



Spinal Fitness

Physics Demonstration of Locomotion

John S. Scherger, D.C.

Athletic Spinal Fitness Institute

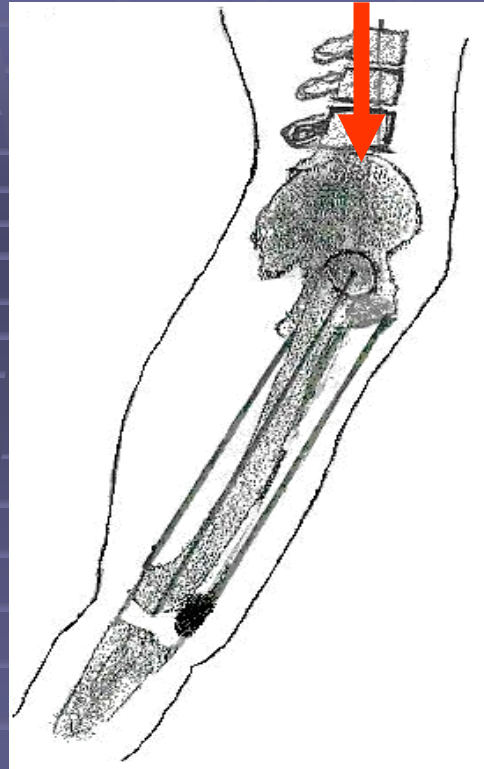
19321 NE 10th AVE

Ridgefield, WA 98642

(360) 887-8600

www.spinalfitness.com

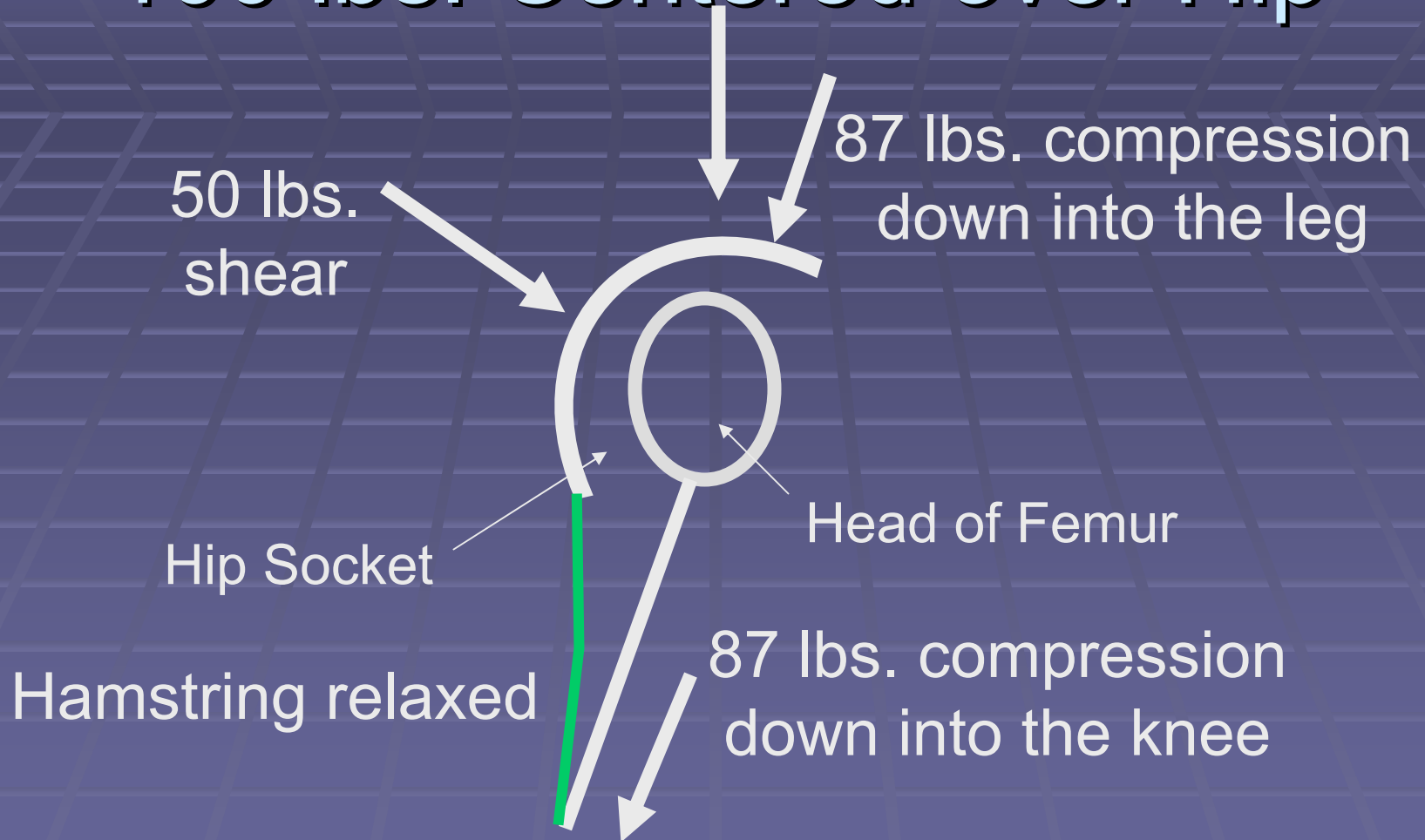
Proper Posture



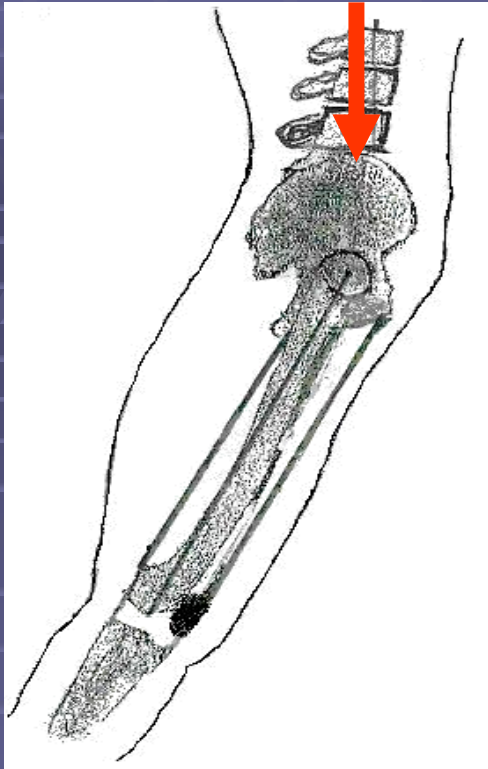
100 lbs. centered over hip

In locomotion when the upright spine has its proper curves, the center of mass is over the hip joint. At the hip joint there is some compression created and some shear. When in the act of locomotion the rear leg is on the ground carrying the body.

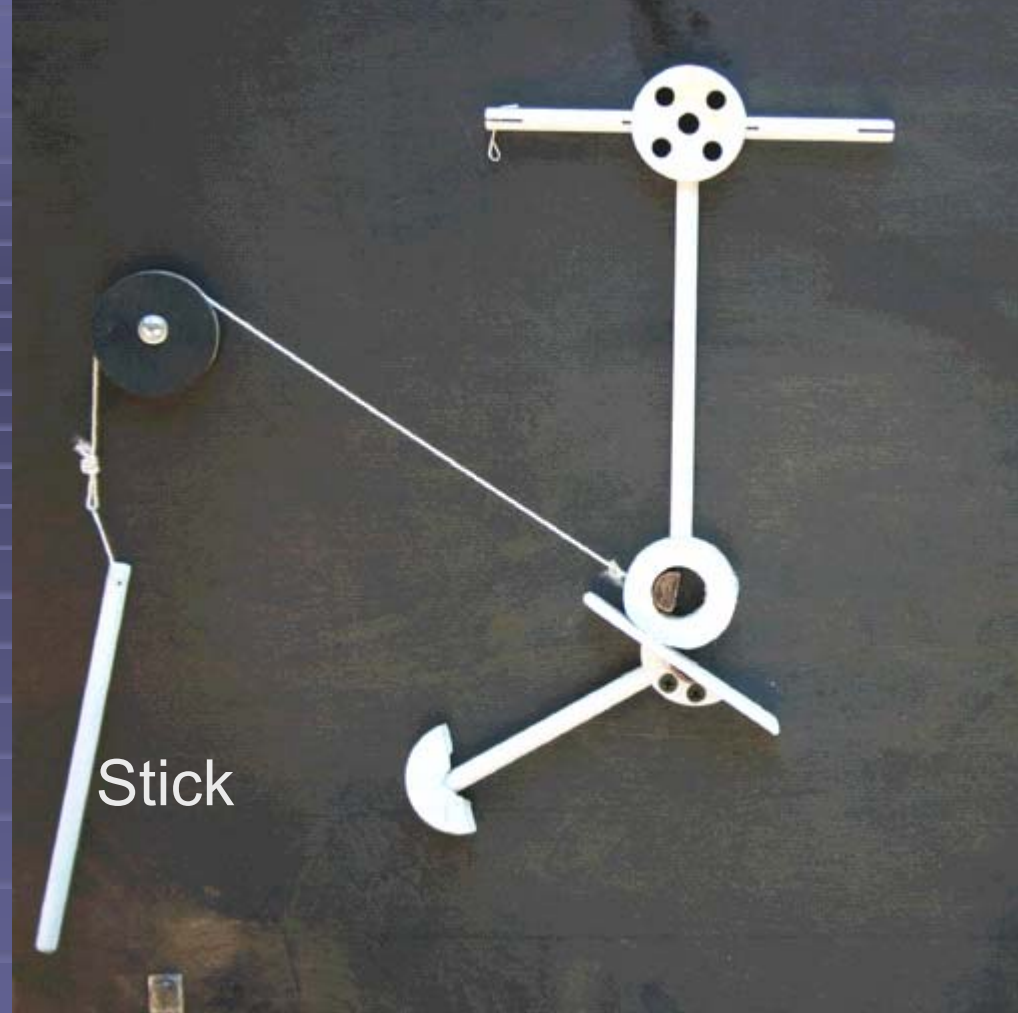
100 lbs. Centered over Hip



The shear force creates the movement and the muscles are free to control the movement.

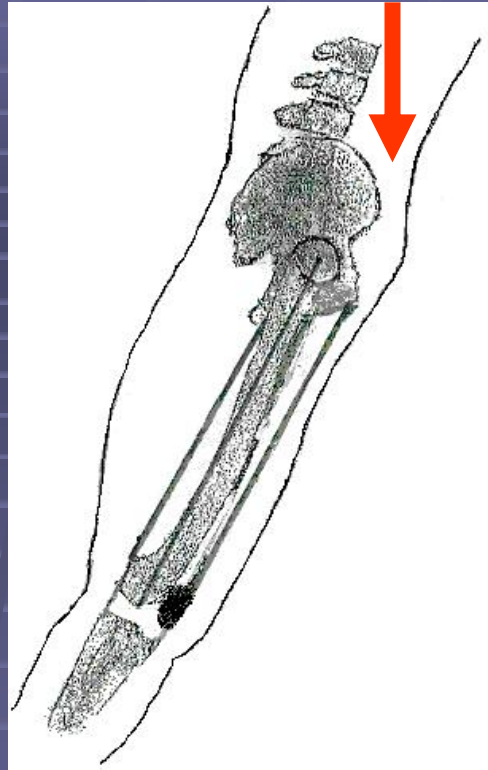


100 lbs. centered over hip



In this example you see compression is pushing the hip socket onto the ball of the leg down to the ground. There exists some shear force and the stick represents the amount of this force.

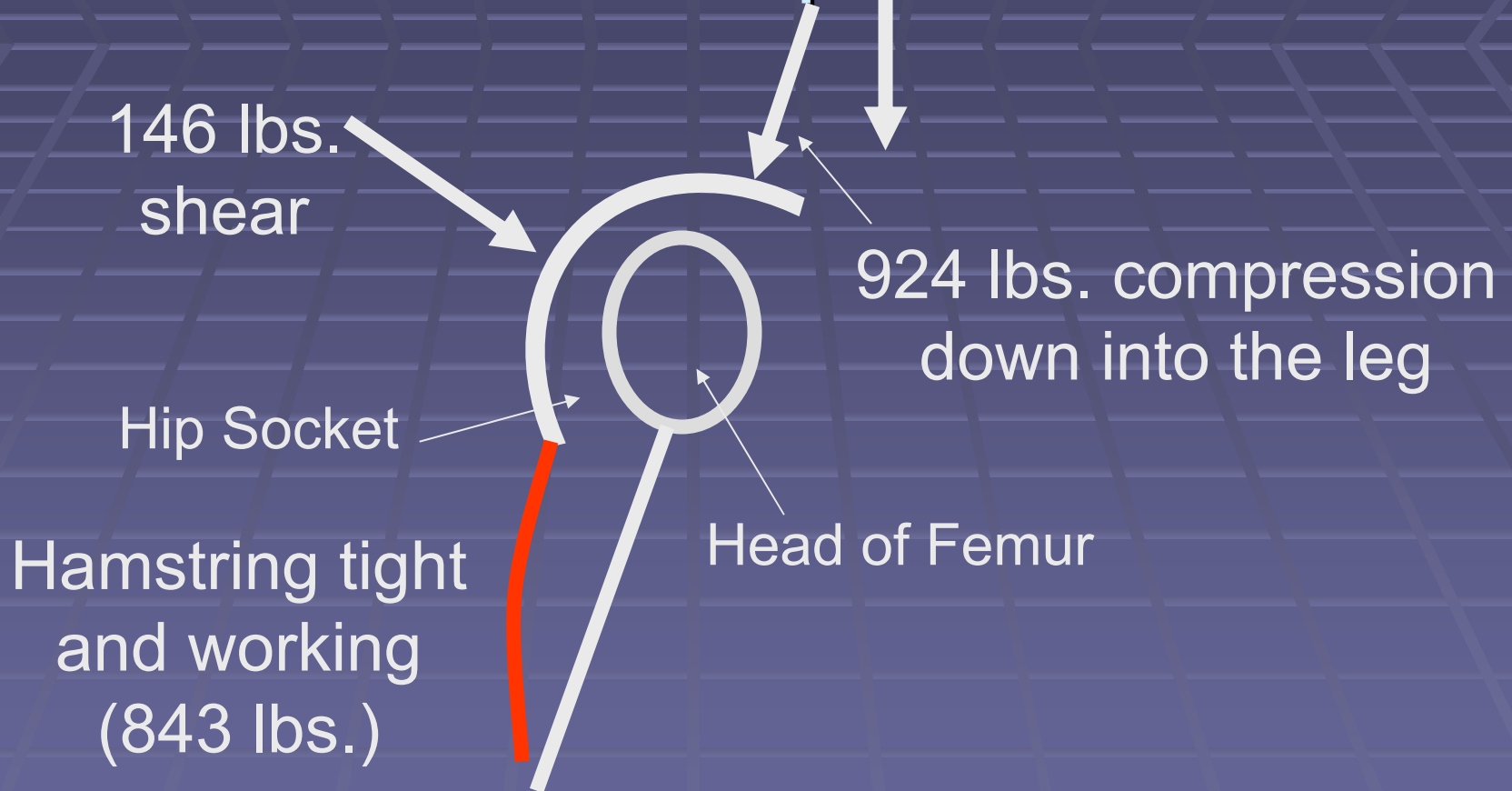
Improper Posture



100 lbs. 4" forward of hip

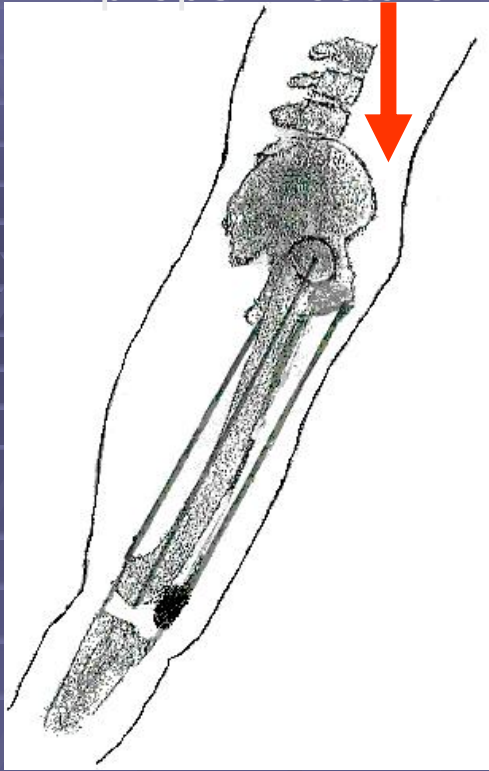
In locomotion when the upright spine has improper curves, the center of mass is forward of the hip joint. As a result, additional effort is needed to maintain upright posture and additional forces are created at the hip.

100 lbs. 4" Forward of the Hip at the Hip

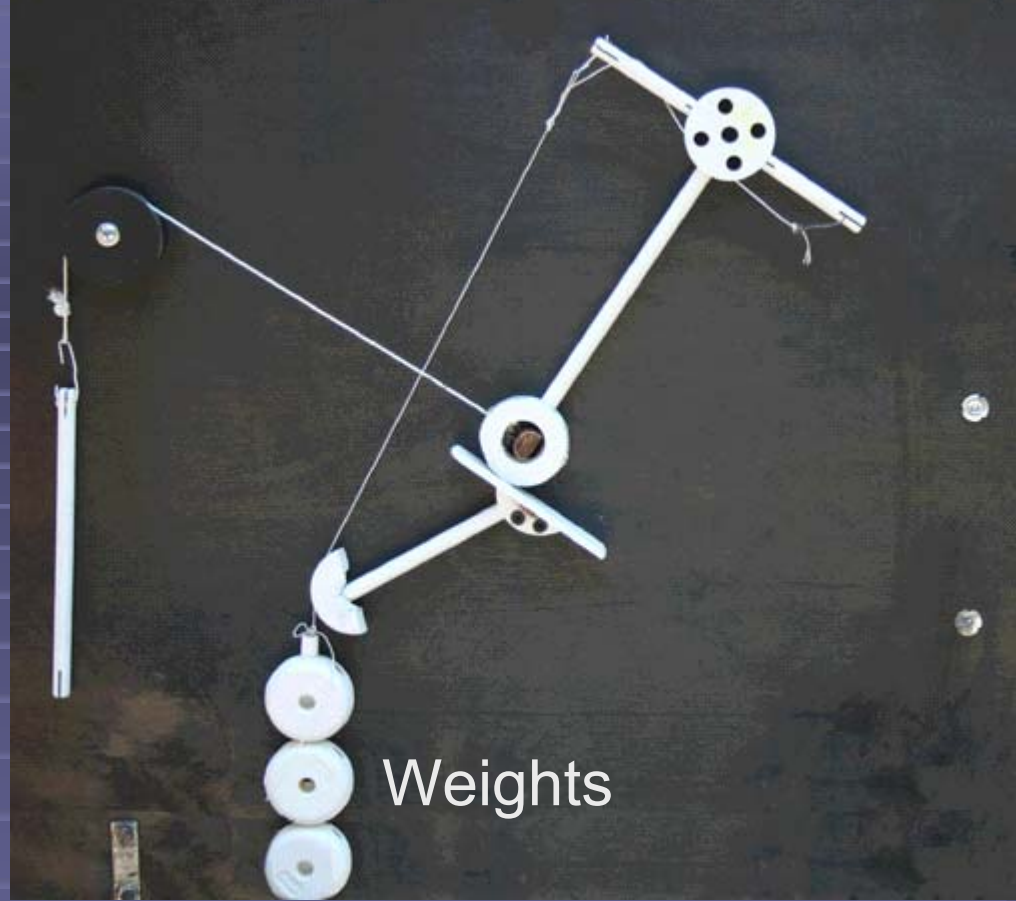


In this instance, the leg muscles are forced to maintain posture not control movement (locomotion).

Improper Posture



100 lbs. 4" forward of hip



Weights

In this picture, the center of mass has been moved forward. The string represents the hamstring muscle as it attaches to the hip and runs down to the lower leg which is extended behind the body when walking or running with this posture. In this example, the weight has been added to the string to demonstrate the amount of weight or force the hamstring must produce while in locomotion to simply maintain the upper trunk mass in stability at the hip.

This added weight or force by the hamstring also increases greatly the amount of compression at the hip joint creating osteoarthritic degeneration. Shear force is increased, but in our demonstration it was not enough to require more weight.