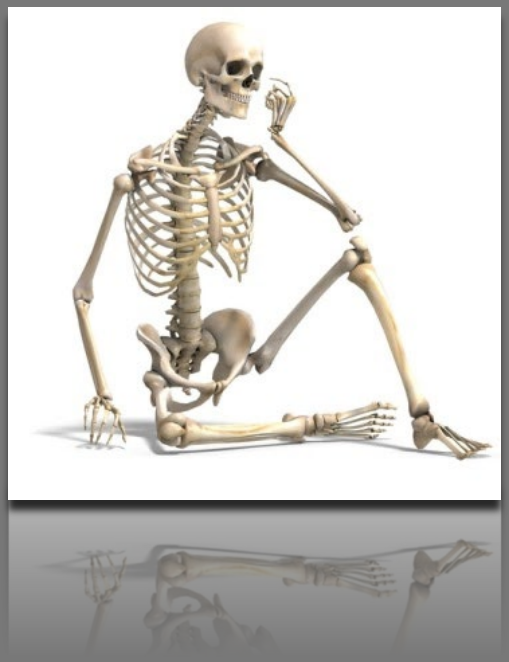
BALANCED BODY
ANATOMY IN THREE DIMENSIONS™



An Introduction to Anatomy for Movers and Movement Educators

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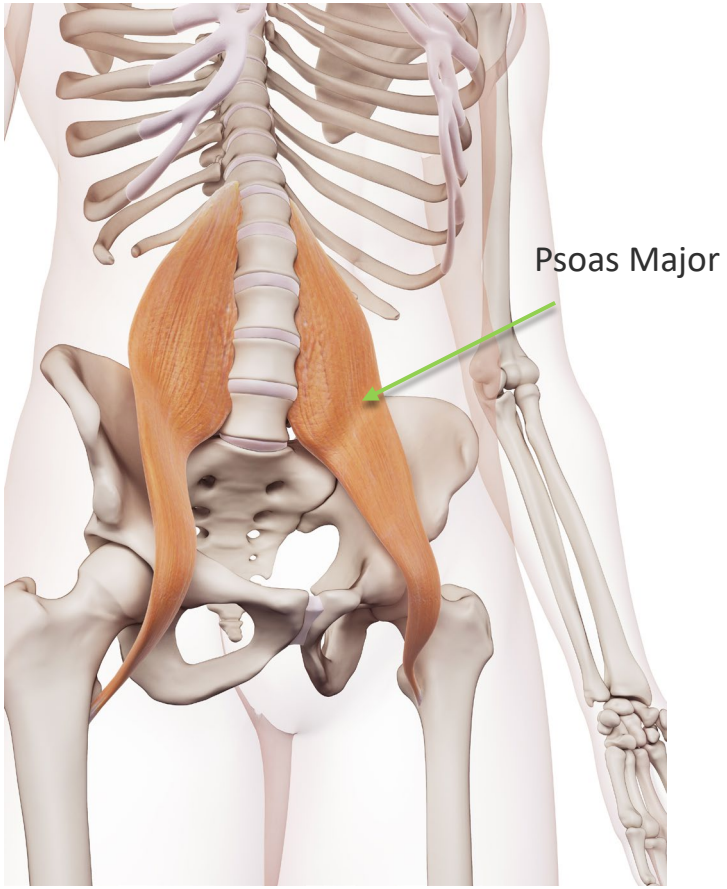
Iliacus and Psoas

- Iliacus
- Psoas Major
- Psoas Minor



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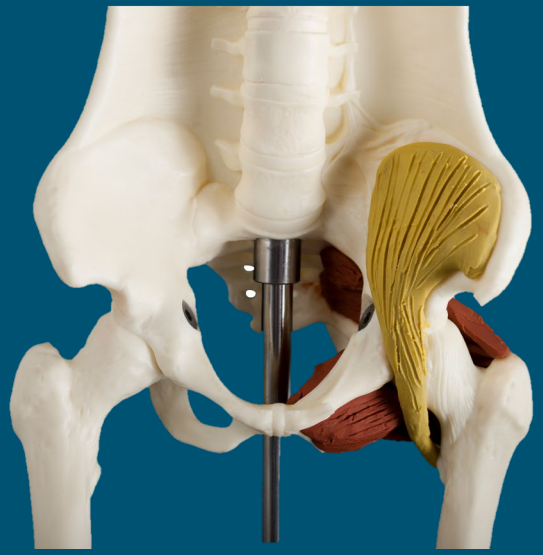
Iliacus

Anterior
View



Origin:

- Superior two thirds of iliac fossa
- Iliolumbar and ventral sacroiliac ligaments

Insertion:

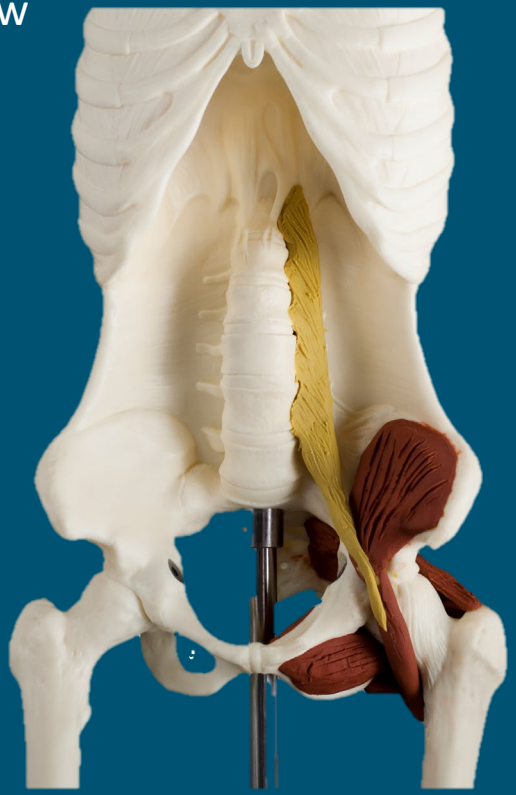
- Lesser trochanter of the femur

Actions:

- Fixed Pelvis:
  - Hip flexion, adduction, lateral rotation
- Fixed Leg:
  - Anterior pelvic tilt

Psoas Major

Anterior View



Origin:

- Bodies, transverse processes and intervertebral discs of T12 to L5

Insertion:

- Lesser trochanter of the femur
- Shares common tendon with iliacus

Actions:

- Fixed Pelvis:
  - Hip flexion, adduction, lateral rotation
- Fixed Leg:
  - Anterior pelvic tilt

Psoas Minor

Anterior View

Origin:

- Sides of vertebral bodies of T12 and L1

Insertion:

- Superior pubic ramus
- Medial to iliopsoas tendon

Actions:

- Posterior pelvic tilt
- Anterior translation of the ribcage

Psoas minor is absent in approximately 60% of the population.

Deep Anterior Hip Muscle Movements

	Hip Actions			Pelvic Actions	
Muscles	Flexion	Adduction	Lateral rotation	Anterior pelvic tilt	Posterior pelvic tilt
Iliacus	X	X	X	X	
Psoas major	X	X	X	X	
Psoas minor					X

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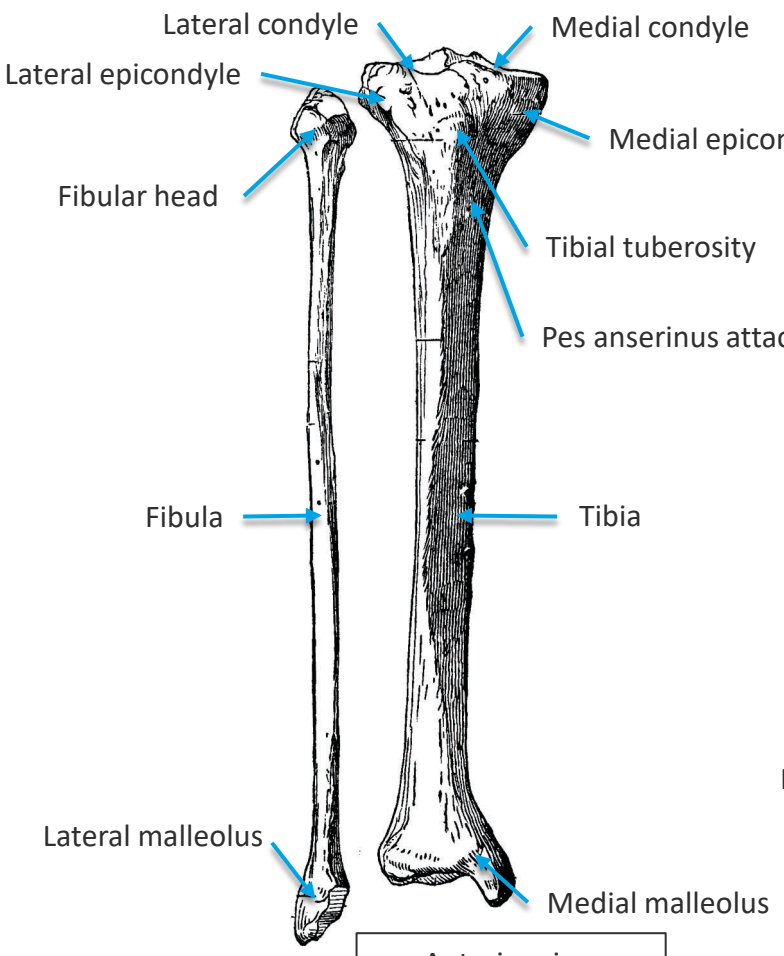
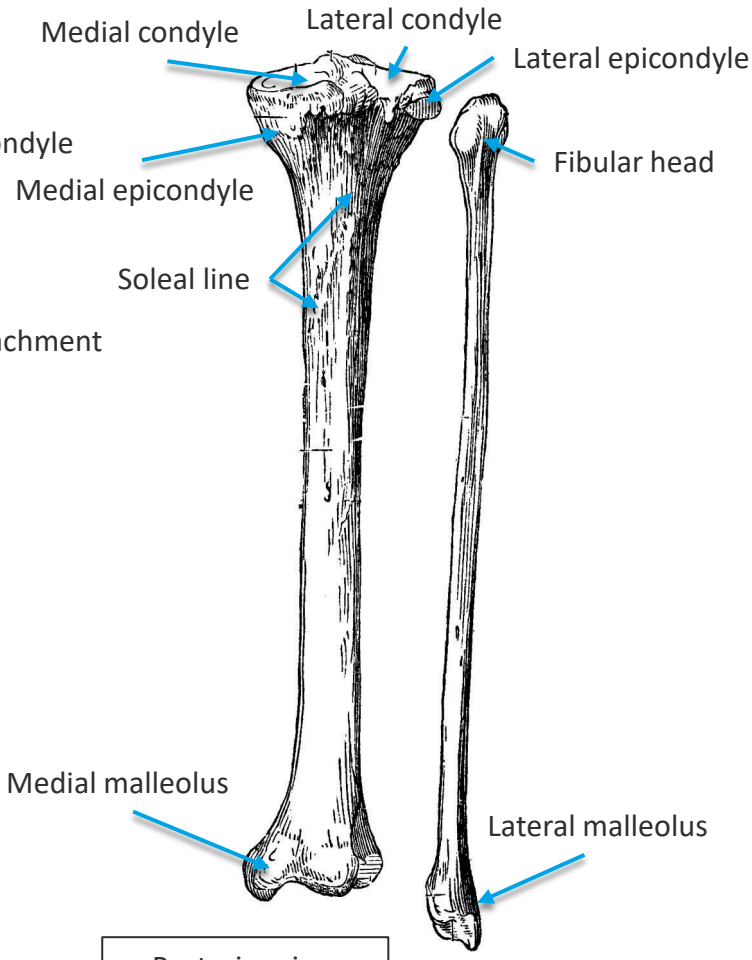
Bony Landmarks
Tibia and Fibula



Anterior view



Posterior view

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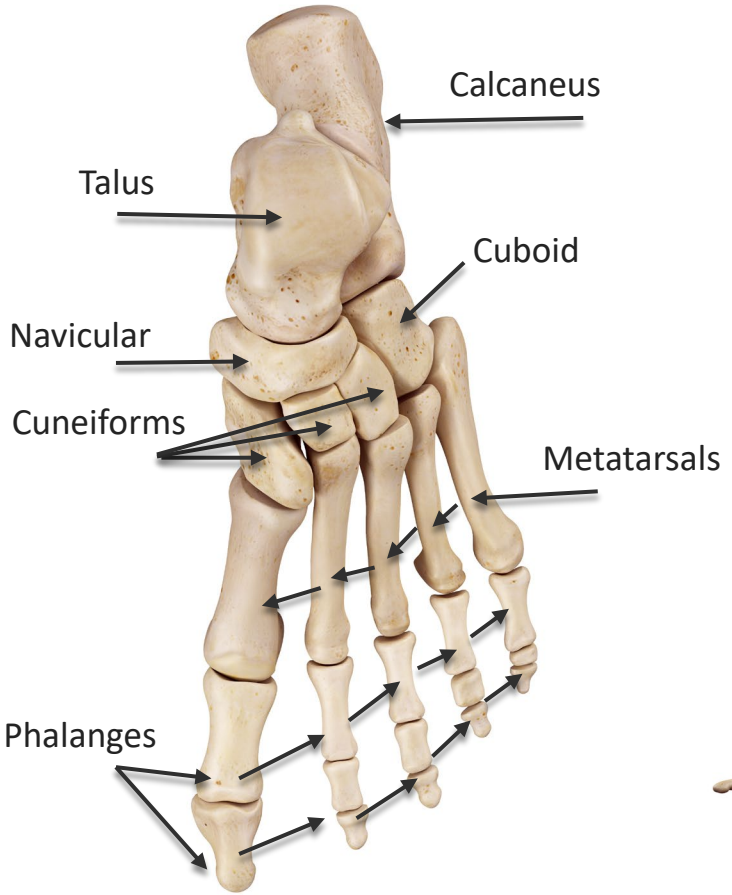
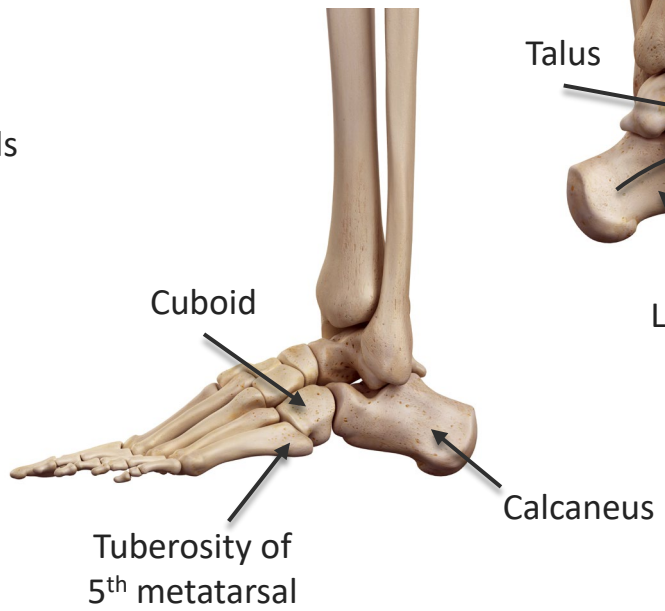
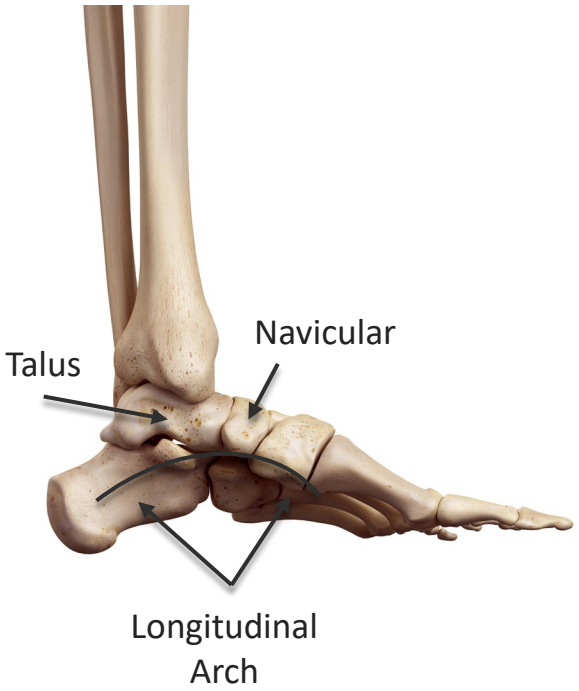
Bony Landmarks
Foot







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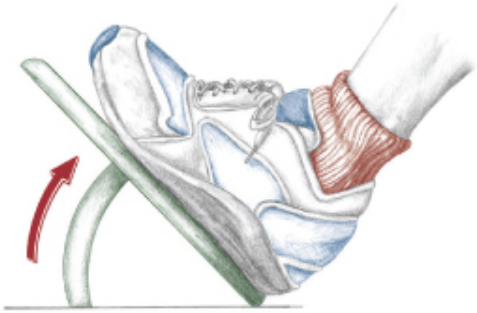
Movements: Ankle, Foot and Toes

(talocrural, talotarsal, midtarsal, tarsometatarsal, metatarsophalangeal and interphalangeal joints)



Dorsiflexion of ankle

Inversion of foot

Flexion of toes

Plantar flexion of ankle

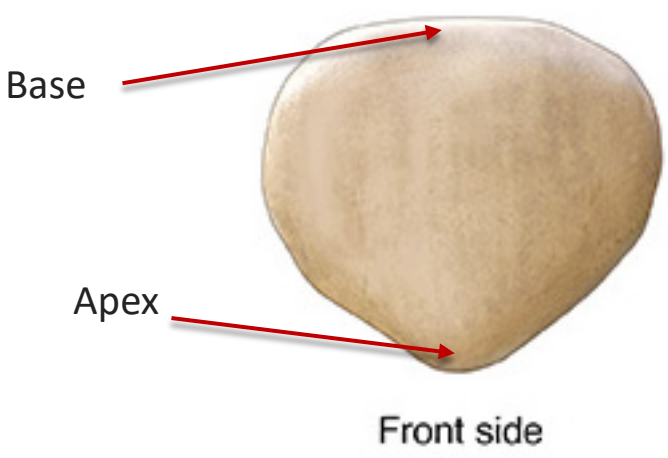
Eversion of foot

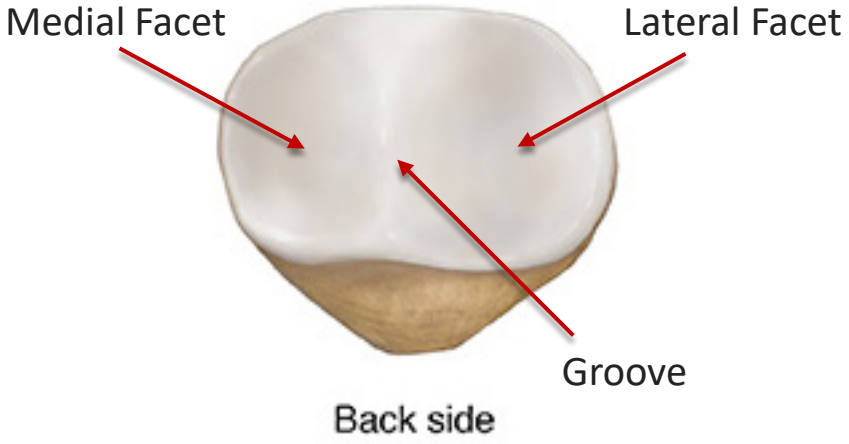
Extension of toes

Patella

The patella is a sesamoid bone. It is slightly triangular shaped and is encased in the tendon of the quadriceps muscle.

Notice the slight groove in the posterior view. Imagine how that groove will rest in the space between the condyles at the distal end of the femur.





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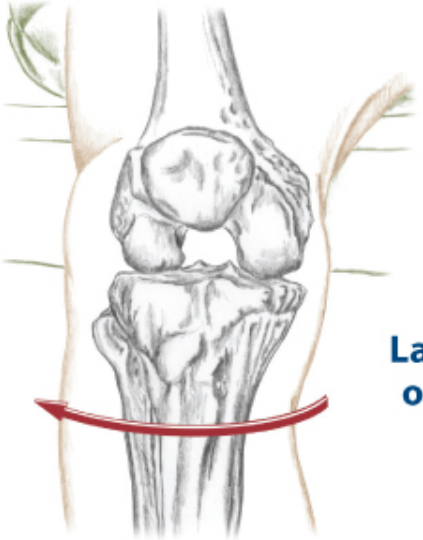
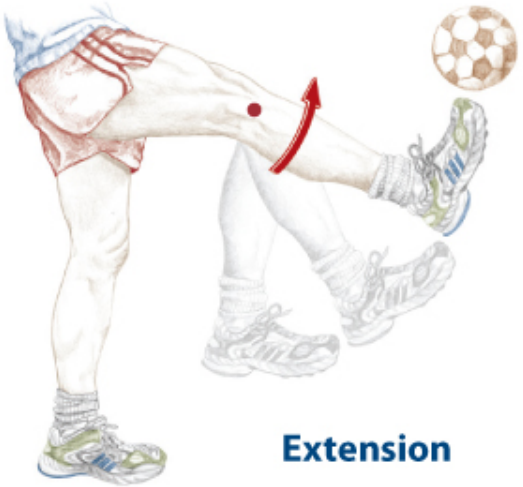
Movements: Knee

(tibiofemoral joint)

Flexion



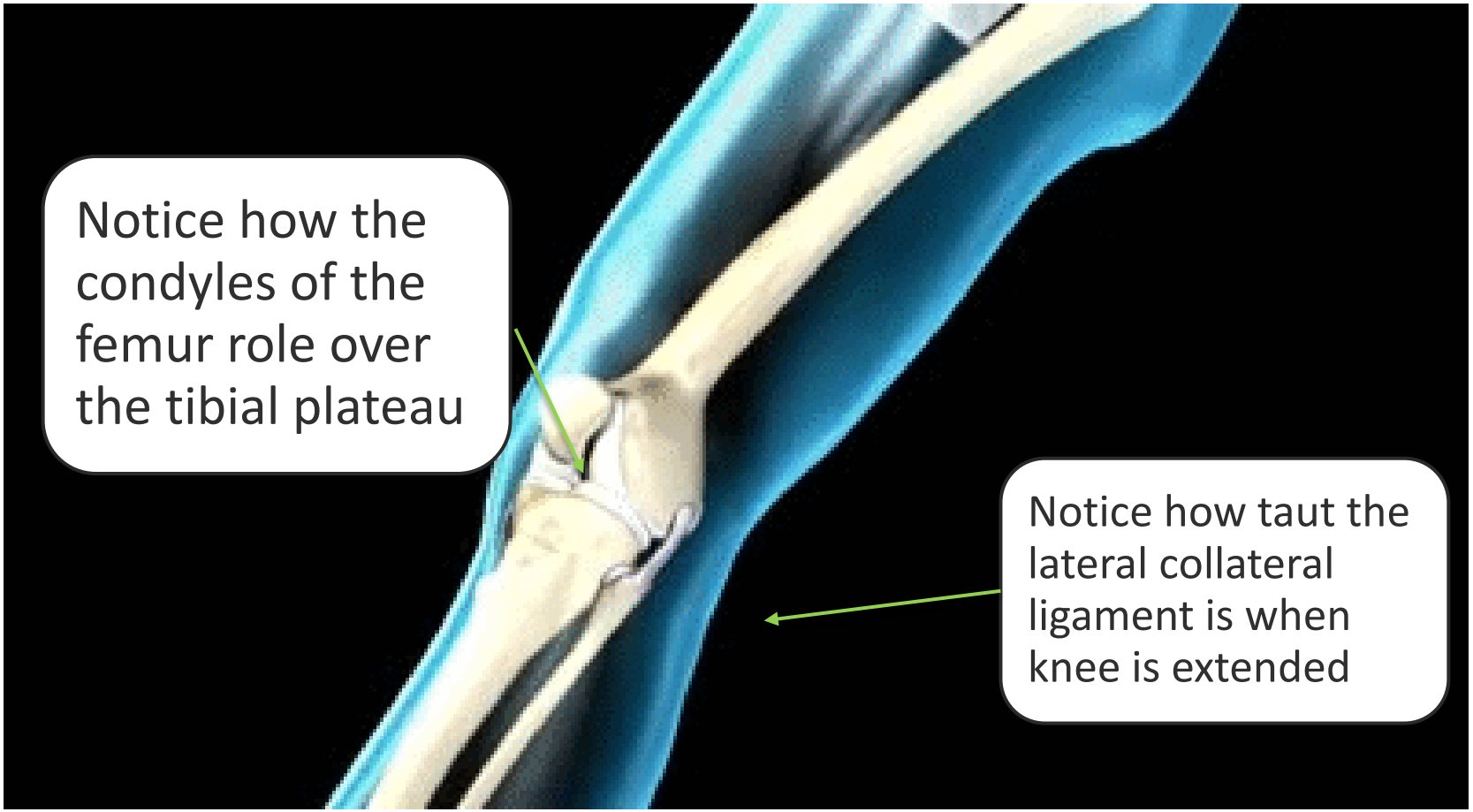
Lateral rotation of flexed knee (right knee)



Extension

Medial rotation of flexed knee (right knee)

Knee Movement



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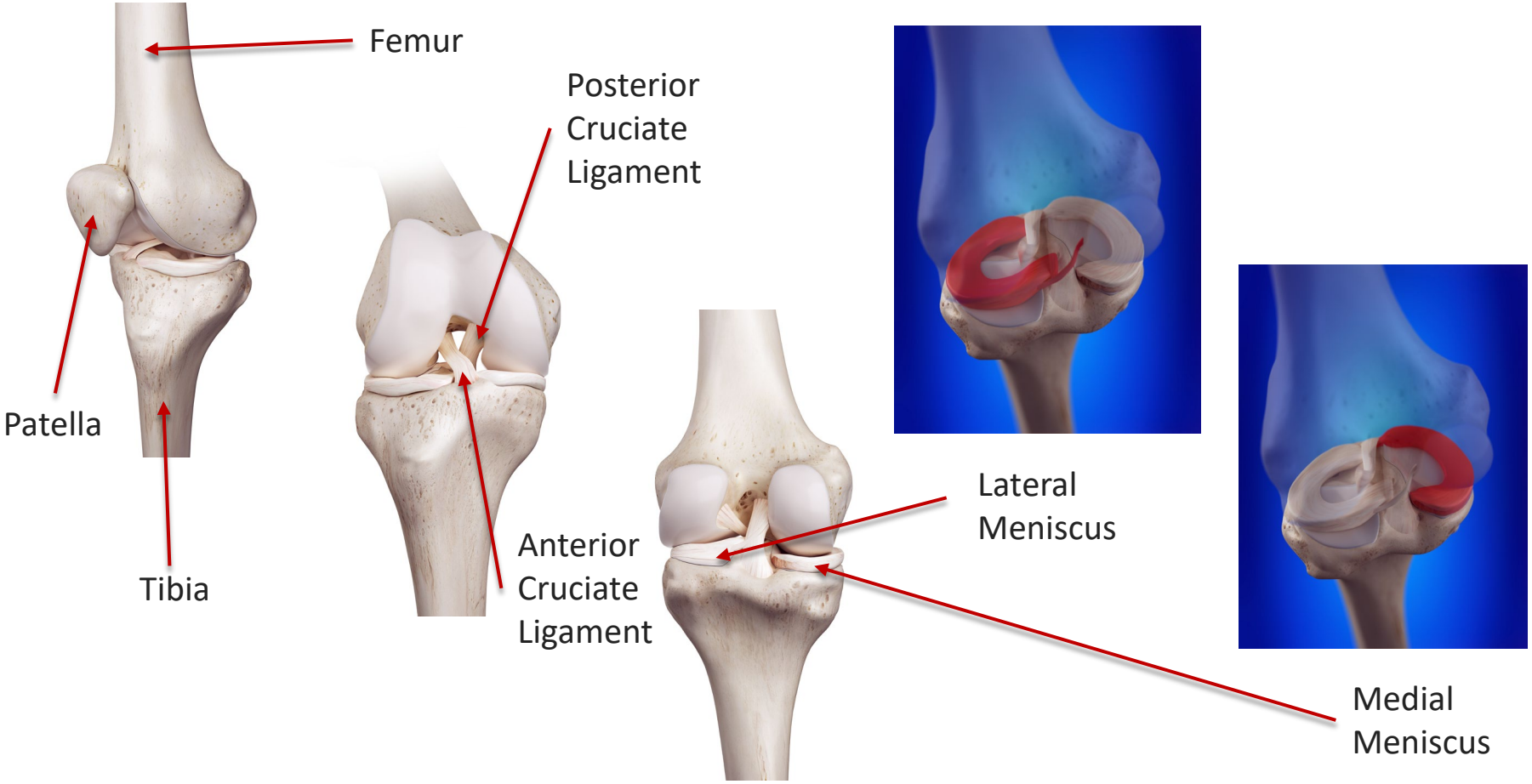
Let's Build The Knee



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Tendon vs. Ligament

Tendon

Structure: Tendons are flexible but inelastic tissue made of fibrous collagen tissue

Function: Tendons connect muscle to bone, focusing the force of the muscle onto the bone.

Common Pathologies: Sprains and full or partial tears, tendonitis

Ligament

Structure: Ligaments are made of dense connective tissue and are viscoelastic.

Function: Ligaments connect bones to bones and create a passive support structure for the joints, limiting how far a joint can move in any one direction

Common pathologies: Sprains and full or partial tears

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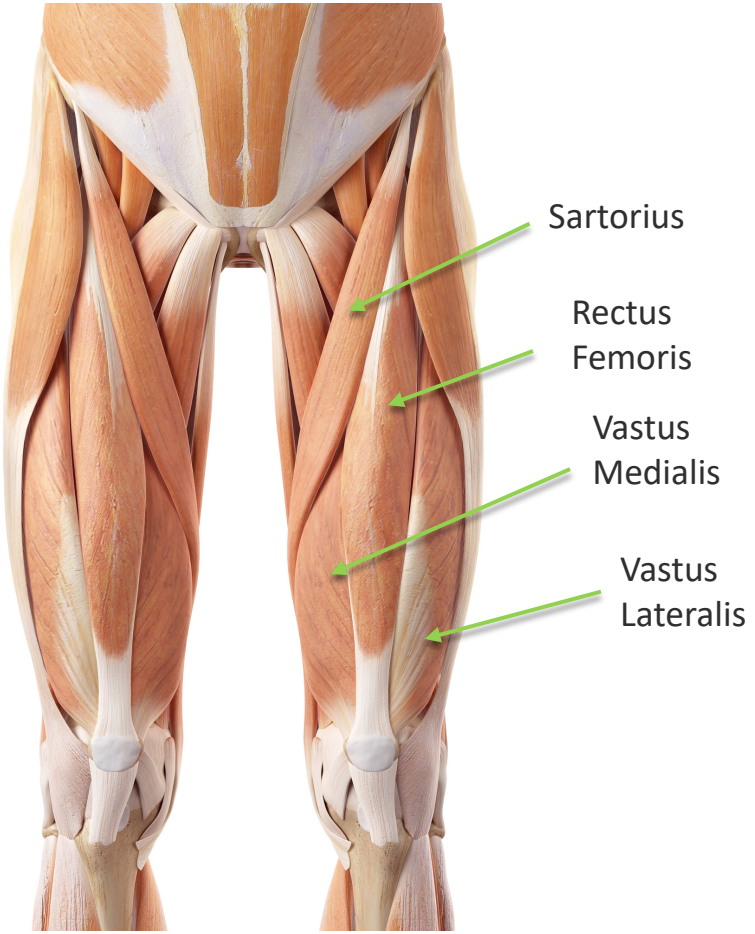
Anterior Thigh

Hip Flexors and Knee Actors

- Vastus Intermedius
- Vastus Lateralis
- Vastus Medialis
- Rectus Femoris
- Sartorius



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Vastus Intermedius

Origin:

- Anterior and lateral surfaces of proximal two thirds of shaft of the femur
- Intermedius wraps around the femur to attach to distal half of medial and lateral edges of the linea aspera and lateral intermuscular septum

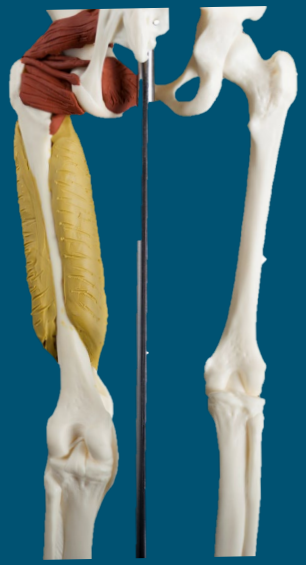
Insertion:

- Tibial tuberosity via patella and patellar tendon

Actions:

- Extend the knee

Vastus Lateralis and Medialis



Origin:

Vastus Lateralis:

- Anterior and inferior border of greater trochanter
- Lateral lip of gluteal tuberosity
- Lateral intermuscular septum
- Lateral lip of linea aspera

Origin:

Vastus Medialis:

- Below the intertrochanteric line
- Proximal part of medial supracondylar line
- Medial intermuscular septum
- Medial lip of linea aspera

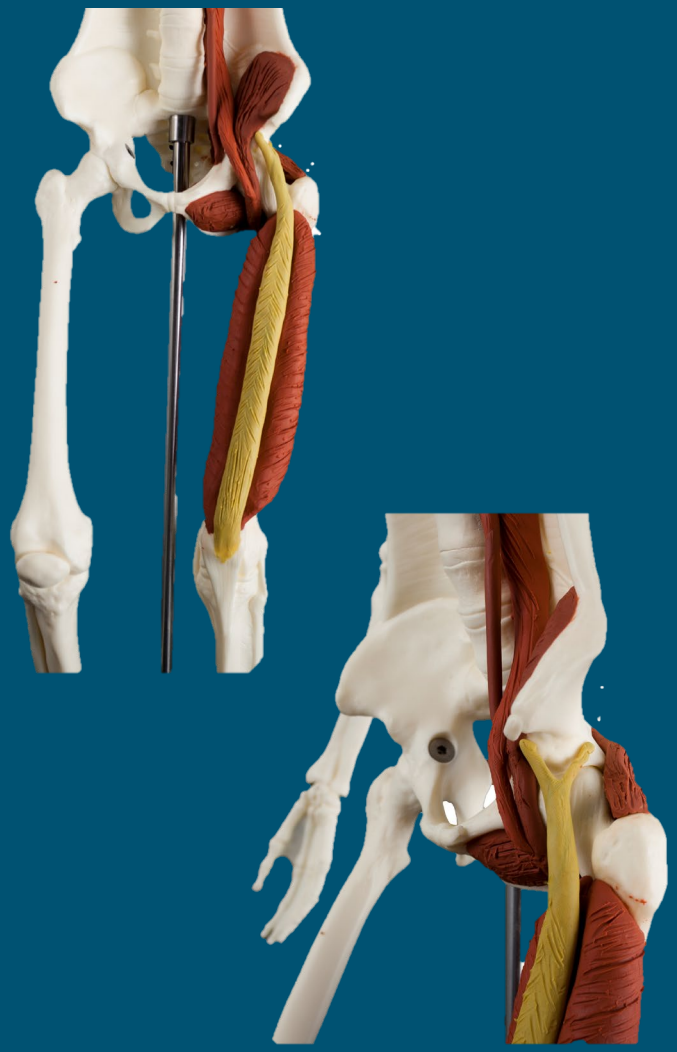
Insertion:

- Tibial tuberosity via patella and patellar tendon

Actions:

- Extend the knee

Rectus Femoris



Origin:

- Straight head arises from anterior inferior iliac spine (AIIS)
- Reflected head arises from groove of acetabulum

Insertion:

- Tibial tuberosity via patella and patellar tendon

Actions:

- Flexes the hip
- Extends the knee

Sartorius

Origin:

- Anterior superior iliac spine (ASIS)

Insertion:

- Proximal, medial shaft of the tibia at pes anserinus

Actions:

- Flexes, abducts and laterally rotates the flexed hip
- Flex the knee
- Medially rotate the flexed knee at tibiofemoral joint

Pes Anserinus (Goose Foot)
The joined tendon of Semitendinosus, Gracilis and Sartorius on the medial surface of the tibia.

Anterior Hip & Thigh Muscle Movements

	Hip Actions			Pelvic Actions	Knee Actions	
Muscle	Flexion	Lateral Rotation	Abduction	Anterior Tilt	Extension	Flexion
Vastus intermedius, lateralis and medialis					X	
Rectus femoris	X			X	X	
Sartorius	X	X	X			X (with medial tibial rotation)

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Types of Muscle Contractions

Isotonic

Concentric

A concentric contraction is a shortening contraction. The muscle contracts with a force greater than the resistance causing it to shorten

Eccentric

An eccentric contraction is a lengthening contraction. The muscle contracts with a force less then the resistance causing the muscle to lengthen.

Isometric

An isometric contraction does not change the length of the muscle. The muscle contracts with a force equal to the resistance so the muscle does not change length.

Isokinetic

Movement at a constant speed regardless of the force applied. Muscles contract and shorten at a constant speed.

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Roles of Muscles in Movement

Agonist

Muscle or muscles that contract to produce the desired action. “Prime Mover” i.e. biceps brachii in elbow flexion.

Antagonist

Muscle or muscles who oppose the action of the agonist. i.e. triceps brachii in elbow flexion.

Co-contraction

Occurs when the agonist or prime mover and the antagonist contract together. i.e. concentric biceps and eccentric triceps contracting to control elbow flexion.

Stabilizers

Muscle that acts to stabilize a joint against the pull of another muscle or gravity.

Synergist

Muscles which contribute to the desired action but are not the agonist. Synergists can also correct for unwanted action. i.e. wrist flexors in elbow flexion.

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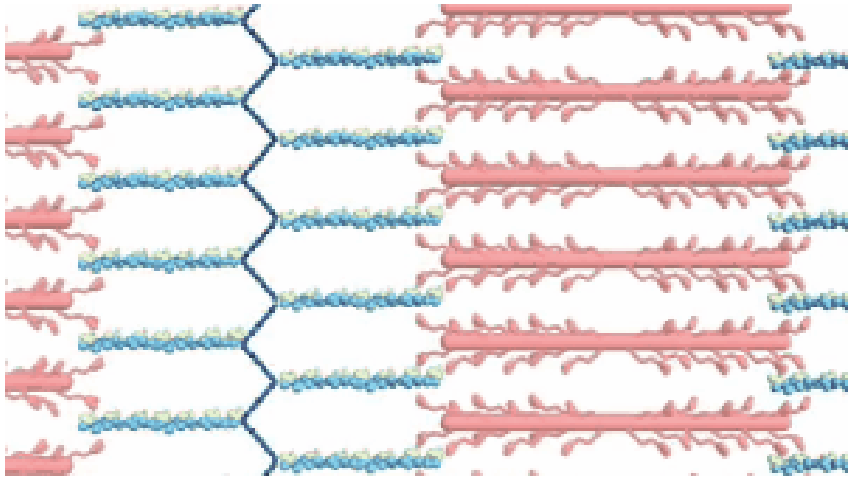
Actin and Myosin Crossbridge



Actin and Myosin cross bridge sliding act as a molecular dance whose wave creates muscle contraction.

A graceful image of force generating movement.

Notice how the shorter lever arm and force of pull change the movement speed and quality.

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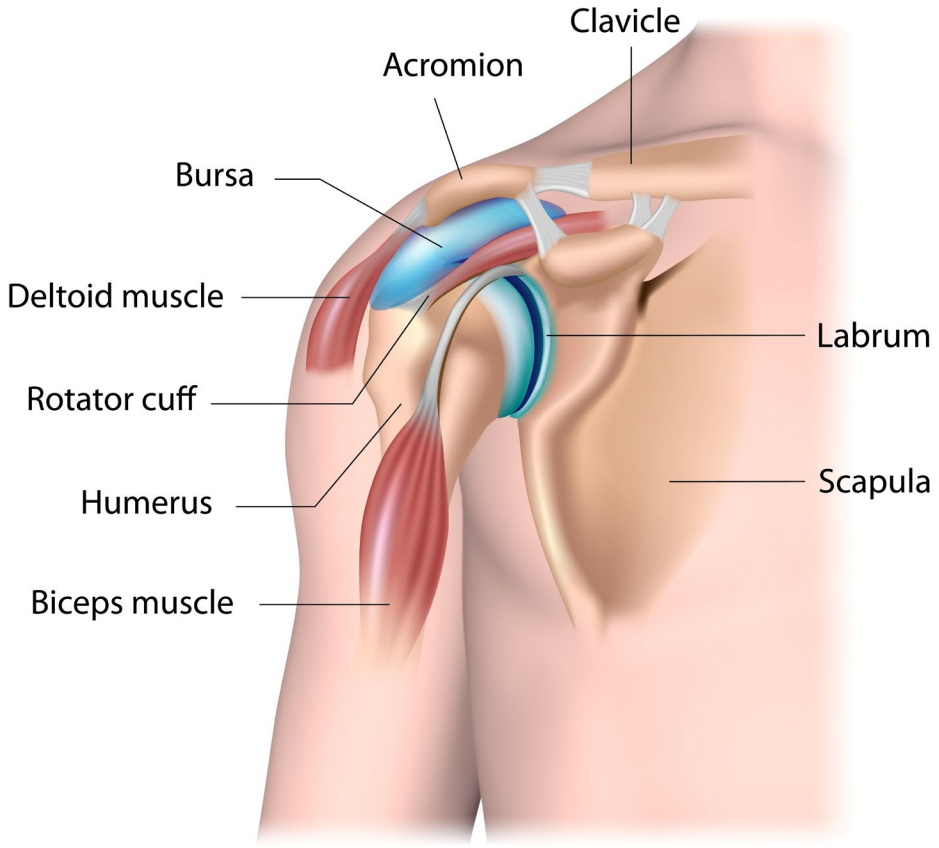
Bursae

Structure and function:

- Small, fluid filled sacks that reduce friction and help to provide cushioning between adjacent muscles, tendons and bones.

Common pathologies:

- Inflammation and swelling.



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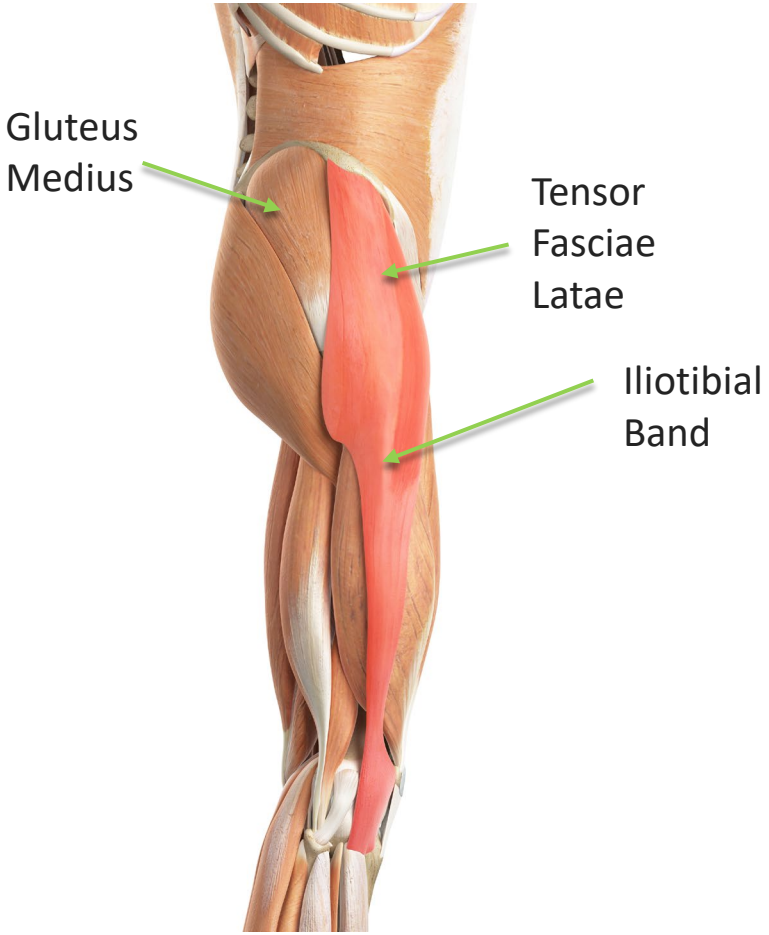
Abductors and Lateral Thigh

- Gluteus Minimus
- Gluteus Medius
- Iliotibial Band
- Tensor Fasciae Latae



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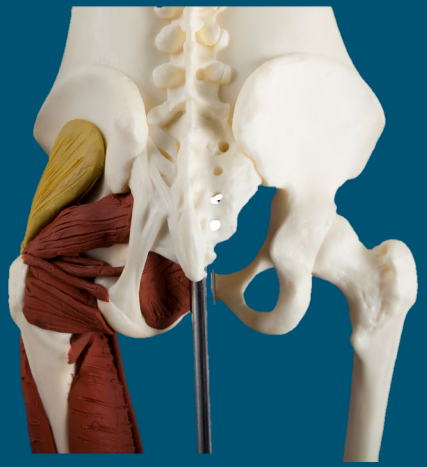
Gluteus Minimus

Origin:

- Gluteal surface of the ilium between the anterior and inferior gluteal lines

Insertion:

- Anterior aspect of greater trochanter and hip joint capsule



Actions:

Fixed Pelvis

- Abducts the hip
- Hip flexion
- Medially rotates a flexed hip
- Stabilizes the hip

Fixed Leg

- Anterior pelvic tilt
- Pelvic down slip
- Pelvic out flare

Gluteus Medius

Origin:

- External surface of ilium between iliac crest and posterior gluteal line

Insertion:

- Lateral surface of greater trochanter of femur

Actions:

Fixed Pelvis

- Hip abduction, flexion, and medial rotation

Fixed Leg

- Anterior pelvic tilt

Fixed Pelvis

- Hip abduction, extension and lateral rotation

Fixed Leg

- Posterior pelvic tilt
- Pelvic down slip

Iliotibial Band (ITB)

The Iliotibial Band is a thick band of connective tissue originating on lateral iliac crest and inserting onto lateral side of the tibia. It is not a muscle!

Origin:

- High point of iliac crest, over greater trochanter.

Insertion:

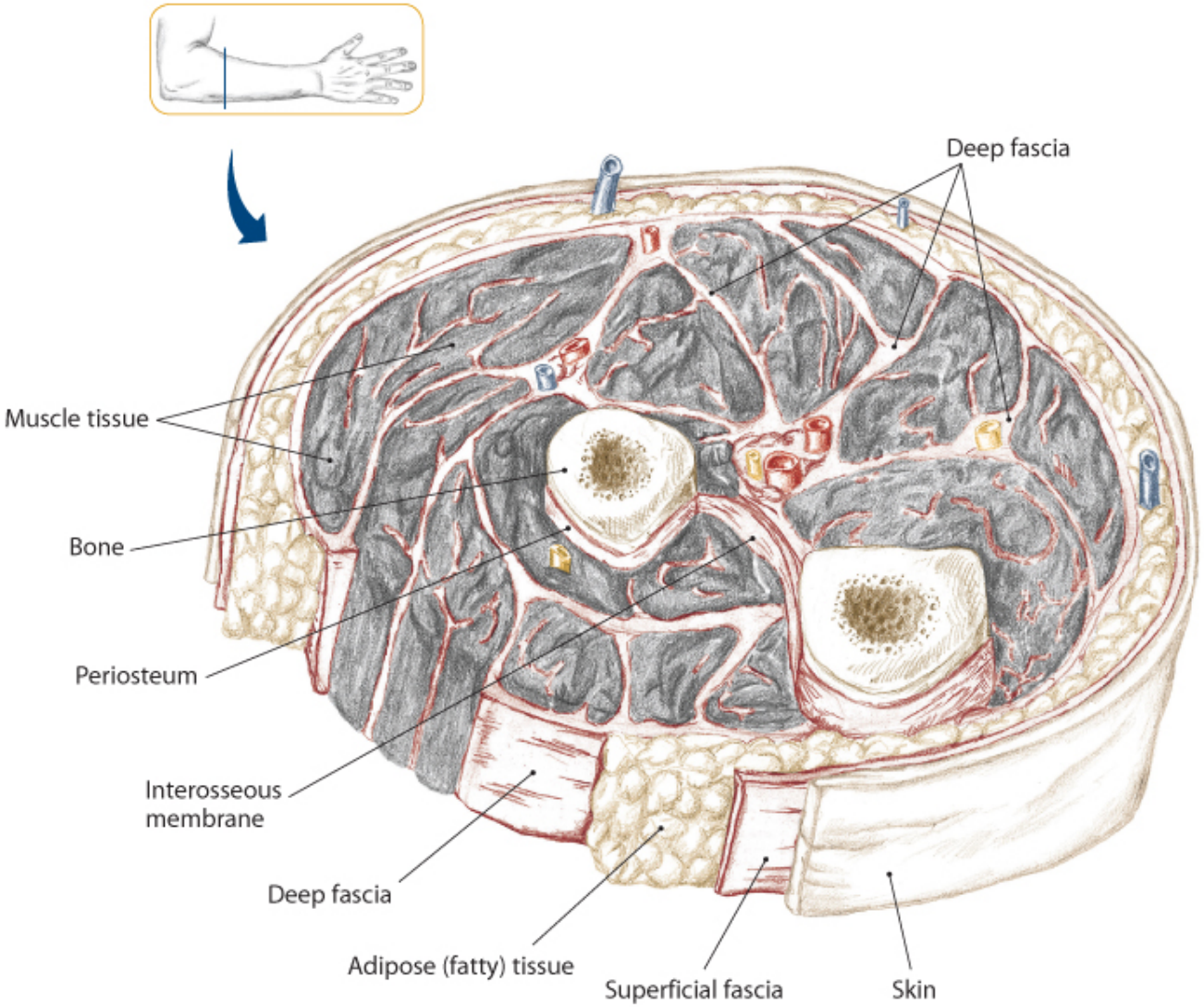
- Lateral anterior tibia.

Actions:

- Acts as an attachment for Tensor Fascia Lata and Gluteus Maximus.
- Stabilizes lateral leg.

Fascia

- Fascia, interpenetrates and surrounds muscles, bones, organs, nerves, blood vessels and other structures.
- An uninterrupted, three-dimensional web of tissue that extends from head to toe, from front to back, from interior to exterior *(T. Meyers)*



0.20 Cross section of the forearm showing the arrangement of bone, muscle and fascia

Tensor Fascia Lata

Origin:

- Anterior part of iliac crest
- Outer surface of ASIS and proximal part of IT band

Insertion:

- Into IT Band at proximal and middle third of thigh

Actions:

- Abduction and medial rotation when the hip is flexed
- Stabilize lateral knee through IT band

What is Fascia?

Fascia includes all the different kinds of connective tissue that create and support the structure of the body including:

- Tendons
- Ligaments
- Muscle structure (endomysium, perimysium and epimysium)
- Organ structure
- Bones

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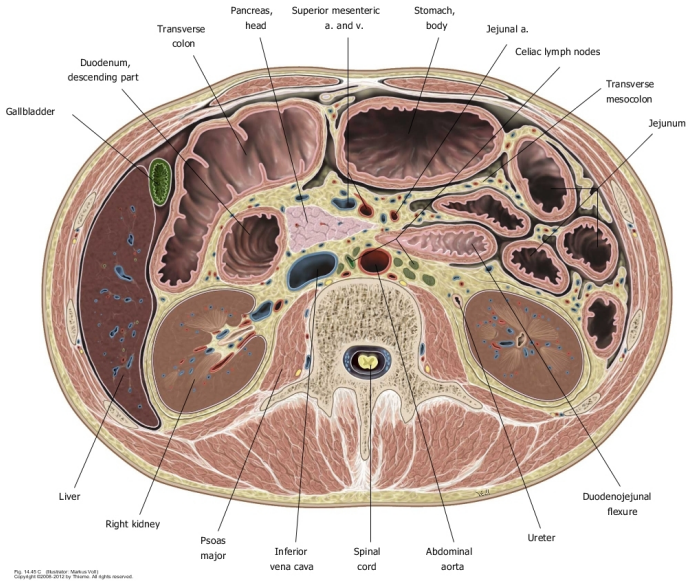
What does fascia do?

It surrounds and penetrates all of the structures of the body to:

- Create structure
- Transfer force
- Assist with proprioception
- Serve as a pathway for
  - Cellular nutrition
  - Immune system
  - Hydration
  - Healing and recovery



The Structure of Fascia

Fascia takes on many different shapes and textures depending on where it is in the body.

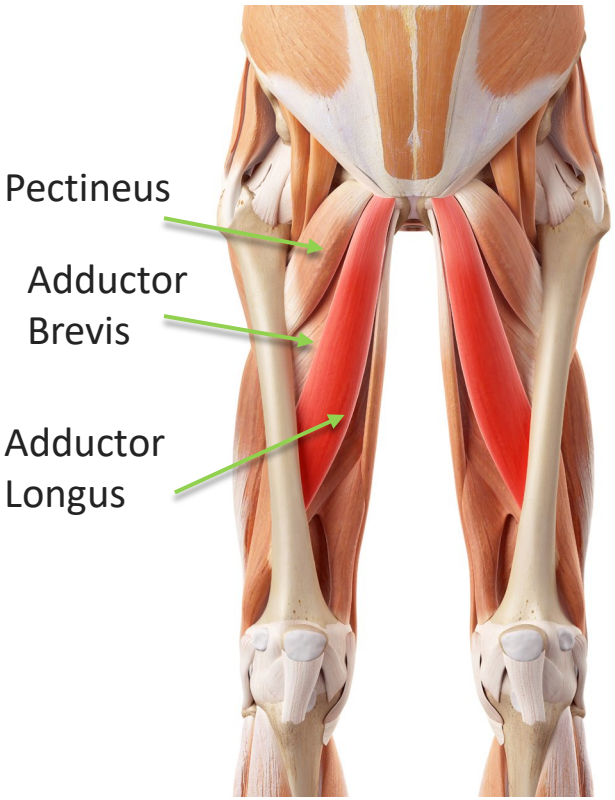
- Superficial fascia occurs between the skin and the underlying muscles.
  - It is a very loose structure that supports fat cells and allows gliding between the muscles and skin.
  - It provides a matrix for veins, arteries and nerves to be flexibly supported.
- Deep fascia is a stiffer and more structured version of fascia surrounding and separating muscle bellies, creating tendons and ligaments, transferring force and creating stiffness.

Fascia

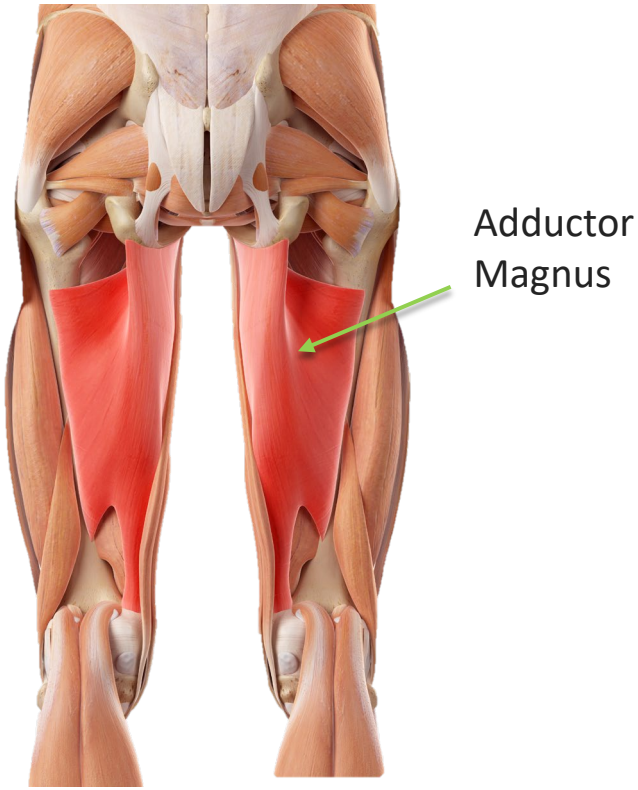
Lateral Hip and Thigh Muscle Movements

	Hip Actions, Pelvis stable					Pelvis Actions, femur stable	
Muscle	Abduction	Flexion	Extension	Medial Rotation	Lateral Rotation	Downslip	Anterior Tilt
Gluteus minimus	X	X		X		X	X
Gluteus medius (anterior fibers)	X	X		X		X	X
Gluteus medius (posterior fibers)	X		X		X	X	
Tensor fascia lata	X	X		X		X	X

Adductors and Medial Thigh



- Pectineus
- Adductor Longus
- Adductor Brevis
- Adductor Magnus
- Gracilis



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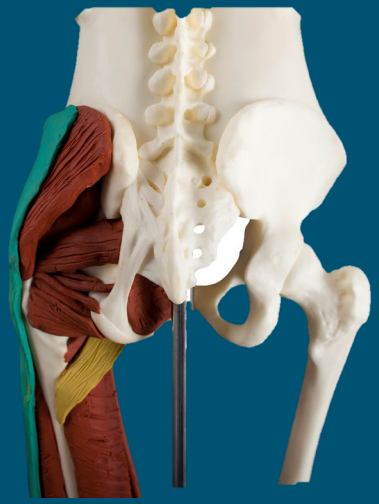
Pectineus



Origin:

- Anterior lip of superior pubic ramus between the iliopectineal eminence and the pubic tubercle

Insertion:

- Pectineal line of femur

Actions:

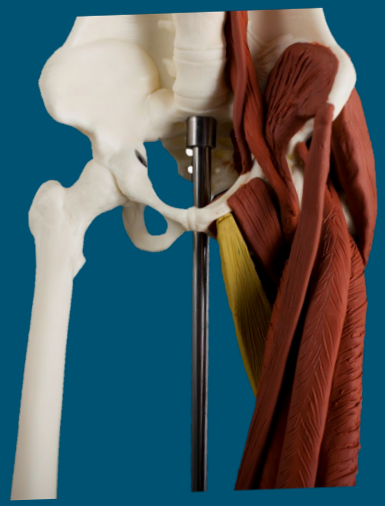
Fixed pelvis

- Hip adduction and flexion

Fixed leg

- Anterior pelvic tilt and pelvic up slip

Adductor Longus



Origin:

- Anterior surface of pubis at junction of pubic crest and pubic symphysis

Insertion:

- Middle one third of medial lip of linea aspera

Actions:

Fixed pelvis

- Hip adduction and flexion

Fixed leg

- Anterior pelvic tilt and pelvic up slip

Adductor Brevis

Origin:

- Outer surface of inferior pubic ramus

Insertion:

- Distal two thirds of pectineal line and proximal half of medial lip of linea aspera

Actions:

Fixed pelvis

- Hip adduction and flexion

Fixed leg

- Anterior pelvic tilt and pelvic up slip

Adductor Magnus

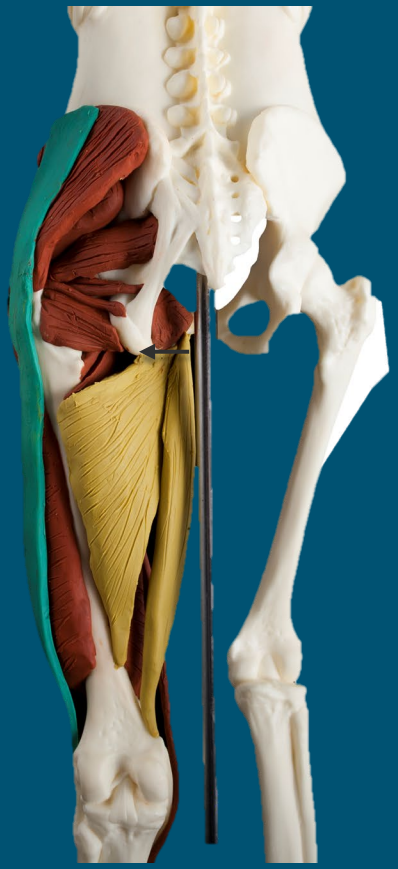
Anterior Fibers

Origin:

- Inferior pubic ramus, ramus of ischium

Insertion:

- Medial to gluteal tuberosity
- Middle line of linea aspera
- Medial supracondylar line



NOTE: Posterior fibers origin = Ischial tuberosity
Image not accurate

Posterior Fibers

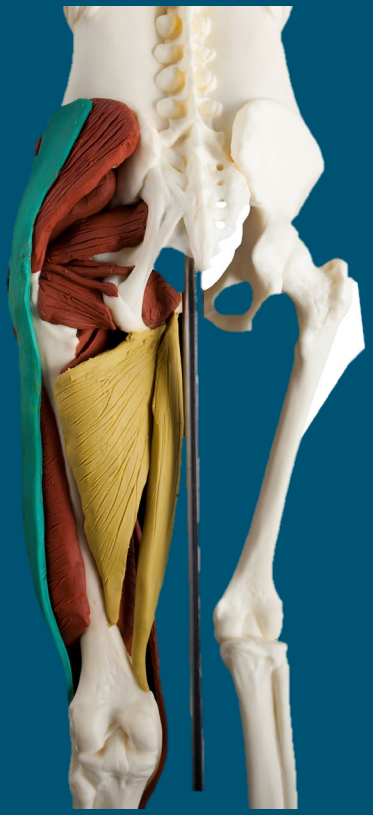
Origin:

- Anterior portion of the ischial tuberosity

Insertion:

- Adductor tubercle
- Medial condyle of femur

Adductor Magnus



Actions:

Fixed pelvis
- Hip adduction, flexion and slight medial rotation

Fixed leg
- Anterior pelvic tilt, pelvic up slip and pelvic out flare

Fixed pelvis
- Hip adduction, extension and slight flexion

Fixed leg
- Posterior pelvic tilt, pelvic up slip and pelvic out flare

Gracilis

Origin:

- Inferior half of pubic symphysis and medial margin of inferior pubic ramus

Insertion:

- Medial surface of body of tibia, distal to condyle, proximal to the insertion of the Semitendinosus and lateral to insertion of Sartorius at pes anserinus

Actions:

Fixed pelvis

- Hip adduction and assists with flexion

Fixed leg

- Anterior pelvic tilt and pelvic up slip

Action at the knee

- Stabilizes medial knee and assists knee flexion and medial rotation

Medial Hip and Thigh Muscle Movements

	Hip Actions, Pelvis stable			Pelvis Actions, femur stable			Knee
Muscle	Hip Adduction	Hip Flexion	Hip Extension	Anterior Pelvic Tilt	Posterior Pelvic Tilt	Pelvic Upslip	Flexion and Med Rotation
Pectineus	X	X		X		X	
Adductor longus	X	X		X		X	
Adductor brevis	X	X		X		X	
Adductor magnus	X	X (anterior fibers)	X (posterior fibers)	X	X (posterior fibers)	X	
Gracilis	X	X		X		X	X

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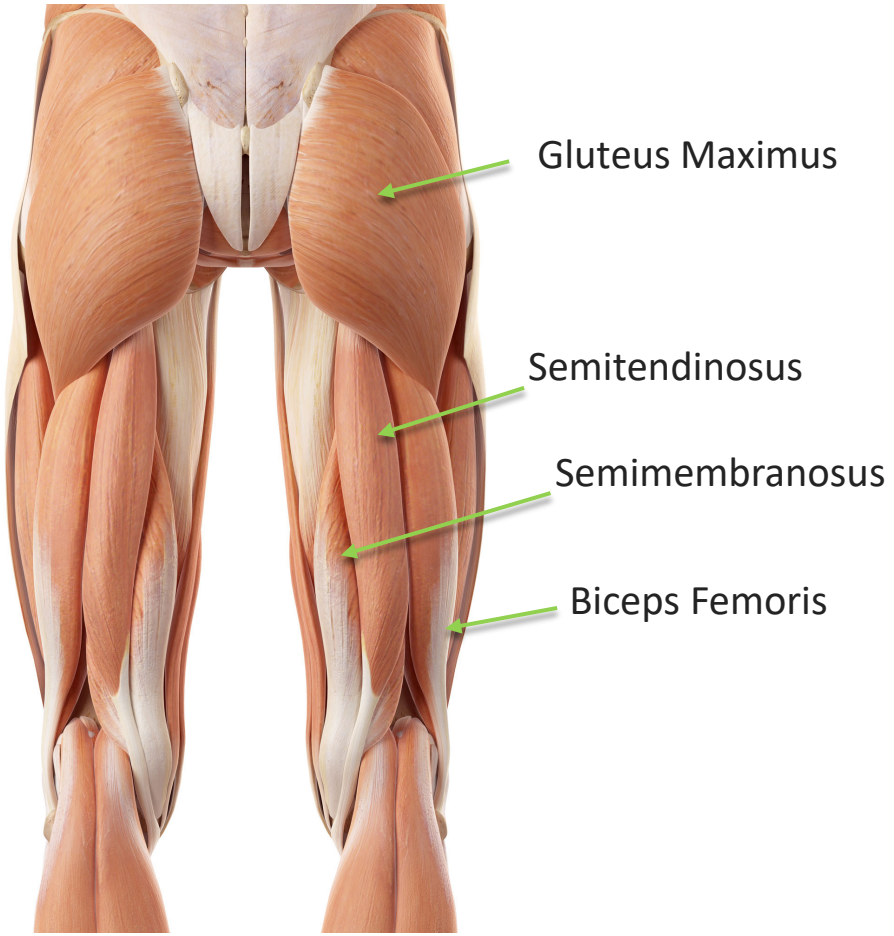
Muscles of the Posterior Leg

Hip extension, knee flexion

- Semitendinosus
- Semimembranosus
- Biceps Femoris
- Gluteus Maximus



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Semimembranosus

Origin:

- Tuberosity of ischium, proximal and lateral to Biceps Femoris and Semitendinosus

Insertion:

- Posteromedial aspect of medial condyle of tibia, popliteal fossa and medial meniscus

Actions:

- Knee flexion, hip extension and tibial medial rotation

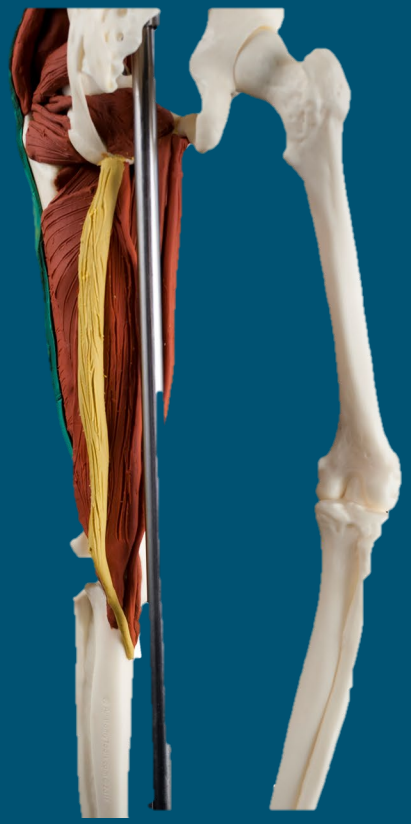
Fixed pelvis

- Hip extension, adduction and medial rotation

Fixed leg

- Posterior pelvic tilt

Semitendinosus



Origin:

- Tuberosity of ischium by common tendon with long head of Biceps femoris

Insertion:

- Proximal part of medial surface of body of tibia and deep fascia of leg at pes anserinus along with sartorius and the gracilis

Actions:

- Knee flexion, hip extension and tibial medial rotation

Fixed pelvis

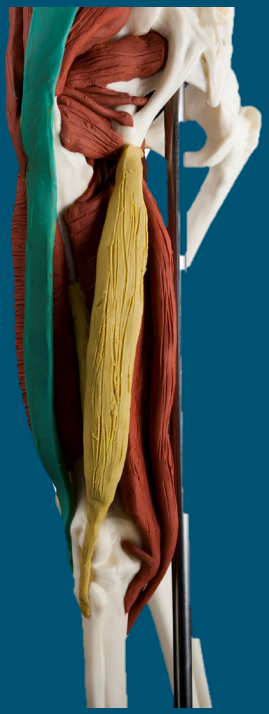
- Hip extension, adduction and medial rotation

Fixed leg

- Posterior pelvic tilt

Biceps Femoris

Short Head



Long Head

Origin:

Short head

- Lateral lip of linea aspera, proximal two thirds of supracondylar line and lateral intermuscular septum

Long head

- Distal part of sacrotuberous ligament and posterior part of ischial tuberosity

Insertion:

- Lateral side of head of fibula, lateral condyle of tibia and deep fascia on lateral side of leg

Actions:

- Knee flexion, hip extension and tibial lateral rotation

Fixed pelvis

- Hip extension, lateral rotation and assists with abduction.

Fixed leg

- Posterior pelvic tilt

Gluteus Maximus

Deep Fibers

Superficial Fibers

Origin:

- Posterior gluteal line of ilium and a portion of bone superior and posterior to it
- Posterior surface of lower part of sacrum, side of coccyx
- Aponeurosis of erector spinae, sacrotuberous ligament and gluteal aponeurosis

Insertion:

- Deep fibers insert into the gluteal tuberosity of femur
- Proximal and superficial fibers inserts into iliotibial tract of fascia lata

Actions:

- Fixed pelvis – Hip extension, lateral rotation, adduction and abduction
- Fixed leg – Posterior pelvic tilt

Posterior Hip and Thigh Muscle Moves

	Fixed Pelvis					Fixed Leg	Knee	
MUSCLES	**Hip Extension**	**Hip Abduction**	**Hip Adduction**	**Hip Medial Rotation**	**Hip Lateral Rotation**	**Posterior Pelvic Tilt**	**Flexion and Medial Rotation**	**Flexion and Lateral Rotation**
Semi-membranosus	X		X	X		X	X	
Semi-tendinosus	X		X	X		X	X	
Biceps Femoris	X	X			X	X		X
Gluteus Maximus	X	X	X		X	X		

balanced body