



CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

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Project Title Car Seats and Damage Control: Finding the Optimal Distance that a Car Seat Should Be Placed from a Crumple Zone	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In our project, we are trying to understand how the distance away from the crumple zone can affect the acceleration of a child's head, and how this acceleration is similar to the acceleration of a child's head when experiencing whiplash in a car crash. Our hypothesis was that pulling back the car seat 1 meter from the crumple zone would lead to an increased acceleration when compared to shorter distances. This hypothesis was reached due to our understanding of the Law of Conservation of Energy.</p> <p>Methods/Materials To conduct this experiment, we made a mannequin that was the average height and weight of a child suited for a car seat. We tied the car seat with the mannequin to the top of a fence and pulled it back in an arc (imagine a pendulum). We measured horizontal distances away from the fence in increments of 10 cm, then proceeding to drop the car seat, which would then swing towards the fence (again, refer to a pendulum). We measured the acceleration of the child's head just as it hits a crumple zone using an accelerometer app for iOS, called Sensor Monitor.</p> <p>Results Our results show a direct relationship between the change in acceleration of the child's head and the distance at which the car seat is pulled. With each additional increment of 10 centimeters, the acceleration increased.</p> <p>Conclusions/Discussion Our results explain that even when we pulled the car seat only 10 centimeters horizontally from the wall, the child's head experienced enough change in acceleration to cause whiplash and potential brain damage to a child. By studying this, we learned that car seats like the one we used are very unsafe and can cause serious brain damage and even death for children who experience car crashes. This is especially important when considering that car crashes are the number one killer of children from ages 3 to 14. Also, we learned that 3 out of every 4 parents incorrectly use child restraints to keep children safe in potential car crashes. Simple solutions to this significant problem can save many children from damage like Shaken Baby Syndrome and whiplash, especially when they have immature skeletal and muscular structures in their necks and heads. Through this experiment, we discovered that car seats require a much safer design in order to keep children safe. A possible design we concocted was a small strap around the head of the child to ensure head safety.</p>	
Summary Statement Our project studies how the horizontal distance a car seat is from a crumple zone affects the acceleration of a child's head as if in a real car crash and how the problem must be solved to prevent child deaths.	
Help Received We worked in teacher's classroom and used school fence for method.	