

Lauren Sommer

*Would Newton Have Preferred a Non-Newtonian Bumper?*

All car passengers need a more effective bumper because safety in automobiles can always be improved. About 3,000,000 people are injured in car accidents each year and over 100 people die from them every day. Dilatent Rheology, the study of movement in non-Newtonian fluids, could solve this problem and decrease the amount of injuries and deaths by automobile collisions.

I designed a pendulum testing device to keep all variables constant except for an adjustable mass/momentum and the type of bumper. I found a threshold mass with the Newtonian bumper and did three or more trials on the Newtonian and non-Newtonian bumpers with or without foam padding under a raw egg.

This analysis utilized four prototypes to determine if a non-Newtonian bumper would be superior to a Newtonian bumper: a car with and without a non-Newtonian bumper and a car with and without seat padding. All prototypes performed at 100% of the first and third design criteria, facilitating the measurement of mass and momentum of impact and the car body was consistently efficiently elastic. Prototype one and three met 100% of the second design criteria. However, prototypes two and four both failed the second design criteria. Non-Newtonian prototypes never resulted in un-cracked eggs in multiple trials. Newtonian prototypes resulted in a mix of cracked and un-cracked eggs over many trials to determine the "superiority" threshold mass. 100% of the non-Newtonian bumper prototypes failed the fourth design criteria.

The non-Newtonian bumper was not superior and Newton probably would not have preferred one!