

PHYE 281 - Applied Kinesiology

Lecture 10

The Knee Joint

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Objectives

- Identify the bones of the knee joint
- Identify specific anatomic landmarks on these bones
- List the movements of the knee joint
- Identify the muscles of the knee joint
- Know the origin, insertion and action for each muscle of the knee joint
- Understand the mechanism of injury and affected anatomy in specific knee injuries
- Master detailed kinesiological analysis of the knee joint

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Bones of the Knee Joint

Largest/most complex joint in the body - mostly two joints

Tibiofemoral: femoral condyles articulating with tibial condyles forming a hinge joint

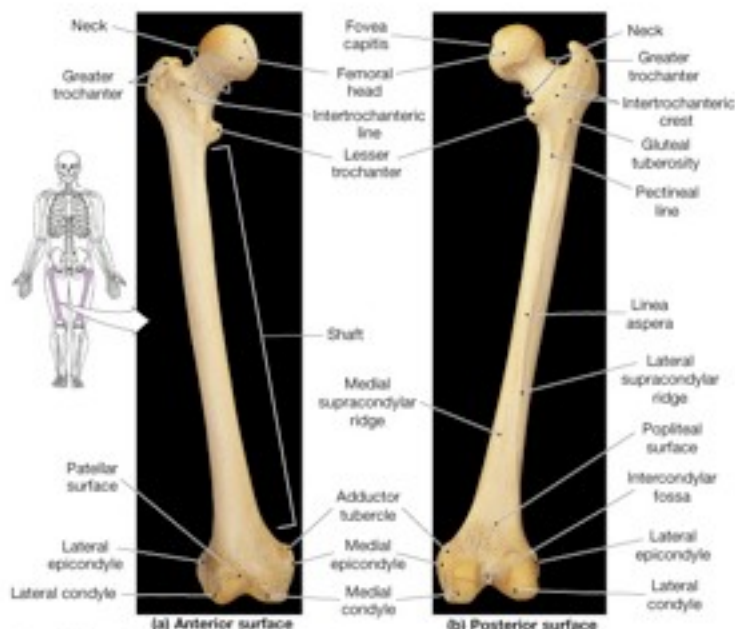
Patellofemoral: patella is a sesamoid bone that glides atop the femur and provides mechanical advantage to the joint by increasing muscle angle of pull

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Landmarks of the Knee Joint

Femur

- Medial condyle
- Medial epicondyle
- Lateral condyle
- Lateral epicondyle
- Patellar surface



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Landmarks of the Knee Joint

Tibia

Medial condyle

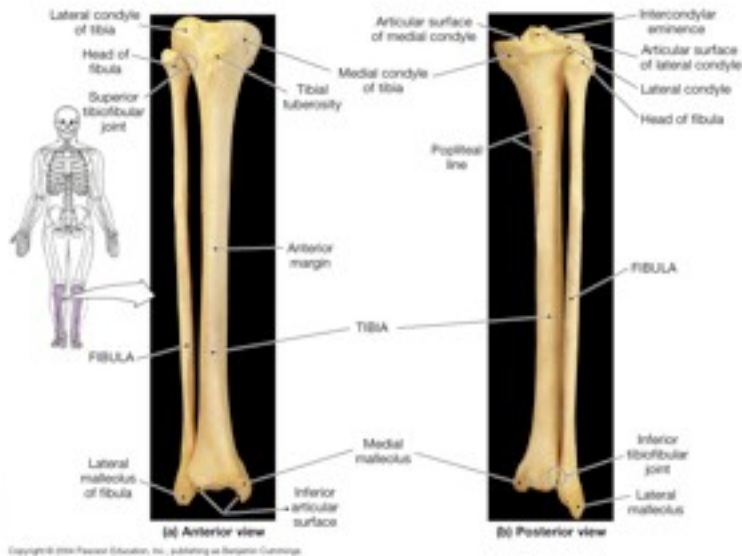
Lateral condyle

Intercondylar eminence

Tibial plateau

Fibula

Head



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Knee Joint Structures

Ligaments

Medial collateral

Lateral collateral

Anterior cruciate

Posterior cruciate

Cartilages

Medial meniscus

Lateral meniscus



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Knee Joint Movements

Flexion
Extension



Flexion



Extension

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Knee Joint Muscles

Extensors

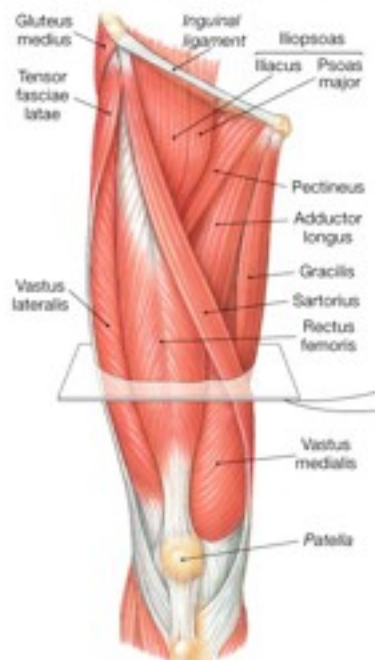
Quadriceps femoris

Rectus femoris -
also functions as
hip joint flexor

Vastus medialis

Vastus lateralis

Vastus intermedius



(b) Anterior view of right thigh

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Knee Joint Muscles

Flexors

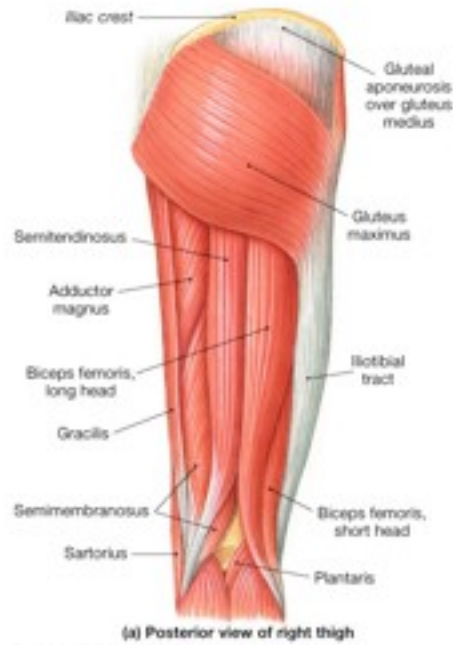
Hamstrings

Biceps femoris

Semitendinosus

Semimembranosus

All of the above also function as hip joint extensors



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Vastus medialis

Origin

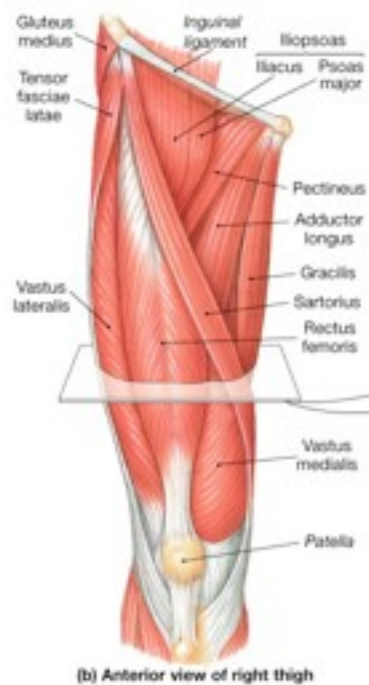
Upper anterior femur

Insertion

Tibial tuberosity via patellar ligament

Action

Knee joint extension



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Vastus lateralis

Origin

Lateral and posterior femur to linea aspera

Insertion

Tibial tuberosity via patellar ligament

Action

Knee joint extension



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Vastus intermedius

Origin

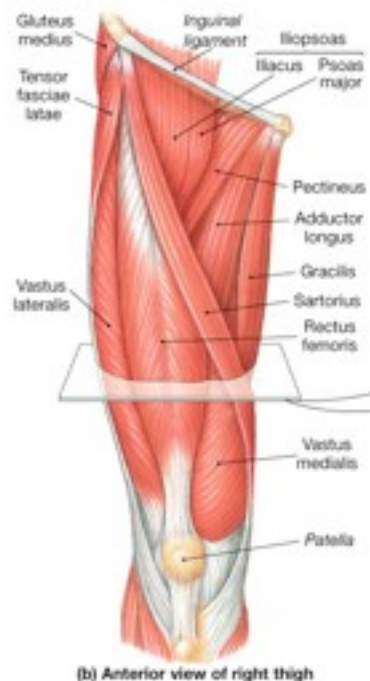
Anterior femur

Insertion

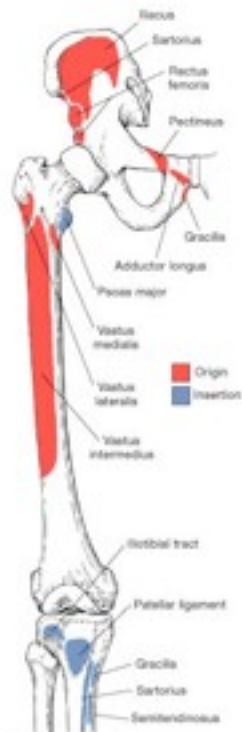
Tibial tuberosity via patellar ligament

Action

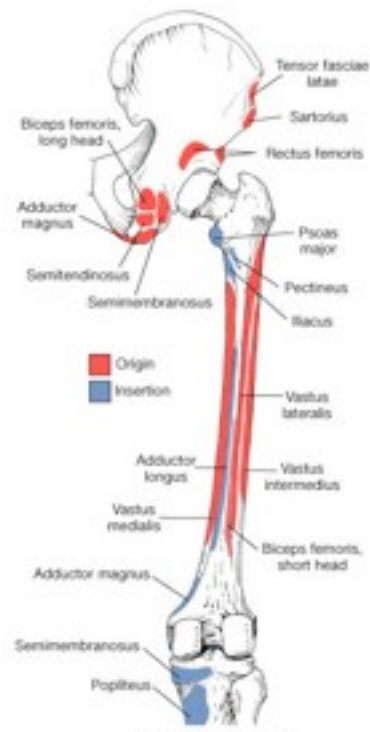
Knee joint extension



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(c) Origins and insertions, anterior view



(f) Origins and insertions, posterior view

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Knee Joint Injury

Unhappy Triad Injury

Blow to lateral knee while weight bearing

Medial tibia separates from medial femur

More likely to happen on artificial turf

Causes damage to:

Medial collateral ligament

Medial meniscus

Anterior cruciate ligament - also happens individually with rotational movement

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Knee Injury

Q Angle

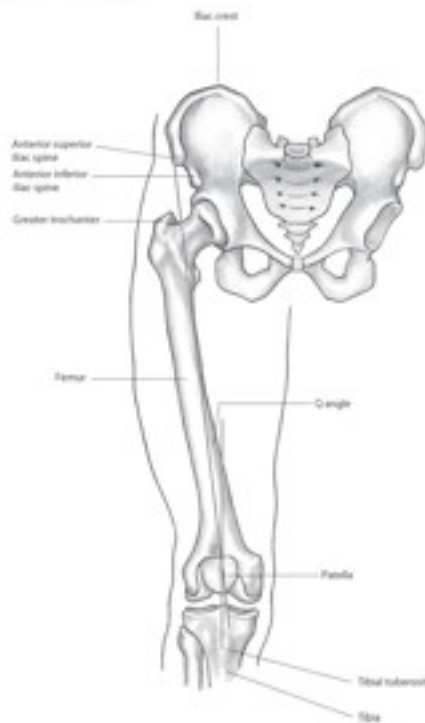
Quadriceps femoris line of pull runs from ASIS to center of patella

Patellar ligament line of pull runs from center of patella to tibial tuberosity

Q Angle is formed at the intersection of these two lines

Greater Q Angles increase knee injury risk and poor patella tracking

Generally, females have greater Q Angles



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Pelvic Girdle and Hip Joint Kinesiological Analysis

Identify three different exercises that involve knee movements

Identify the specific knee joint actions for each phase (up/down) of the exercise

Identify the muscles involved

Identify the type of muscle contractions (concentric vs. eccentric) for each phase

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