



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Ken R. Ruth	Project Number J0322
Project Title A Better Way to Prevent Concussions: The Addition of Non-Newtonian Fluids to Helmet Padding	
Abstract Objectives/Goals To study the effect of the addition of non-Newtonian fluid to helmet padding on the force generated on the head during a football hit. Methods/Materials I studied this concept by dropping a weight onto standard helmet padding material, non-Newtonian fluids (borax/glue and cornstarch/water) of different thicknesses and non-Newtonian fluids in combination with the helmet pads. I used an accelerometer to measure the deceleration of the ten pound weight dropped from 50 and 100 cm heights onto the test materials. Results The addition of non-Newtonian fluids to helmet padding does decrease the deceleration of the dropping weight, from 32% to 79% at a 50 cm drop height, and from 17% to 60% at a 100 cm drop height. In addition to decreasing the maximum deceleration, non-Newtonian fluids spread the forces out over a longer period of time, and decrease the rebound of the weight. At 50 cm, the borax and glue affected the deceleration the most, while at 100 cm, the cornstarch and water was superior. Conclusions/Discussion I learned that the addition of non-Newtonian fluids to helmet padding decreased the force of impact. This may mean that the addition of non-Newtonian fluid to helmet padding will decrease the concussion rate.	
Summary Statement I studied the ability of football helmet padding and non-Newtonian fluids to lessen the force of an impact.	
Help Received Nathan Pfaff helped with using the accelerometer, and recording the data; Dad helped construct the test device.	