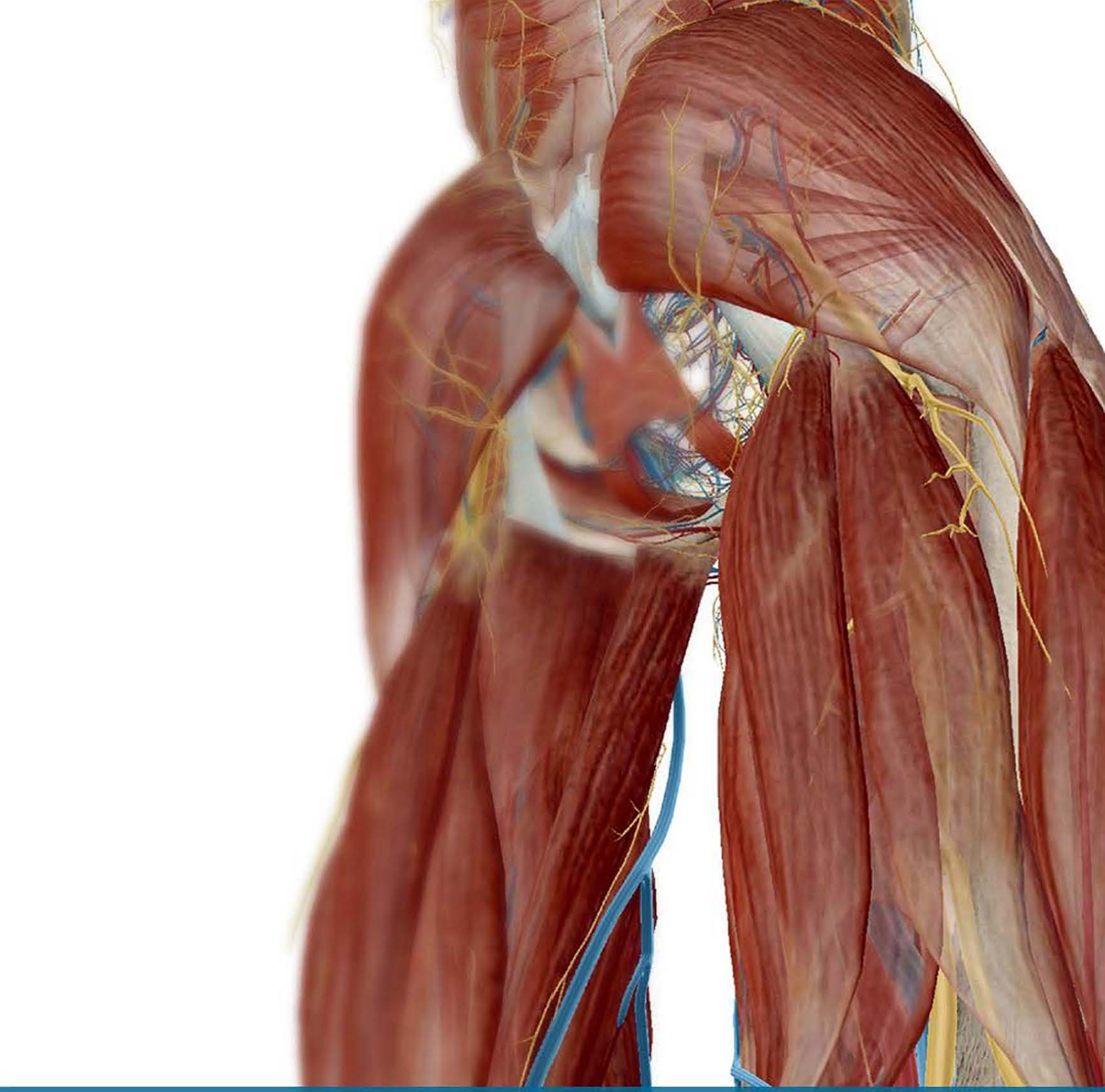

VISIBLE BODY®

The Muscular System: Pelvis and Lower Limb

A muscular system lab activity using Visible Body Suite

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PRE-LAB EXERCISES

Before coming to lab, get familiar with a few muscle groups we'll be exploring during lab. Open Visible Body Suite. Search for and select the Muscular System View "Hip" and find the following muscles. When you select a muscle, you can use the book icon in the content box to read the muscle's definition.

You are responsible for the identification of **all bold terms**.

1. **Gluteus maximus**
2. **Pectineus** (you will need to rotate the model)

Define the following terms:

1. **Extension** –
2. **Flexion** –
3. **Rotation** –

IN-LAB EXERCISES

Use the following modules to guide your exploration of the pelvis and lower limb regions of the muscular system. As you explore the modules, locate the muscles on any available charts, models, or specimens.

The muscles of the pelvis and lower limb are generally larger than other muscles, because they serve to support the weight of the body as well as to provide movement. These muscles have different jobs, depending on where they are located, but they are all involved in moving the lower limb. A few are also able to move the trunk if the leg is fixed. You will be able to make a good guess about what action the muscle performs if you know which side of the joint the muscle crosses.

The long names of some of these muscles can be daunting, but they are often very descriptive. You can find origins, insertions, actions, and/or locations of these muscles, simply in the names. When reviewing the action of a muscle, it will be helpful to think about where the muscle is located and where the insertion is. Muscle physiology requires that a muscle will "pull," instead of "push," during contraction, and the insertion is the part that will move. Imagine that the muscle is "pulling" on the bone or tissue it is attached to at the insertion.

Access 3D views and animated muscle actions in Visible Body Suite, which will be especially helpful to visualize muscle actions. When you select a structure in Visible Body Suite, you'll see options to read the definition and hear the pronunciation in the content box. When you select a muscle, be sure to select the blue pin icon in the content box to view origins and insertions as visible pins on the muscle (select "attachments") and to view the blood supply and/or the nerve supply.

In each module below, identify the following:

- Muscle location
- Origin(s) and insertion(s)
- Muscle action
- Nerve supply

You are responsible for the identification of **all bold terms**.

A. Hip and Gluteal Muscles

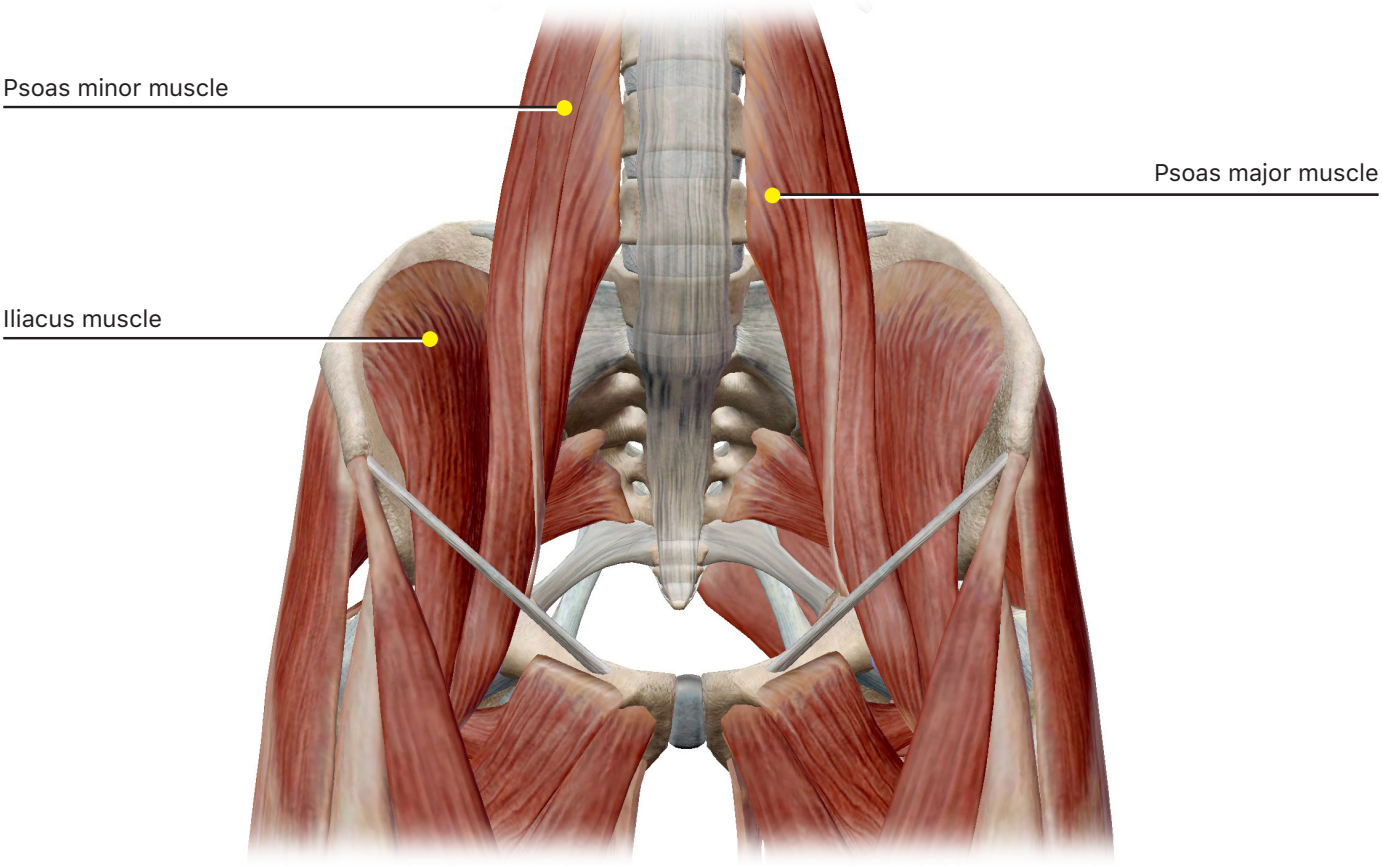
Open the Muscular System View "Hip."

Then, search for and select each of the following Muscle Actions:

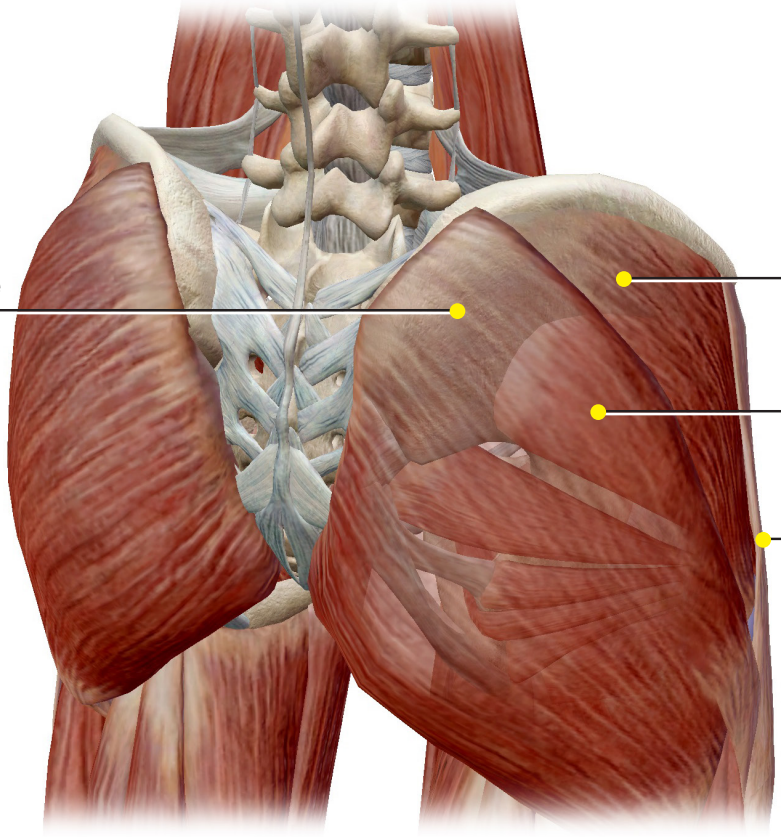
Hip flexion	Hip lateral rotation
Hip extension	Hip adduction
Hip medial rotation	Hip abduction

These muscles cross the hip joint, and therefore, they affect movement at that joint. Most of these muscles attach to the femur and cause the thigh to move, depending on exactly where the attachment is located. You will find the lateral rotators deep to the **gluteus maximus** and inferior to the **gluteus minimus**. As their group name implies, these muscles laterally rotate, as well as abduct or adduct, the thigh.

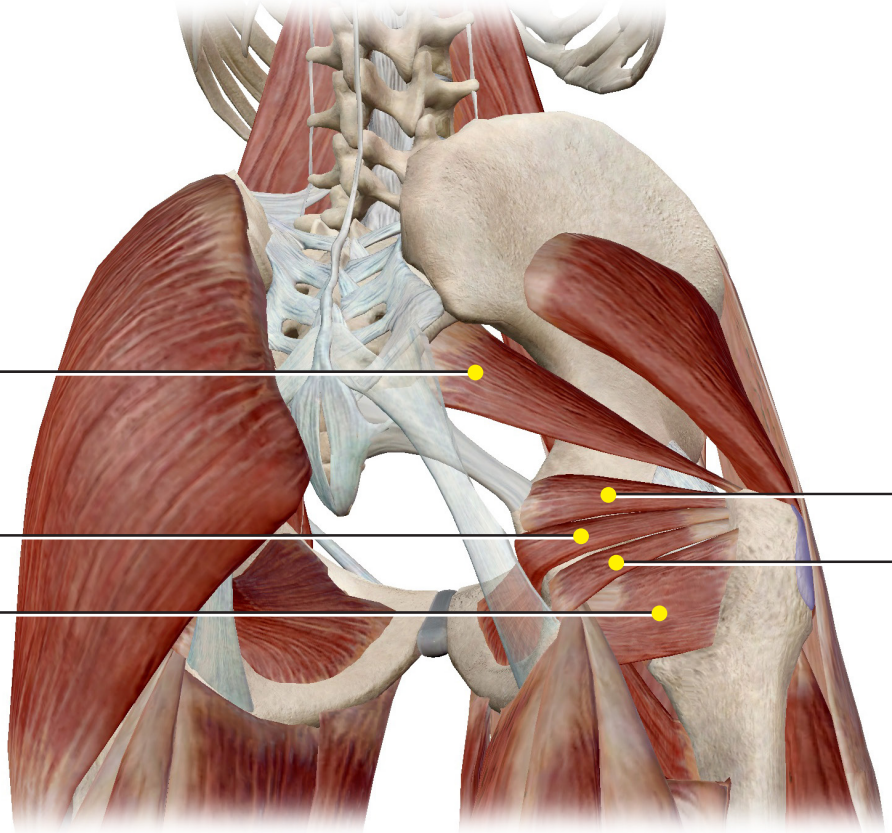
Muscular System View "Hip" (Part 1)



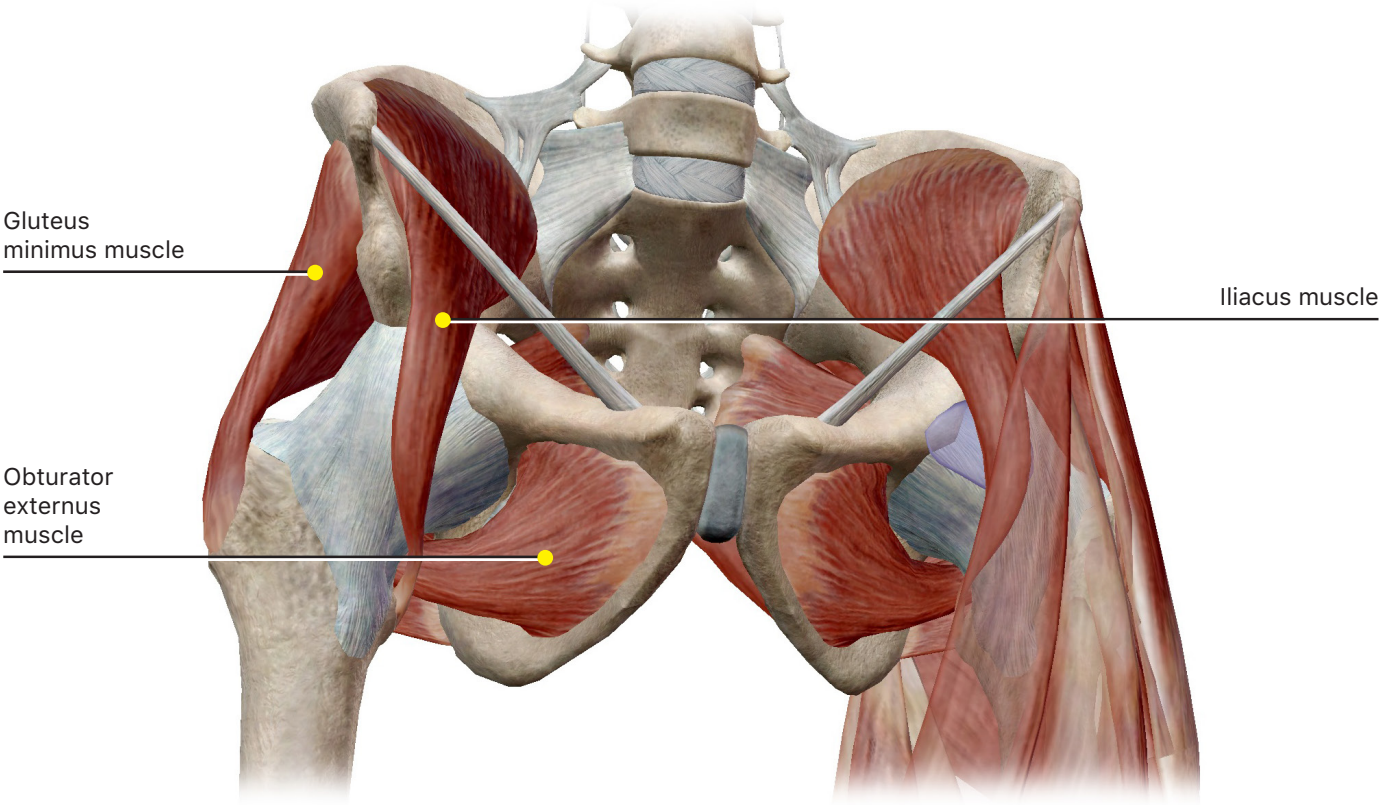
Muscular System View "Hip" (Part 2)



Muscular System View "Hip" (Part 3)



Muscular System View "Hip" (Part 4)



Hip and Gluteal Muscles				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Psoas major				
Psoas minor				
Iliacus				
Gluteus maximus				

Hip and Gluteal Muscles (cont.)				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Gluteus medius				
Gluteus minimus				
Tensor fasciae latae				
Obturator externus				
Obturator internus				
Superior gemellus				
Inferior gemellus				
Quadratus femoris				
Piriformis				

B. Thigh: Anterior Compartment

Open the Muscular System View "Hip." Zoom out and rotate the model, so you can see the anterior thigh muscles.

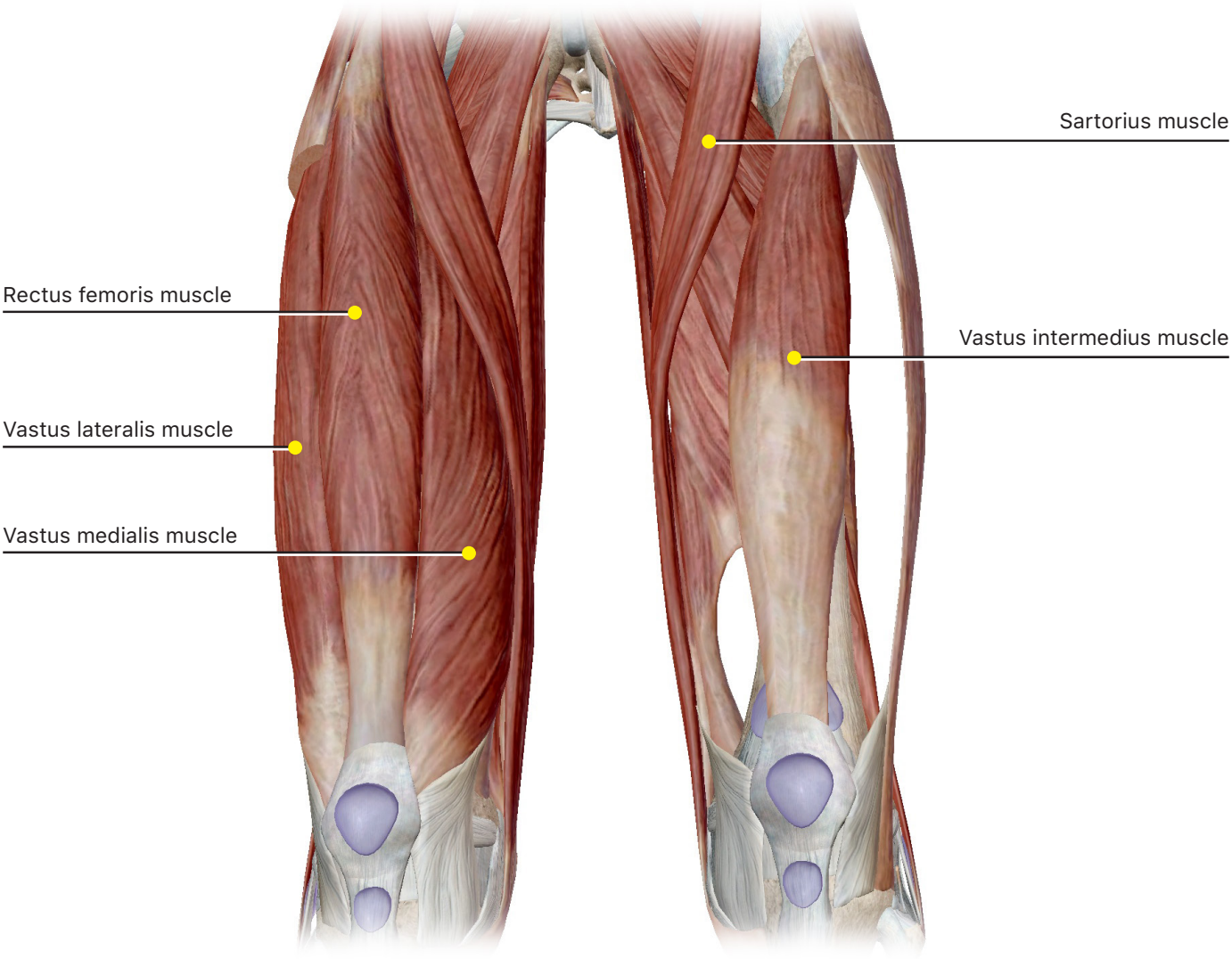
Then, search for and select each of the following Muscle Actions:

Knee flexion

Knee extension

The quadriceps group is composed of four muscles: the **rectus femoris**, **vastus medialis**, **vastus lateralis**, and **vastus intermedius**. They share a common tendon as they cross the knee joint and insert on the tibia. Since these muscles cross the knee on the anterior side, their contraction pulls the tibia upward and extends the knee.

The **long sartorius** is also found in the anterior compartment, but due to its attachment on the inside of the knee, it causes lateral rotation at the hip.



Thigh: Anterior Compartment				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Sartorius				
Rectus femoris				
Vastus medialis				
Vastus lateralis				
Vastus intermedius				

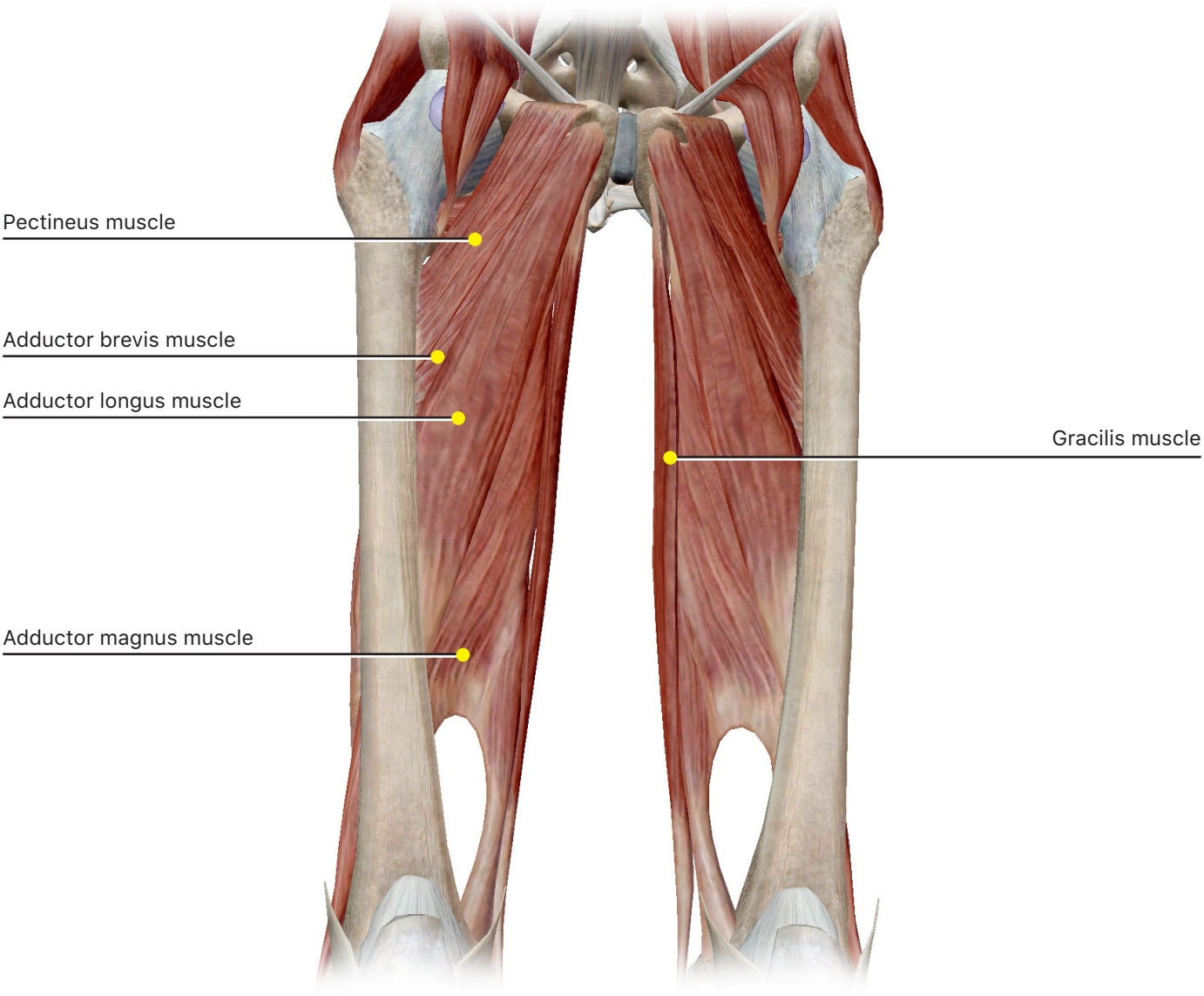
C. Thigh: Medial Compartment

Open the Muscular System View “Hip.” Zoom out and rotate the model, so you can see the anterior thigh muscles. Hide the superficial anterior muscles (the quadriceps and **sartorius**) to reveal the middle layer of muscles in the thigh.

Then, search for and select each of the following Muscle Actions:

Hip adduction
Knee medial rotation
Knee extension

These muscles are located deep to the muscles of the anterior compartment and primarily act to adduct the thigh.



Thigh: Medial Compartment				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Pectineus				
Gracilis				
Adductor brevis				
Adductor longus				
Adductor magnus				

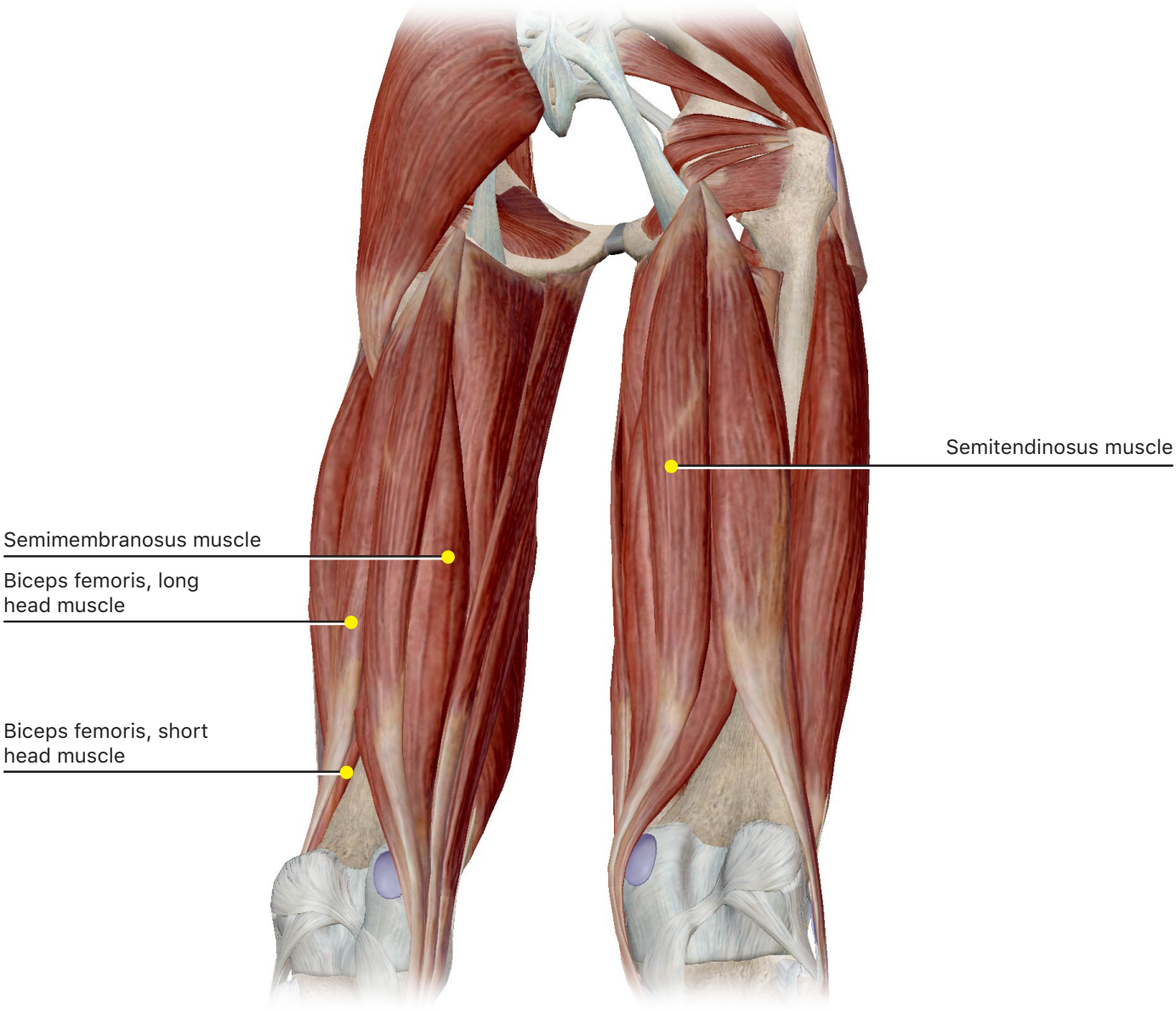
D. Thigh: Posterior Compartment

Open the Muscular System View “Hip.” Zoom out and rotate the model, so you can see the posterior thigh muscles.

Then, search for and select each of the following Muscle Actions:

Hip extension
Knee medial rotation
Knee lateral rotation

These muscles, commonly known as the hamstrings, are located on the posterior side of the femur. They cross the knee on the posterior side and cause leg flexion at the knee joint.



Thigh: Posterior Compartment				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Biceps femoris				
Semitendinosus				
Semimembranosus				

E. Lower Leg: Anterior Compartment

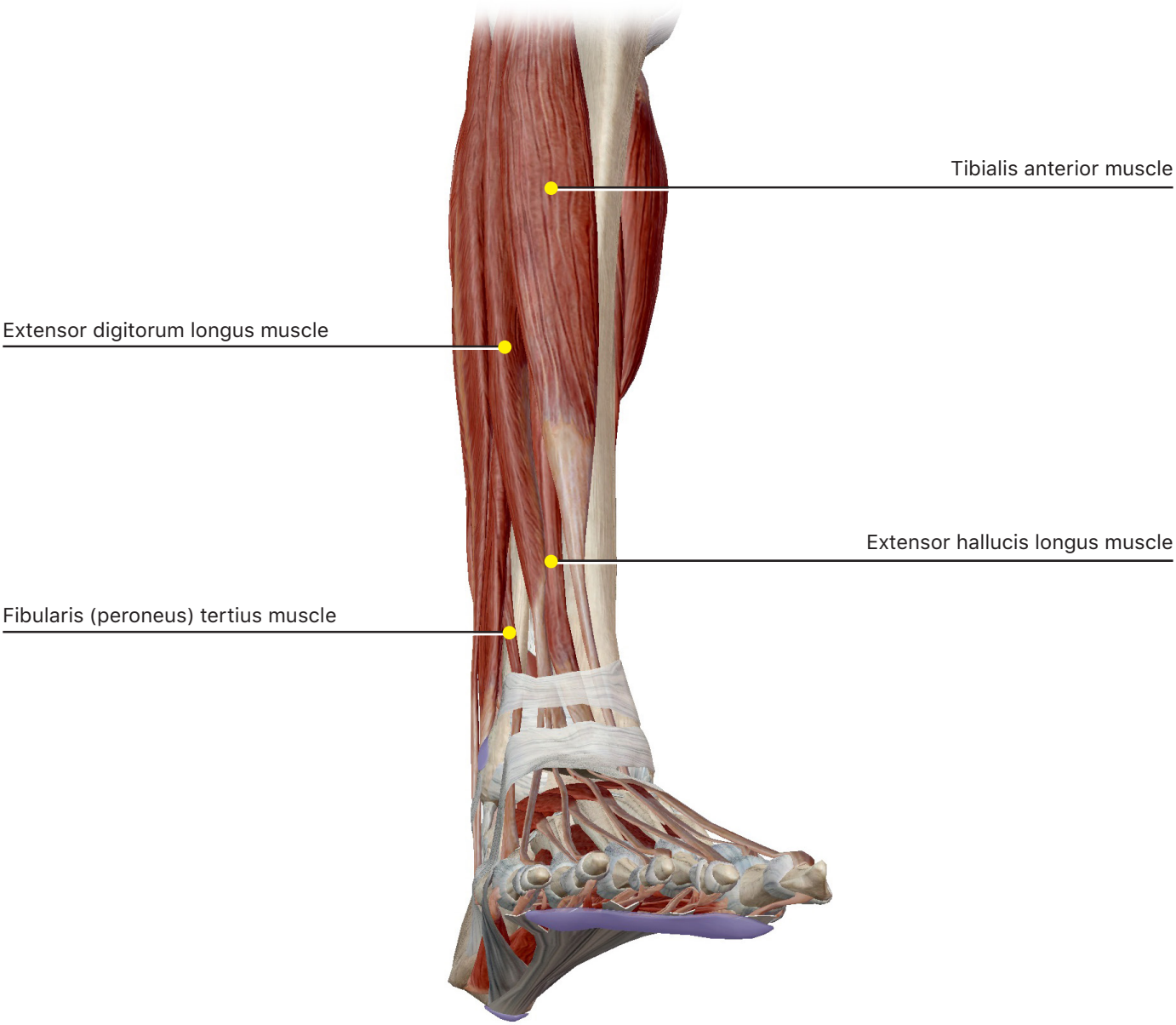
Open the Muscular System View “Ankle and Foot.”

Then, search for and select each of the following Muscle Actions:

Dorsiflexion
Foot inversion
Foot eversion

The muscles of the lower leg are also separated into compartments, each of which serves a similar function. The anterior compartment muscles all cross the ankle joint on the anterior side, and therefore, each causes dorsiflexion of the foot as one of their actions.

To view the **extensor hallucis longus** more clearly, be sure to hide the **tibialis anterior** and **extensor digitorum longus**.

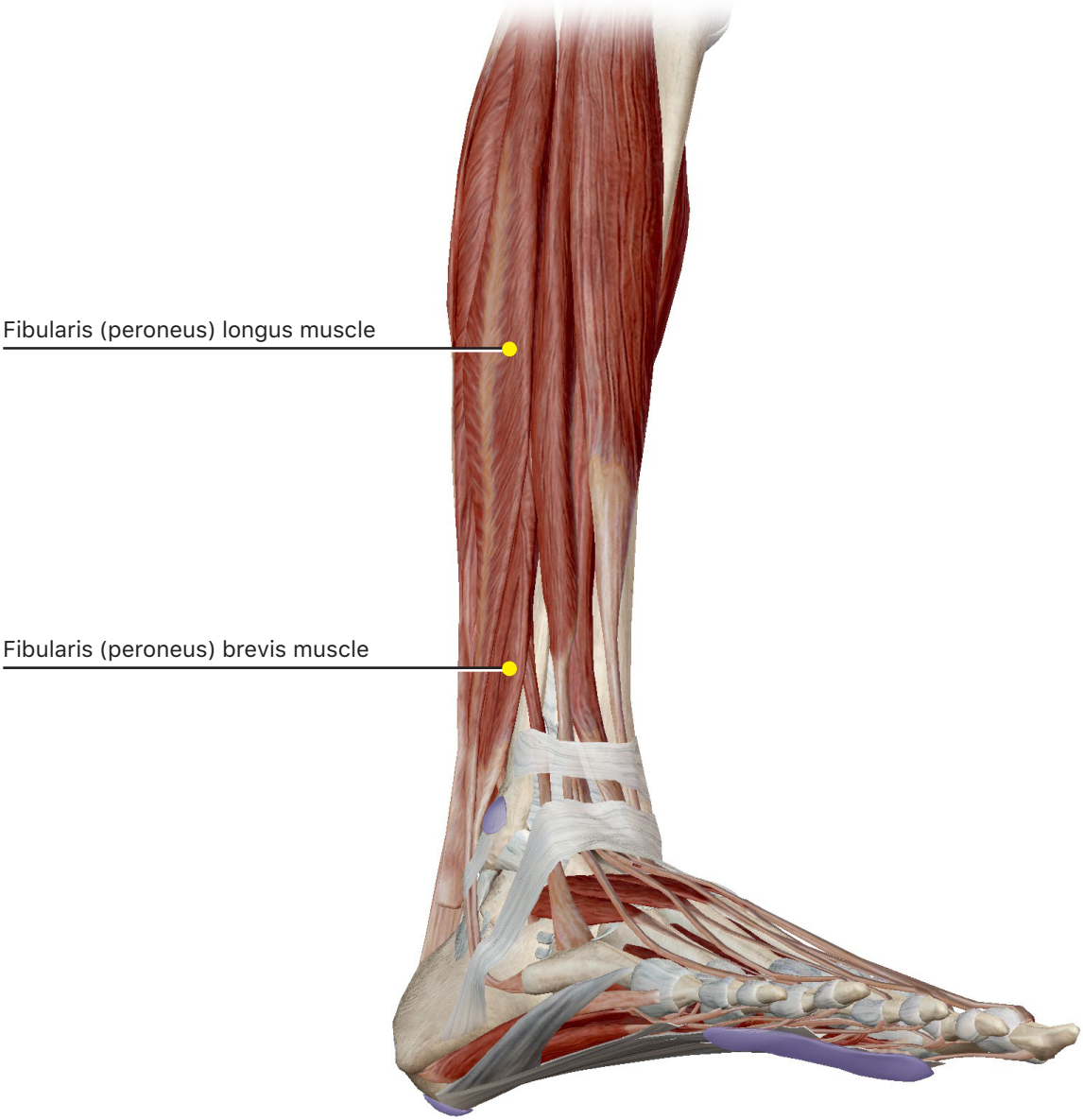


Lower Leg: Anterior Compartment				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Tibialis anterior				
Extensor digitorum longus				
Extensor hallucis longus				
Fibularis (peroneus) tertius				

F. Lower Leg: Lateral Compartment

Open the Muscular System View “Ankle and Foot” and the Muscle Action “Plantarflexion.”

These muscles, located on the lateral side of the leg, cause plantarflexion and eversion of the foot.



Lower Leg: Lateral Compartment				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Fibularis (peroneus) longus				
Fibularis (peroneus) brevis				

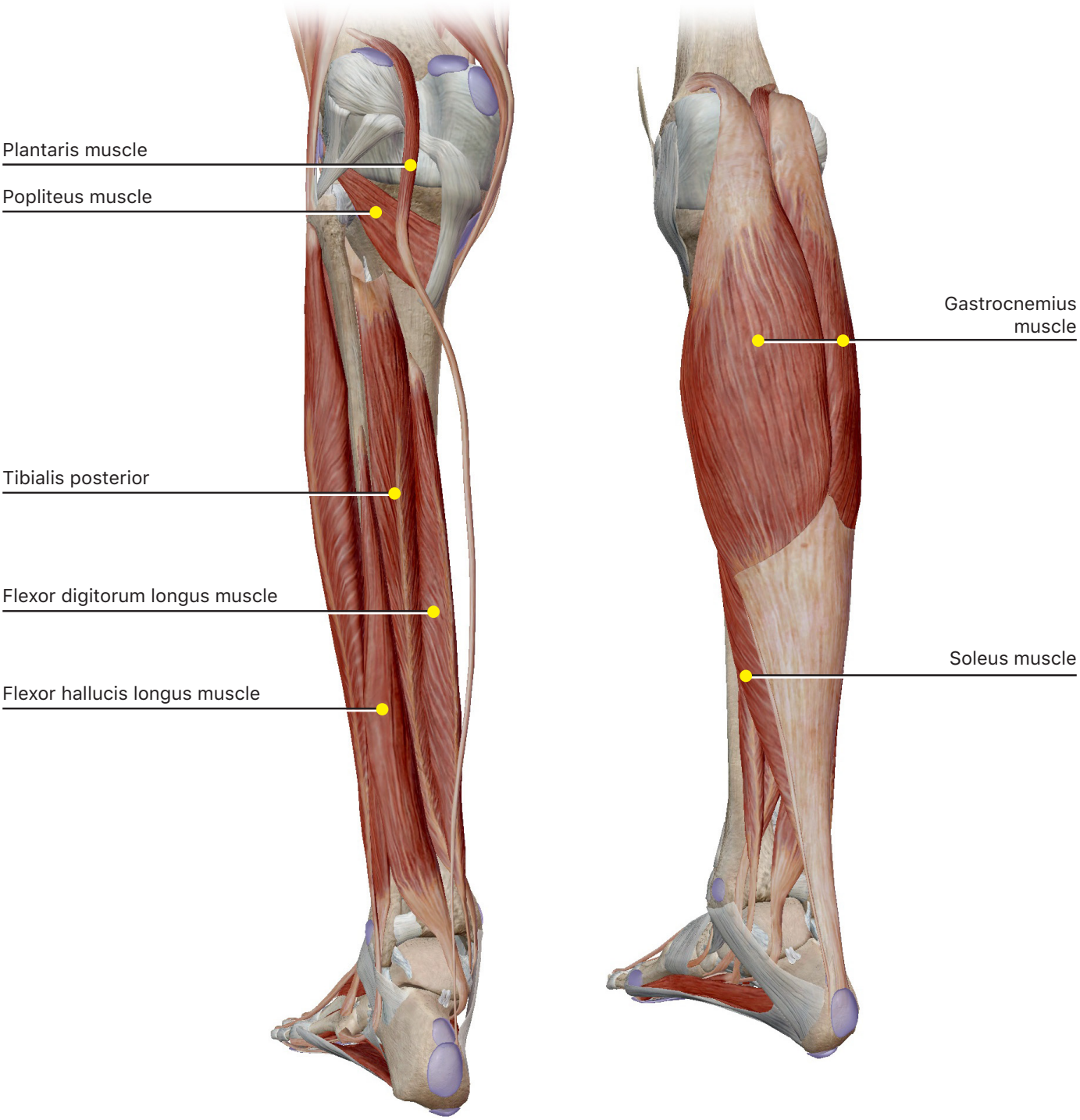
G. Lower Leg: Posterior Compartment

Open the Muscular System View "Ankle and Foot."

Then, search for and select each of the following Muscle Actions:

Plantarflexion
Knee flexion
Knee medial rotation

Except for the popliteus, all the posterior compartment muscles of the lower leg cross the ankle joint on the posterior side and are involved in plantarflexion of the foot.



Lower Leg: Posterior Compartment				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Gastrocnemius				
Soleus				
Plantaris				
Popliteus				
Flexor digitorum longus				
Tibialis posterior				
Flexor hallucis longus				

H. Foot

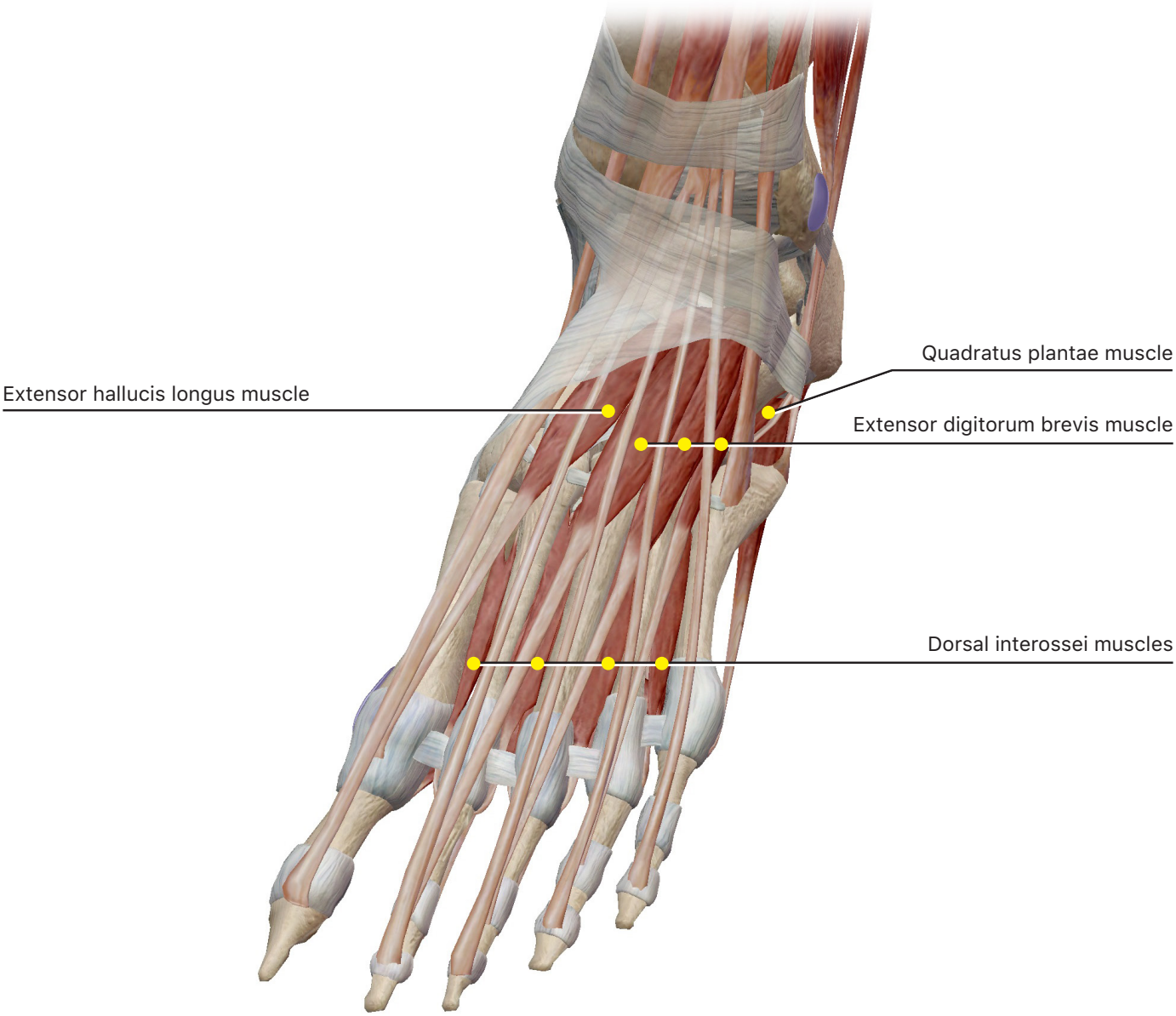
Open the Muscular System View “Ankle and Foot.”

Then, search for and select each of the following Muscle Actions:

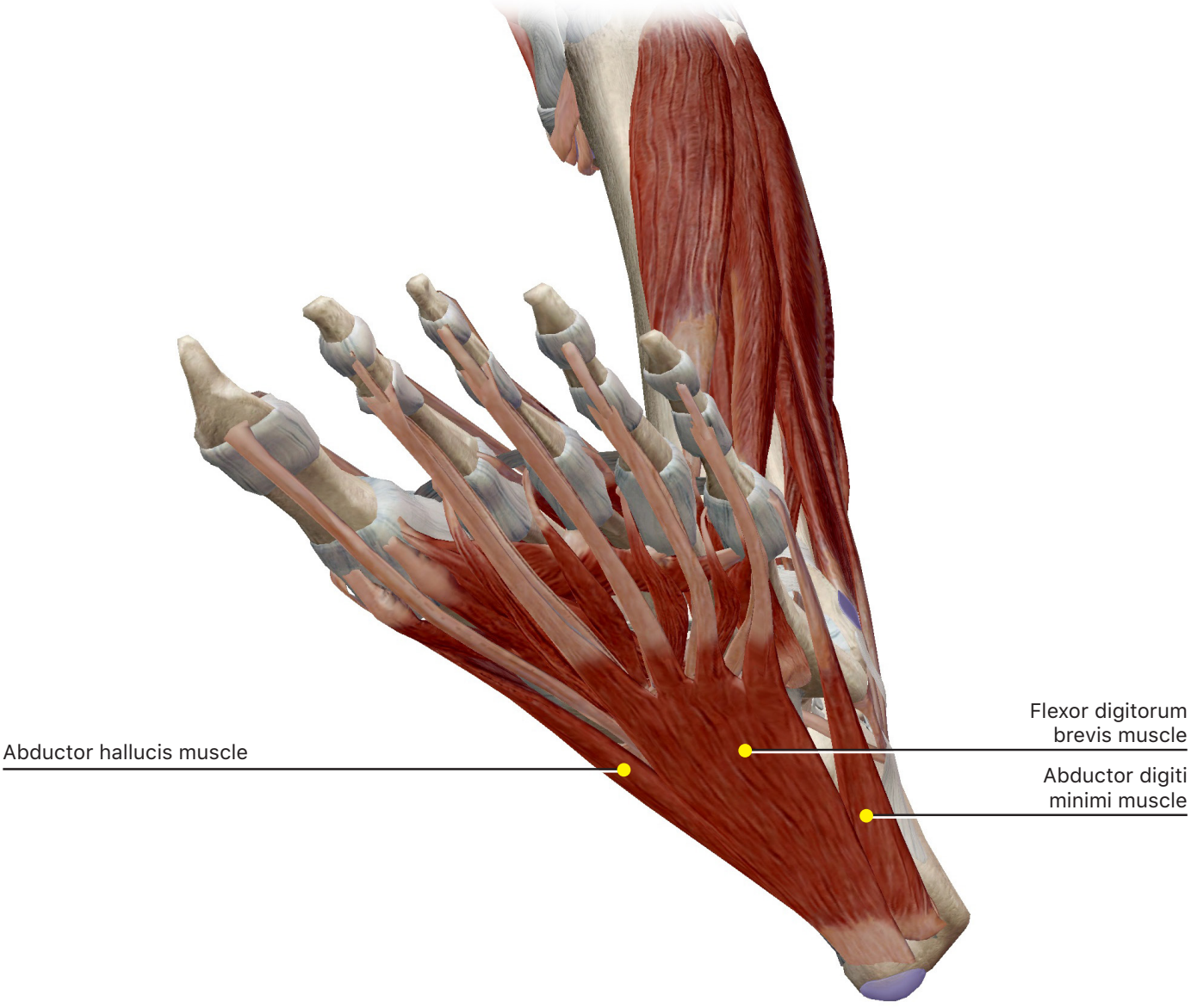
Foot digits flexion
Foot digits extension

These muscles are all located within the foot and act to move the toes. Keep your anatomical terminology in mind as you learn these muscles: hallucis refers to the big toe (digit 1), digitorum refers to toes 2-5, and digiti minimi refers specifically to the little toe (digit 5).

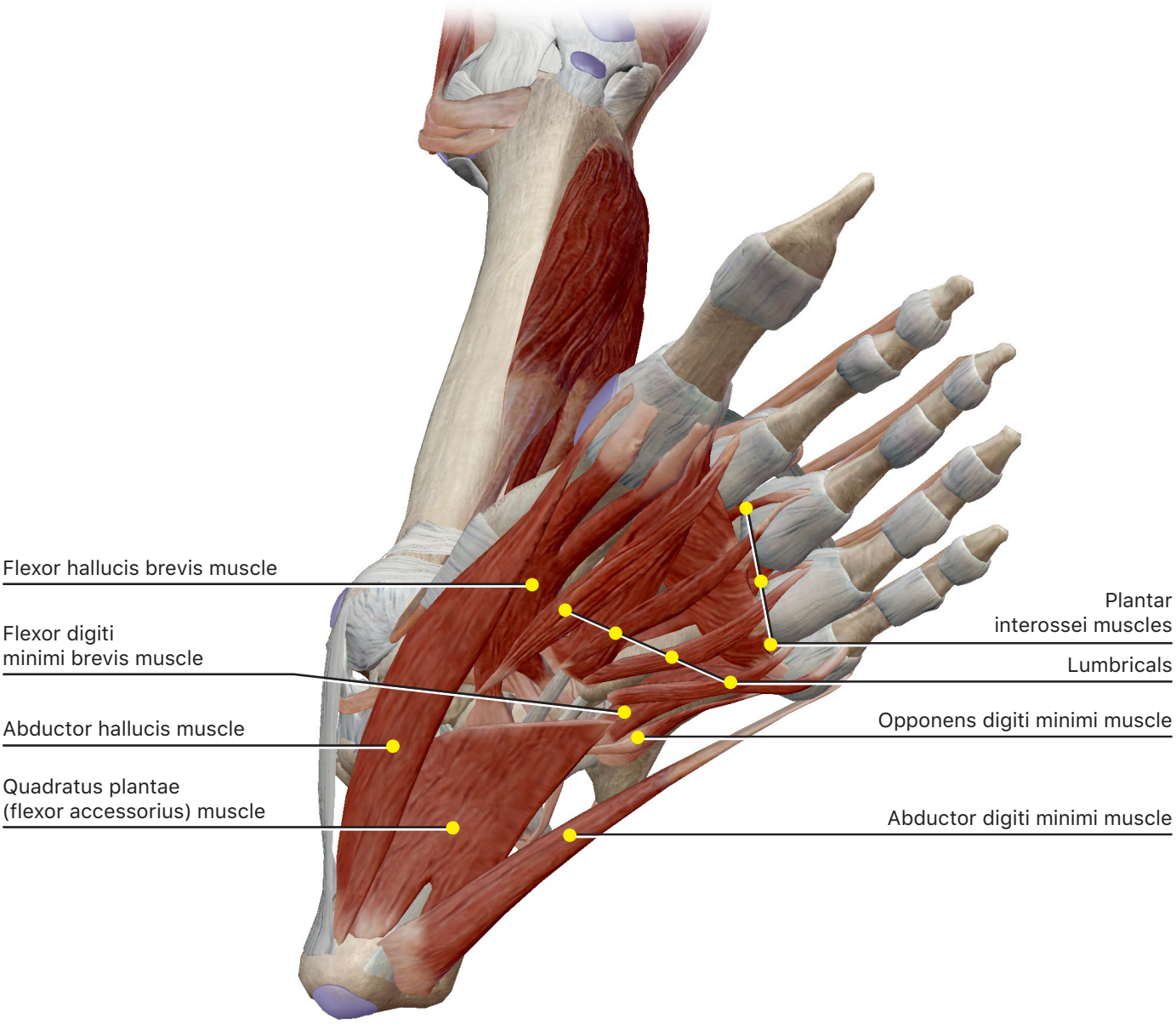
Muscular System View “Ankle and Foot” (Part 1)



Muscular System View "Ankle and Foot" (Part 2)



Muscular System View "Ankle and Foot" (Part 3)



Foot				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Extensor digitorum brevis				
Extensor hallucis brevis				
Flexor digitorum brevis				
Abductor hallucis				
Abductor digiti minimi				
Quadratus plantae				
Lumbricals				
Flexor hallucis brevis				
Adductor hallucis				

Foot (cont.)				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Flexor digiti minimi brevis				
Opponens digiti minimi				
Dorsal interossei				
Plantar interossei				

PUTTING IT ALL TOGETHER

1. Based on what you've learned about the muscles in this exercise, what do you think the following terms mean?

a. Brevis –

b. Longus –

c. Lateralis –

d. Medialis –

e. Digitorum –

f. Hallucis –

g. Digiti minimi –

2. Which muscles are used when performing the following actions?

a. Extending the leg to kick a ball

i.

ii.

iii.

iv.

b. Sitting cross-legged

i.

ii.

iii.

iv.

v.

vi.

vii.

c. Pulling the knees up to the chest, as when jumping into a pool “cannonball” style

i.

ii.

iii.

iv.

v.

d. Standing on tiptoes

i.

ii.

iii.

e. Climbing stairs

i. Raising the body up and lifting a leg:

1.

2.

3.

4.

5.

6.

7.

8.

i. Stepping up to the next step:

1.

2.

3.

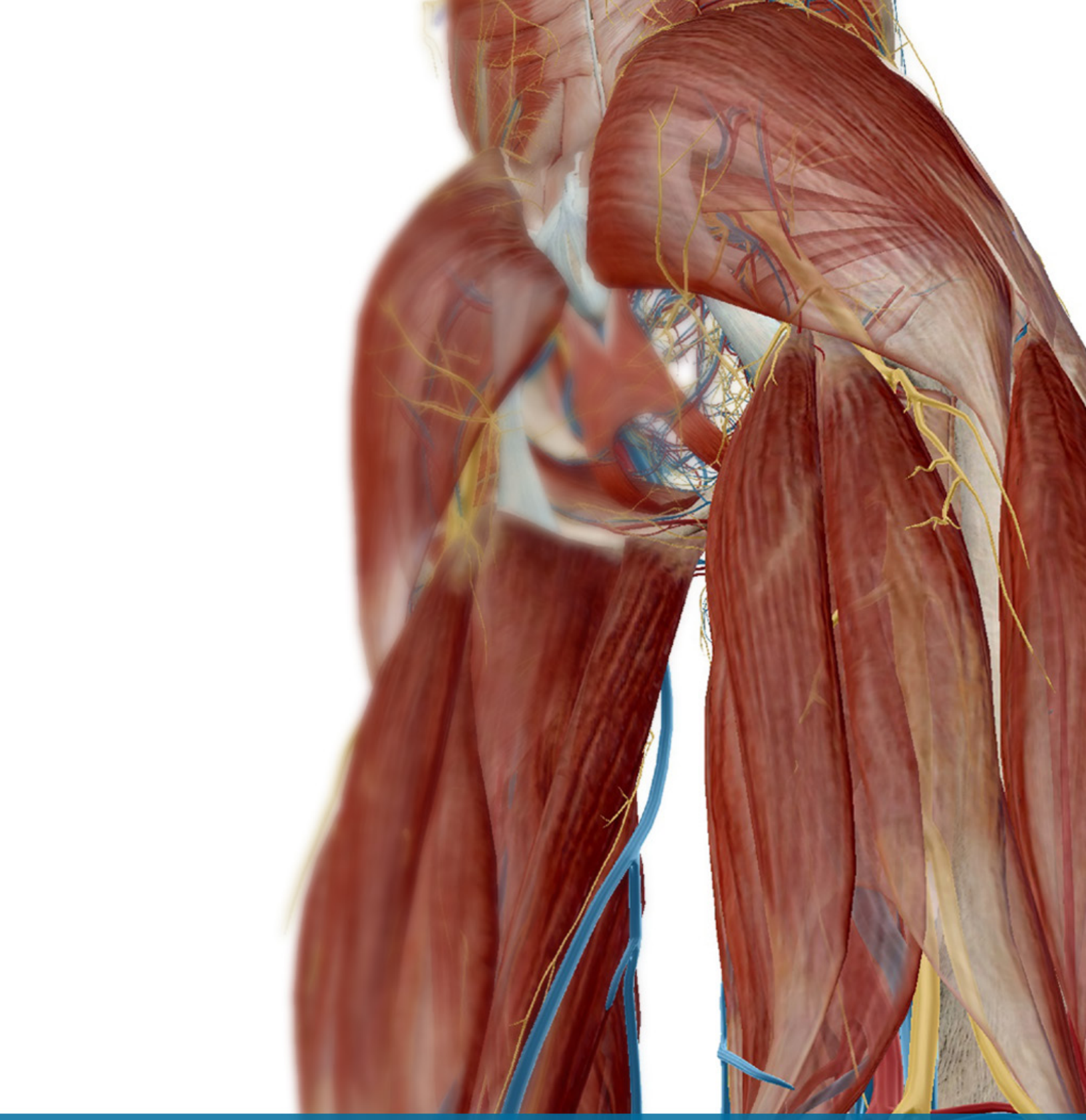
4.

5.

6.

3. Foot drop involves difficulty or inability to lift the front of the foot. It may be due to a variety of factors, including nerve injury. Which nerve would be affected?

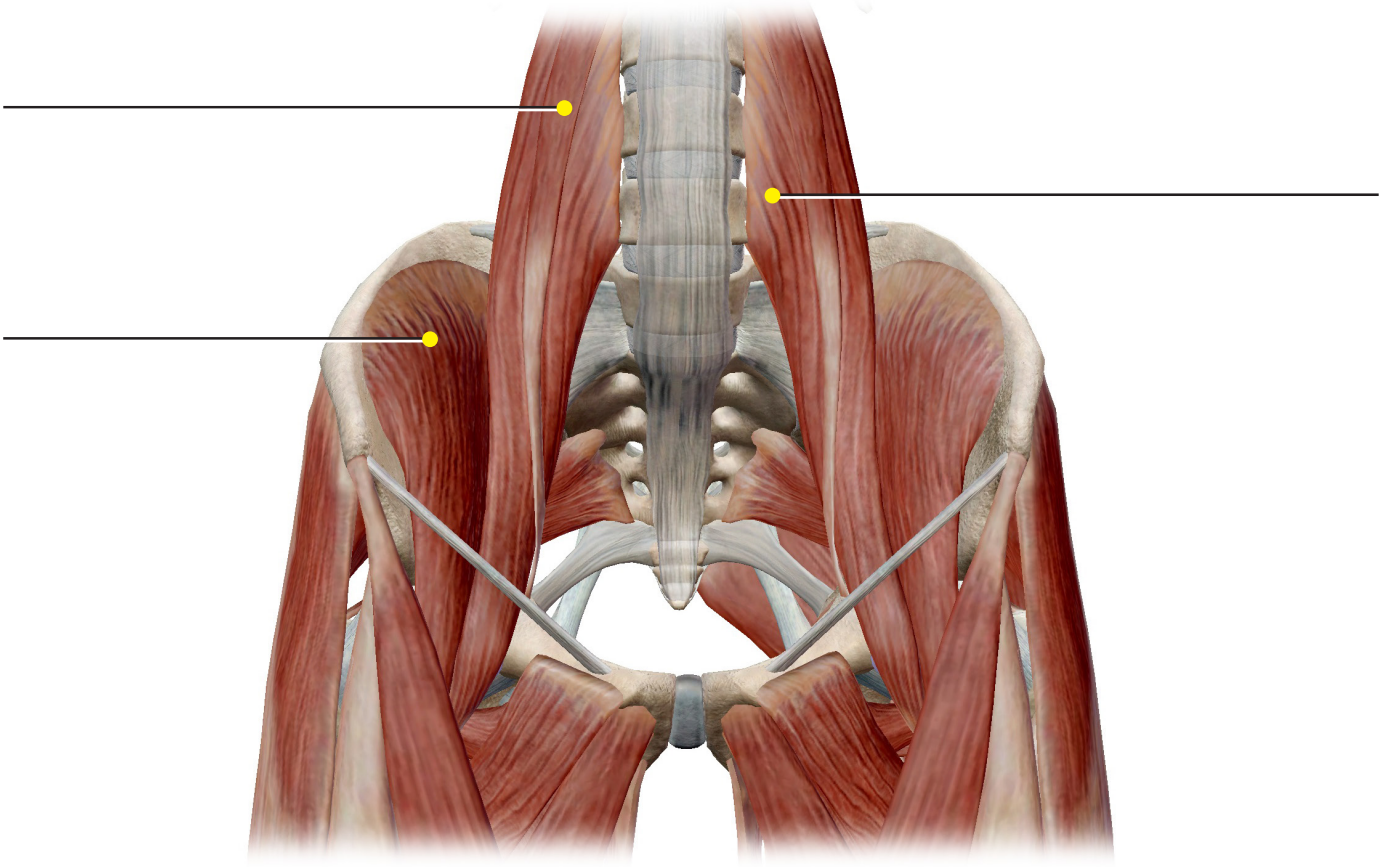
4. If someone were to tear his/her Achilles (calcaneal) tendon, what muscle action(s) would be affected?



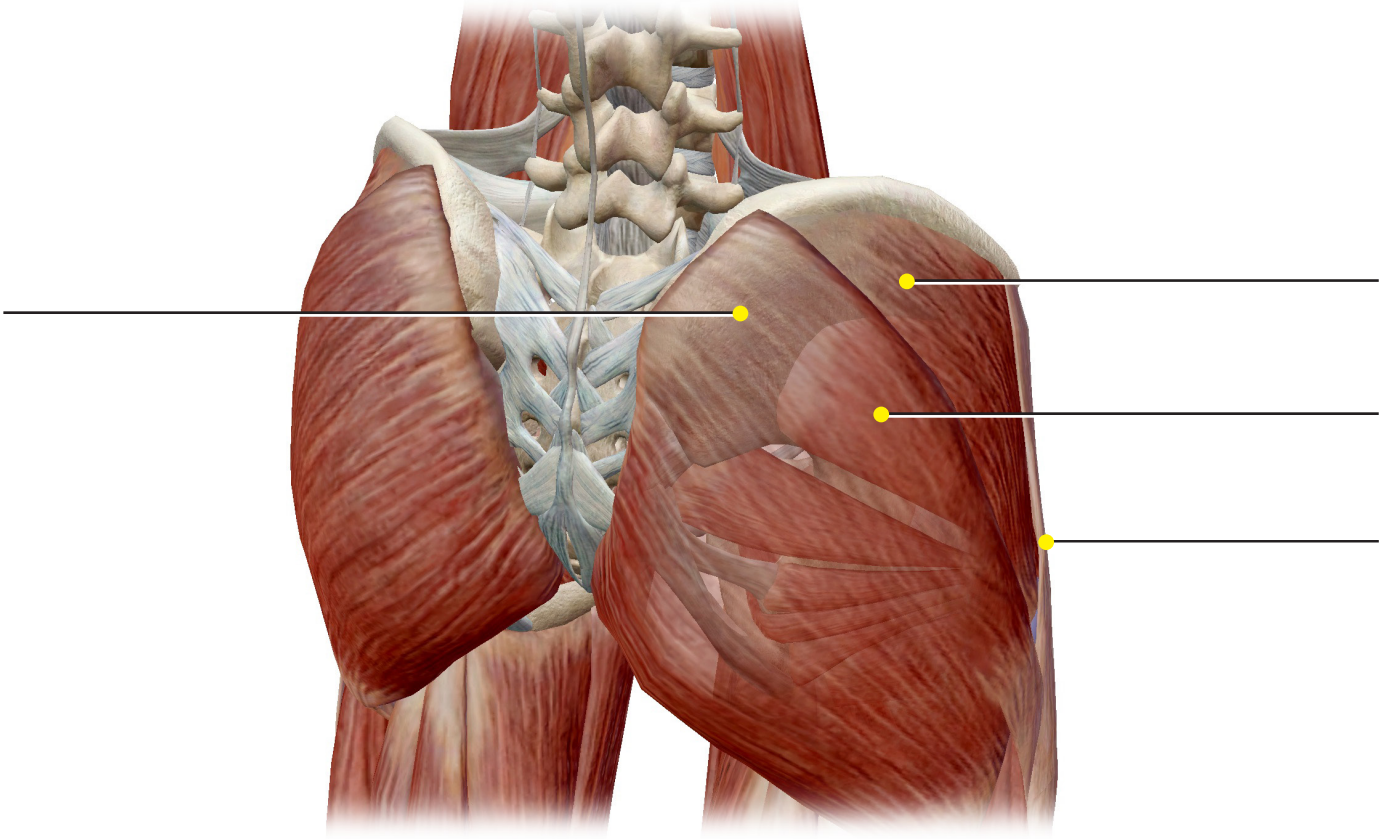
Student Practice

Label the muscles in the following figures

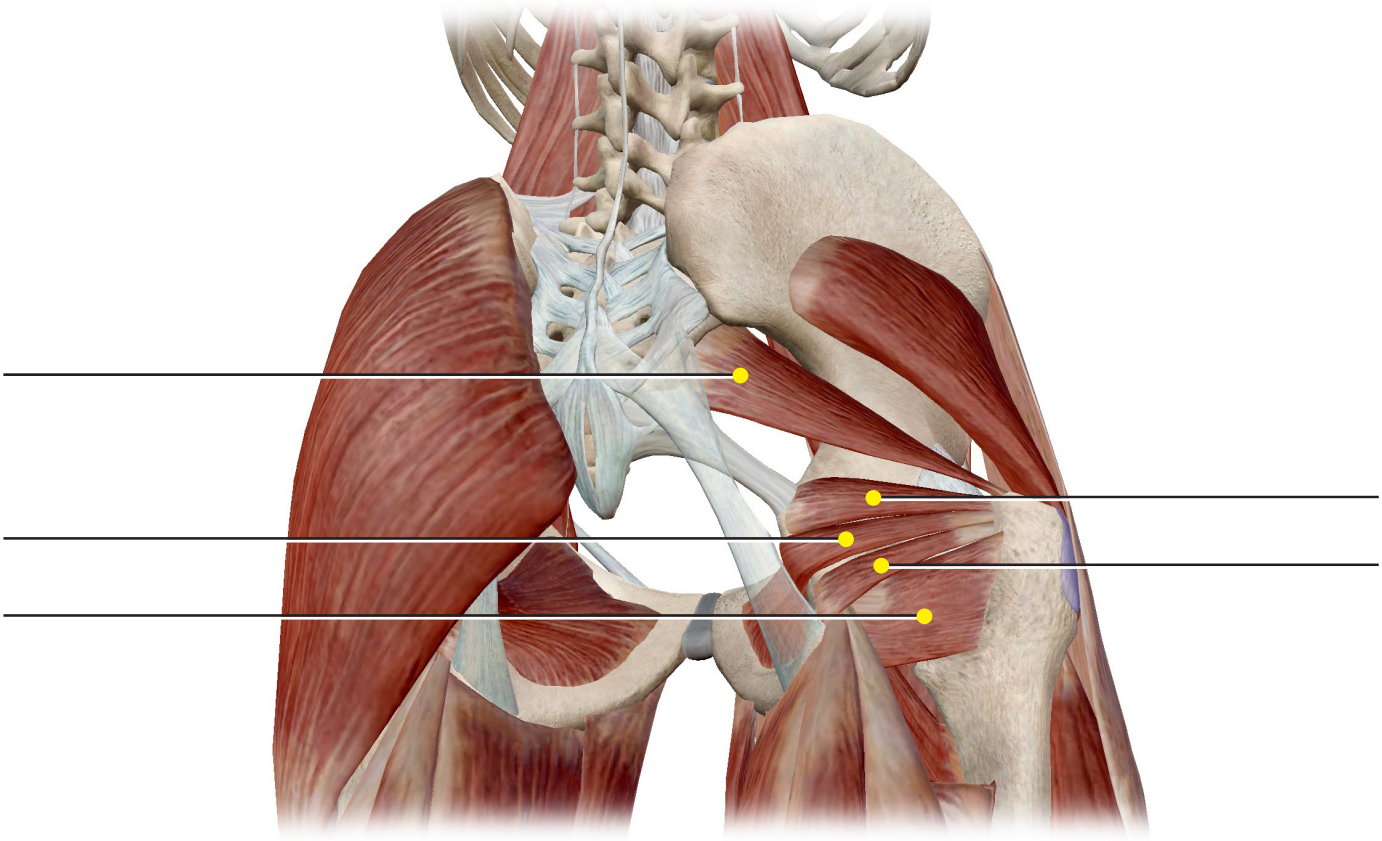
Source: Muscular System View "Hip" (Part 1)



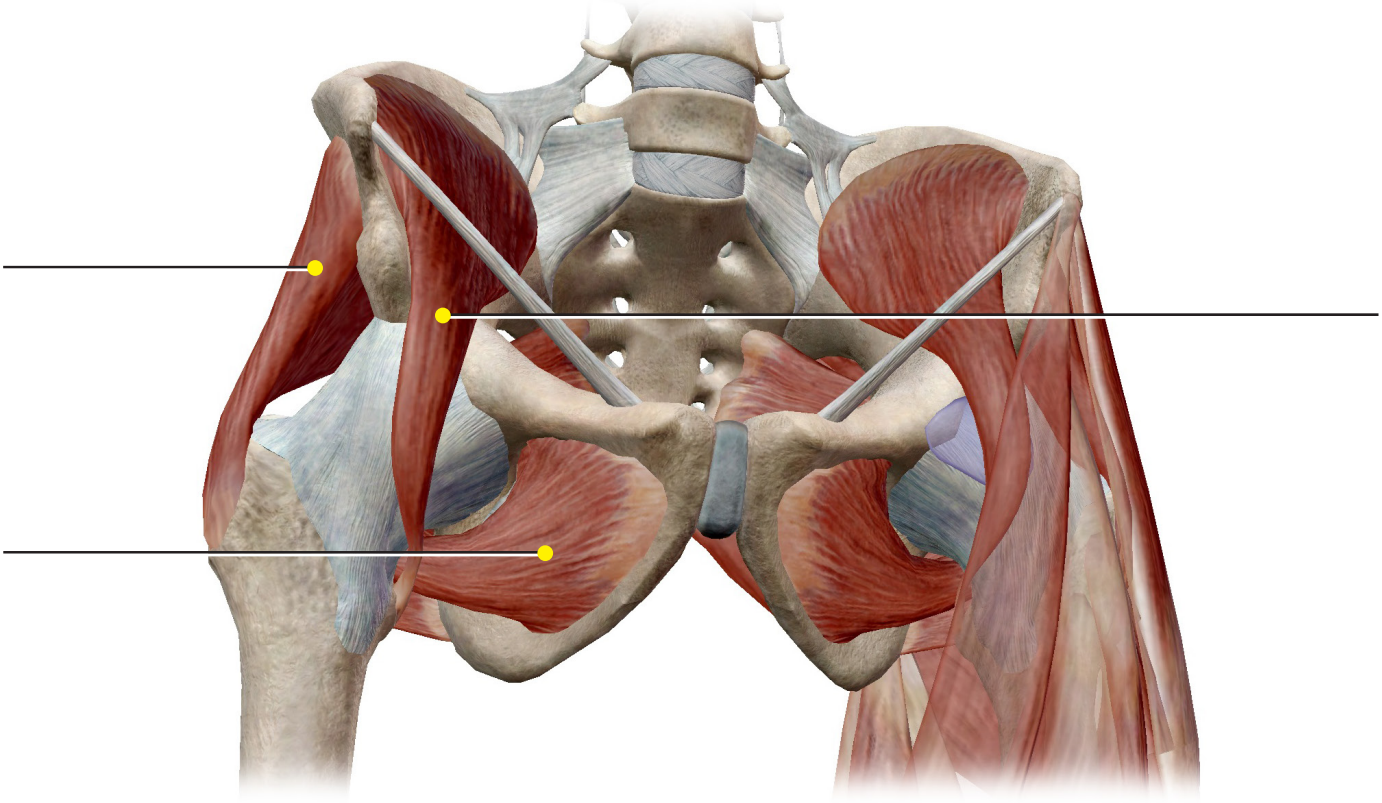
Source: Muscular System View "Hip" (Part 2)



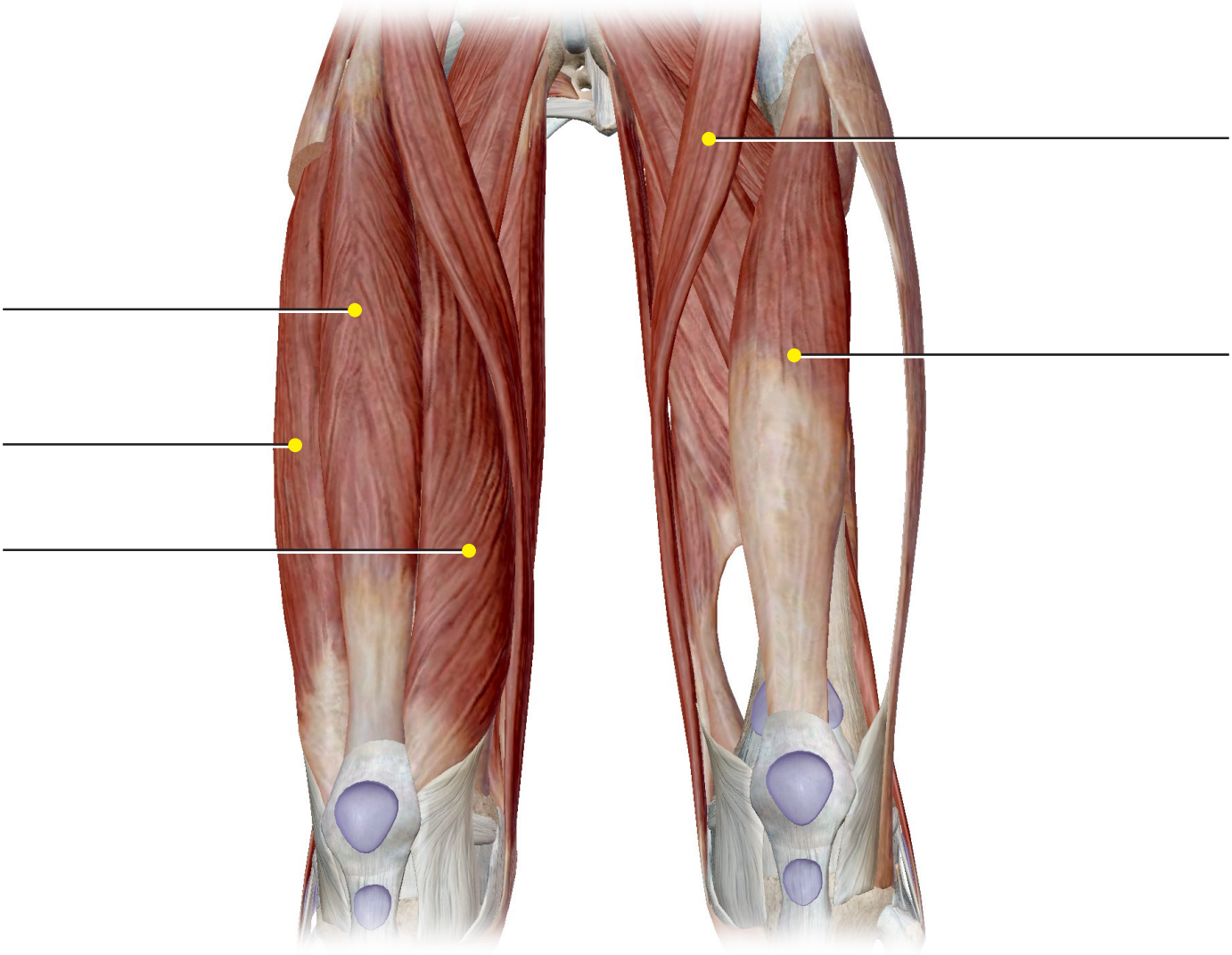
Source: Muscular System View "Hip" (Part 3)



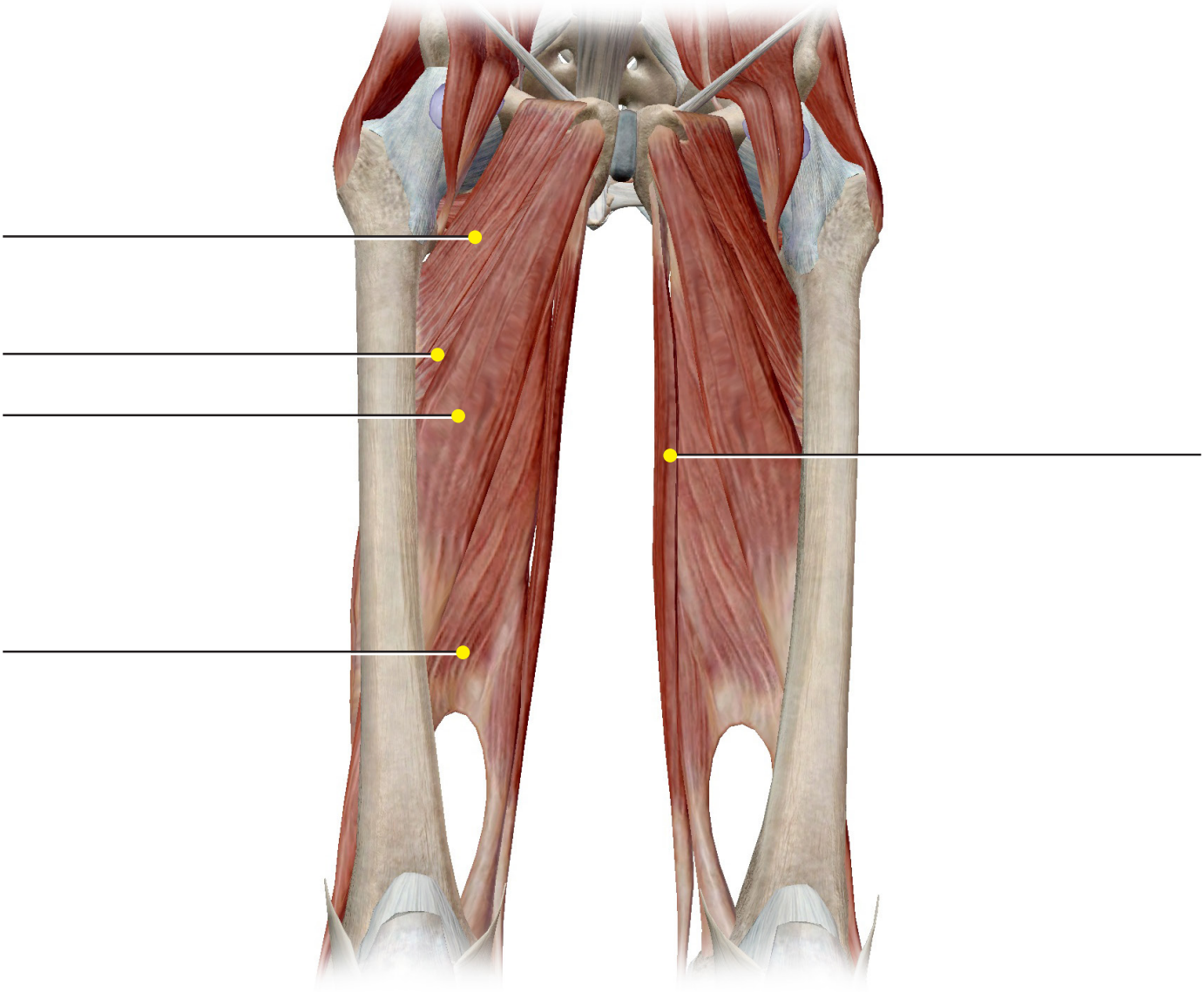
Source: Muscular System View "Hip" (Part 4)



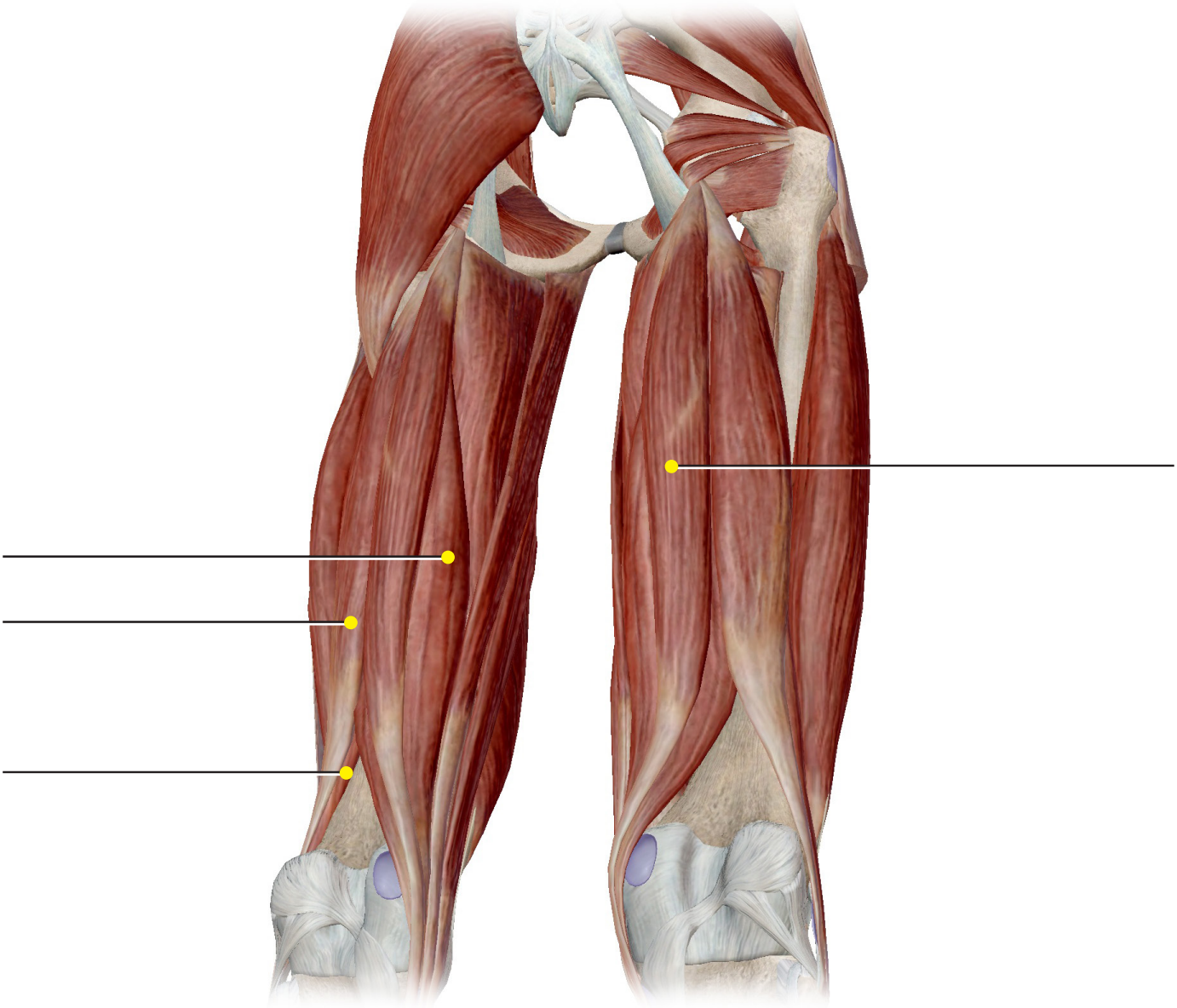
Source: Muscular System View "Hip" (Thigh: Anterior Compartment)



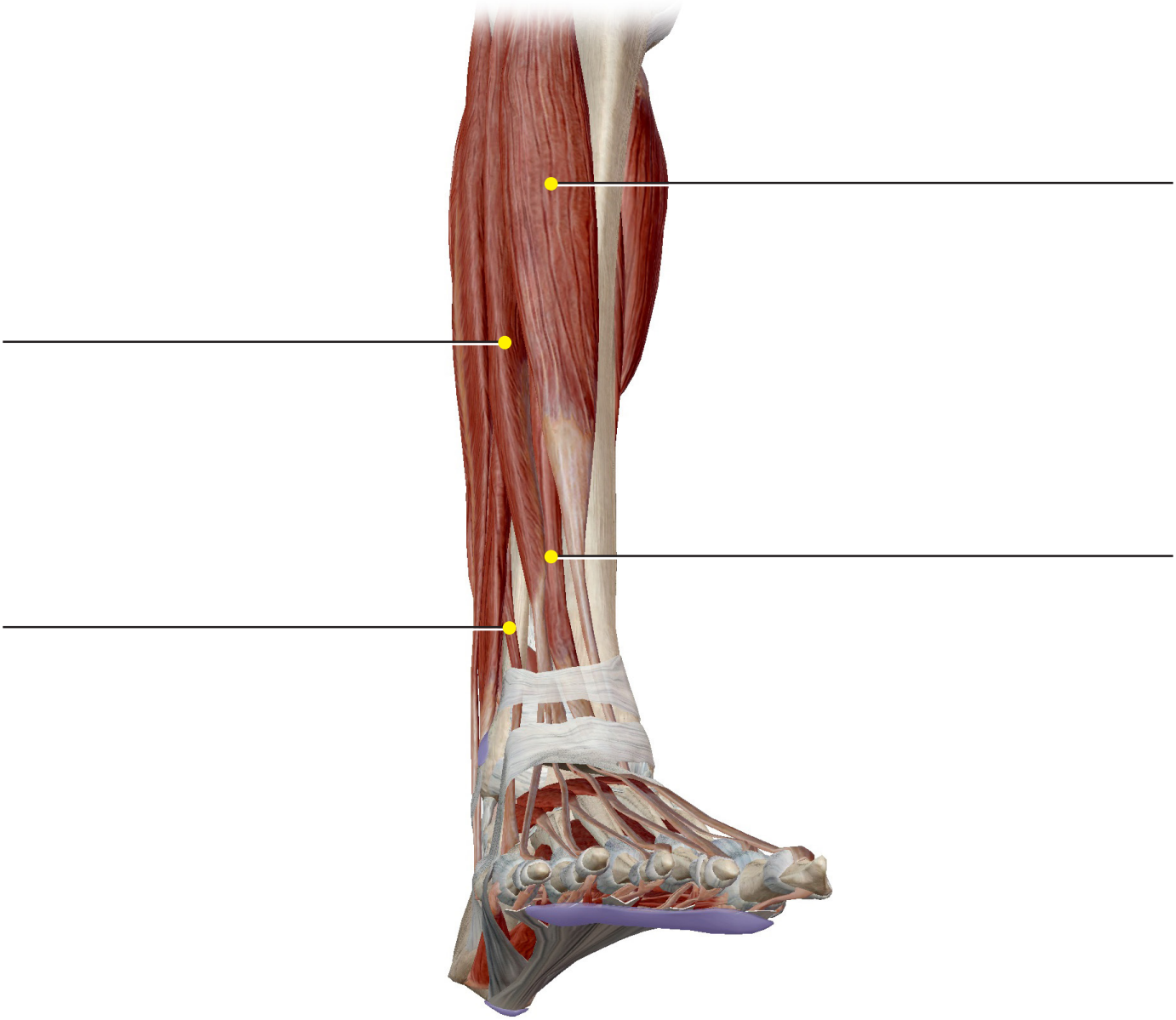
Source: Muscular System View "Hip" (Thigh: Medial Compartment)



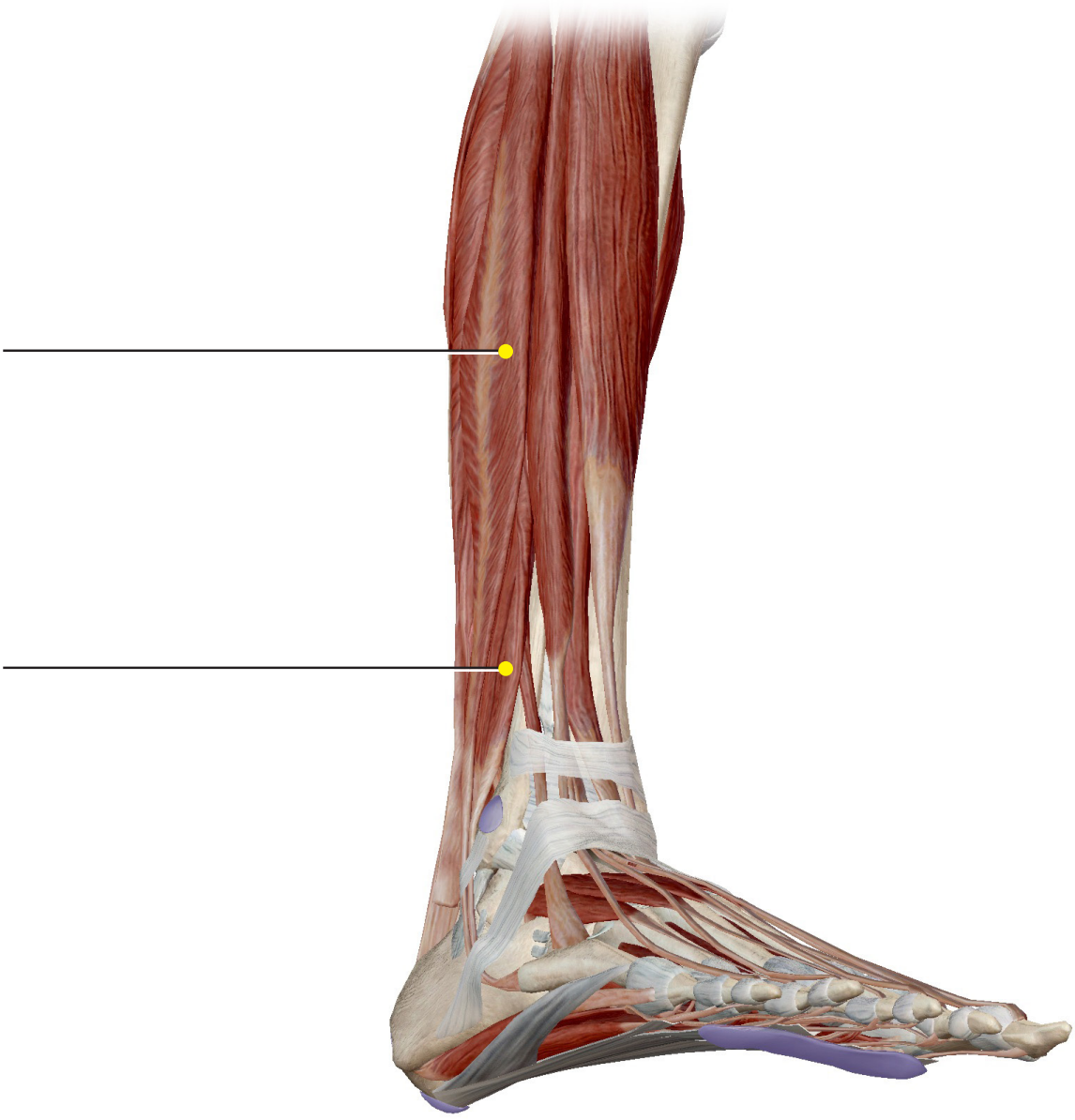
Source: Muscular System View "Hip" (Thigh: Posterior Compartment)



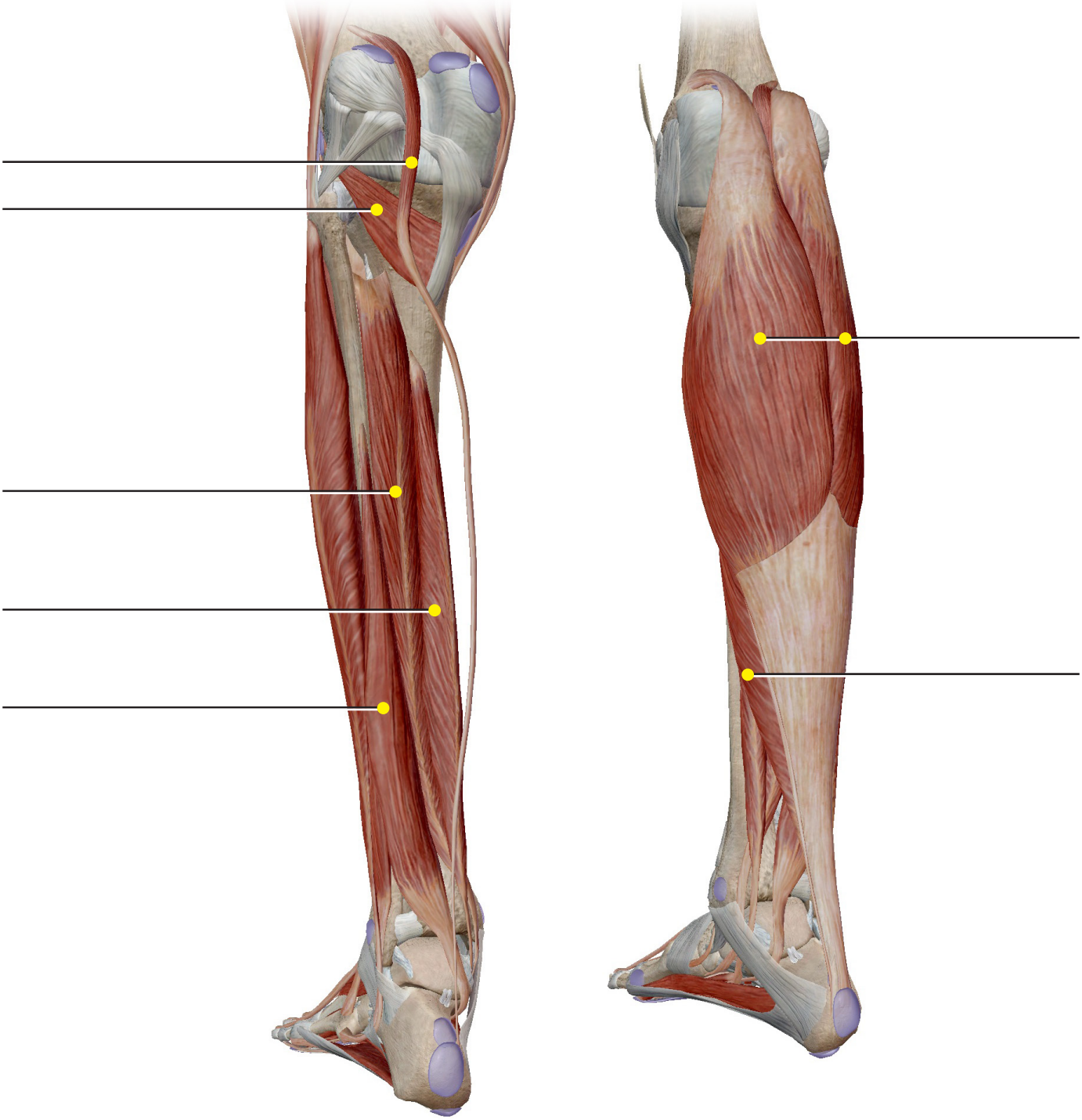
Source: Muscular System View "Ankle and Foot" (Lower Leg: Anterior Compartment)



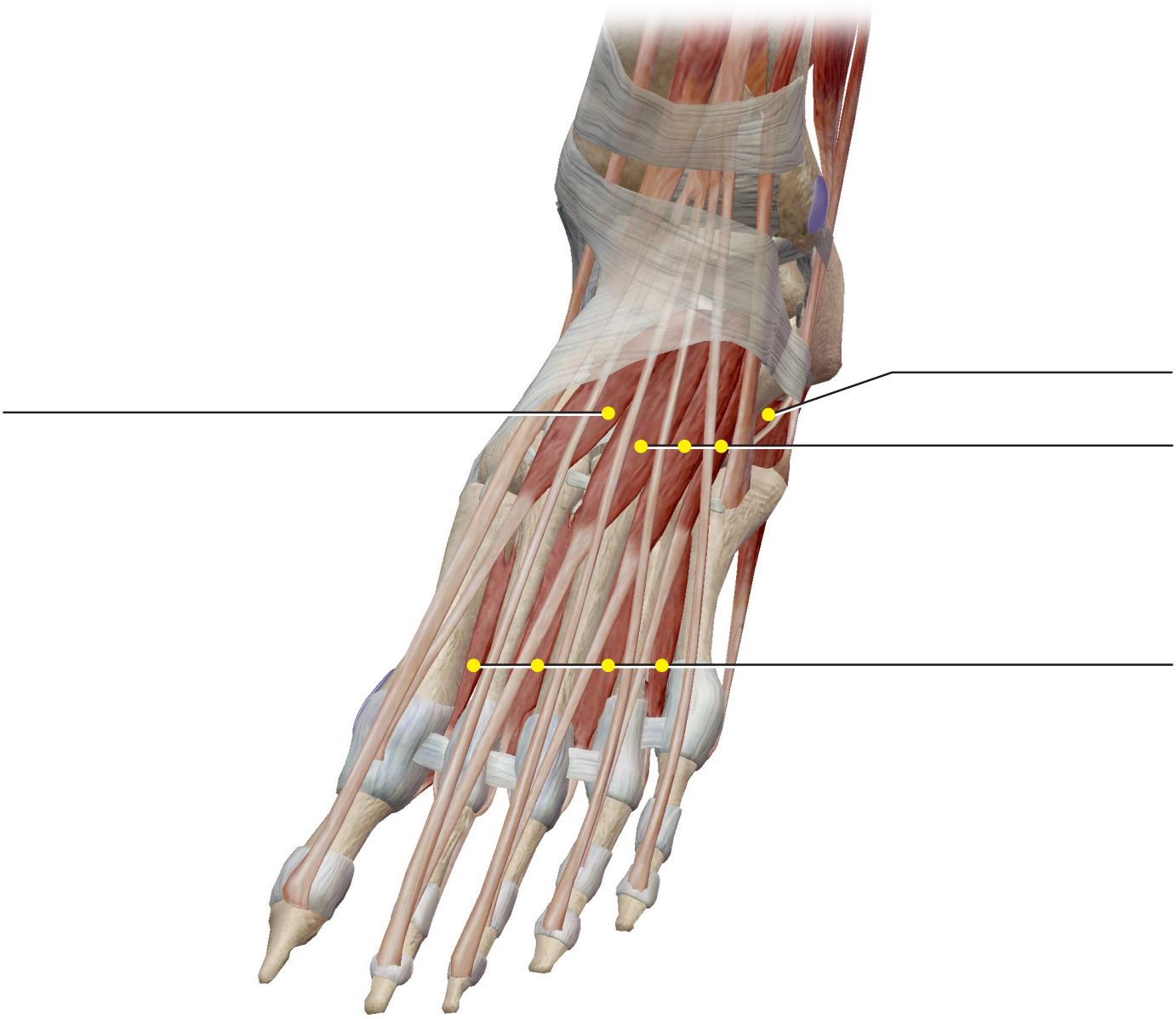
Source: Muscular System View "Ankle and Foot" (Lower Leg: Lateral Compartment)



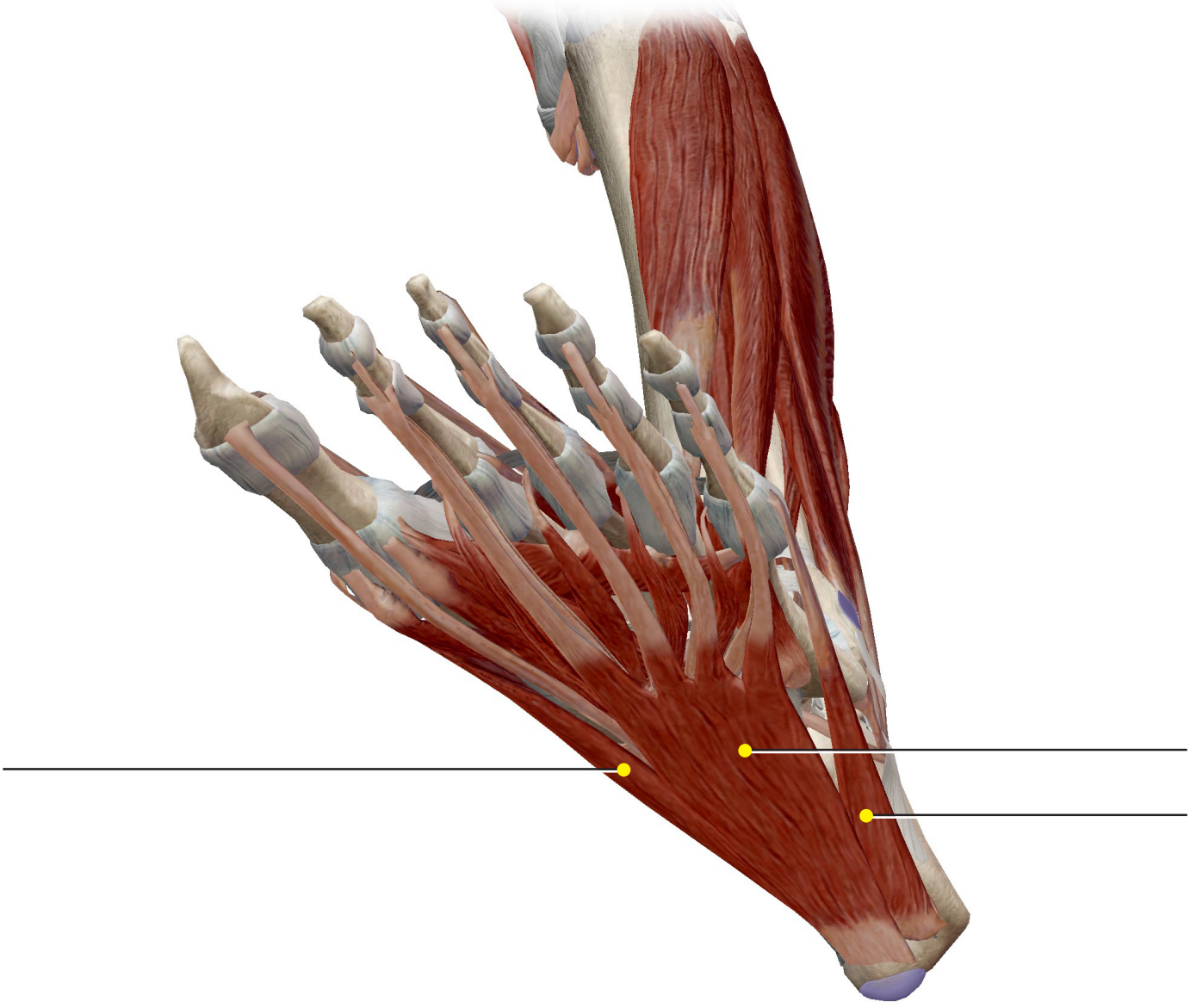
Source: Muscular System View "Ankle and Foot" (Lower Leg: Posterior Compartment)



Source: Muscular System View "Ankle and Foot" (Part 1)



Source: Muscular System View "Ankle and Foot" (Part 2)



Source: Muscular System View "Ankle and Foot" (Part 3)