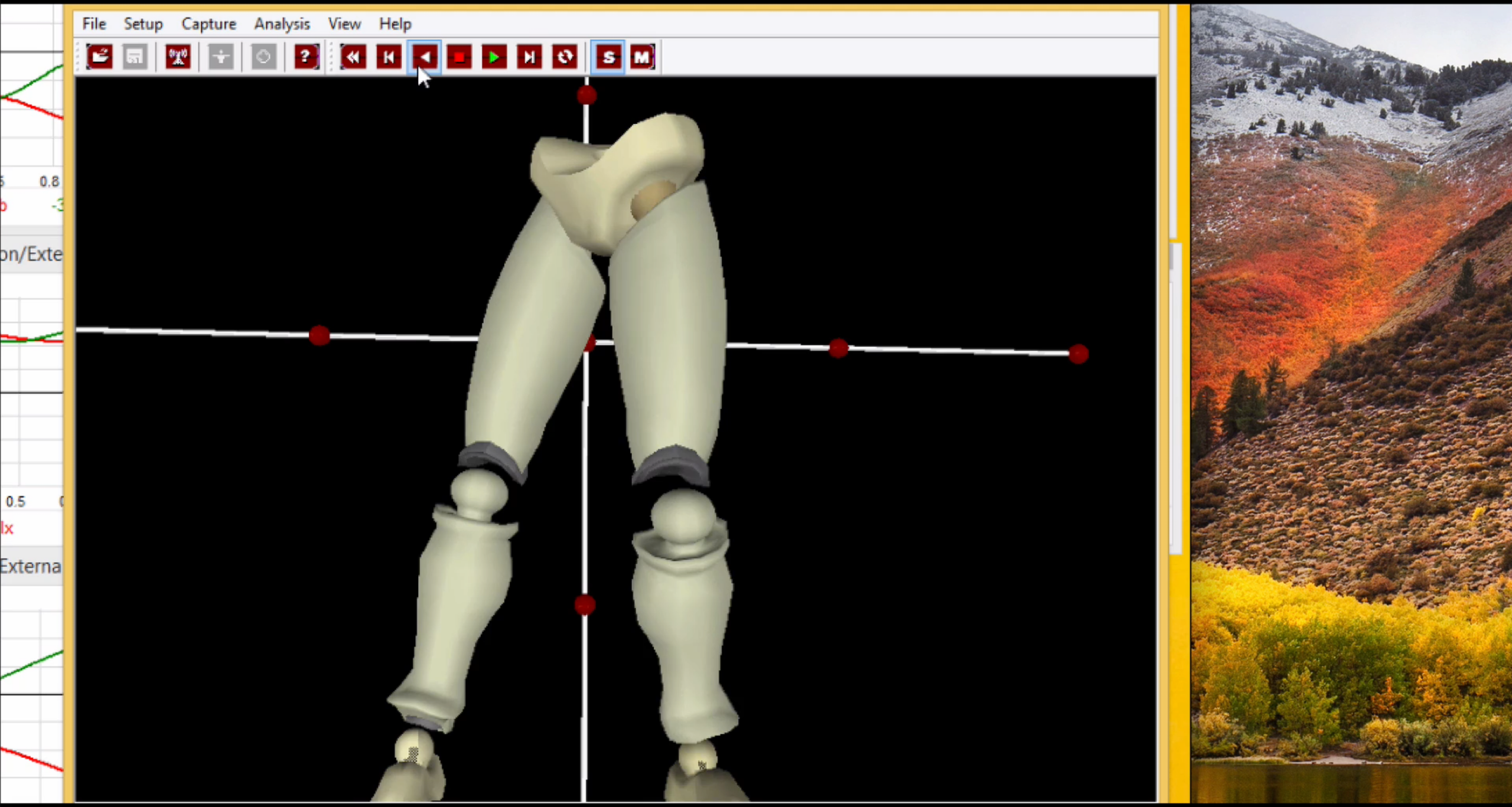
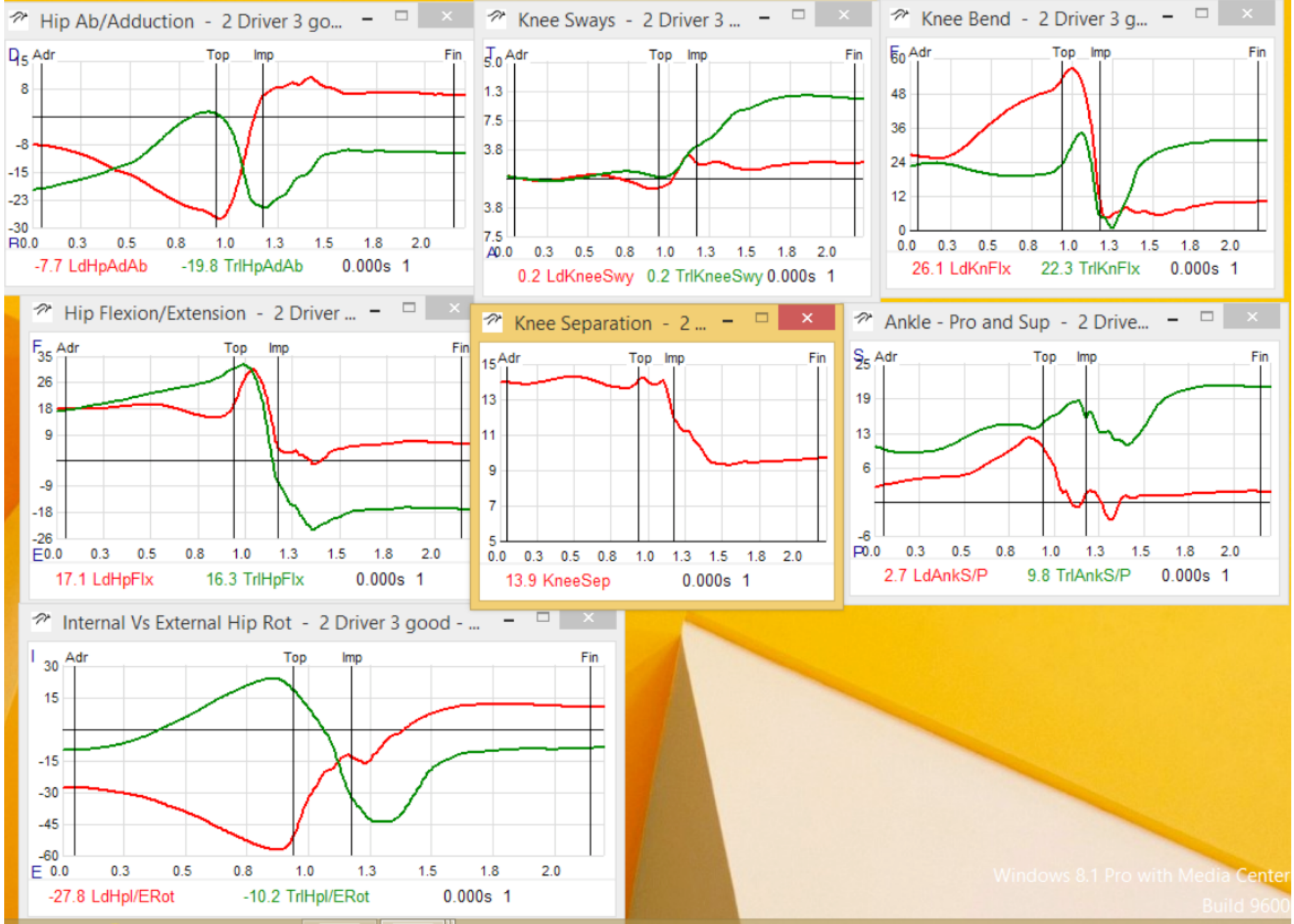
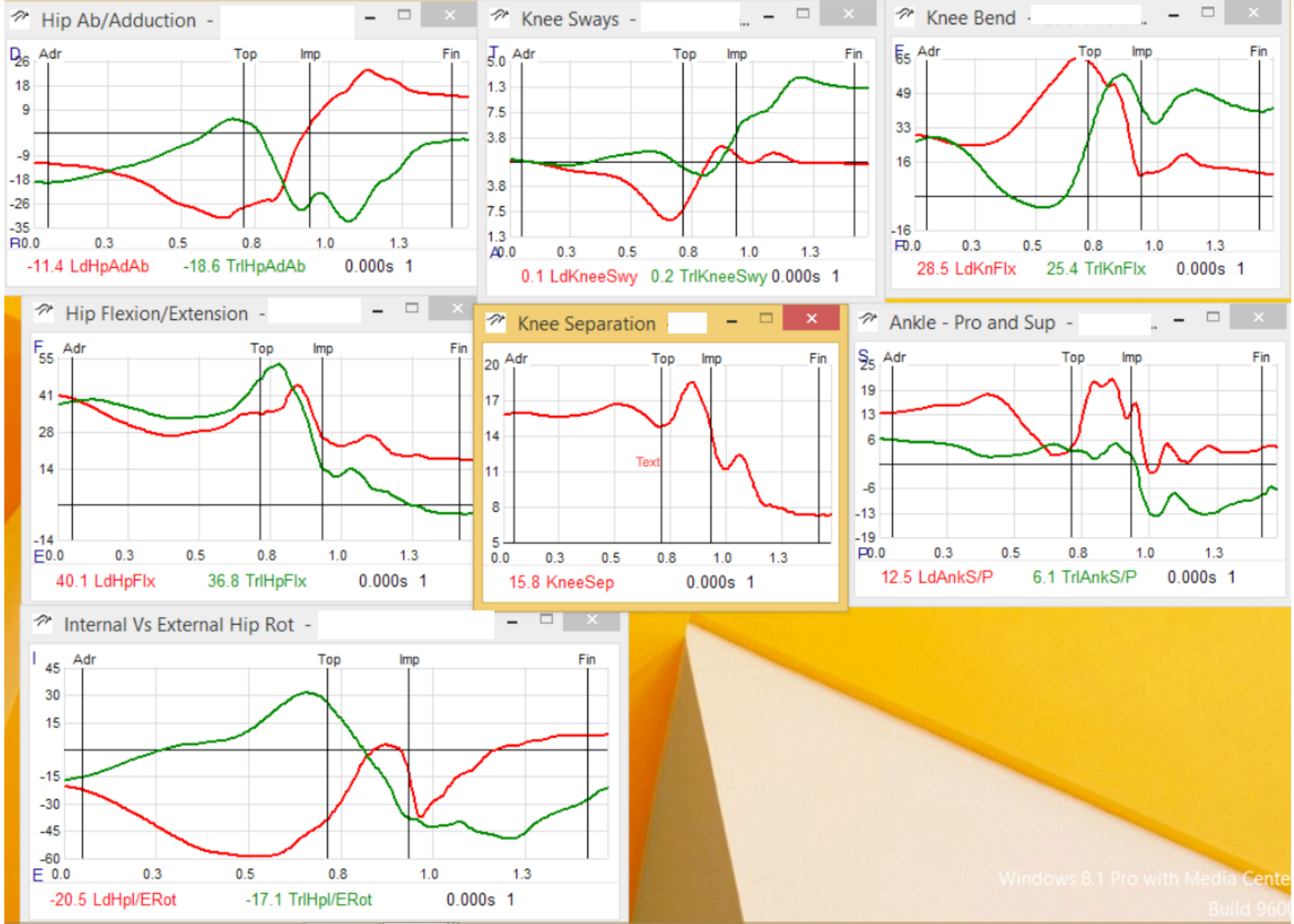
Topics

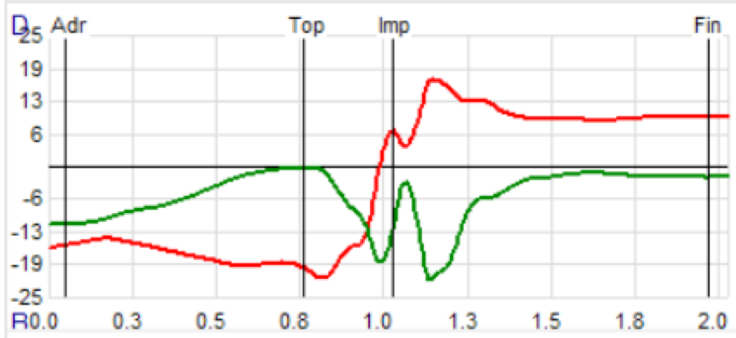
- 3D – “Dual External” – comparing the knee movements in transition
- Anatomy – Knee Basic Anatomy
- Coaches Questions/Swing Discussions


File
Setup
Capture
Analysis
View
Help
S
M
0.8
0.5


Hip Ab/Adduction - 2 Driver 3 go...
Adr
Top
Imp
Fin
-7.7 LdHpAdAb
-19.8 TrlHpAdAb
0.000s 1
Knee Sways - 2 Driver 3 ...
0.2 LdKneeSwy
0.2 TrlKneeSwy
0.000s 1
Knee Bend - 2 Driver 3 g...
26.1 LdKnFlx
22.3 TrlKnFlx
0.000s 1
Hip Flexion/Extension - 2 Driver ...
17.1 LdHpFlx
16.3 TrlHpFlx
0.000s 1
Knee Separation - 2 ...
13.9 KneeSep
0.000s 1
Ankle - Pro and Sup - 2 Drive...
2.7 LdAnkS/P
9.8 TrlAnkS/P
0.000s 1
Internal Vs External Hip Rot - 2 Driver 3 good - ...
-27.8 LdHpI/ERot
-10.2 TrlHpI/ERot
0.000s 1
Windows 8.1 Pro with Media Center
Build 9600

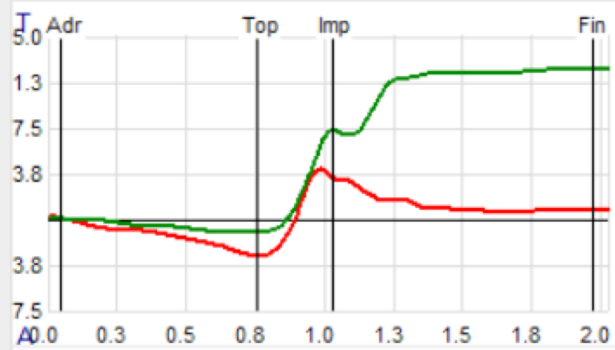

Hip Ab/Adduction -
Adr
Top
Imp
Fin
-11.4 LdHpAdAb
-18.6 TrlHpAdAb
0.000s 1
Knee Sways -
0.1 LdKneeSwy
0.2 TrlKneeSwy
0.000s 1
Knee Bend -
28.5 LdKnFlx
25.4 TrlKnFlx
0.000s 1
Hip Flexion/Extension -
40.1 LdHpFlx
36.8 TrlHpFlx
0.000s 1
Knee Separation
Text
15.8 KneeSep
0.000s 1
Ankle - Pro and Sup -
12.5 LdAnkS/P
6.1 TrlAnkS/P
0.000s 1
Internal Vs External Hip Rot -
-20.5 LdHpI/ERot
-17.1 TrlHpI/ERot
0.000s 1
Windows 8.1 Pro with Media Cente
Build 960

Hip Ab/Adduction



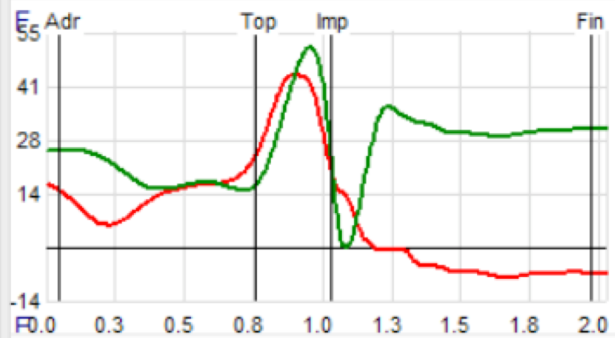
-15.6 LdHpAdAb -11.2 TrlHpAdAb 0.000s 1

Knee Sways



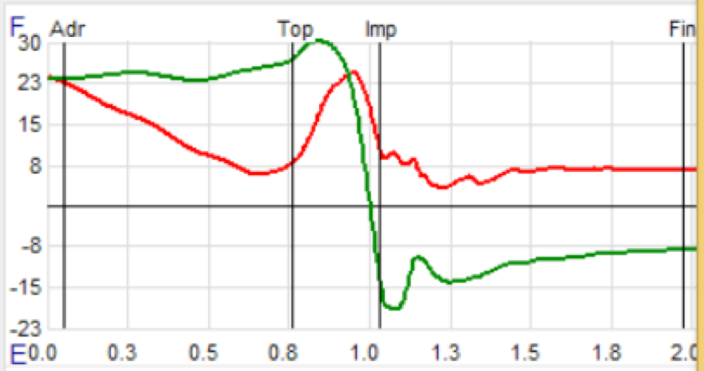
0.3 LdKneeSwy 0.1 TrlKneeSwy 0.000s 1

Knee Bend



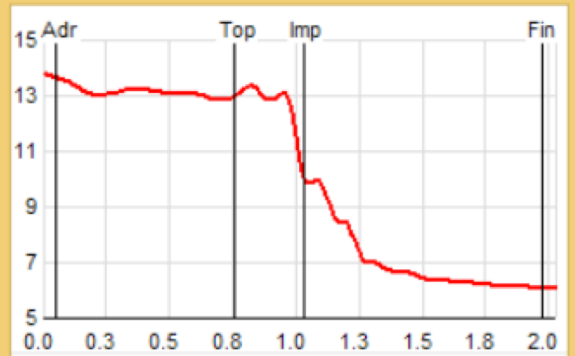
15.9 LdKnFlx 24.4 TrlKnFlx 0.000s 1

Hip Flexion/Extension



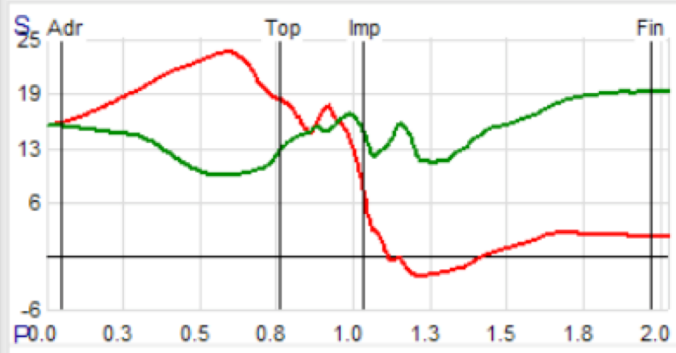
23.1 LdHpFlx 23.1 TrlHpFlx 0.000s 1

Knee Separation



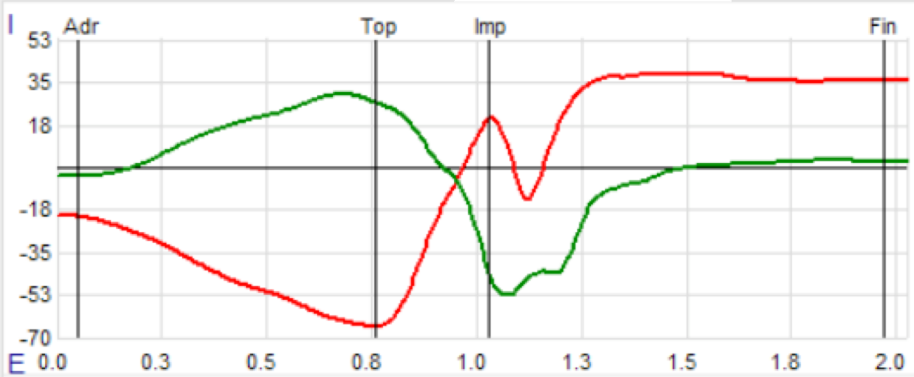
13.7 KneeSep 0.000s 1

Ankle - Pro and Sup



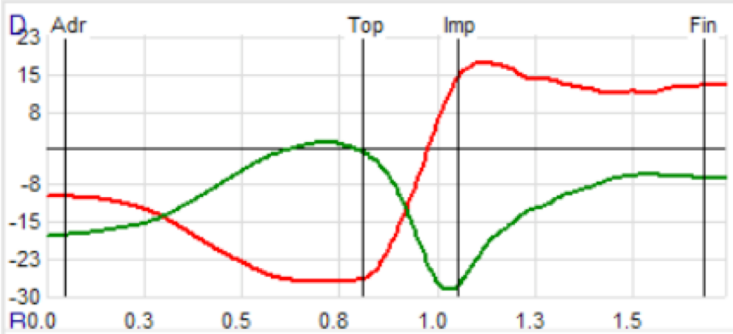
14.9 LdAnkS/P 15.0 TrlAnkS/P 0.000s 1

Internal Vs External Hip Rot



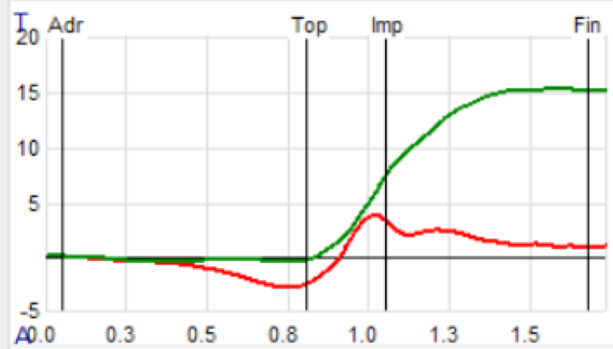
-19.8 LdHpI/ERot -3.5 TrlHpI/ERot 0.000s 1

Hip Ab/Adduction - Driver 5 - Wa...



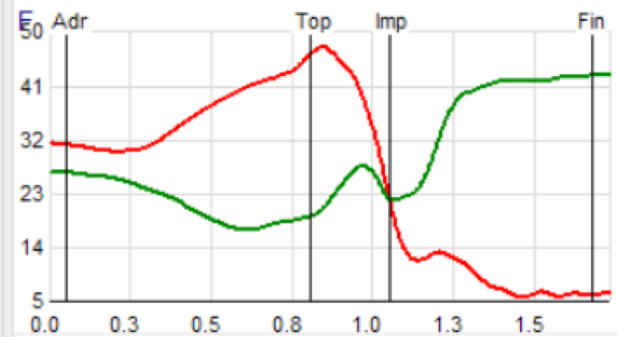
-9.7 LdHpAdAb -17.8 TrlHpAdAb 0.000s 1

Knee Sways - Driver 5 - ...



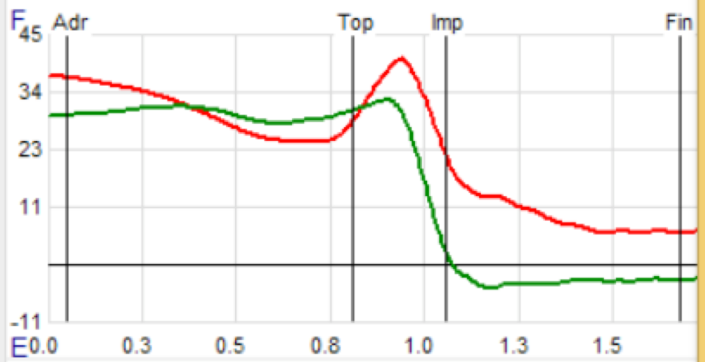
0.1 LdKneeSwy 0.1 TrlKneeSwy 0.000s 1

Knee Bend - Driver 5 - ...



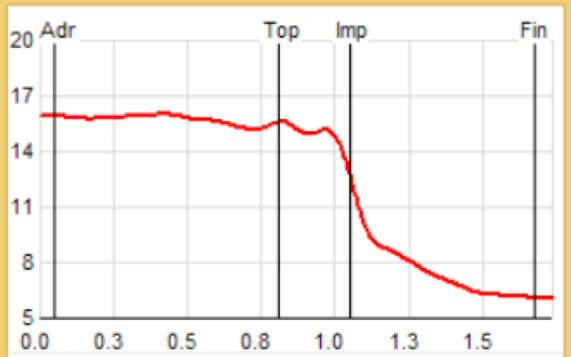
31.1 LdKnFlx 26.3 TrlKnFlx 0.000s 1

Hip Flexion/Extension - Driver 5 ...



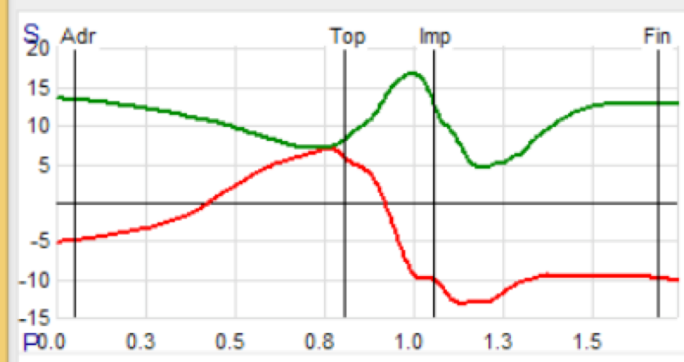
36.7 LdHpFlx 28.8 TrlHpFlx 0.000s 1

Knee Separation - D...



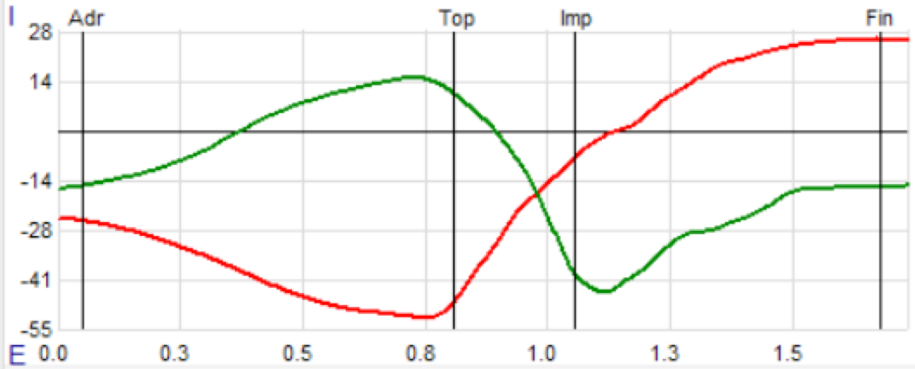
15.9 KneeSep 0.000s 1

Ankle - Pro and Sup - Driver ...



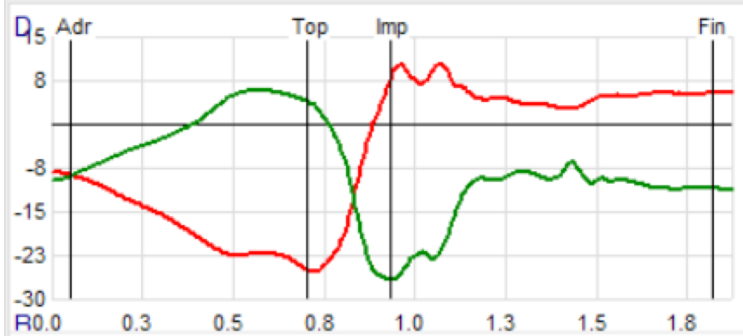
-5.2 LdAnkS/P 13.2 TrlAnkS/P 0.000s 1

Internal Vs External Hip Rot - Driver 5 - Waite Gr...



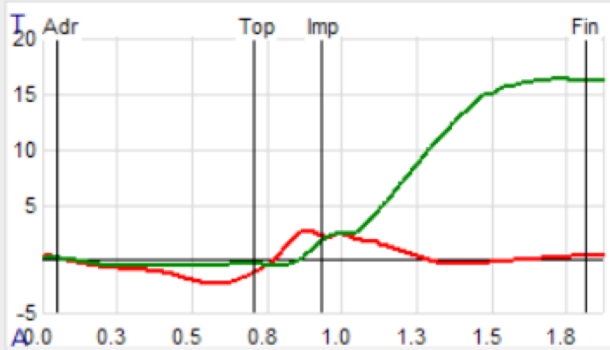
-24.2 LdHpI/ERot -16.0 TrlHpI/ERot 0.000s 1

Hip Ab/Adduction -



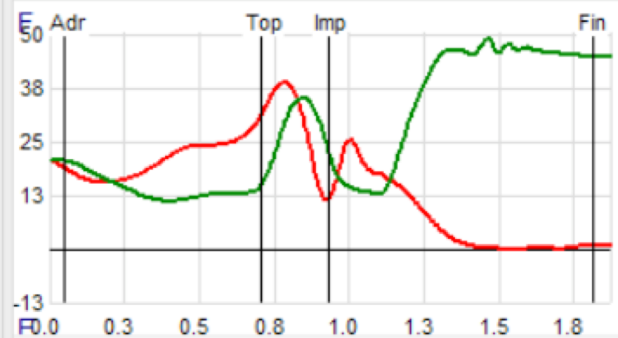
-8.4 LdHpAdAb -9.8 TrlHpAdAb 0.000s 1

Knee Sways -



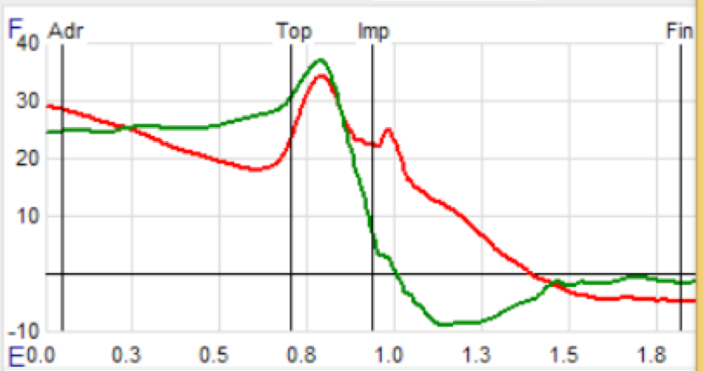
0.3 LdKneeSwy 0.2 TrlKneeSwy 0.000s 1

Knee Bend -



20.3 LdKnFlx 20.6 TrlKnFlx 0.000s 1

Hip Flexion/Extension -

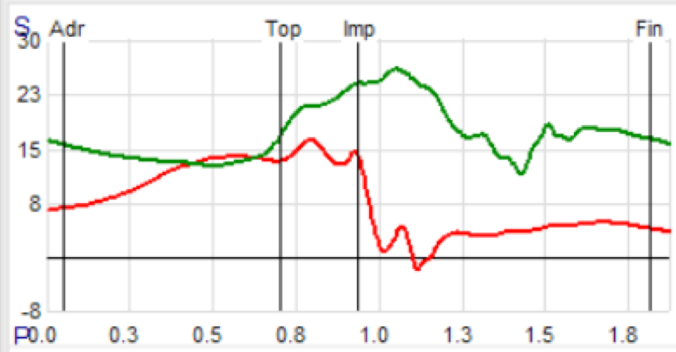


28.9 LdHpFlx 24.4 TrlHpFlx 0.000s 1

Knee Separation -

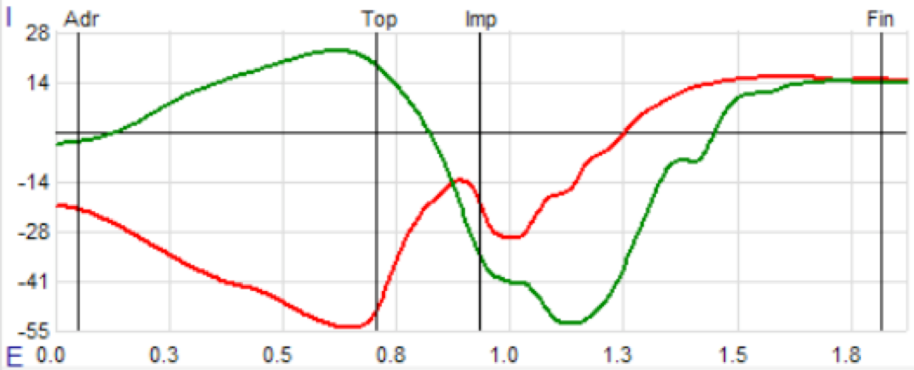
13.2 KneeSep 0.000s 1

Ankle - Pro and Sup -



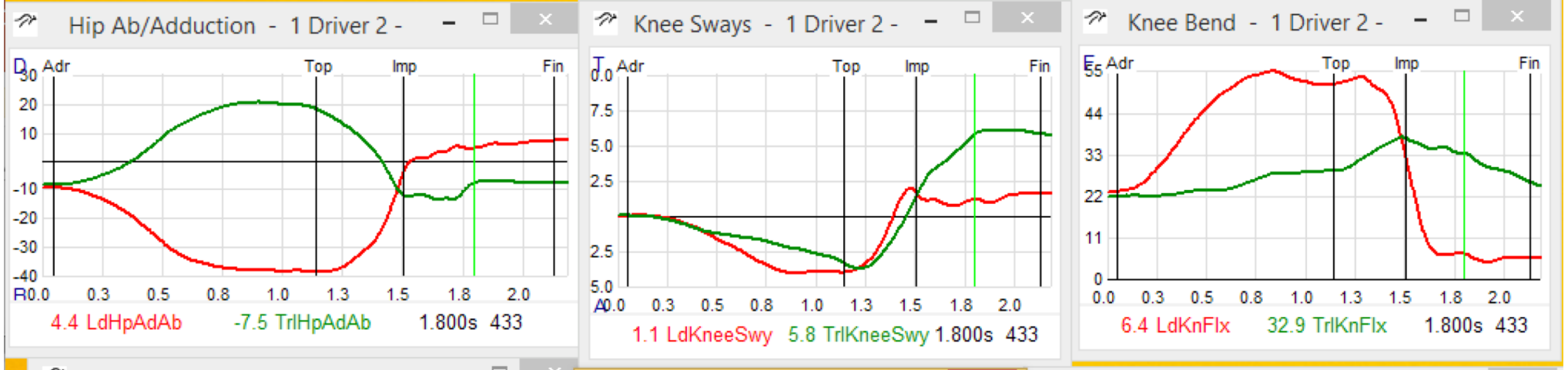
6.4 LdAnkS/P 15.9 TrlAnkS/P 0.000s 1

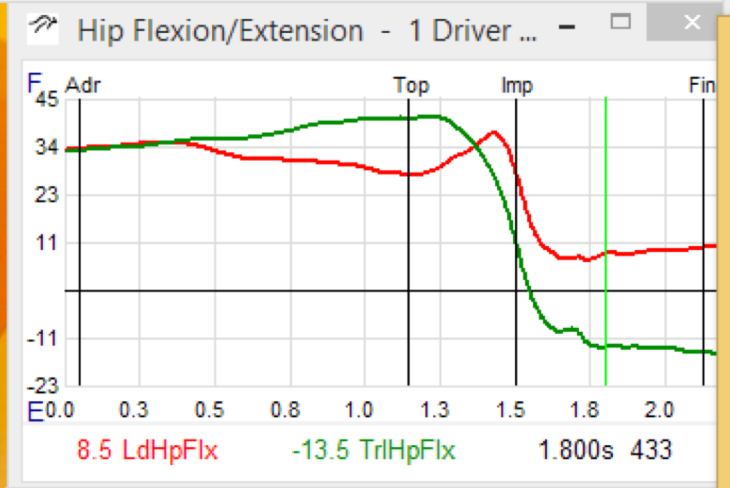
Internal Vs External Hip Rot -

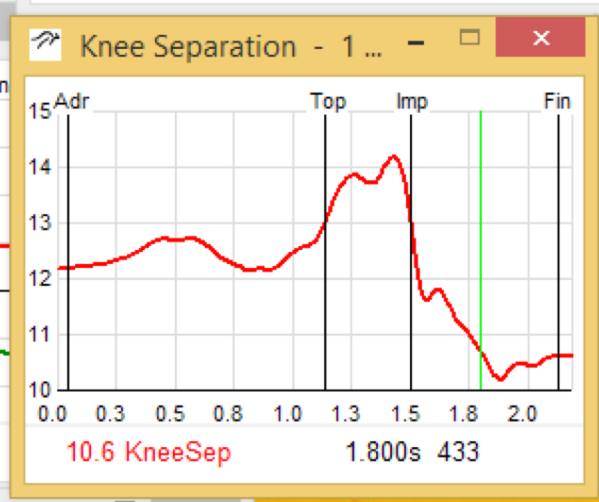


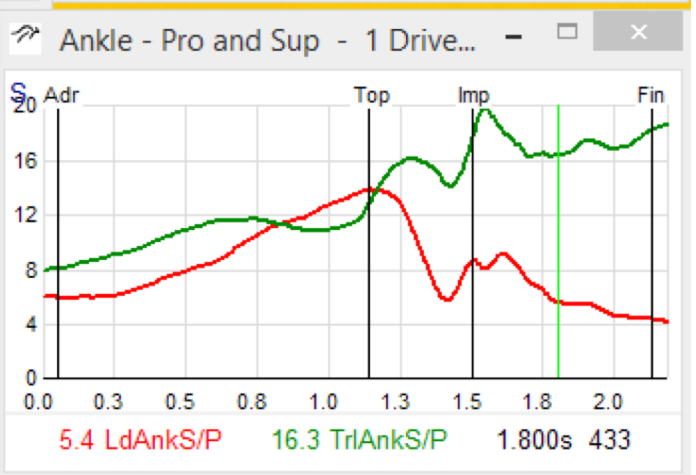
-20.4 LdHpI/ERot -3.5 TrlHpI/ERot 0.000s 1

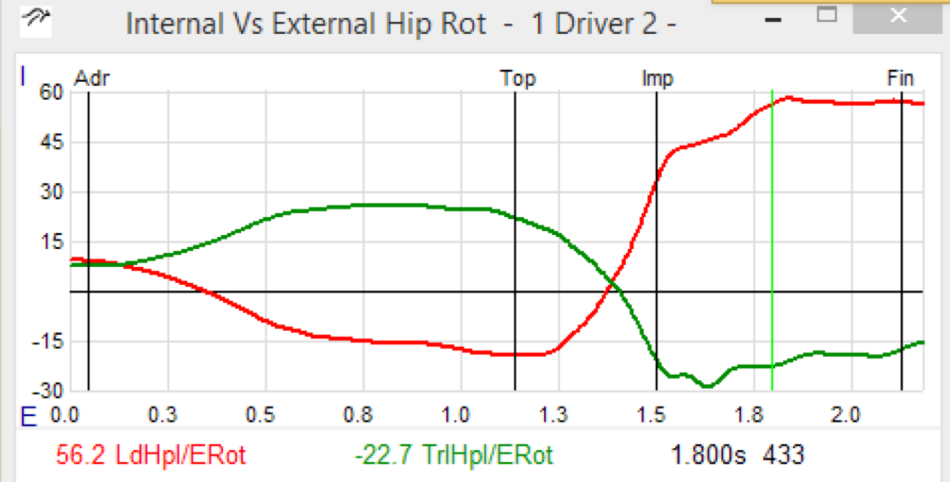
High Handicap



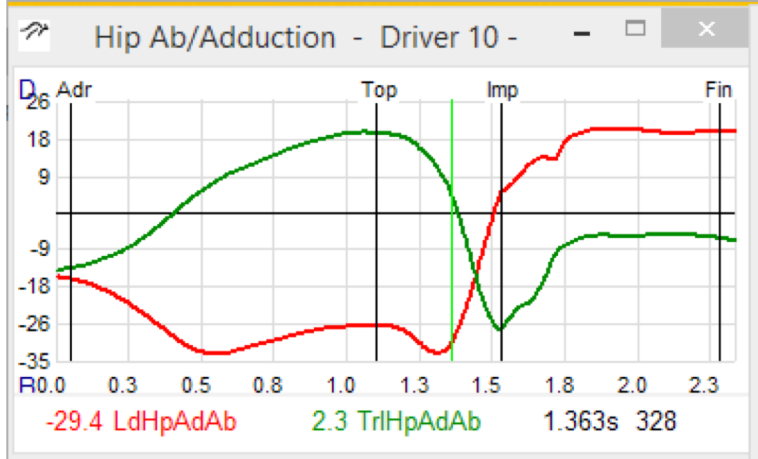


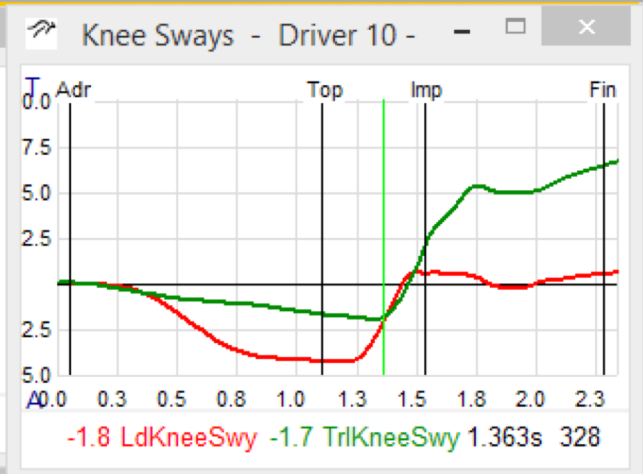


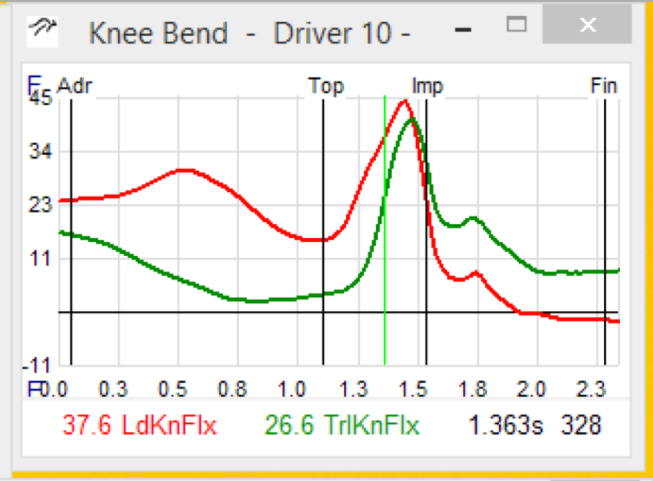


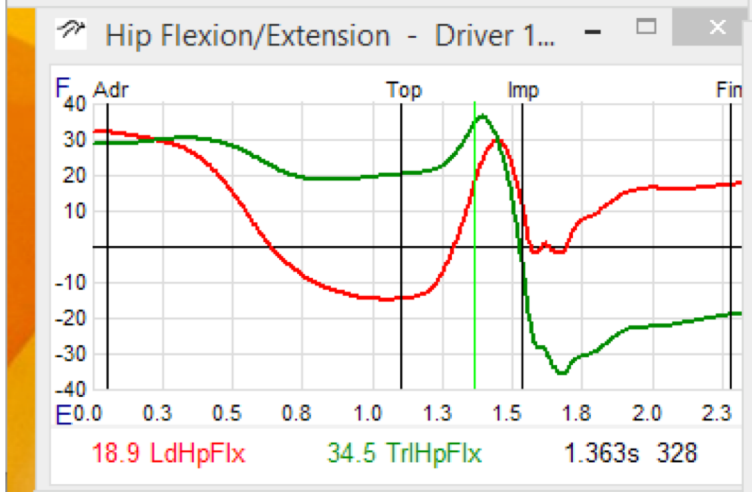


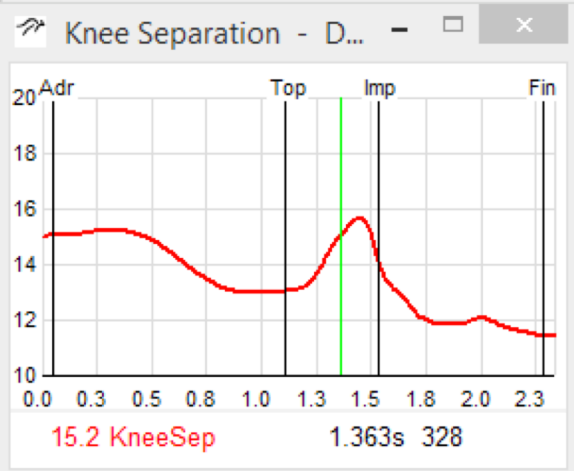
High Handicap

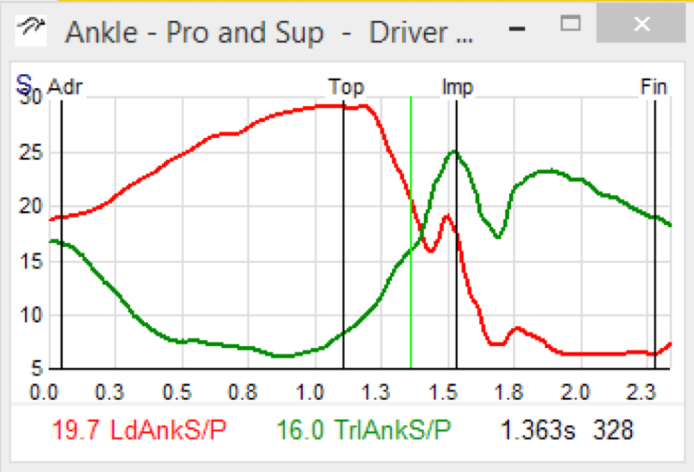


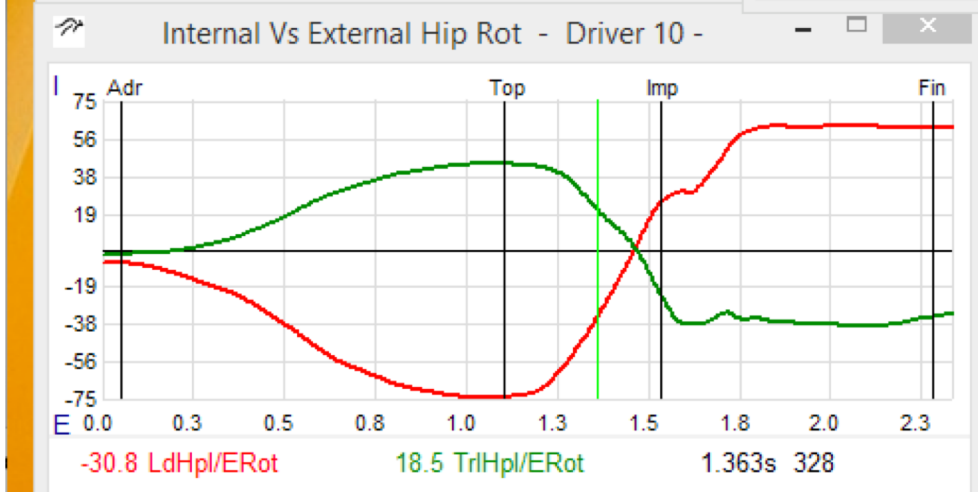




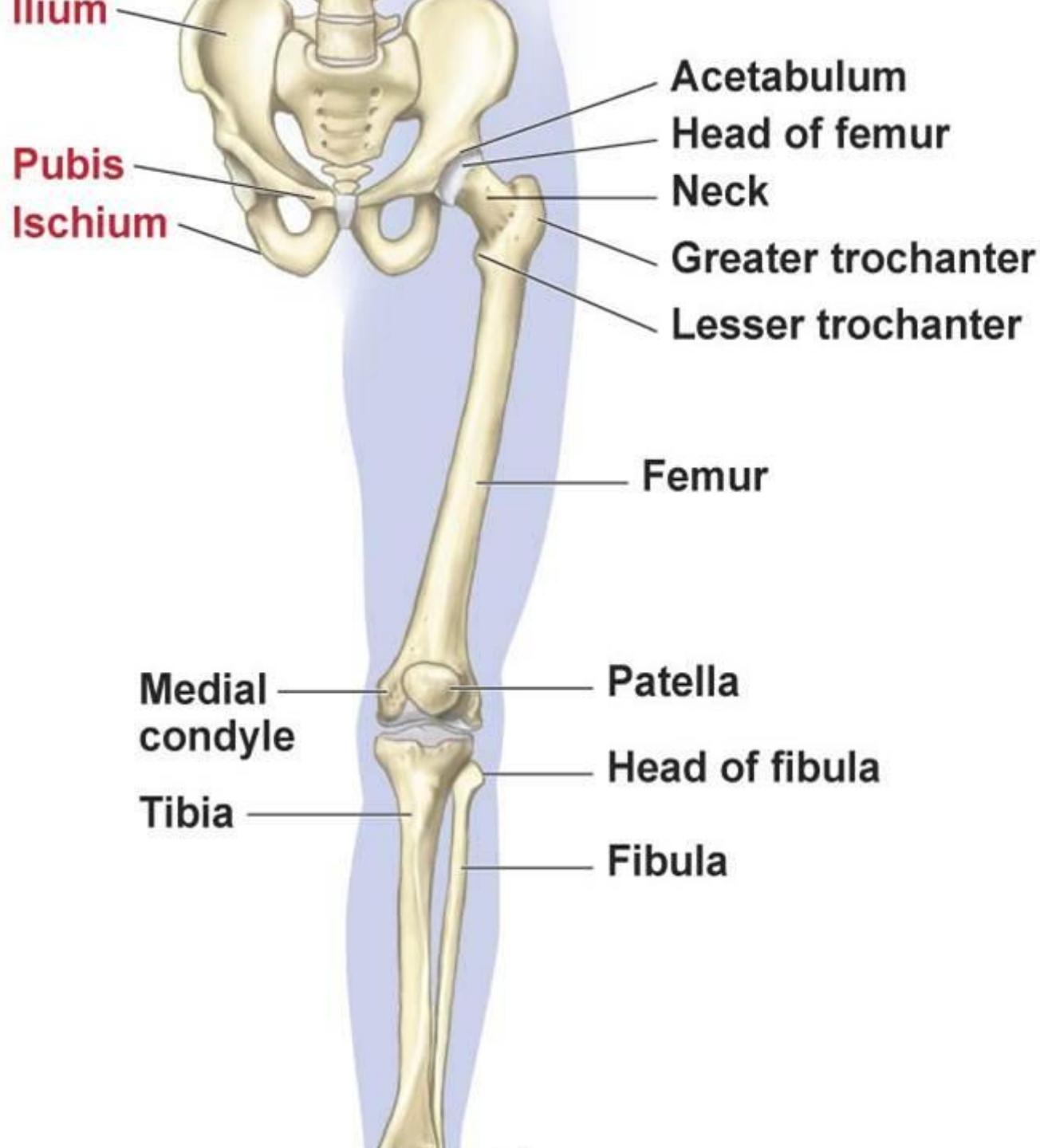


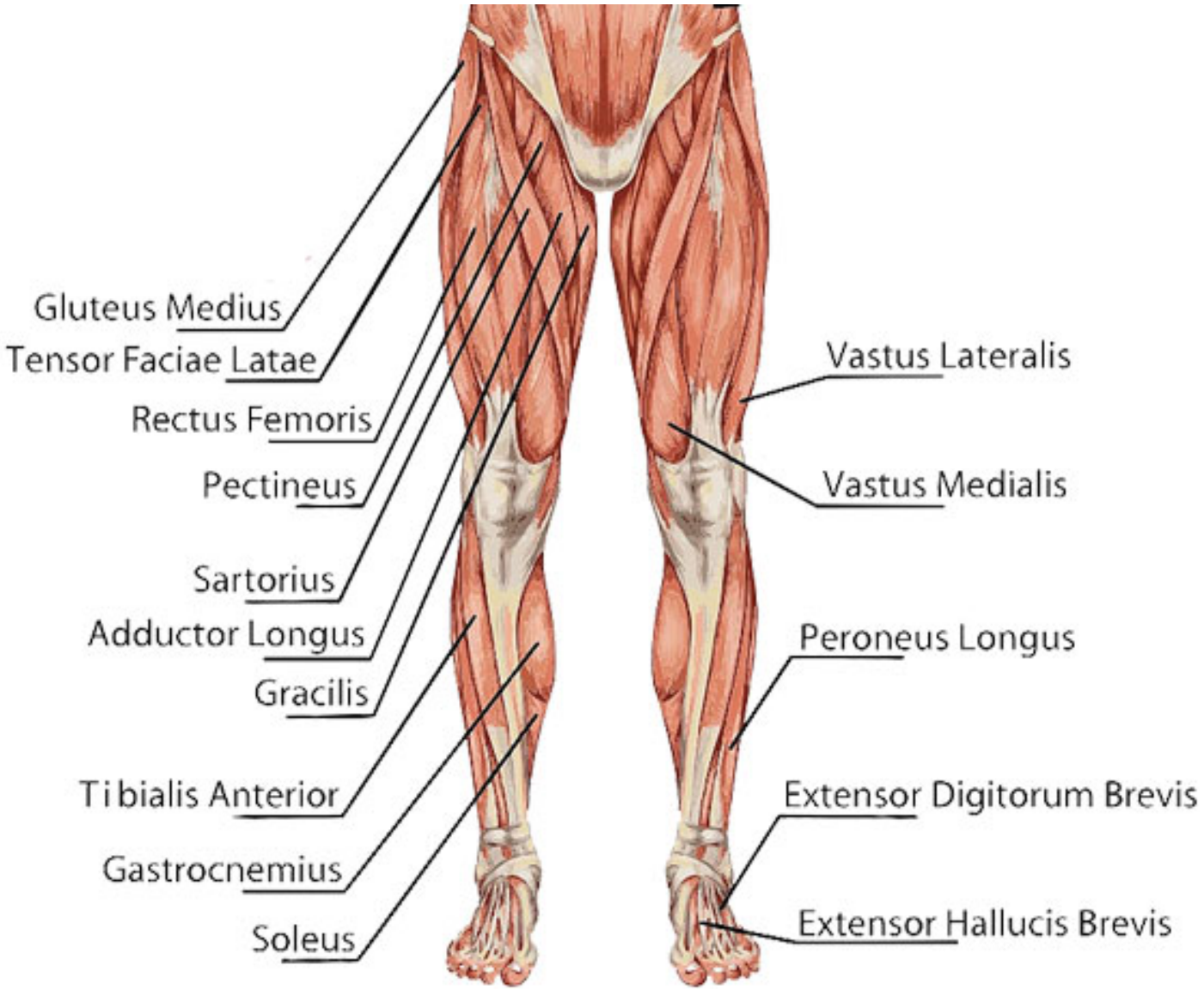


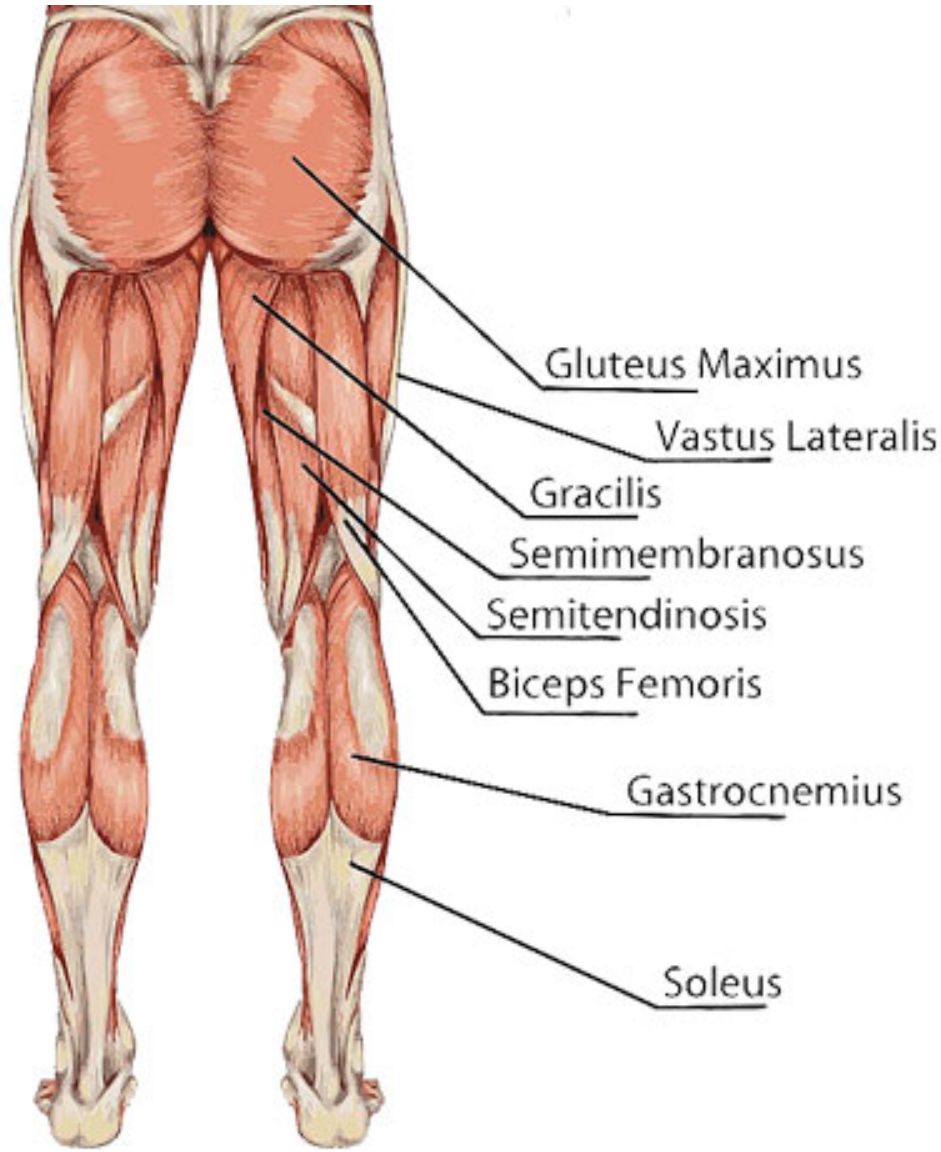




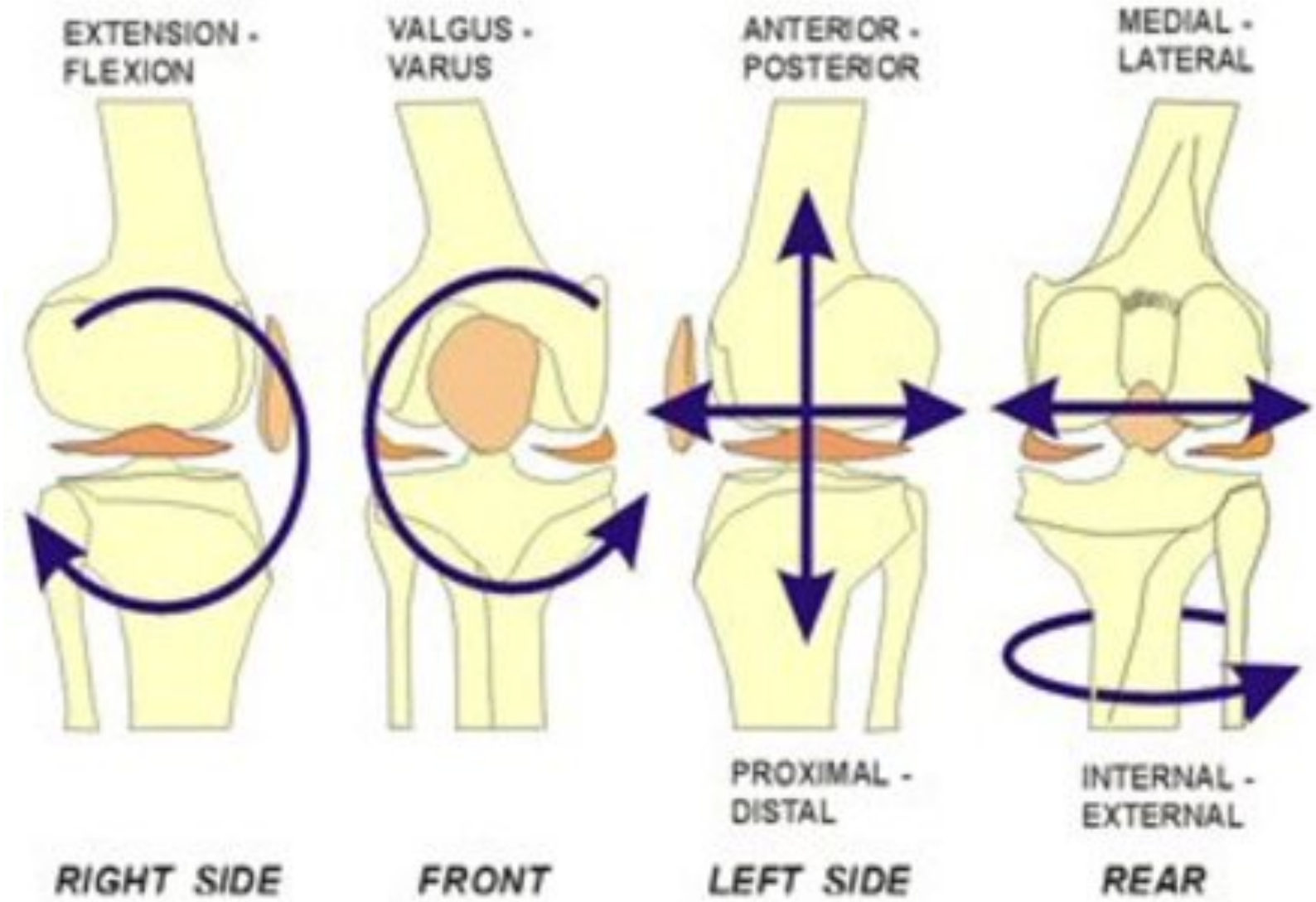
Knee Anatomy

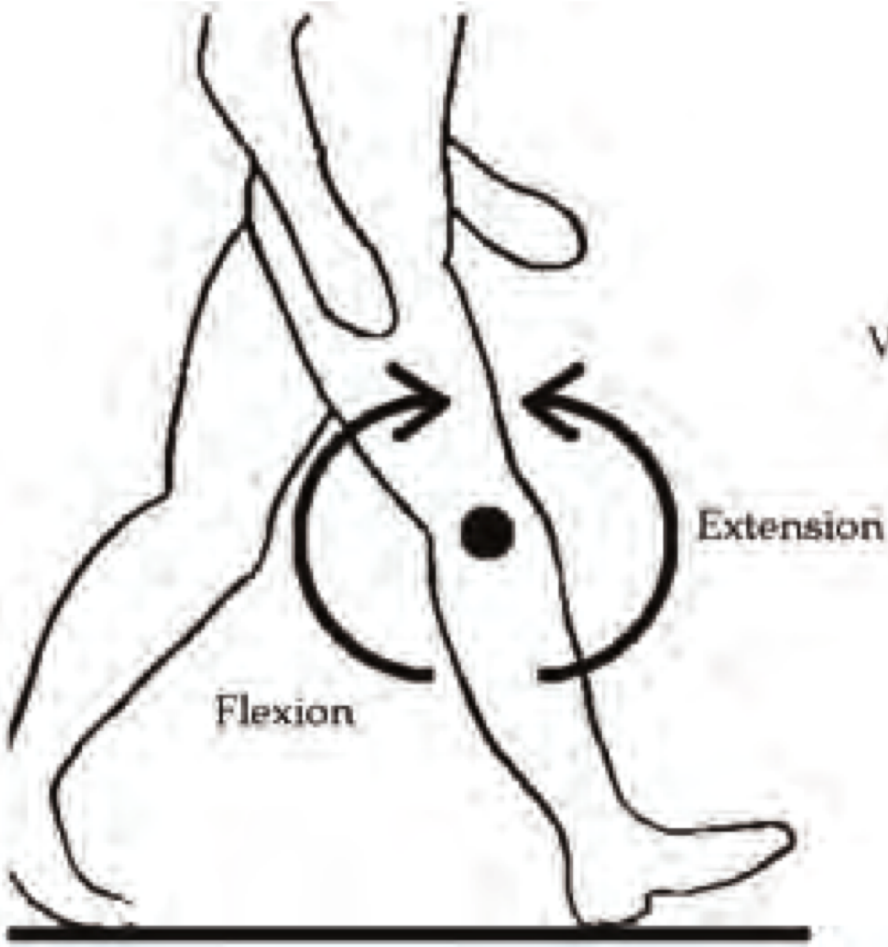

Ilium
Pubis
Ischium
Acetabulum
Head of femur
Neck
Greater trochanter
Lesser trochanter
Femur
Medial condyle
Patella
Head of fibula
Tibia
Fibula

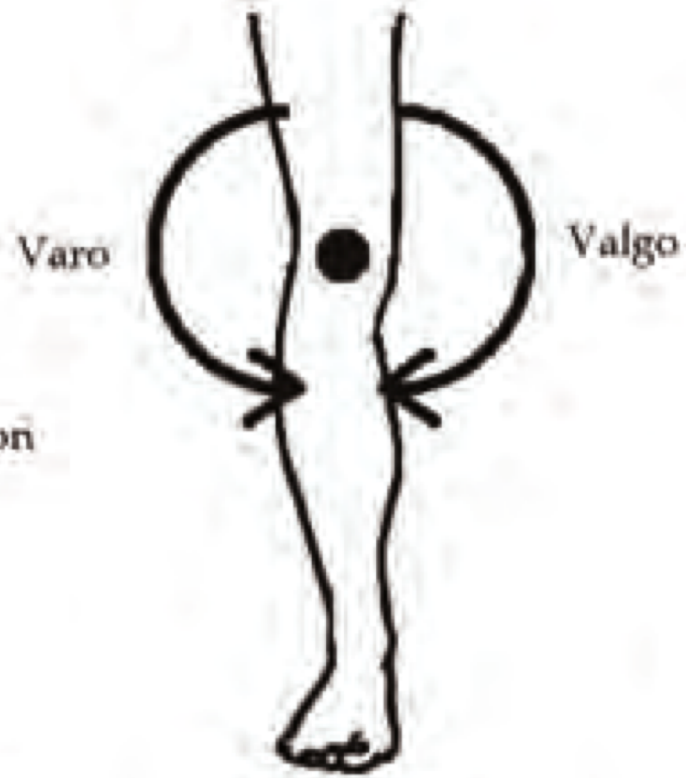

Gluteus Medius
Tensor Faciae Latae
Rectus Femoris
Pectineus
Sartorius
Adductor Longus
Gracilis
Tibialis Anterior
Gastrocnemius
Soleus
Vastus Lateralis
Vastus Medialis
Peroneus Longus
Extensor Digitorum Brevis
Extensor Hallucis Brevis

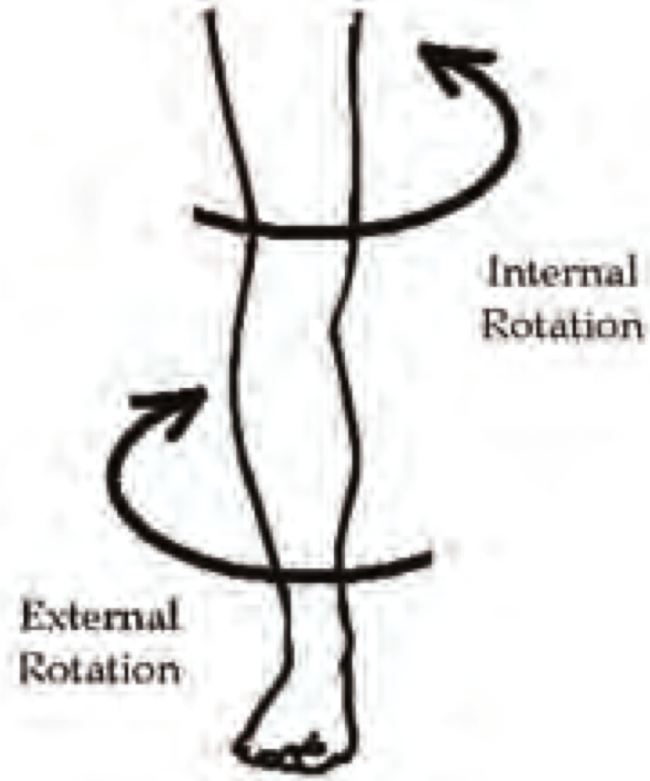

Gluteus Maximus
Vastus Lateralis
Gracilis
Semimembranosus
Semitendinosis
Biceps Femoris
Gastrocnemius
Soleus

6 Degrees of Motion Present in the Human Knee




Extension
Flexion


Varo
Valgo


Internal
Rotation
External
Rotation

Knee Movements

- **Flexion** : these muscles produce flexion :

  Biceps femoris , Semitendinosus , Semimembranosus , Gracilis, Sartorius , Popliteus .

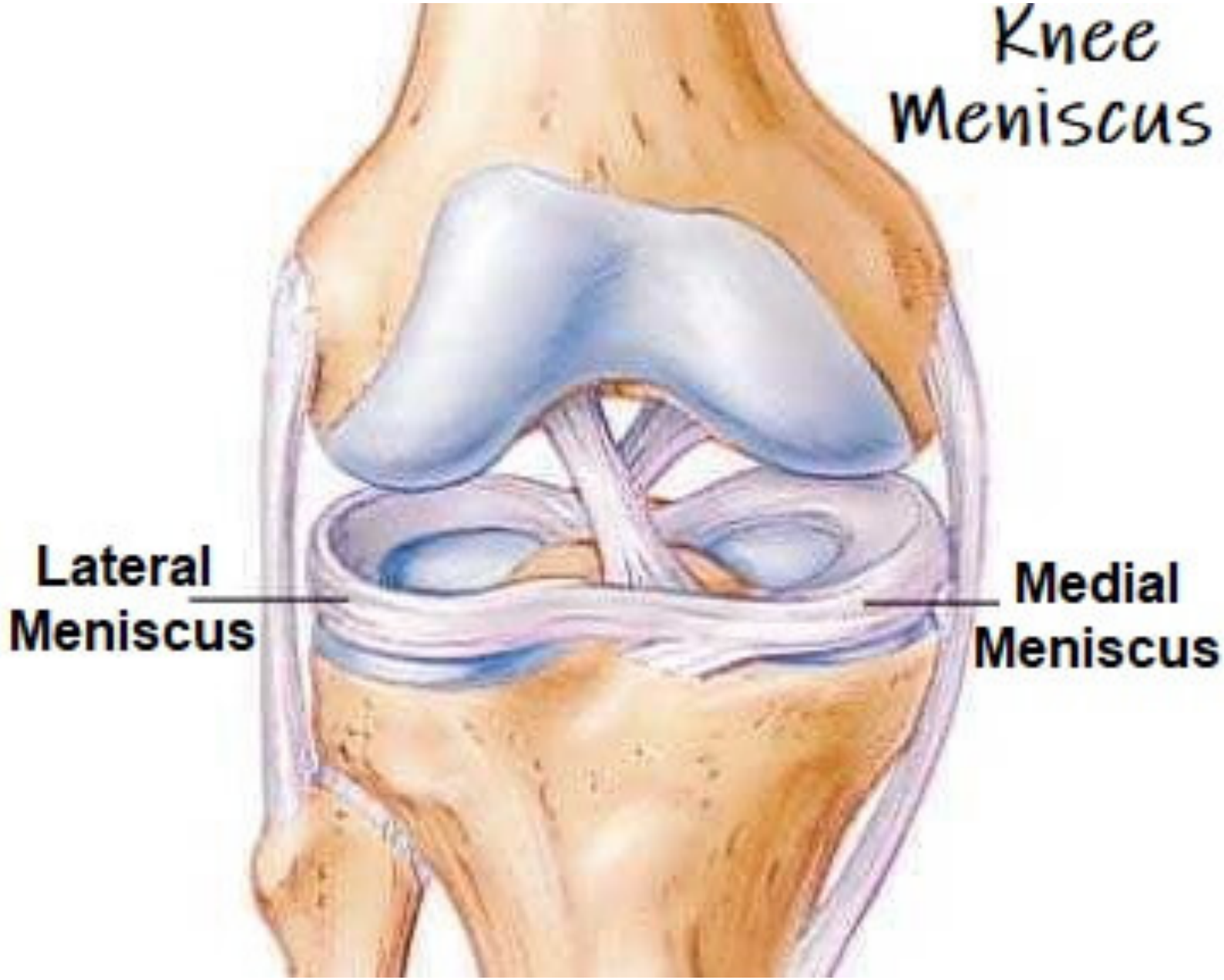
~ Flexion is limited by the contact of the back of the leg with the thigh .

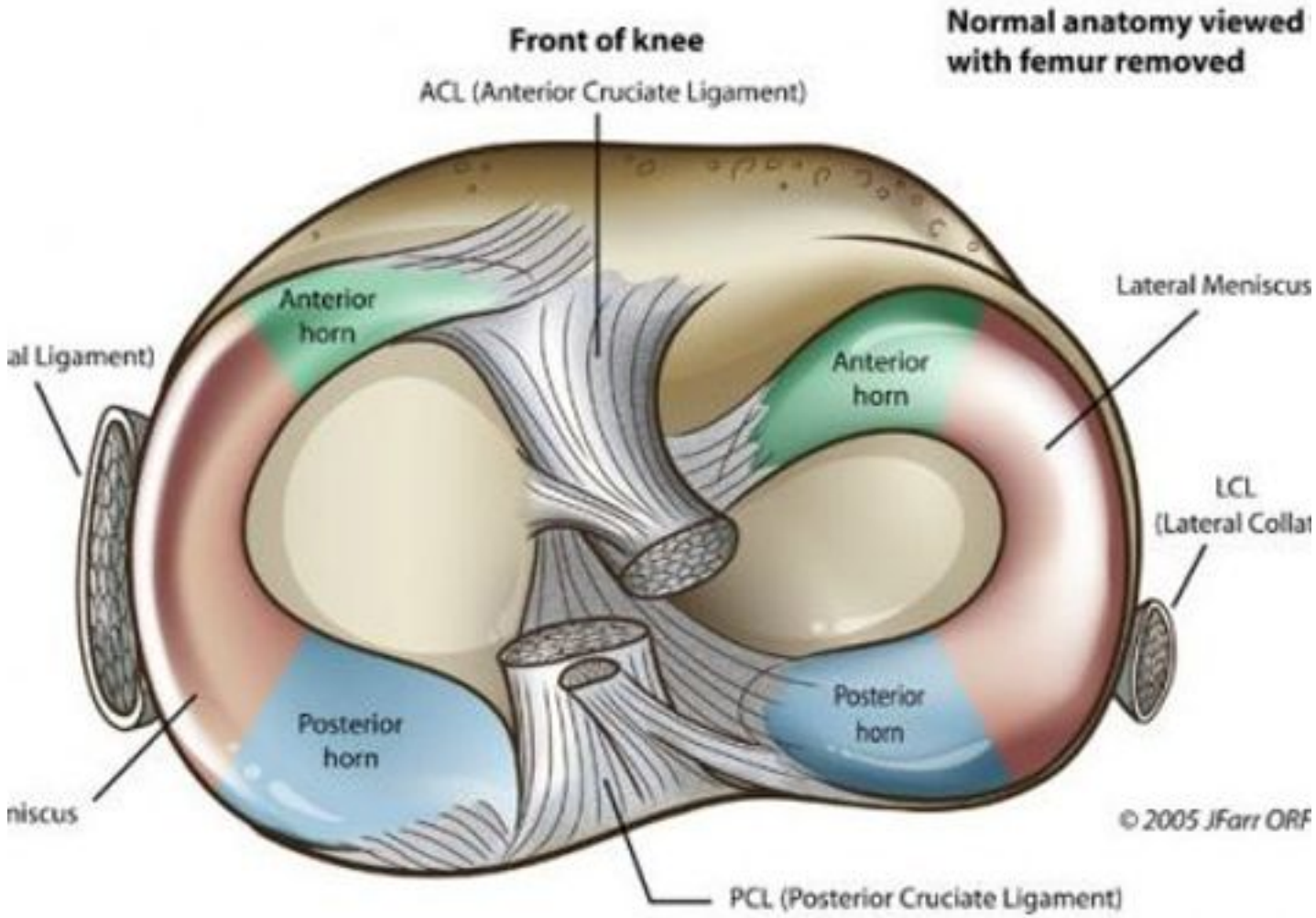
- **Extension** : by the Quadriceps femoris .

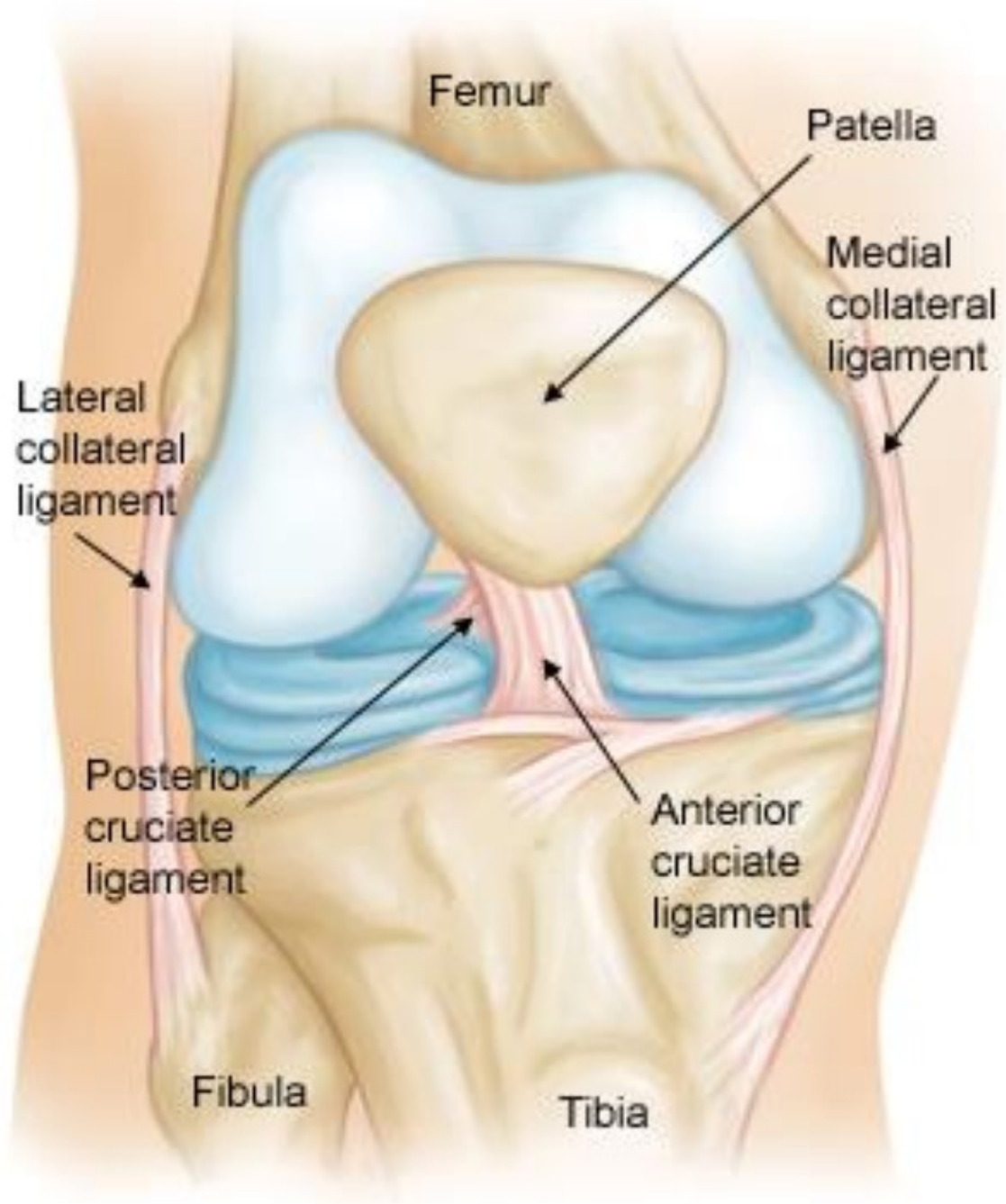
~ Extension is limited by the tension of all the ligaments of the joint .

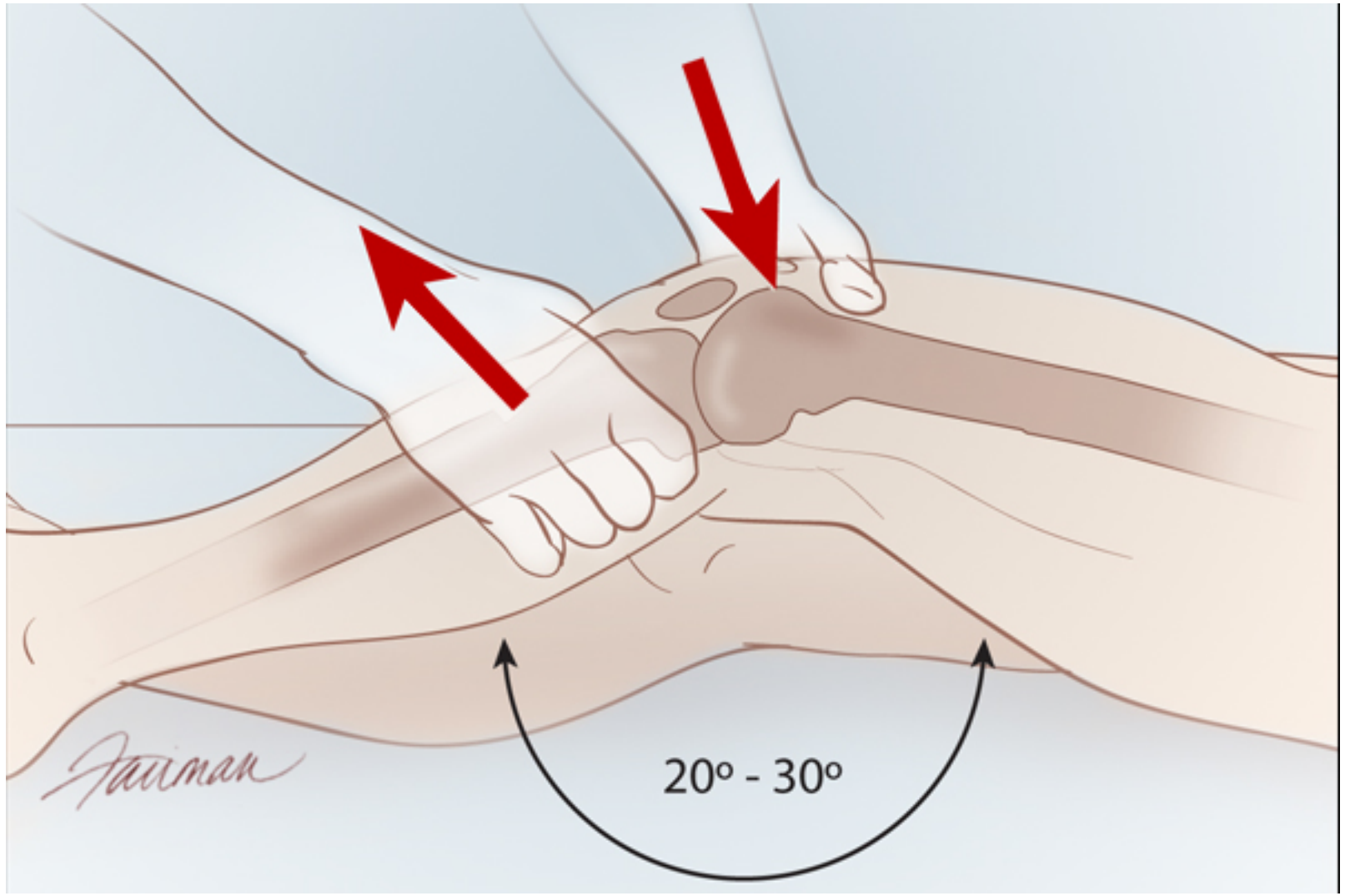
- **Medial Rotation** : by the Sartorius , Gracilis , Semtendinosus .

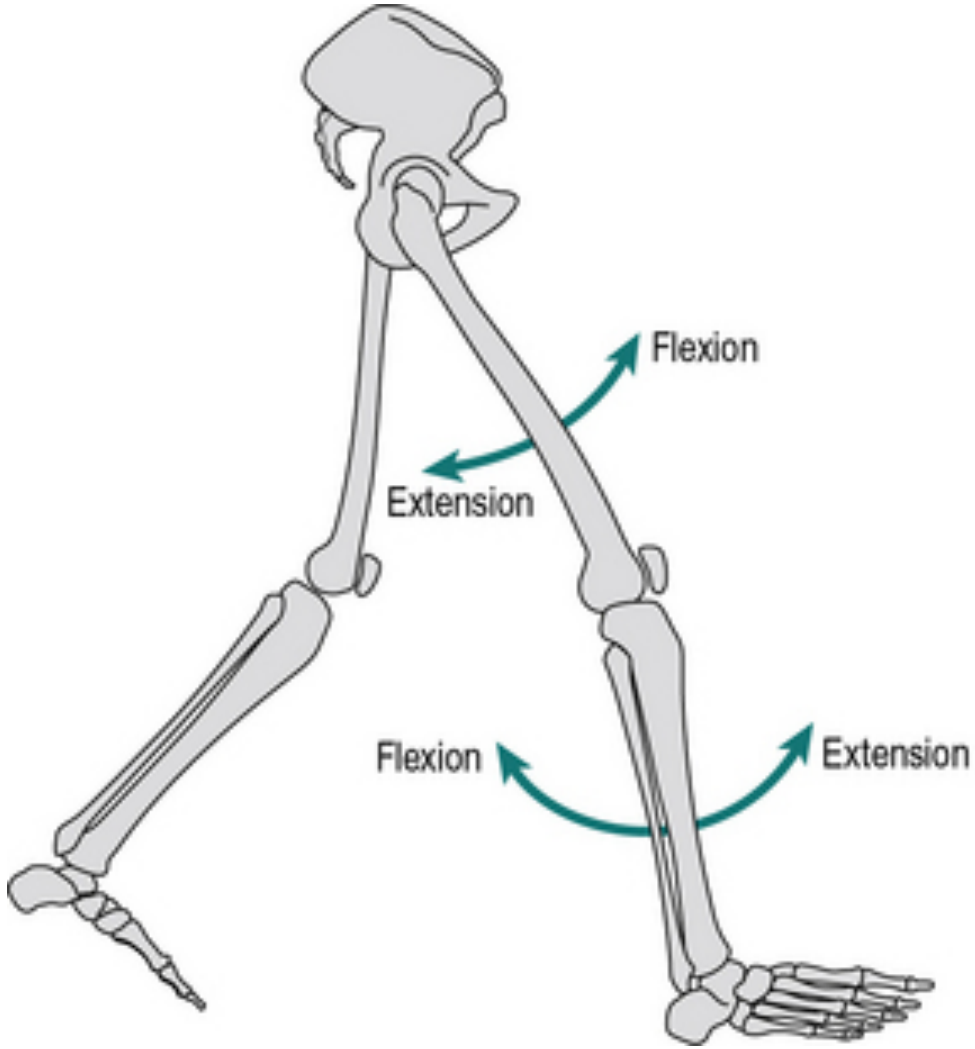
- **Lateral Rotation** : by the Biceps femoris .

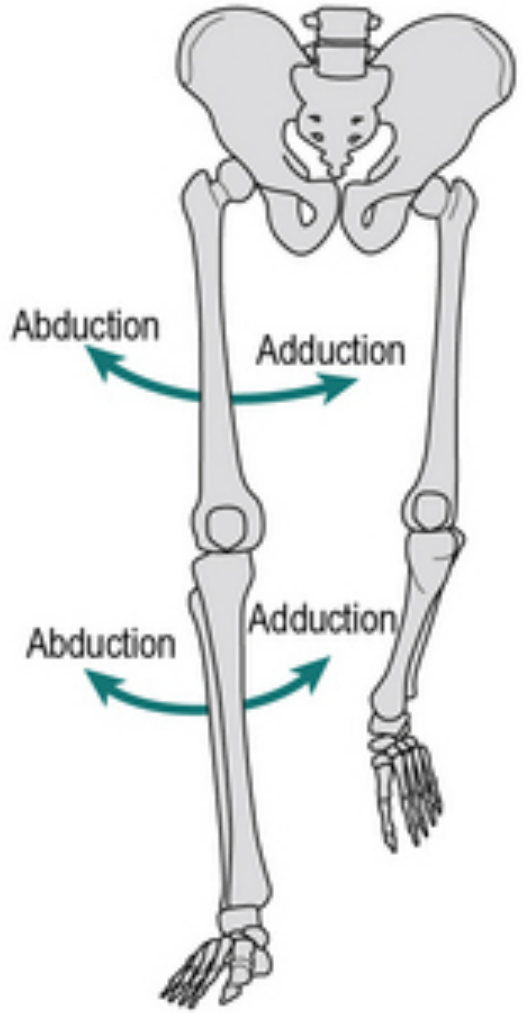

Knee
Meniscus
Lateral
Meniscus
Medial
Meniscus

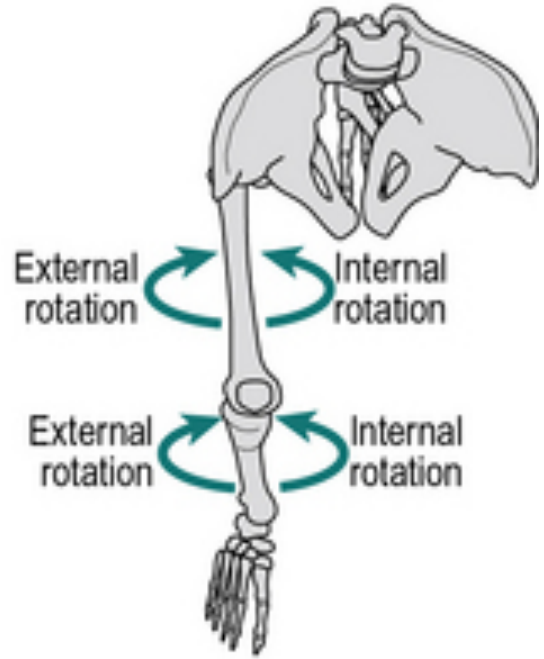

Front of knee
Normal anatomy viewed with femur removed
ACL (Anterior Cruciate Ligament)
Anterior horn
Anterior horn
Lateral Meniscus
LCL
Posterior horn
Posterior horn
PCL (Posterior Cruciate Ligament)
© 2005 JFarr ORF


Femur
Patella
Medial collateral ligament
Lateral collateral ligament
Posterior cruciate ligament
Anterior cruciate ligament
Fibula
Tibia

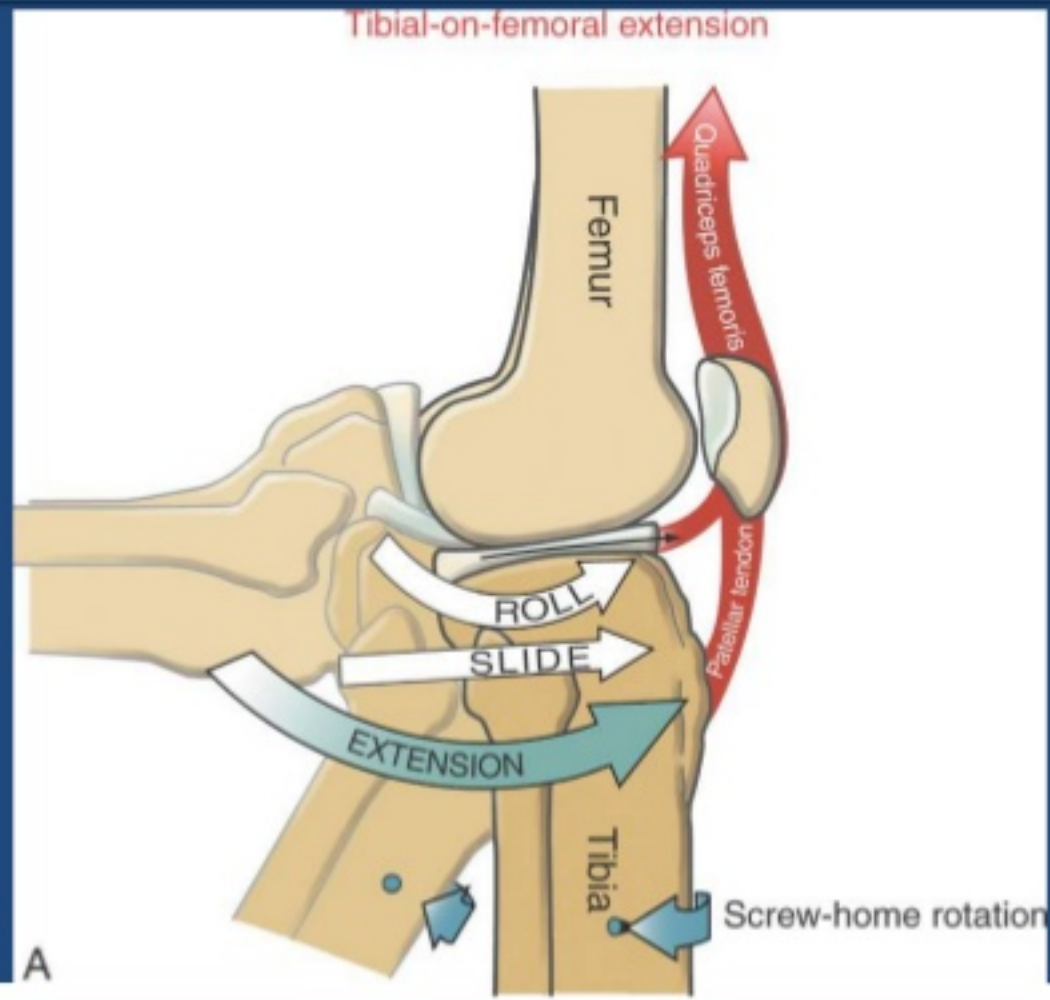

20° - 30°


Flexion
Extension
Flexion
Extension


Abduction
Adduction
Abduction
Adduction

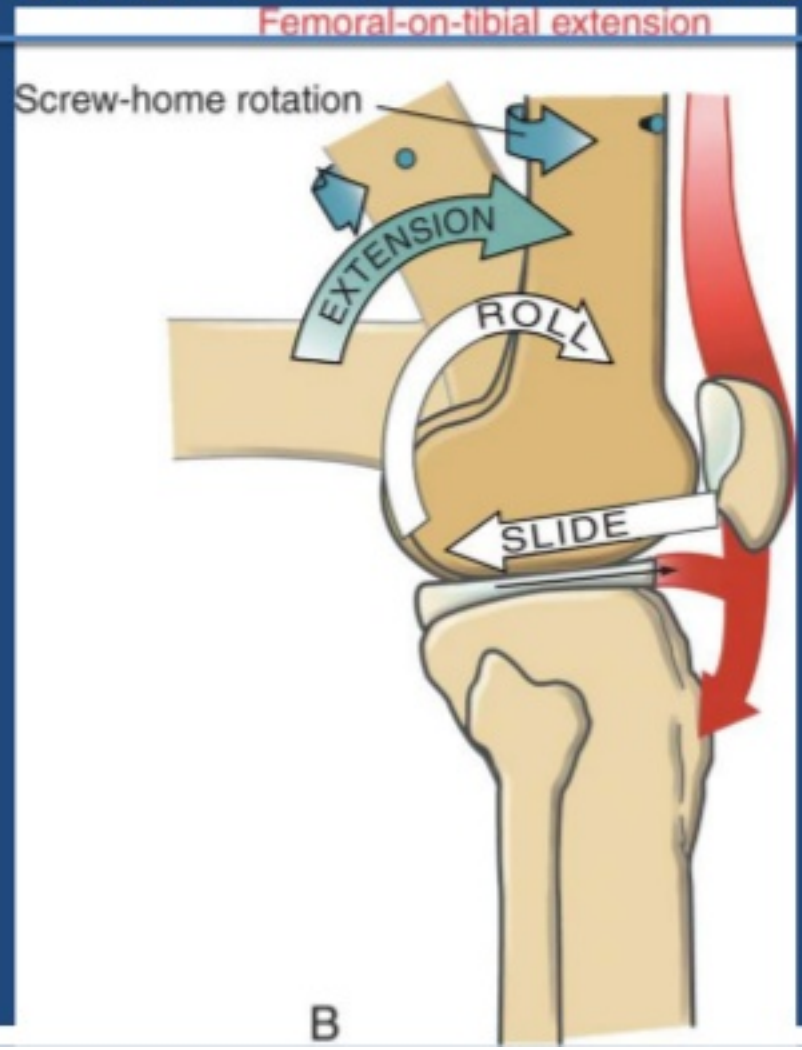

External rotation
Internal rotation
External rotation
Internal rotation

Arthrokinematics: Tibia on femoral extension

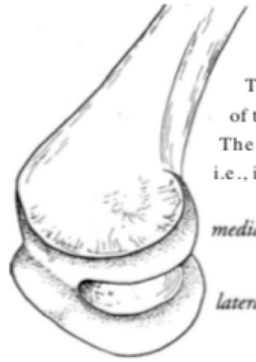


Neumann, 2010

Arthrokinematics: Femur on Tibia Extension



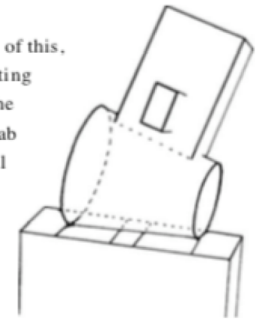
Neumann, 2010



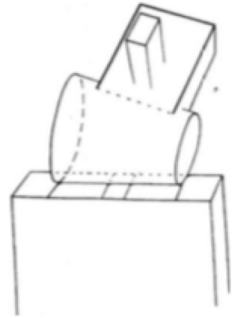
Some "automatic" rotation of the knee occurs during flexion/extension. Why is this?

The primary explanation involves the shape of the femoral and tibial condyles. The medial femoral condyle is more curved than the lateral one, i.e., its radius of curvature is smaller.

To understand the implications of this, visualize the two condyles as fitting inside a truncated cone, and the femoral shaft as a rectangular slab with a projection which we shall use as a reference landmark.



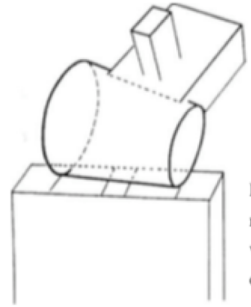
During extension, the shaft of the femur is directed forward.



During flexion, due to the shape of the cone, the landmark becomes directed somewhat laterally.

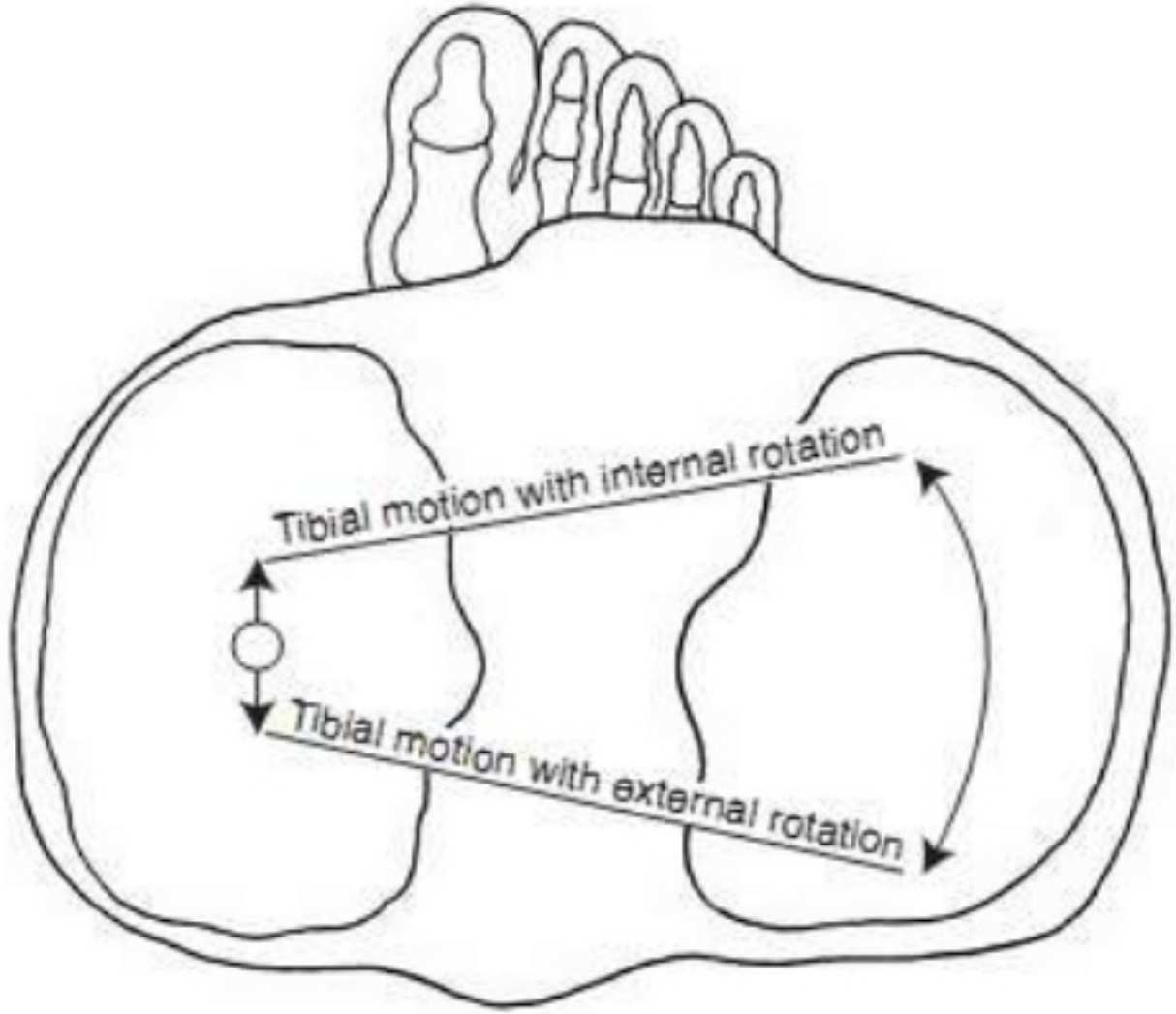
The tibial condyles are also not totally symmetric; both are concave transversely, but from front to back the lateral condyle is slightly convex while the medial one is concave. Therefore, the lateral tibial condyle allows more rolling than does the medial one.

[POSTERIOR VIEW]



During flexion, the lateral femoral condyle rolls backward more than the medial one does, which accentuates the lateral orientation of our landmark, i.e., the lateral rotation of the femur.

The secondary explanation for automatic rotation of the knee is that the medial collateral ligament is stronger than the lateral one (see p. 221). This reinforces the tendency of the medial femoral condyle to be less mobile than the lateral one.



▲ **Figure 11-31** ■ With internal/external rotation of the tibia, there is more motion of the lateral tibial condyle than of the medial tibial condyle in both directions; that is, the longitudinal axis for medial/lateral rotation appears to be located on the medial tibial plateau.

The knee joint consists of three bones

The femur articulates with the patella, which is called the femoropatellar joint.

The femur articulates with the tibia, which is called the femorotibial joint.

The patella does not articulate with the tibia. We will study it in detail on page 225. Here, we will just take a look at the femorotibial joint.

The base of the femur:

The shaft of the femur is triangular in cross section (see p. 200).

At the bottom: the posterior edge of the femur's distal end bifurcates such that its shape in cross section changes to a square, which expands: thus, the base of the femur looks like the trunk of a pyramid.

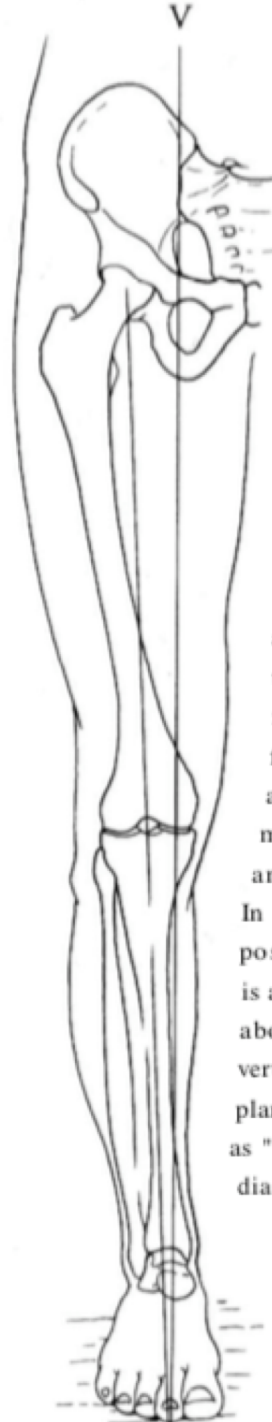
The top of the tibia:

At the top: the anterior edge of the tibia's proximal end also bifurcates and changes to an expanding square shape. Its top looks like an upside-down pyramid.

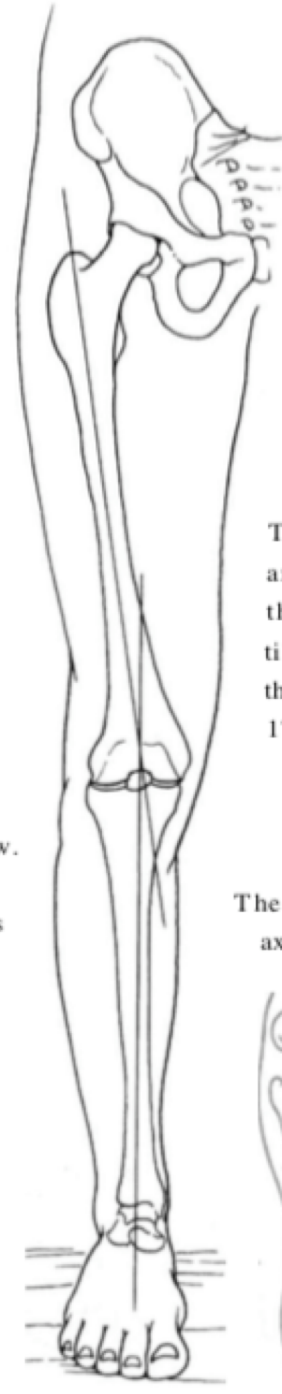
The shaft of the tibia is triangular in cross section.

Thus, the two bones are both expanded where they come together and form a massive structure, like the ends of two columns. This increases their stability and weight-bearing ability.

The fibers of the alveolar (spongy) tissue inside are oriented diagonally and vertically, as well as horizontally, which increases their strength.



The first ("mechanical axis") passes through the middle of the femoral head above and the middle of the ankle joint below. In anatomical position, this axis is at an angle of about 3° from a vertical (sagittal) plane (shown as "V" in the diagram).



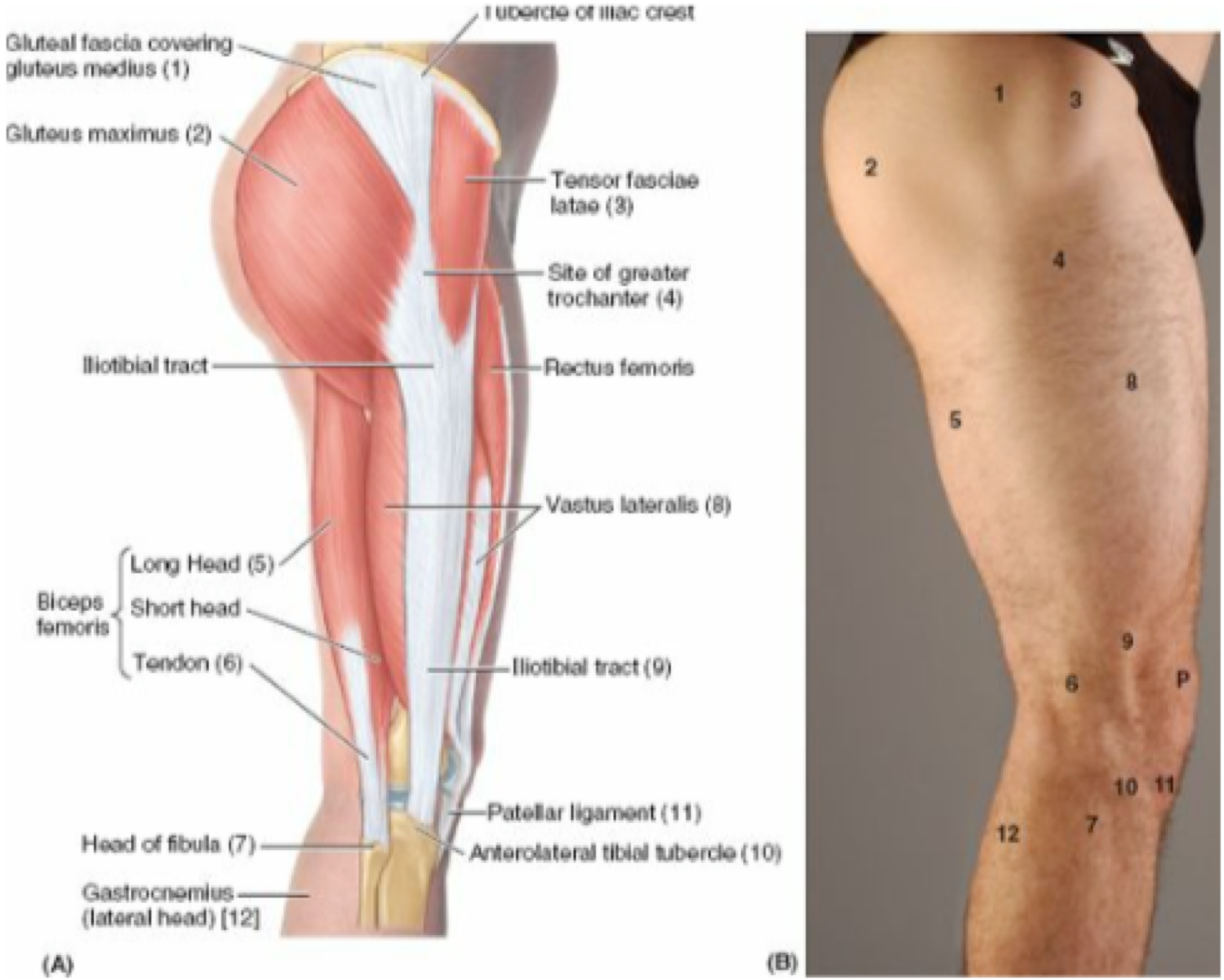
The second and third axes are those passing through the shafts of the femur and tibia, which form an angle that is usually between 170° and 175°.

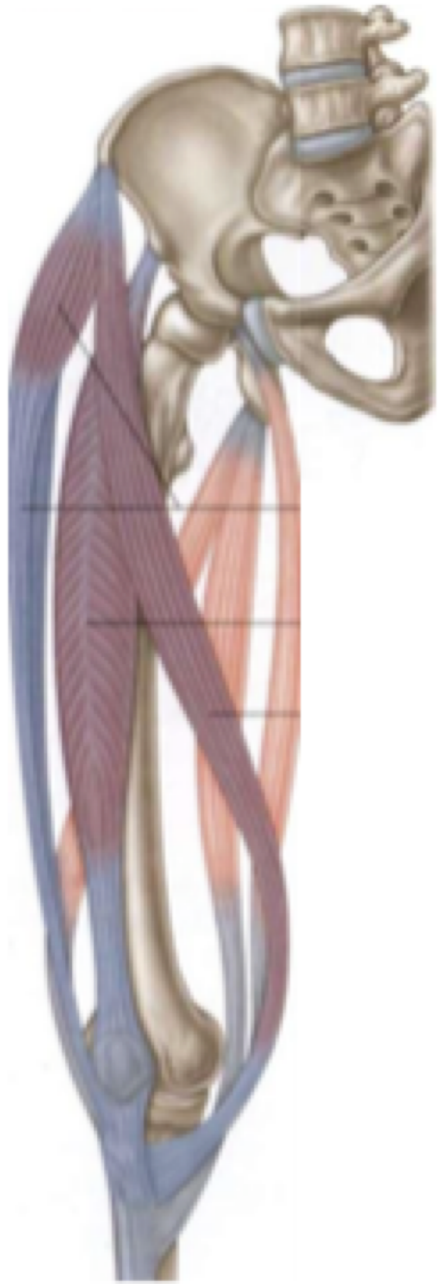
The lateral angle formed by these two axes varies from person to person:

One or both knees rotate internally

Both knees remain on an imaginary line drawn from hip-joint to the foot

One or both knees rotate externally

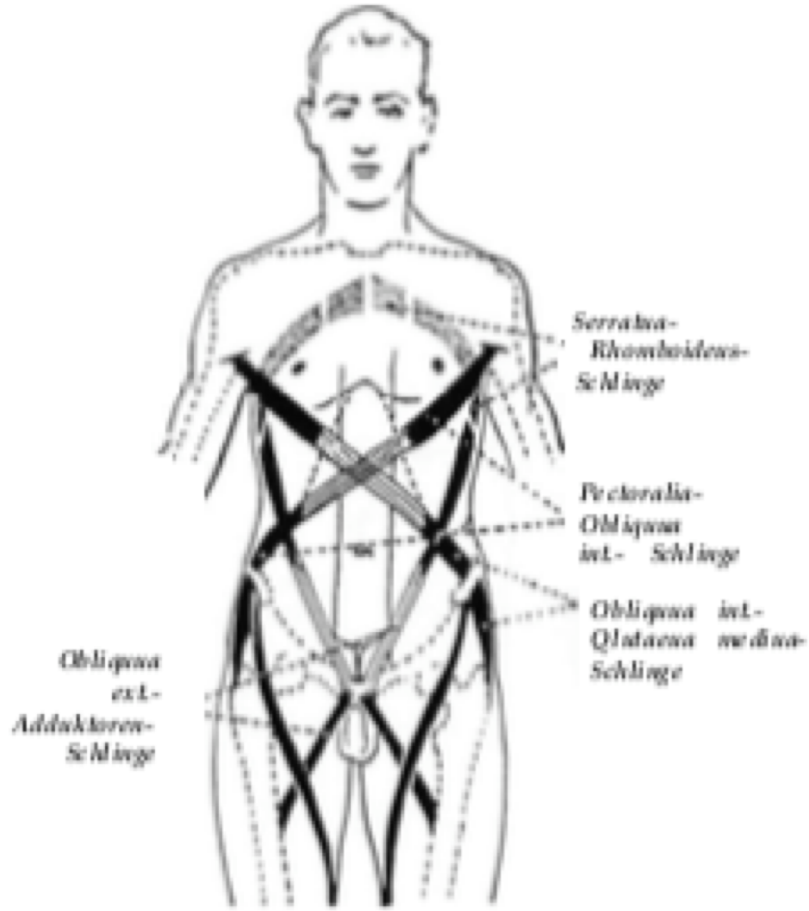

Tubercle of iliac crest
Gluteal fascia covering gluteus medius (1)
Gluteus maximus (2)
Tensor fasciae latae (3)
Site of greater trochanter (4)
Iliotibial tract
Rectus femoris
Vastus lateralis (8)
Biceps femoris
Long Head (5)
Short head
Tendon (6)
Iliotibial tract (9)
Patellar ligament (11)
Head of fibula (7)
Anterolateral tibial tubercle (10)
Gastrocnemius (lateral head) [12]
(A)
1
3
2
4
8
5
9
6
P
10
11
12
7
(B)

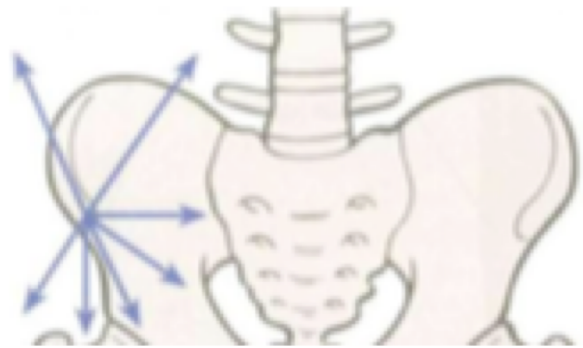


-Tensor fasciae latae and iliotibial band

- Rectus femoris

-Sartorius





Knee Replacements

1 – Deep Flexion
2 – Impact
3 – Quick Torsion

Questions and Swings

in transition do we want to get the lead wrist going into ulnar straight away?

Do you see most tour guys have no/very little addition in radial at start down?

he has left hemispheric cerebral palsy he was suppose to never get out of a wheelchair when he was born. He has a brace on his left leg and uses neoprene wrap on his left hand he cannot process information when talk into his left ear and has visual problems with left eye he tends to line everything left of target.

Would like some advice on what drills and ideas to help his game.