



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

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Project Title Concussion Cushion	
<p align="center">Abstract</p> <p>Objectives/Goals In a high school football season, a player takes an average of 650 hits to the head. These hits can cause severe concussions and even permanent damage. This project was designed to calculate the amount of decrease in impact when two helmets with both outer and inner absorbable layers collide versus two helmets colliding with only inner cushioning.</p> <p>Methods/Materials To begin this project, 2 helmets were borrowed from the high school football team. The helmet covers were made with a polyurethane material. Memory foam and gel insoles were then bought to be placed inside of the covers. 2 robots were then borrowed and used manually, not mechanically. The robots were disassembled and then reassembled to mount the helmets at a downward facing angle. A rail system was made using metal pieces. The track was sized at 75 in. to allow build up of acceleration. Stoppers were placed at the ends of the track and one placed 25 in. away from an end. Once the helmets were set on the track, a 1 in. elastic band was tied onto the front of 1 robot, ran through the 2nd robot and tied to the opposite end of the track. Each test began with the 1st robot, which was tied to the elastic, pulled back to the end of the track at the stopper. The 2nd robot was moved to the 25 in. stopper. The 1st robot was then released and rolled down the track until it hit the 2nd robot, causing it to roll backwards. A measurement was taken to calculate the distance it traveled. The designed nine tests, each tested 20 times, were as follows; Test #1: (Control) No Outer Covers Test #2: Gel vs. Gel Test #3: Foam vs. Foam Test #4: Gel Vs. Foam Test #5: Foam vs. Gel Test #6: Gel vs. No Cover Test #7: Foam vs. No Cover Test #8: No Cover vs. Gel Test #9: No Cover vs. Foam. * "vs." rather means, the first material named ran into the second material.</p> <p>Results After the 9 different combinations were tested 20 times each, for a total of 180 individual tests, the measurements for how far the second helmet moved were averaged for each combination. Test#1 none (control). Test#2 46% decrease. Test#3 15% decrease. Test #4 30% decrease. Test #5 18% decrease. Test#6 29% decrease. Test#7 27% decrease. Test#8 21% decrease. Test#9 13% decrease.</p> <p>Conclusions/Discussion The experiment reported that the best combination, gel versus gel, decreased the movement by 46%, softening the blows to the head and reducing the chances of receiving a concussion.</p>	
Summary Statement This project was designed to calculate the amount of decrease in impact when two helmets with both outer and inner absorbable layers collide versus two helmets colliding with only inner cushioning.	
Help Received The robotics material was supplied by Mr. Mickey Bowan. Mother pulled the first robot back and released, while I measured the distance moved.	