The Bounce of Playgrounds and Gym Floors

How does the surface of a gym, tennis court, or playground affect the bounceability of a ball? This activity allows you to investigate how balls bounce on different surface materials.

Stuff You'll Use:

▸various sports balls, including ping-pong balls, tennis balls, baseballs, and golf balls ▸different surfaces to bounce the balls on (such as carpet, grass, floor tile, ceiling tile, wood, cardboard, cork, foam pad, Styrofoam®) ▸meterstick ▸graph paper

What to Do:

1. Choose one ball from a variety for sports balls to be your test ball.
2. Look at and feel each of the different surfaces but don't bounce the ball on them yet. *On what surfaces do you think the ball will bounce best? Why?*
3. As a group, design an experiment to determine how different surfaces affect how high your ball bounces. Write your experimental design and create a data table to record your observations.
4. Conduct your experiment. Record the results in your data table and make a graph of your results using graph paper. *How do different surface affect how high the ball bounces? How do the results compare with your predictions? Why did the ball bounce better on some surfaces than others?*
5. Compare your results with those of others who used different balls.

How It Works:

What determines how high balls bounce on different surfaces? During the bounce, both the shape of the ball and the shape of the surface are deformed. The height of the bounce is determined by how much energy of compression is returned as the shape of both the ball and the surface go back to normal. Each ball type and surface type interact differently, producing a unique result.

Even so, some surfaces produce fairly consistent results with all types of balls. For example, all of the balls bounce on the foam pad because the foam deforms rather than the ball, acting much like a trampoline. In contrast, if the surface stays deformed as the Styrofoam surface may, then the energy that went into causing the deformation does not return to the ball. Rubber is an elastomer, which is characterized by its elasticity and flexibility. Elastomeric materials stretch and have the ability to recover with limited distortion.

When looking at which playground flooring to install, many factors have to be considered, including safety, accessibility, cost, and maintenance. In recent years, playground safety been an increasing concern. Playgrounds with climbing equipment often have wood mulch surfaces to break children's falls. Rubber mulch from recycled tires is also becoming popular for environmental reasons and because of its added capacity to break falls.

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More Fun?

Learn more about the physics and chemistry of bouncing balls. Terrific Science Press (www.terrificscience.org/sciencestore) offers the following books that include activities involving bounceability and elasticity:

- *Chain Gang: The Chemistry of Polymers*
- *Exploring Energy with TOYS*
- *Teaching Physics with TOYS EASYGuide Edition*