



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Alanna J. Russell	Project Number S1410
Project Title Exploration of Stress on the MCL and LCL in Dancers	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Exploration of amount of stress dancers put on lateral and medial collateral ligaments when performing a pli�. Stress on models of ligaments will be measured at 180� (straight leg), 80� (demi pli�) and 40� (grande pli�). Project will measure stress to ligaments when dancers use improper technique.</p> <p>Methods/Materials Lengths of MCL and LCL springs when lower leg rotated versus aligned in three angles (180, 45 & 80) measured, differences in lengths of MCL spring when rotated versus aligned, and differences in lengths of LCL spring when rotated versus aligned compared. Materials: Flat screws, washers, hook eyes, springs, hinges, wood, guitar strings, guitar tuners, gate locks, ruler, protractor, latches, pins.</p> <p>Results Springs at rest were 2.5 cm long. With knee parallel, length of LCL spring went to 3.7 cm, length of MCL spring went to 3.9 cm when knee was bent to 80�. When angle of knee was bent to 40�, length of LCL spring was 2.7cm, and MCL spring 2.9 cm. With lower part of knee rotated 45�, length of springs remained same at 180� (at rest). When knee bent to 80�, length of LCL spring stretched to 3.0 cm, but MCL spring length increased to 4.1cm. At 40�, length of LCL spring returned to 2.5cm, and length of MCL spring went to 3.2 cm. When aligned, length of MCL spring was 0.2 cm longer than LCL at both 80 and 40 degrees. When rotated 45�, length of MCL was 1.1 cm longer than LCL at 80�, and 0.7 cm longer at 40�. Length of MCL spring was .2 cm longer when knee was turned out as opposed to when it was aligned at 80�, and it was .3 cm longer at 40�. Length of the LCL spring was .7 cm shorter when knee was turned out as opposed to when it was aligned at 80�, and was .2 cm shorter at 40�.</p> <p>Conclusions/Discussion In alignment, stress on MCL and LCL is greatest at 80�, This is most likely because attachment sites for ligaments are farthest apart at 80�. In rotation, stress on LCL is less than in alignment. Similarly, stress is greater at 80� than 40�: as attachment sites are closer. When lower leg is rotated, stress on MCL increases because attachment sites are farther apart than they were when leg was in alignment. Results support hypothesis that when dancer turns out incorrectly, additional stress is put on MCL, therefore increasing chances of irritation, sprain, or rupture.</p>	
Summary Statement This project explores the amount of stress dancers put on the lateral and medial collateral ligaments in their knees when they perform a simple pli� (knee bend)	
Help Received Parents helped with shopping and building of knee	