



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b> <b>Rebeca Castro</b>	<b>Project Number</b> <b>S1706</b>
<b>Project Title</b> <b>Biomechanics of the Golpe</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> Every flamenco dancer begins by learning basic steps such as the golpe which means, the stomp. This is performed by having a slight bend at the knees for balance, a straight back, then raising your knee straight up and then bringing it back down to create a stomping noise. Recently I learned the same noise can be achieved by standing up straight, kicking your ankle back, then bringing it back to its initial position. The latter method is said to reduce injuries, which is beneficial because injuries are so prevalent in this form of dance. If evidence supports this, the new method may reduce injuries common in flamenco dancers.</p> <p>In this experiment I performed trials of both styles of the step measuring the different normal forces on the force plate produced by each style. I graphed the results and was able to compare the maximum and minimum measured forces from the graphs of both styles and found that the average range of normal force applied for the original style is <math>254.4\text{N} \pm 5.0\text{N}</math> and the average range of normal force required for the new style of the step is <math>183.3\text{N} \pm 5.0\text{N}</math>. There is a difference of <math>70.9\text{N} \pm 5.0\text{N}</math> in the average range of force measured in the original step versus the new style of step.</p> <p>Additionally I had someone try both styles of the step without them knowing the purpose of the measurements to see if my knowledge of the experiment greatly influenced the results. After analyzing that data I found that the difference between maximum and minimum for the original style is <math>510.3\text{N} \pm 5.0\text{N}</math>, and the average difference between maximum and minimum normal forces for the new styles was <math>265.6 \pm 5.0\text{N}</math>. There is a difference of <math>255 \pm 5.0\text{N}</math> in the average range of force measured in the original step versus the new style of the step.</p> <p>This means that in the original style of the step there is a greater average range of normal force required to create the original movement necessary compared to the new method of the step where the change in force is not as large. I concluded based on these results that such a distinct reduction in force from the original style's abrupt raising and dropping of the knee has a greater risk of injury than the new style.</p> <p><b>Methods</b> In this experiment I used a PASCO 2-Axis Force Platform and recorded the data through the Sparkvue app on my phone. I initially stood on the plate before recording so the plate could measure the normal force of my weight. I did this before the stomping step began to see the normal force of no movement compared to when stomping began. Then I began stomping with the intention of applying a consistent force with the first method where my knees are bent and my weight is at the back. I did multiple trials and tried to have consistent precision between each trial. Then I followed a similar procedure, but I measured the normal</p>	
<b>Summary Statement</b> After measuring the normal force required for the traditional golpe step and the new golpe step, I found that the new style required less normal force overall and therefore may reduce injuries.	
<b>Help Received</b> My instructor Mr. Hamilton provided the force plate and also guided me throughout the process of taking measurements. Ms. Lepore and Ms. Blomberg helped me prepare for my project for the fair.	