TEACHER WARNING

This lesson includes **a video of crash test dummies in a vehicle collision and data about forces on vehicle occupants.**

This may evoke heightened emotional states due to related traumatic events that teachers, students, and/or their families may have experienced. Please see the unit front matter, the teacher reference associated with this lesson, and the callouts in the *Teacher Guide* for guidance around how to support social and emotional needs as you move through this unit. Never ask students to share their personal experiences unless they volunteer to do so.

Slide A

Student Content Advisory

In this lesson, we will use a simulation of a vehicle collision and analyze data about forces on vehicle occupants and likelihood of survival during a collision.

If needed, you can use strategies from the *Student Mindfulness Resource* handout.

If at any future point in the unit you find you need support, let your teacher or a trusted adult know how you are feeling.

Be aware that your teacher and/or your classmates may have experienced trauma related to this topic. Approach conversations about car crashes and car safety with respect, guided by your class's community agreements.

Navigate

With your class

Considering the evidence we assembled in our timelines, what other variables might help us understand how safety features affect safety in a collision?

Navigate

A crash test dummy is a tool engineers developed to help them collect data from a vehicle collision.

With your class

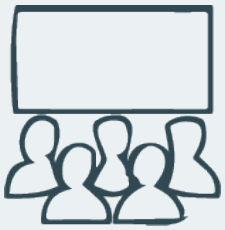
What data would you want to collect from a crash test dummy to better understand how safety features can prevent injury?

Make Predictions

With your class

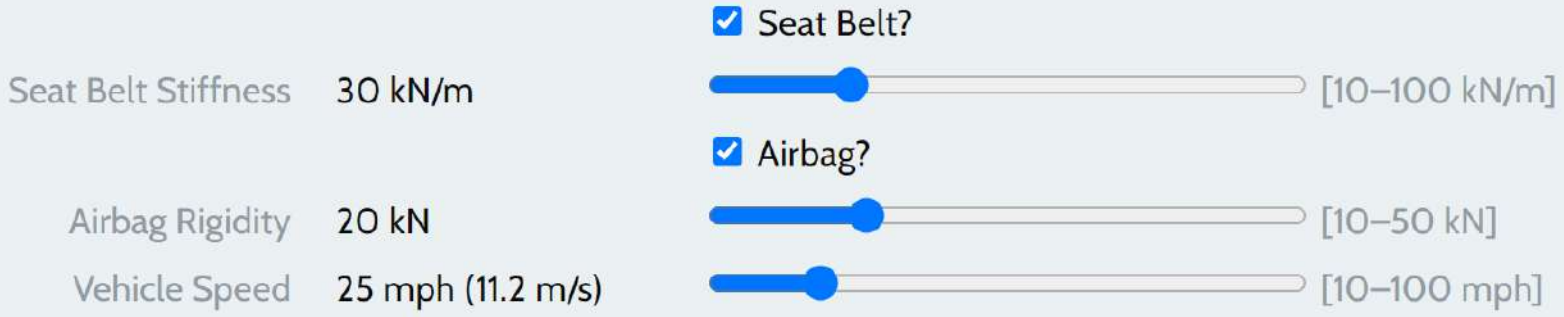
Develop a model showing the forces on a crash test dummy during a collision without a seat belt or airbag.

Plan an Investigation



With your class

Orient to the simulation controls and available variables.



Carry Out an Investigation

With a partner

Optimize for one variable at a time. Record your trials on the *Safety Optimization Investigation* handout.

Compare Findings

With your class

What was the highest likelihood of survival you achieved for your design of the seat belt and airbag for a vehicle colliding with a barrier at 25 mph?

Analyze Data

Individual Think Time

- What patterns do you see in these six attempts to optimize the safety features?
- What design decisions were made to optimize the likelihood of survival?
- What equation(s) from our Force and Motion Relationships poster might help us understand these patterns?

➔ Be ready to share your ideas with the class.

Make Predictions

With your class

Use your thumb to take a poll:

Up = increase, Down = decrease, Side = no change

What impact would an increase in vehicle speed before the collision with a stationary barrier have on

- the peak net force (maximum) acting on the person during the collision?
- likelihood of survival?

Develop and Use a Model to Explain the Data

With your class

Rearrange the equation to isolate the two variables that we saw were not changing.

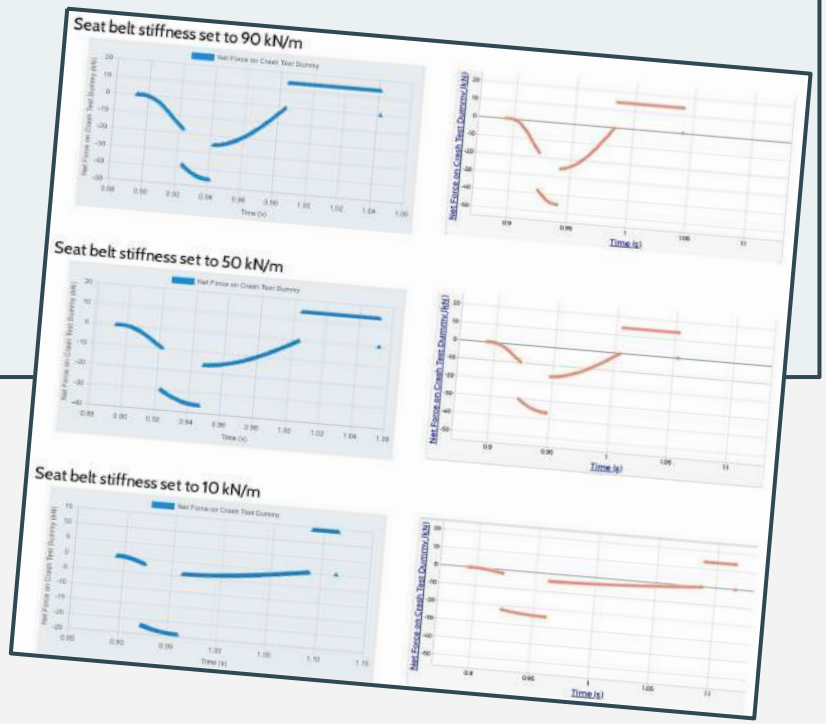
$$\Delta t = \frac{m \times \Delta v}{F}$$

$$F = \frac{m \times \Delta v}{\Delta t}$$

Develop and Use a Model to Explain the Data

With your class

How does this version of the equation help explain the patterns we see in these graphs?



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