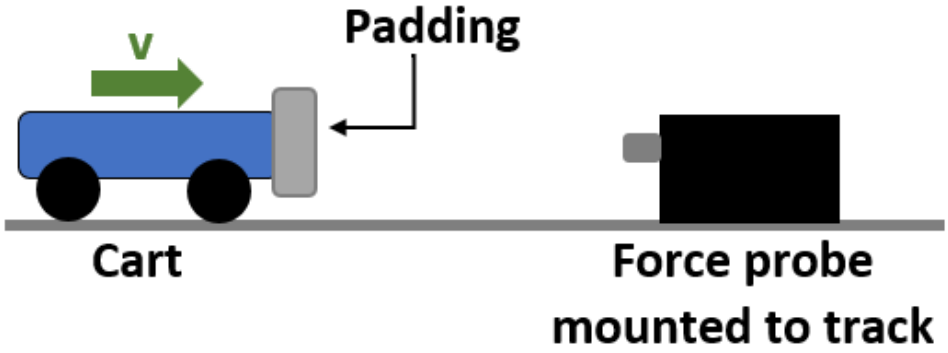
Engineering Safer Helmets

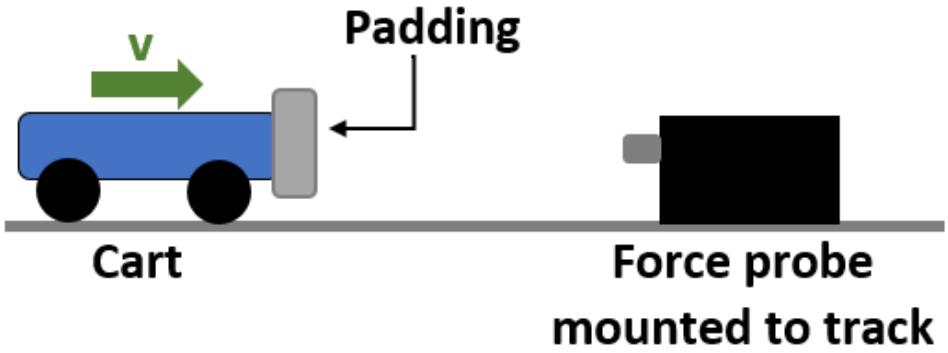
Activity 1: Designing the Experiment

Students wanted to explore ways of making football helmets safer. They decided to design an experiment in which a rolling cart could represent a moving football player. To represent the helmet, they placed different types of padding on the end of the cart that would crash into a force probe mounted to a track. The force probe would quantify the force exerted on the padding over the time of the collision. Four materials were tested as padding: styrofoam, solid rubber, a rubber air bladder (similar to a thick balloon), and polyurethane foam.



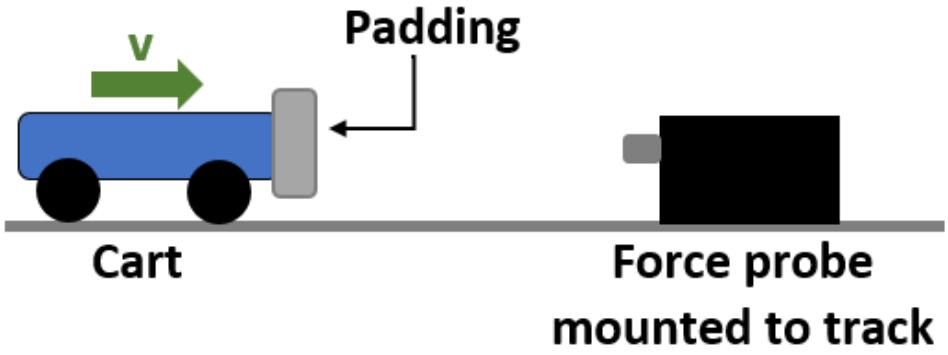
Activity 2: Testing Materials (MC)

Students wanted to explore ways of making football helmets safer. They decided to design an experiment in which a rolling cart could represent a moving football player. To represent the helmet, they placed different types of padding on the end of the cart that would crash into a force probe mounted to the track. The force probe would quantify the force exerted on the padding over the time of the collision. Four materials were tested as padding: styrofoam, solid rubber, a rubber air bladder (similar to a thick balloon), and polyurethane foam.



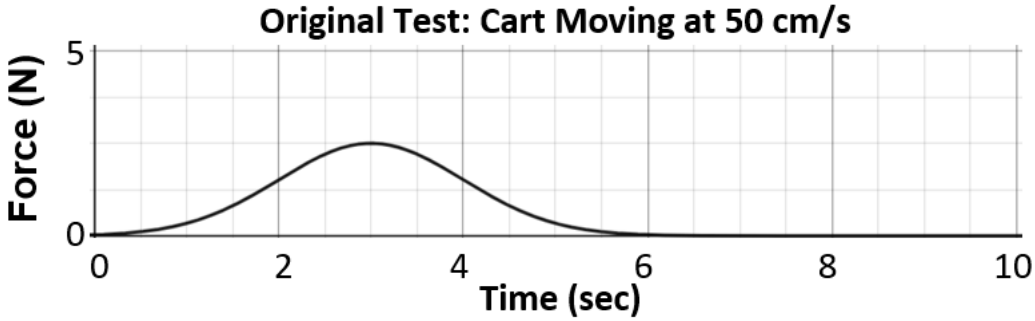
Activity 3: Evaluating Results

Students wanted to explore ways of making football helmets safer. They decided to design an experiment in which a rolling cart could represent a moving football player. To represent the helmet, they placed different types of padding on the end of the cart that would crash into a force probe mounted to the track. The force probe would quantify the force exerted on the padding over the time of the collision. Four materials were tested as padding: styrofoam, solid rubber, a rubber air bladder (similar to a thick balloon), and polyurethane foam.



Activity 4: Refining the Experiment (MC)

During an original test with polyurethane foam as a padding material, the force vs time graph recorded during the collision looked like the graph below. During the original test, the cart was initially moving at 50 cm/s and came to rest after the collision with the force probe.



The teacher now challenged students to refine their padding design in such a way so that when the cart moves **twice** as fast (100 cm/s) it would **not** experience a greater maximum force than it did in the original test.

