



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

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| Name(s) Katie Moon; Kyle Morrissey | Project Number S1215 |
| Project Title Measuring Stress on the Patellar Tendon at Various Bend Angles | |
| <p style="text-align: center;">Abstract</p> <p>Objectives Katie and I both being athletes have experienced knee stress or strain at one point in our athletic career, so we wanted to pin point exactly what major angles contribute most to patellar tendon stress and exactly how much strain in pounds force.</p> <p>Methods Our first step to reaching our goal was to create a knee model out of wood, plastic, a single spring, and a single fishing line. The model can bend from 180 degrees to 10 degrees which stretches the spring applying increasing stress to the fishing line (Patellar Tendon).</p> <p>Results We recorded the stretch of the spring (In inches then converted to meters) from each bend angle going by tens (i.e. 180, 170, etc.) from there we plugged the stretch value, restorative force value, and the 'k' value which we found from multiple tests on the suspended spring with known masses. We took all the values and plugged them into Hooke's Law ($F = -kx$) from which we concluded the pounds of force on the patellar tendon, which was an arithmetic growth of up to 97 pounds on the tendon at the lowest bend angle.</p> <p>Conclusions Tireless nights spent over pages of equations, model failures, and pressure of school and sports were only a few of the challenges we faced and overcame. We experienced many failures yet we persevered and were able to successfully finalize our project. Applying up to 97 pounds of pressure to the knee daily (Add that to your body weight!) is insanely strenuous, and it's important to know just how much damage is being done to one of the most important joints of the body.</p> | |
| Summary Statement We created a knee model which could simulate significant amounts of stress on the patellar tendon at different bend angles. | |
| Help Received My partner and I designed and built the model on our, we received help from Mr. Jacquette, the VHS' AP physics teacher when working with Hooke's Law | |