

## Nice Catch

### What is this about?

You have probably noticed that sometimes when you catch a hard thrown ball in the palm of your glove, it really hurts. Sometimes it doesn't. Have you noticed that when it really hurts, the ball often pops out of your glove? This activity will help you understand the physics of catching a baseball.

### What do I need?

Make a baseball pendulum out of about one meter of string and a ball. A thumbtack is an easy way to attach a string to the ball. You will also need a sponge, some tape, and a meter stick.

### What will I be doing?

You will tape the top end of the baseball pendulum to a wall. Then hold the ball out horizontally and release it. The ball will swing down and then bounce off the wall. You will try it again with a sponge taped to the wall.

### What do I think will happen?

Take a minute and write down a description of what you think will happen and why you think it. Will the ball bounce off the wall farther with the sponge or without it?

### What really happened?

1. Tape the top the baseball pendulum to the wall.
2. Hold the ball out horizontally and release it. It is important to release the ball from the same height every time.
3. Measure how far it bounces from the wall. You might want to try it several times and average.
4. Repeat this with the sponge taped to the wall.



Write a description of your results. In which situation did the ball bounce further?

### What did I learn?

You might have noticed that the ball bounces further without the sponge. This is because in collisions, hard objects tend to exert larger forces than soft objects. The sponge causes the collision to take more time and in the process require less force. Physicists usually talk about trading longer collision times for smaller forces in terms of the "Impulse-momentum Theorem." This is why seat belts are made of a slightly stretchy web material instead of solid steel. After a crash when you slam into the seat belt, it gives a little bit, which slows you down a bit more gently, taking more time and using less force.

### What else should I think about?

When you catch a baseball, you want to act like a sponge and increase the collision time to decrease the force on your hand. You do this by letting your arm move backward a bit as you catch the ball. Infielders call this having "soft hands." If you slow the ball down more gently, you will feel less force, and it will hurt less.