An extensor driving motion on its own

Simulation: Drive knee flexion-extension by simulating contraction of on one of the extensor muscles.

Based on your simulation, what's the problem with using a single muscle to move a bone?

A flexor and extensor driving motion

Simulation: Drive knee flexion-extension by simulating co-contraction of one of the extensor muscles and one of the flexor muscles.

Why do you need at least two muscles to drive controlled motion?

Why is muscle coordination important when co-contracting muscles?

Two extensors driving motion

Simulation: Compare knee extension by contracting the vastus lateralis and vastus medialis muscles individually versus contracting both muscles at the same time.

What's the problem with contracting only the vastus lateralis or only the vastus medialis when extending the knee?

Why is it beneficial (for knee function and stability) to co-contract the vastus lateralis and vastus medialis and how could this relate to patellar tracking disorders?

Two flexors driving motion

Simulation: Compare knee flexion by contracting the semimembranosus and the biceps femoris on their own versus contracting both muscles at the same time.

Why might it be beneficial (for knee function and stability) to co-contract the semimembranosus and biceps femoris?

Do you think the pattern of two muscles on the same side of a joint co-contracting is common for joints? If yes, why? If no, why not?

Agonist-antagonist muscles stabilizing a joint

Simulation: Among the four muscle cords, choose a pair of muscles that, when co-contracted, stiffens/prevents flexion-extension rotation.

Which two muscles did you choose?

Simulation: Among the four muscle cords, find a group of muscles that, when co-contracted, stiffens/prevents both flexion-extension and tibial long-axis rotations at the knee joint.

Which muscles did you choose?

Simulation: Among the four muscle cords, see if you can find a group of muscles that, when co-contracted, stiffens/prevents both anterior-posterior translation of the tibia and tibial long-axis rotations at the knee joint.

Did find a group of muscles to accomplish this? If so, which muscles? Do you think co-contraction of muscles can help to prevent ACL and MCL injuries? If yes, why? If no, why not?

Agonist-antagonist muscles stabilizing a joint (continued)

Based on your simulations, what do you think stabilizes the knee joint: ligaments, muscles, or both? If you think both, which do you think should make a greater contribution in a healthy knee, ligaments or muscles, why?