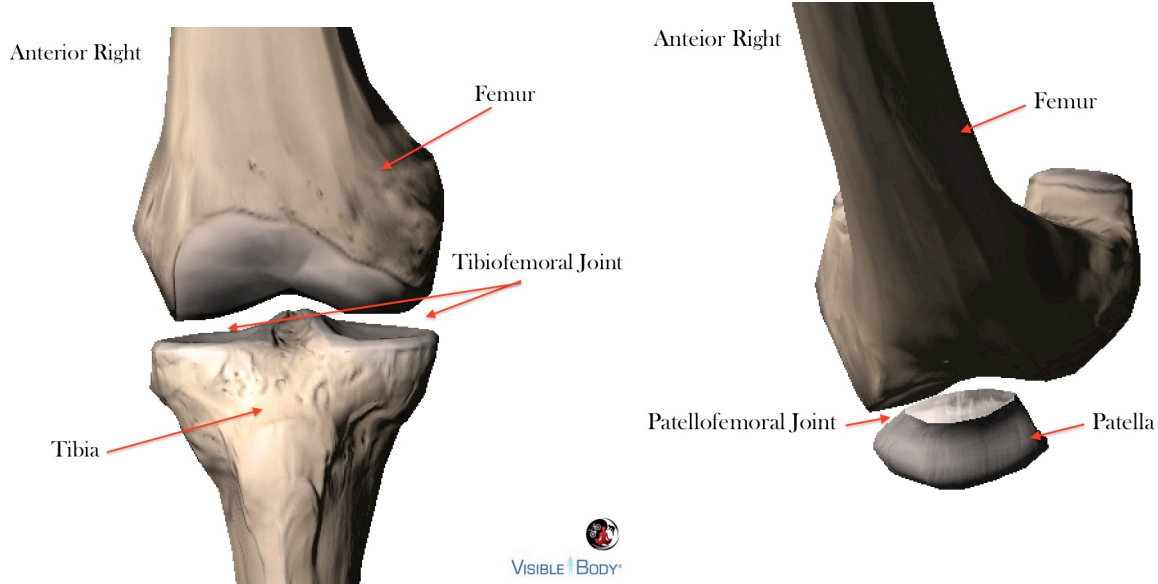



## Knee Joint Movement 101 -- Osteokinematics and Arthrokinematics

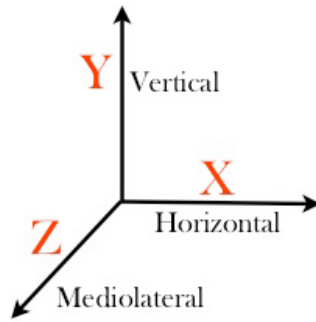
There are two joints at the knee -- tibiofemoral and patellofemoral. The tibiofemoral joint experiences forces between the femur and tibia and operates as a modified hinge joint; whereas, the patellofemoral saddle joint operates primarily as an extensor mechanism to increase quadriceps leverage.



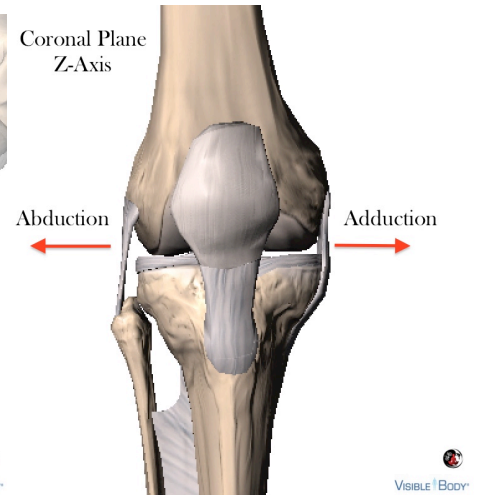
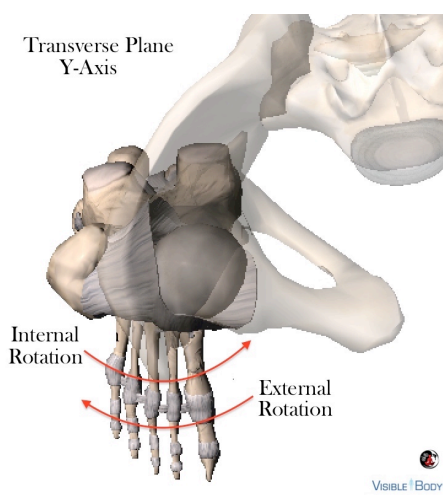
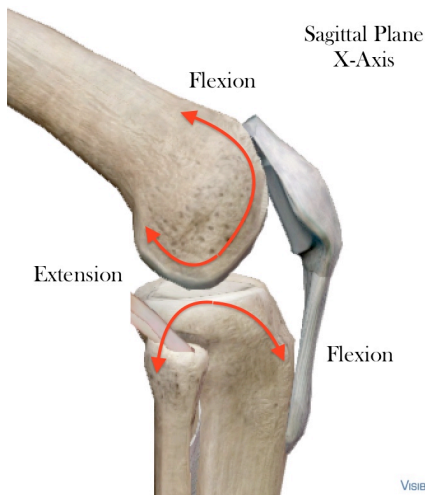
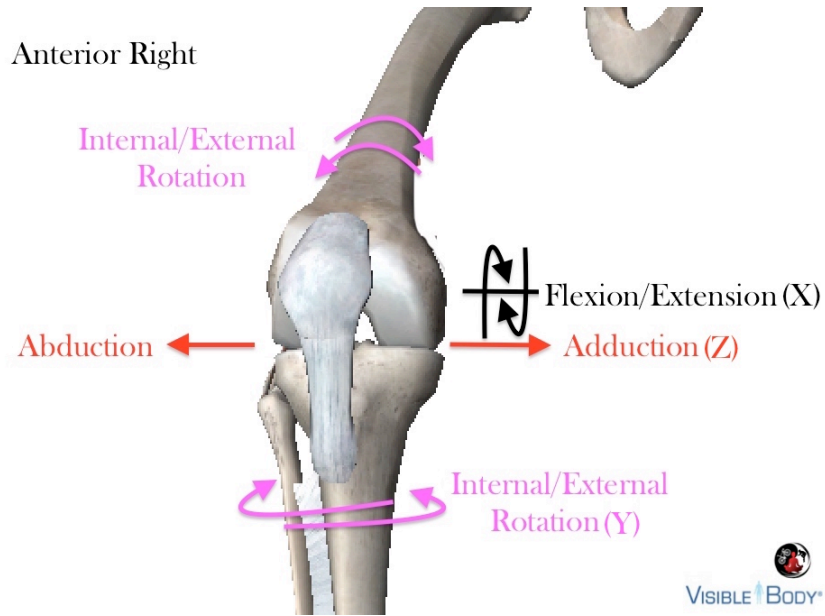
Kinematics describes human movement in three-planes and three-axes.

 Cardinal Planes & Axes of Movement		
Plane	Axis	Description
Sagittal	Coronal (X)	Lateral Perspective - Medial/Lateral Sections
Transverse	Vertical (Y)	Axial Perspective - Superior/Inferior Sections
Coronal	Sagittal (Z)	Frontal Perspective - Anterior/Posterior Sections

The relationship between a plane and its axis can be easily seen as plane/axis in the context of a 3D coordinate system.




An example of these planes/axes applied to the knee joint.

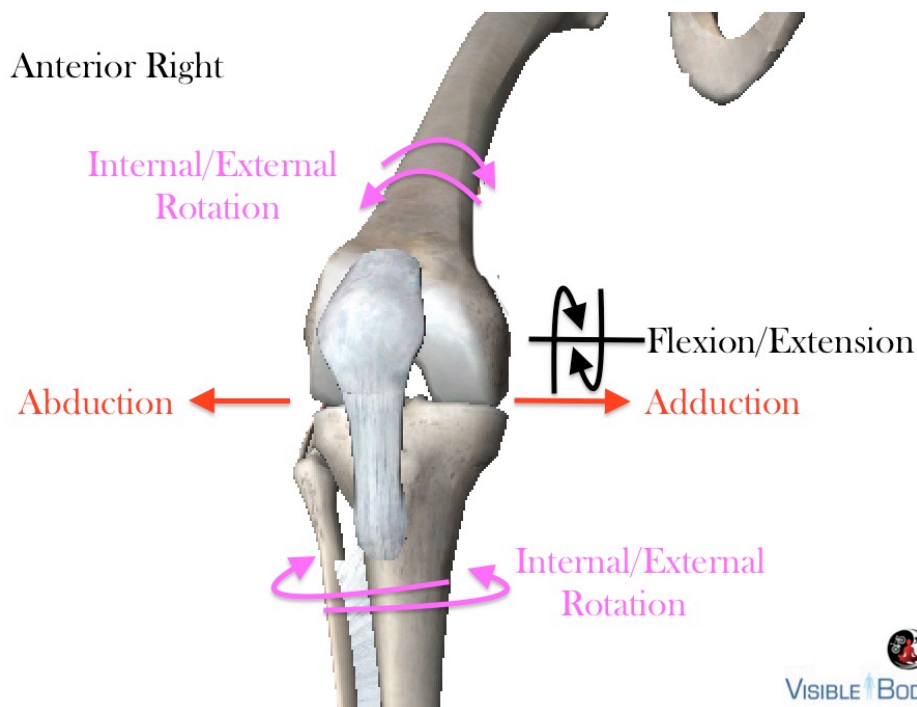


It is imperative to understand how bones move in relation to joints (Osteokinematics) and the manner in which joint surfaces move in relation to adjoining joint- surfaces (Arthrokinematics) to understand the complexity of knee function.


Osteokinematics pertains to the voluntary bone movements at synovial joints relative the joints' central axis of rotation.

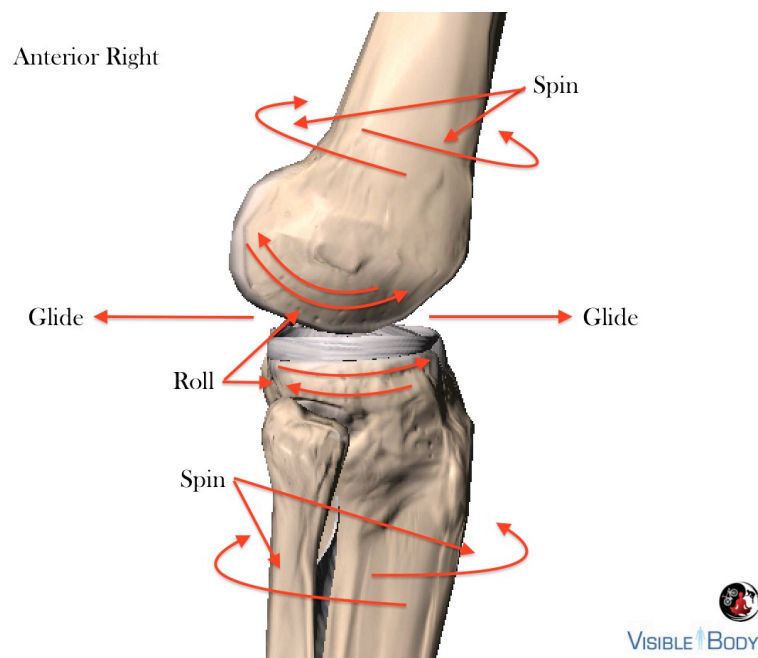
The tibiofemoral joint is considered triaxial, moving in three planes around three axes, giving it three degrees of freedom – flexion/extension, adduction/abduction and internal/external rotation.

 <b>Tibiofemoral Osteokinematics</b>			
Plane	Axis	Description	Movement
Sagittal	Coronal (X)	Lateral Perspective - Medial/Lateral Sections	Flexion/Extension
Transverse	Vertical (Y)	Axial Perspective - Superior/Inferior Sections	Internal/External Rotation
Coronal	Sagittal (Z)	Frontal Perspective - Anterior/Posterior Sections	Abduction/Adduction




Arthrokinematics is concerned with how joint surfaces move in relation to each-other – primarily involuntary roll, glide and spin characteristics that ensure stability and joint congruence during movement

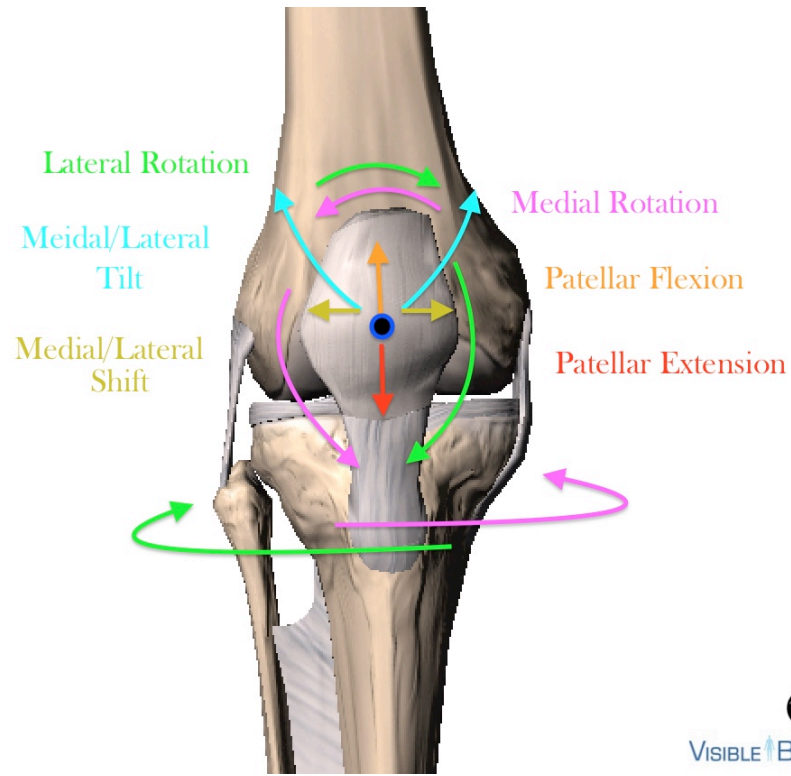
 <b>Tibiofemoral Arthrokinematics</b>			
Plane	Axis	Description	Movement
Sagittal	Coronal (X)	Lateral Perspective - Medial/Lateral Sections	A&P Roll/Glide
Transverse	Vertical (Y)	Axial Perspective - Superior/Inferior Sections	Internal/External Spin
Coronal	Sagittal (Z)	Frontal Perspective - Anterior/Posterior Sections	Medial/Lateral Glide



Tibiofemoral roll & glide are necessary for effective tibiofemoral flexion and extension – without them the larger femur would simply roll off the tibia and/or vice-versa.

Patellofemoral movements are primarily arthrokinematic because it is a synovial glide joint.

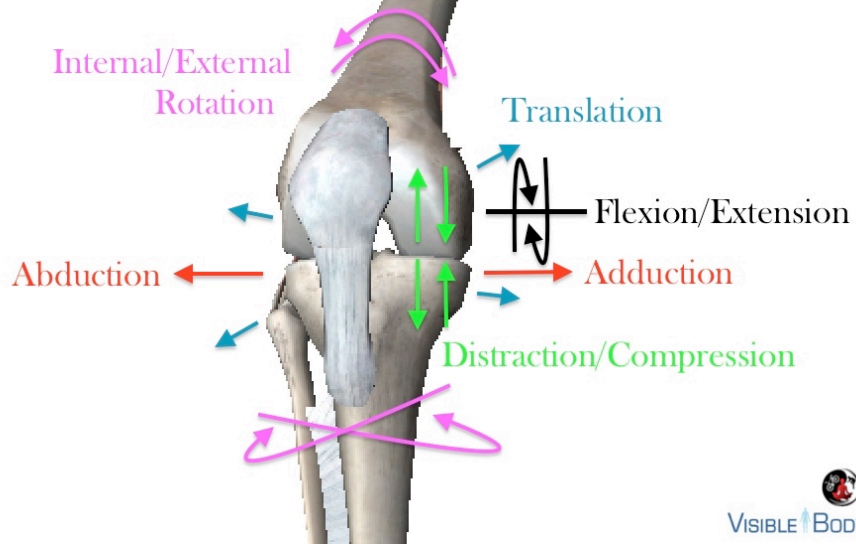
 Patellofemoral Arthrokinematics			
Plane	Axis	Description	Movement
Sagittal	Coronal (X)	Lateral Perspective - Medial/Lateral Sections	Superior & Inferior Glide
Transverse	Vertical (Y)	Axial Perspective - Superior/Inferior Sections	Rotational Glide - Tilt
Coronal	Sagittal (Z)	Frontal Perspective - Anterior/Posterior Sections	Medial/Lateral Glide - Rotation



Combined Osteokinematic and Arthrokinematic Movements of the Knee Joint

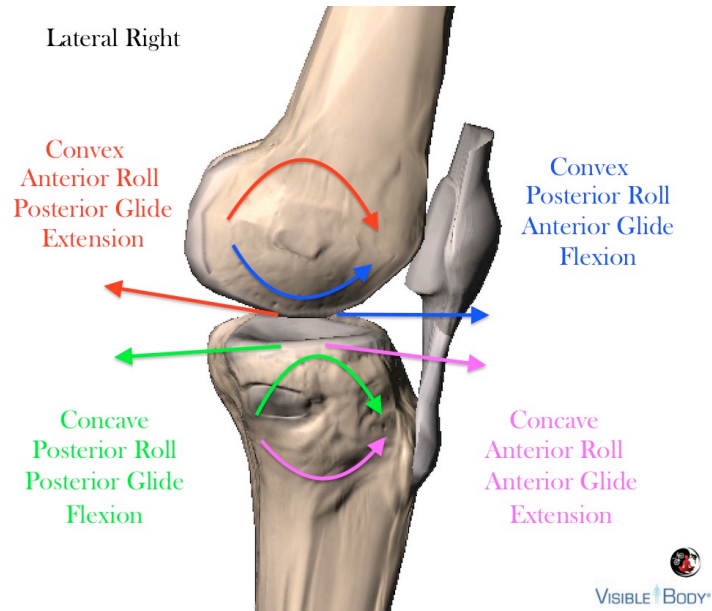
Coronal Tibiofemoral Joint

Anterior Right



### Sagittal Tibiofemoral Joint Movement

Lateral Right



### Coronal Patellofemoral Joint Movement



Anterior Right

