



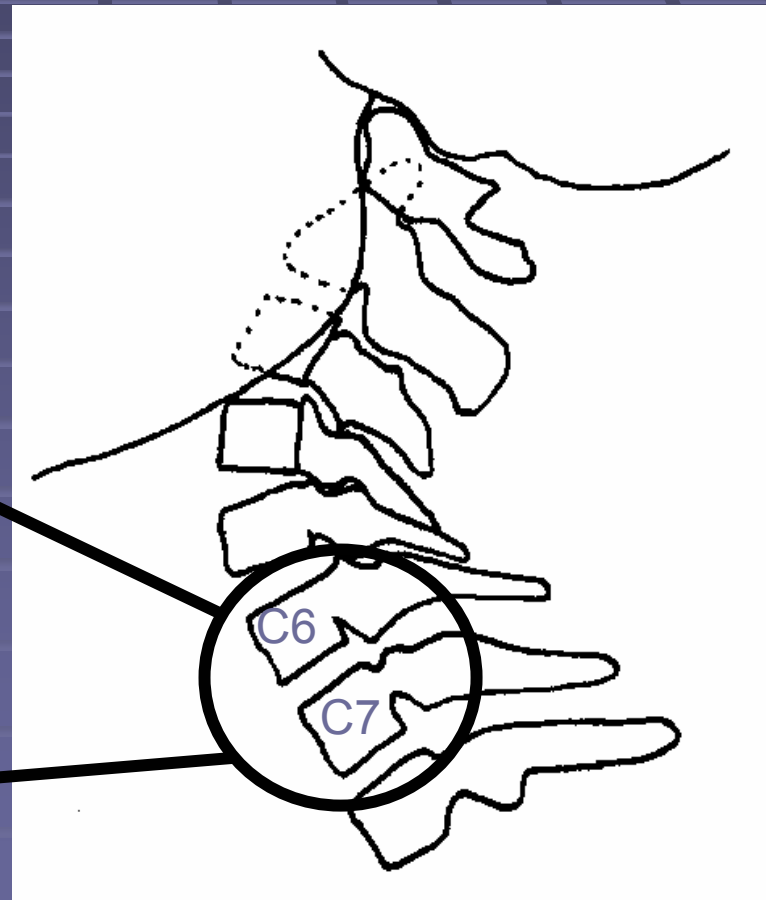
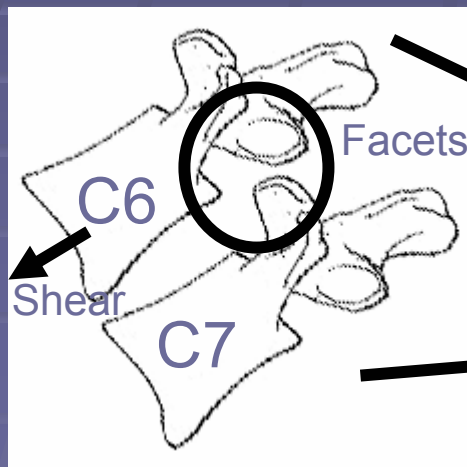
Spinal Fitness

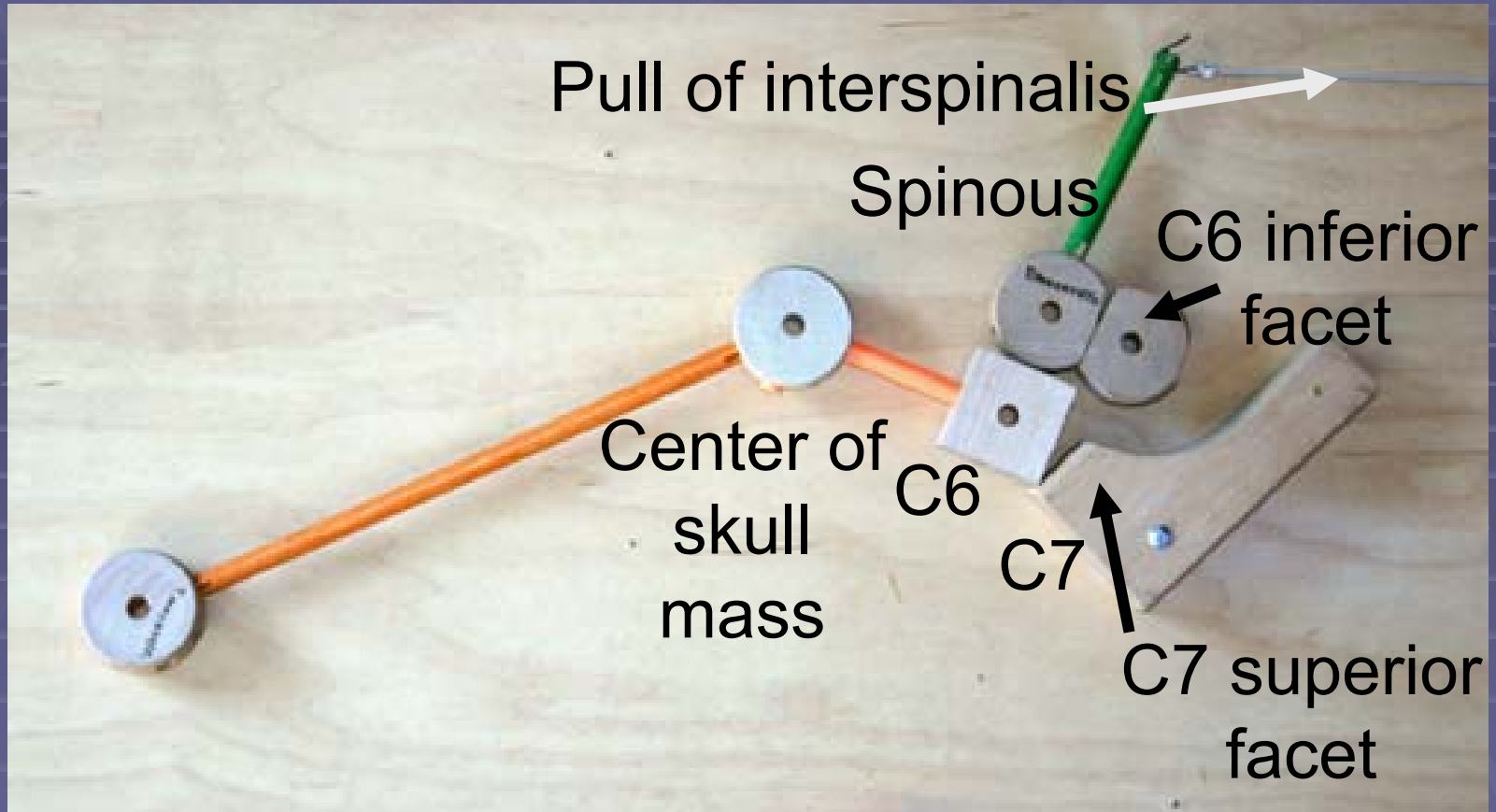
Physics Demonstration of the 3 Equilibrium Principles: Equilibrium of Torque, Equilibrium of Translation and Equilibrium of Shear Representing the Cervical Muscular Skeletal Lever System Maintaining Upright Posture.

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The lordotic curved posture is the desired global position of the cervical muscular complex.

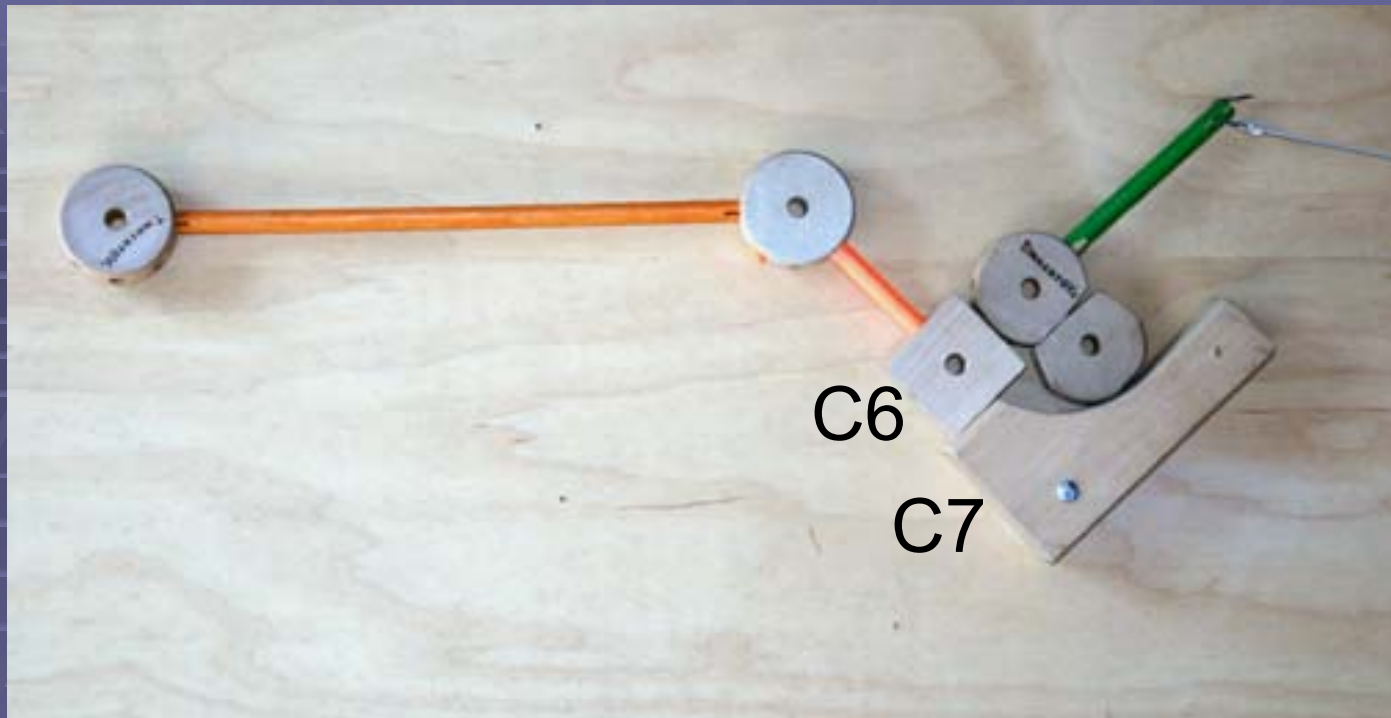
We are looking at this joint/fulcrum.



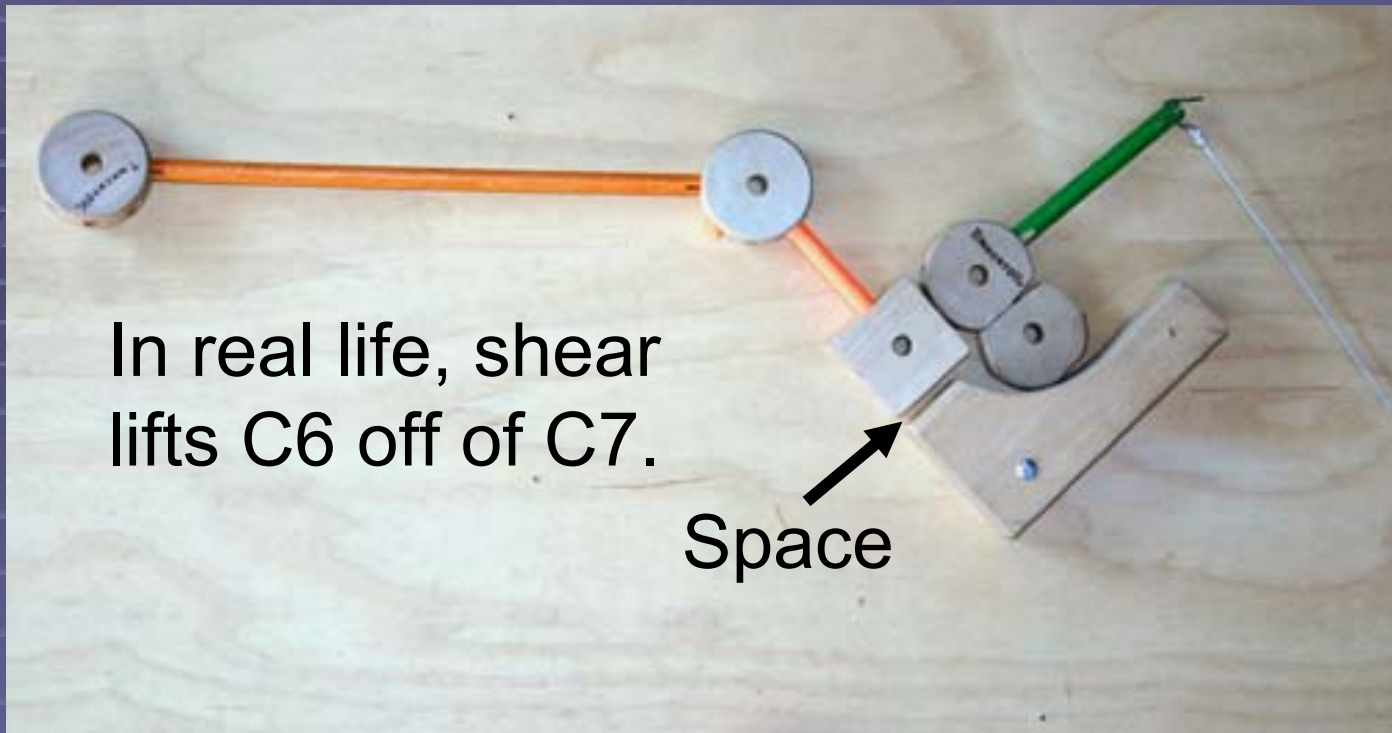


This slide demonstrates that the resistance (force of skull mass) would cause the C6 vertebra to torque or rotate off the C7 body.

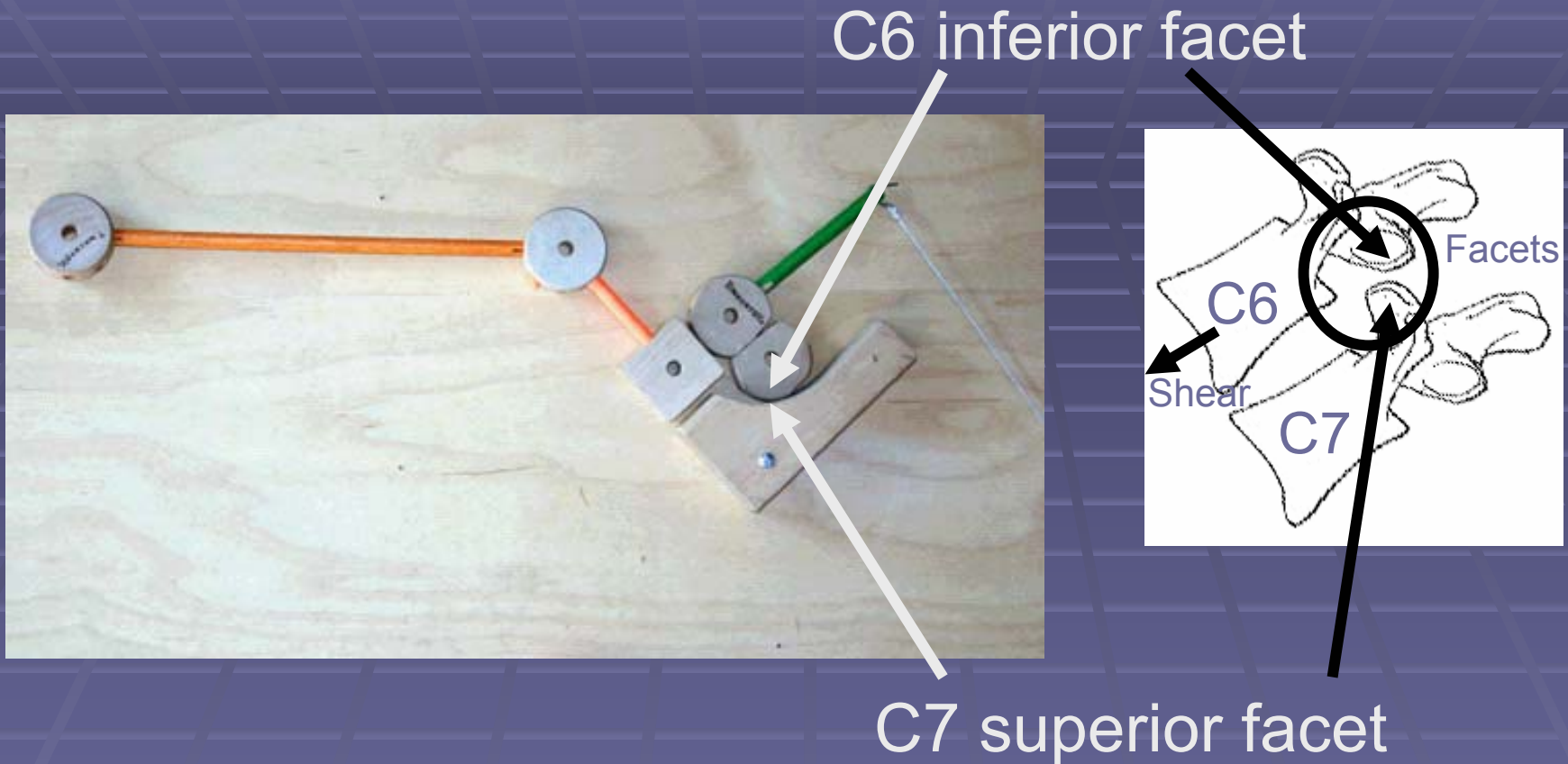
To keep C6 on C7 stabilized and in equilibrium, the interspinalis muscle must contract and produce enough force.



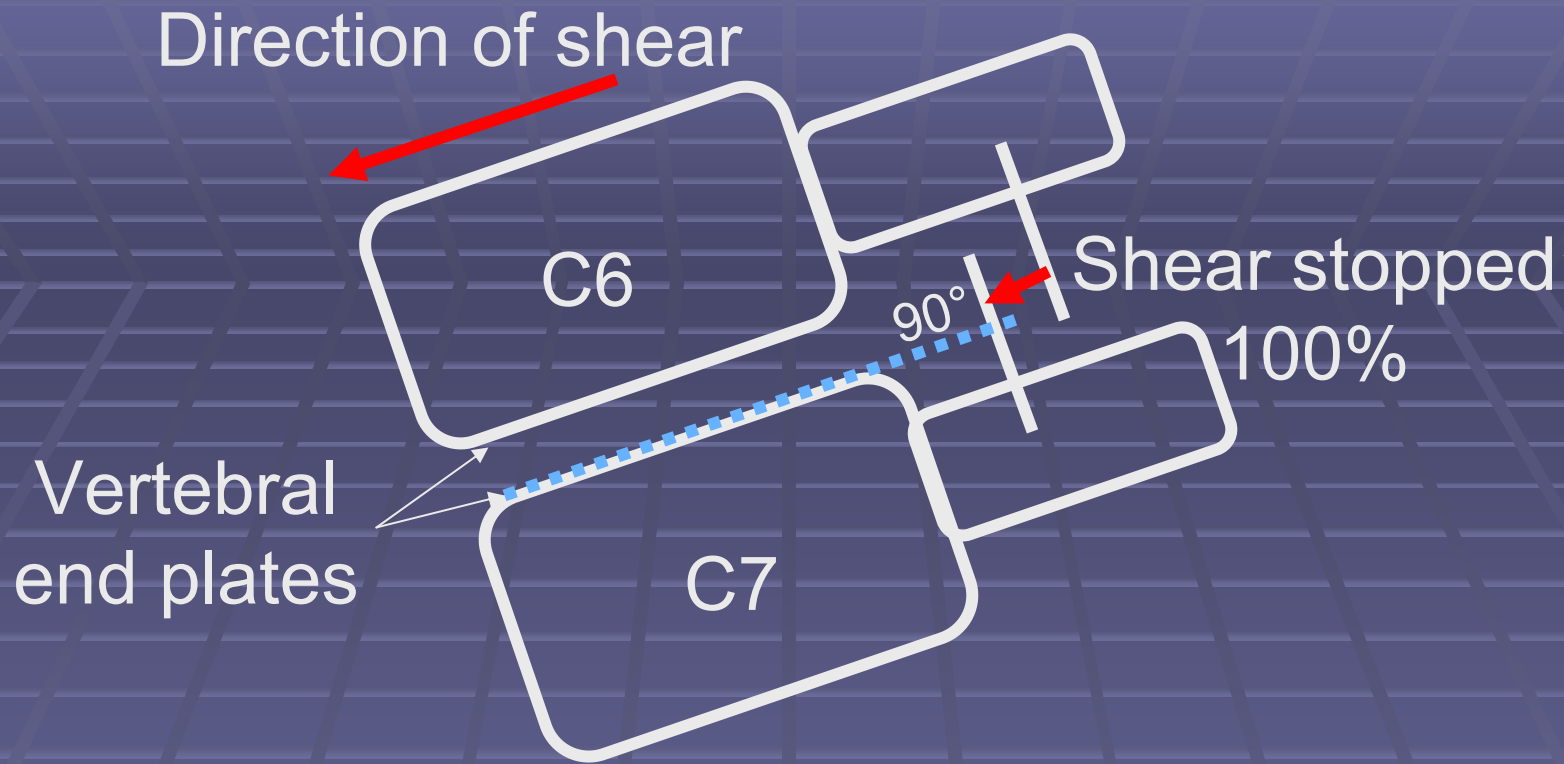
In this slide, the pull representing C6 to C7 is keeping the vertebral bodies centered on each other. This means that the Equilibrium of Translation is in perfect compression on the disc and vertebral bodies.



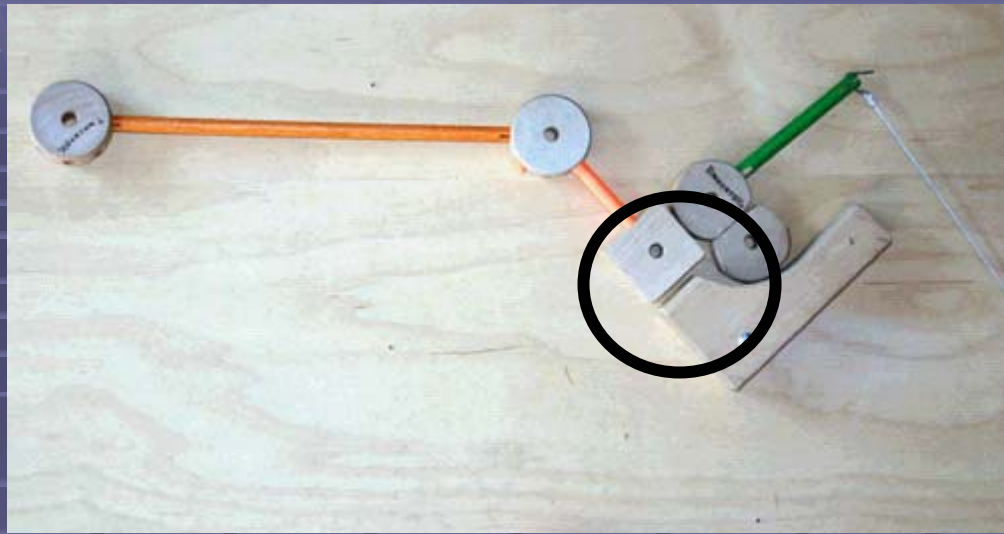
In real life, however, the pull of the interspinalis is more vertical and a shear force is created that is to the anterior causing the inferior facet of C6 to push against the superior facet of C7.



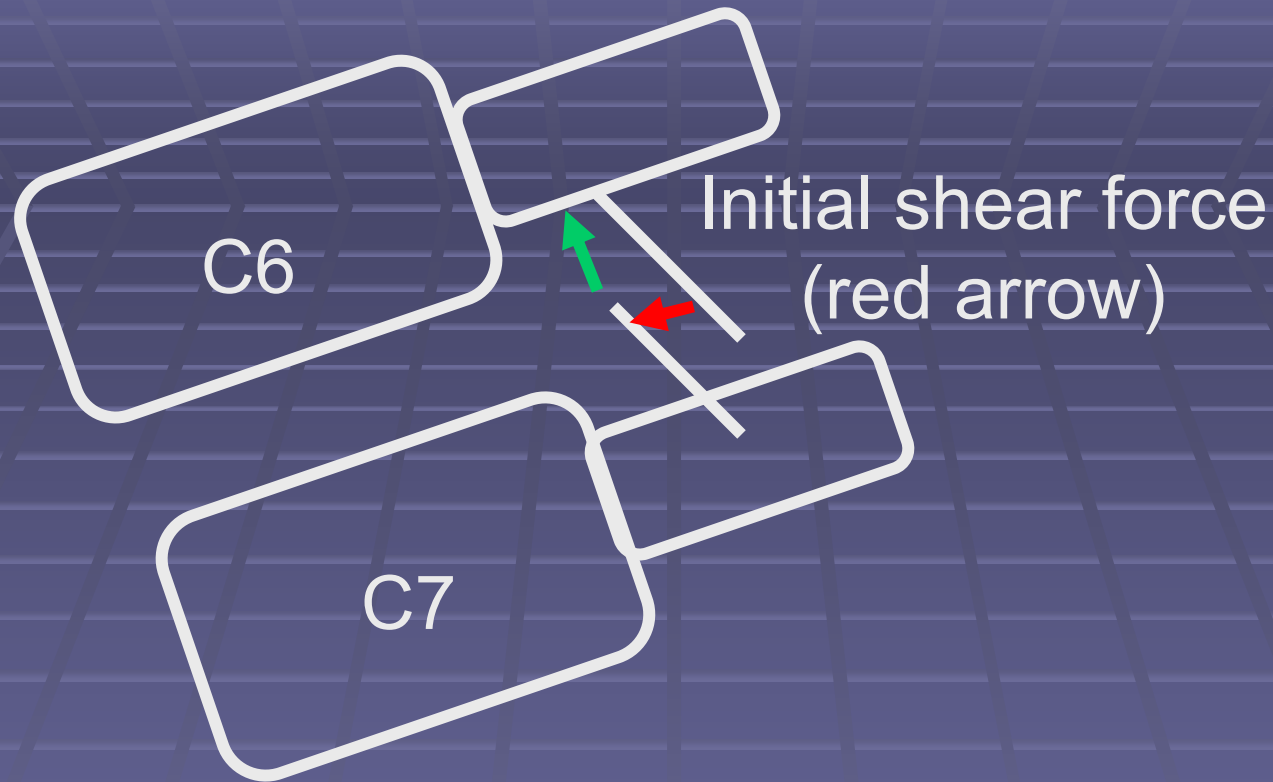
Shear force pushes the inferior facet of C6 against the superior facet of C7.



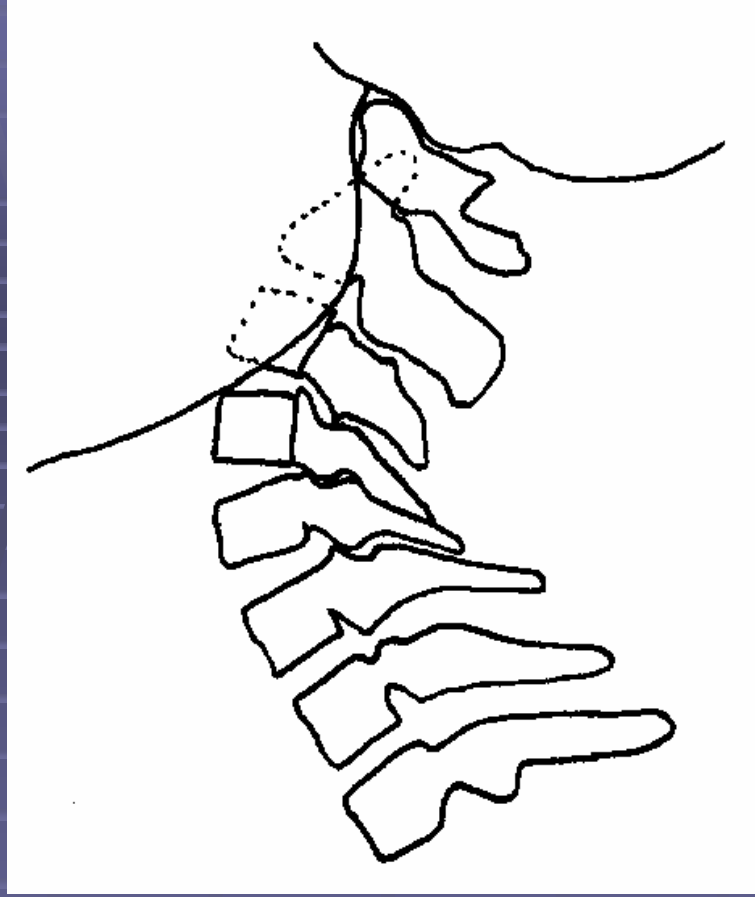
If the inferior facet surface of C6 and the superior facet surface of C7 were both 90° to the vertebral end plates, they would be able to stop shear force perfectly, but this is not the case.



Since the face of the facets are 35° to the vertebral end plate, the shear force will be broken into two forces. Some compression will be directed directly into the lower facet while some additional shear force will be directed upwards. This upwards shear force will be opposing the initial compression and actually float the body of C6 upwards off of C7.

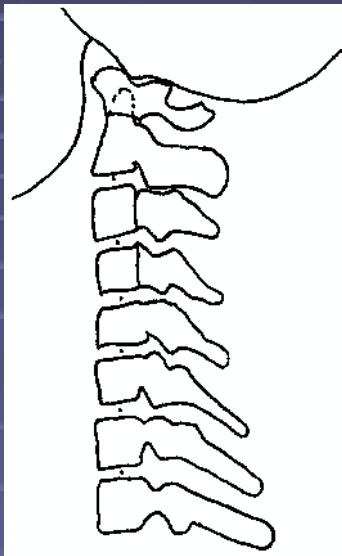


The initial shear force creates some compression into the facet. It also creates some upward shear (green arrow) causing C6 to lift off of C7.

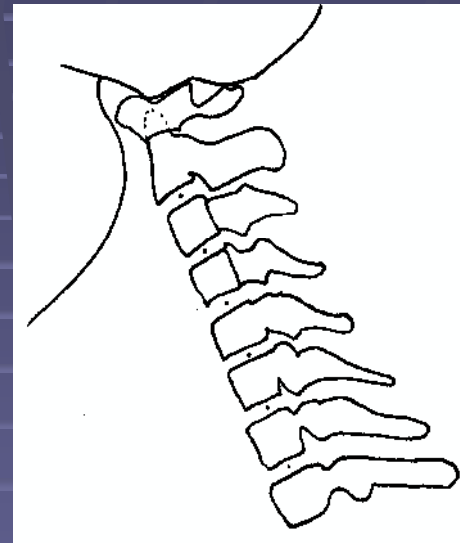


This is the bodies desirable position because as the discs start to lose blood supply (after age 20), this structure allows the disc to float and keep a pumping action going that is necessary to keep the supply of metabolic nutrients to the disc as well as remove waste.

Straight Posture



Head Forward Posture



Biomechanical studies show that when the curve is lost that the anterior shear mechanism that creates the disc floating action is also lost. What remains is compression force into the discs that causes them to degenerate and suffer eventual irreversible osteoarthritic conditions.