

Crash Dummies

What happens to people in automobile collisions is important information for car manufacturers. Crash dummies are often used in collision studies. Velocity is one of the most important factors in such collision studies. In this experiment, you will study the relationship between car velocity and the distance a “crash dummy” is thrown during a collision. A Motion Detector will be used to measure car velocity. You will use a ruler to measure the distance a crash dummy is thrown.

OBJECTIVES

In this experiment, you will

- Measure velocity.
- Measure distances an action figure is thrown.
- Calculate averages.
- Graph the results.
- Make conclusions from your results.



MATERIALS

Your NETBOOK
Vernier Motion Detector
Ramp Set-up w/motion detector
ruler

LabQuest
car
Crash test dummy.
meter stick

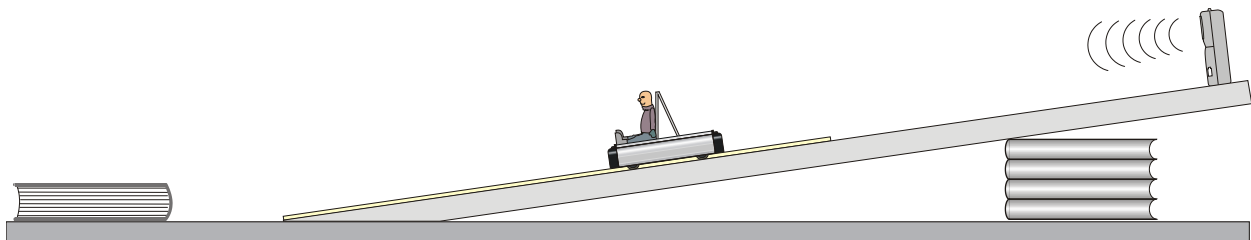
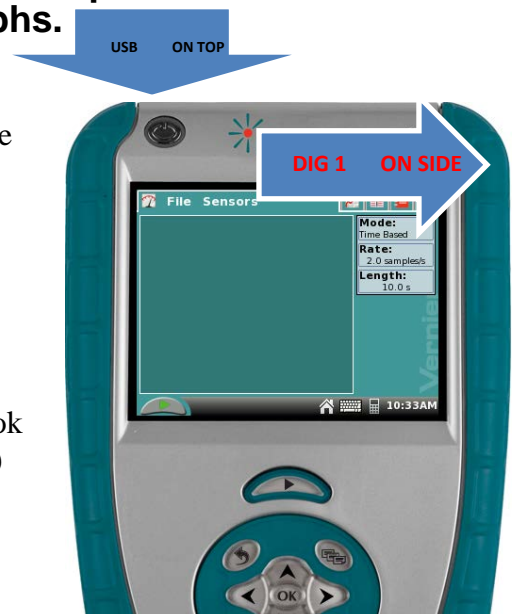


Figure 1

PROCEDURE (If you would like to connect your computer to the interface see your teacher. This will allow you to save your graphs.)

1. Prepare the ramp.
2. Set up a ramp the high end of the ramp should be 45 cm above the floor.
3. Make sure solid wall is on the 30 cm mark
4. Prepare a car for data collection.
5. Seat the action figure (crash dummy) in the car.
6. Plug the Motion Detector into the DIG 1 port of the LabQuest interface. (You can then connect the Labquest to your NetBook and the data will be collected there. SEE YOUR TEACHER.)
7. The LabQuest will auto recognize the sensor
8. Collect data.
9. Place your car on the ramp with its front wheels at the 40-cm line.



10. Tap the play button on the LabQuest (Wait for Data Collection to Start) and release the car.
11. Measure the distance the crash dummy was thrown (to the nearest cm). Record this value in Table 2. Measure from the ramp to the action figure. (Be consistent for all your tests)
12. Determine the velocity of the car. By analyzing
13. Repeat Steps 9-11 two more times.
14. Repeat Steps 9-11 at distances of 60 cm and 80 cm.

DATA

Table 1: Velocity (m/s)			
Release point	40 cm	60 cm	80 cm
Trial 1			
Trial 2			
Trial 3			
Average			

Table 2: Distance Thrown (cm)			
Release point	40 cm	60 cm	80 cm
Trial 1			
Trial 2			
Trial 3			
Average			

PROCESSING THE DATA

1. Calculate the average velocity for each release point. Show your work here. Record the results in Table
2. Calculate the average distance that the crash dummy was thrown for each release point. Show your work here. Record the results in Table 2.

3. Graph your results using the average values. Plot Velocity (in m/s) on the horizontal or x-axis and Distance Thrown (in cm) on the vertical or y-axis.

4. What happened to the velocity of your car as it was released from higher release points?

5. How did increased velocity affect the distance that your crash dummy was thrown?

6. Do you think there would be more serious injuries in a high-speed or a low-speed collision? Explain.

7. What is the purpose of seat belts?

EXTENSIONS

1. What would happen to the results if the wall would move or was soft? Explain?

2. Fasten the crash dummy into your car using a seat belt. Why are internal injuries and concussions still a large problem in car crashes, even with airbags and seatbelts?