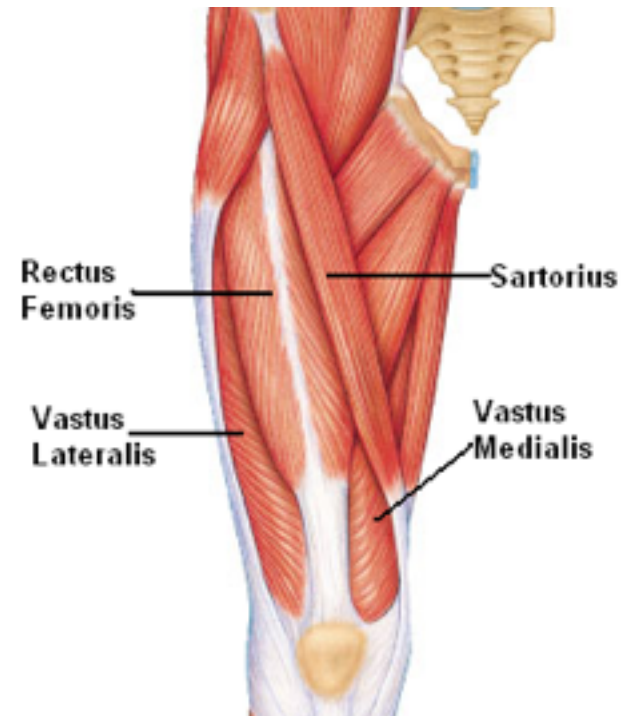


** Gluteus Minimus is under the
Gluteus Medius

- Gluteus Maximus—
Extension
- Gluteus Medius—
Abduction
- Gluteus Minimus—
Abduction
- Tensor Fasciae
Latae—
 - Flexion
 - Abduction

Muscles of Anterior Thigh

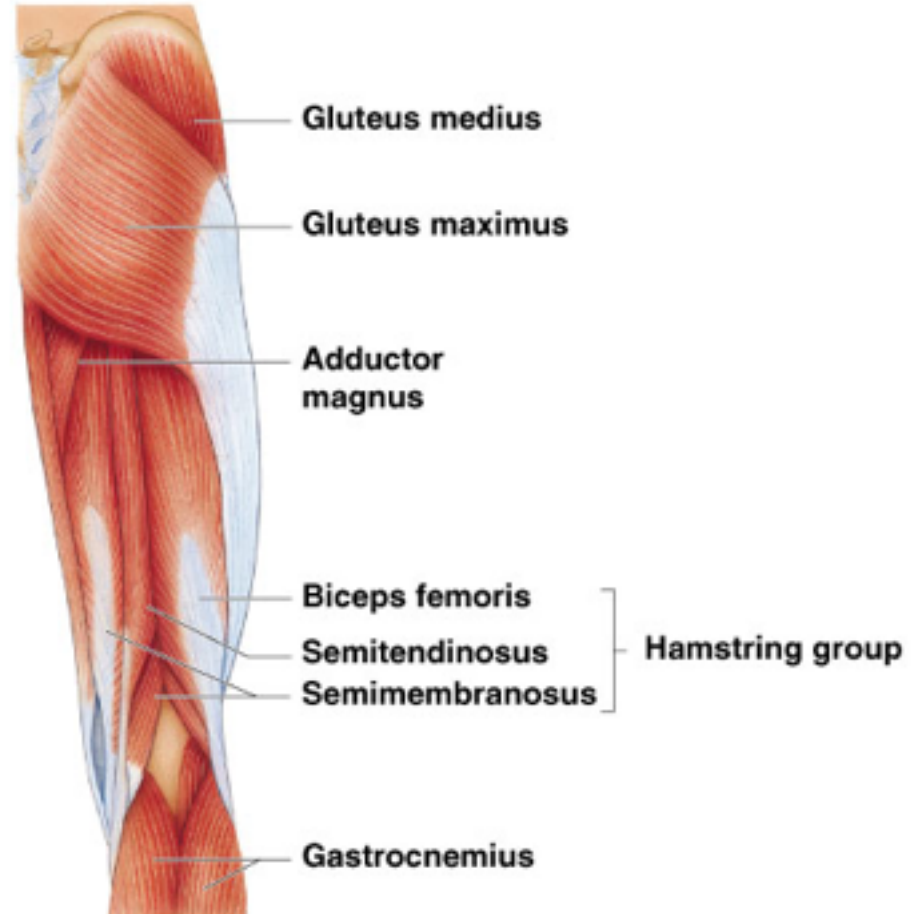
- “Quadriceps”
 - Rectus Femoris—
 - Hip flexion
 - Knee extension
 - Vastus Lateralis—knee extension
 - Vastus Medialis—knee extension
 - Vastus Intermedius—knee extension
 - Sartorius—
 - Hip & Knee Flexion
 - Lateral Hip Rotation



**Vastus Intermedius is beneath Rectus Femoris

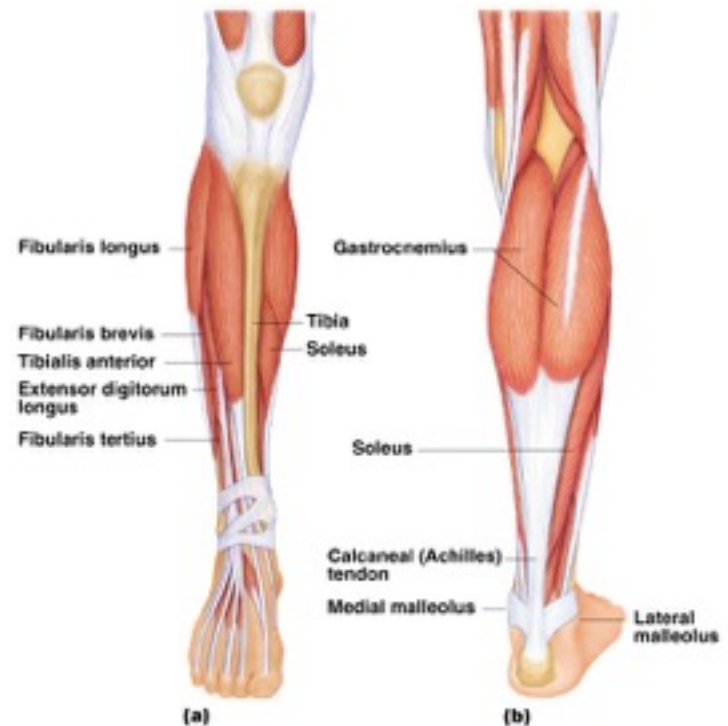
Muscles of Posterior Thigh

- “Hamstrings”
 - Responsible for Knee Flexion & Hip Extension
 - Semimembranosus
 - Semitendinosus
 - Biceps Femoris
- Gastrocnemius
 - Knee Flexion



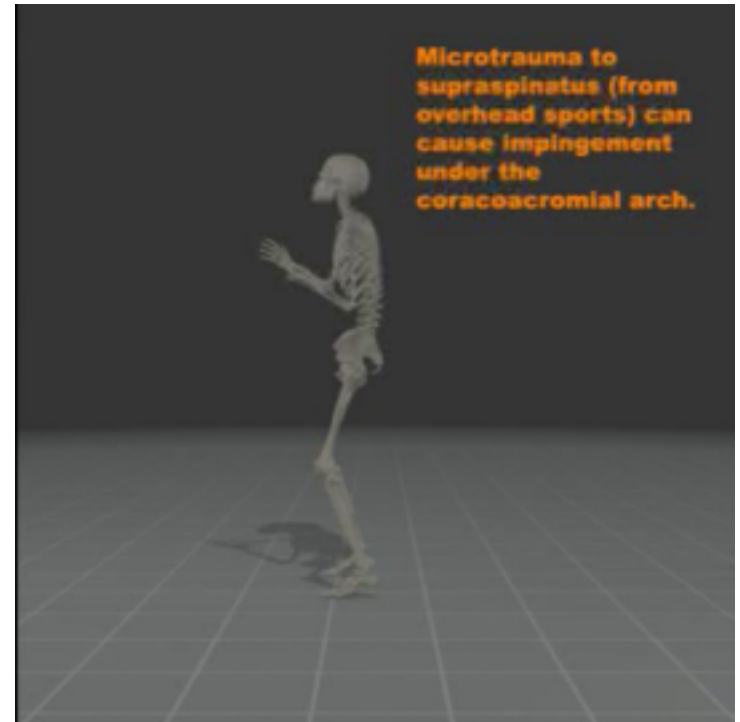
Muscles of the Lower Leg

- Anterior Compartment
 - Tibialis Anterior—Dorsiflexion & inversion
 - Extensor Digitorum Longus
 - Fibularis Tertius—dorsiflexion & eversion
- Posterior Compartment
 - Gastrocnemius—plantarflexion, knee flexion
 - Soleus—plantarflexion
- Lateral Compartment
 - Fibularis Longus—plantarflexion & eversion
 - Fibularis Brevis—plantarflexion & eversion



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Throwing Movement



Running & Kicking

