



Spinal Fitness

Physics Demonstration of the Leg Curl Exercise

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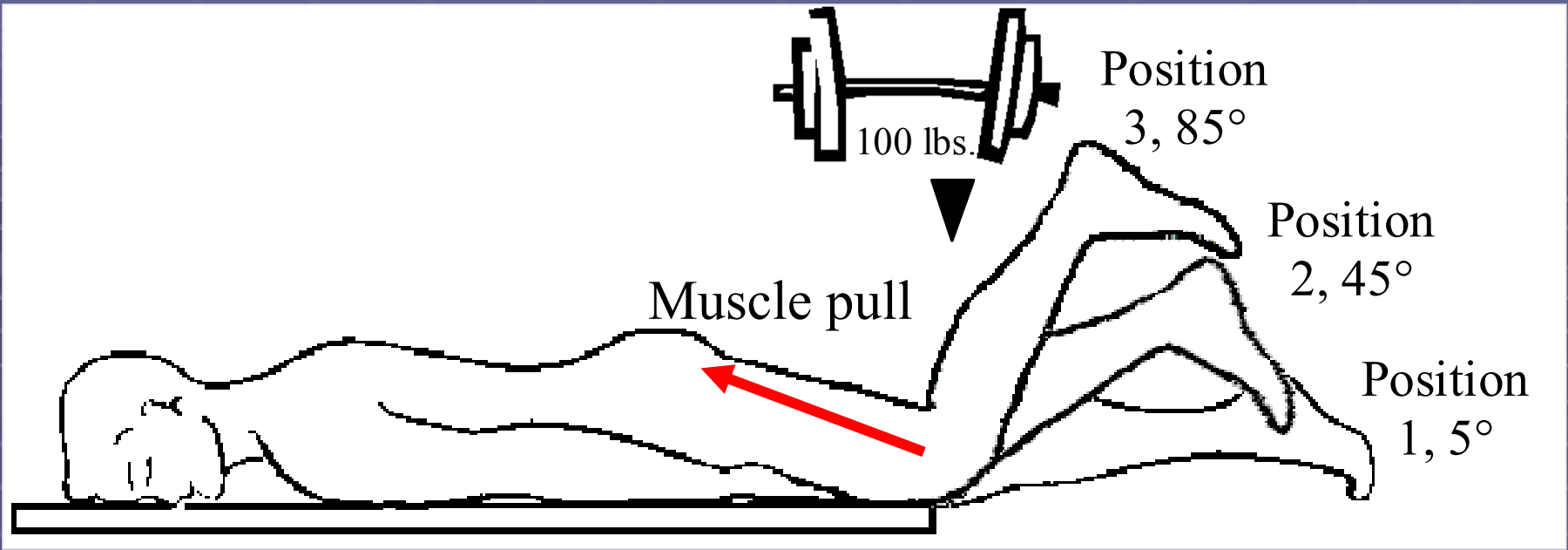
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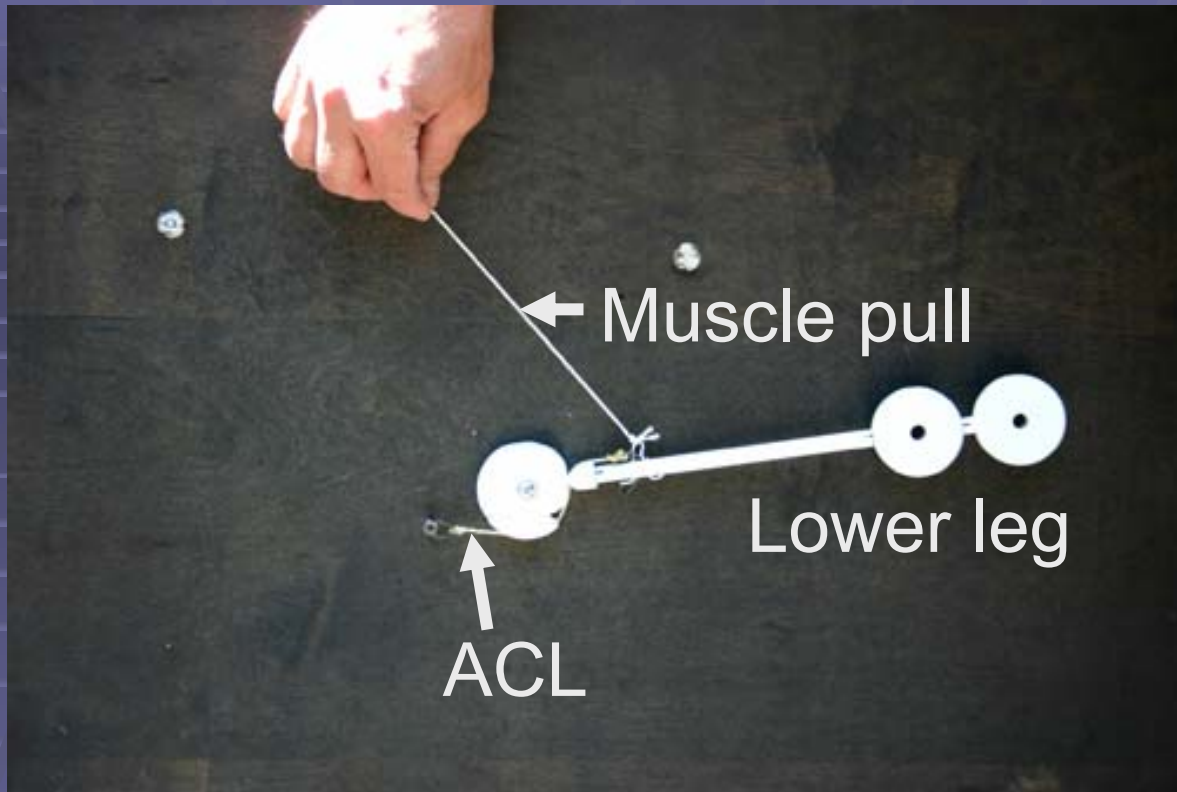
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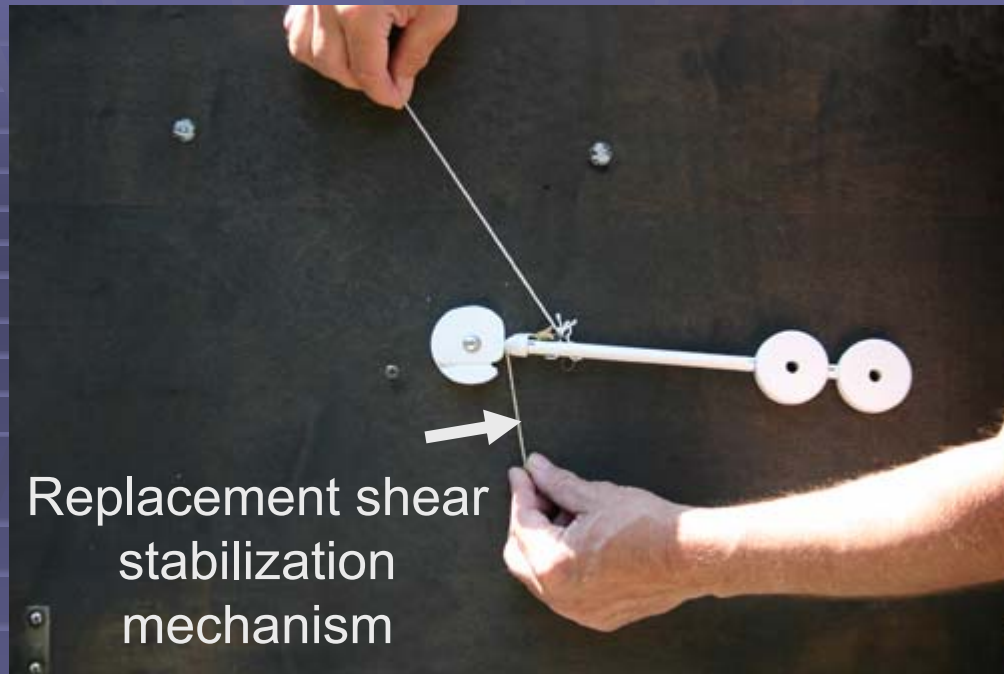
In the leg curl exercise, there is both compression and shear created at the joint. The compression force is stabilized by the articular surfaces of the joint. The shear force is stabilized by the anterior cruciate ligament (ACL).



We are pulling up on the stick acting as the lower leg. The string is acting as the muscle contraction. You will notice this is more vertical than the more actual line of pull in the previous example, but this will work for our demonstration. We see the lower leg held in equilibrium stabilized against the knee joint. The string attached below is acting like the ACL to stop upward shear force of the lower leg as it sits at the joint.



In this slide, we have unhooked the string. Now with no functioning ACL as a shear stabilizing mechanism, the lower leg dislocates upward.



In this slide, we are holding the string. Now we have a shear stabilization mechanism back in place and the leg is again stabilized in equilibrium against the joint. For those more advanced in leverage study, you will notice the pull at the joint by the string (ACL) is away from the joint and the actual pull by the ACL is more forward, not backward from the joint as seen here.

In the study of Equilibrium of Shear, our example would create less ultimate compression at the joint's articular surfaces than the actual line of pull of the ACL which would ultimately increase the compression at the joint surfaces.