

# Inertia Zoom Ball

## Summary

In this hands-on activity, students see how force causes an object to change in motion. While the focus is Newton's first law of motion, the activity actually demonstrates all three laws of motion.

**Newton's first law of motion:** Objects at rest will stay at rest, and objects in motion will stay in motion in a straight line unless they are acted upon by an unbalanced force.

**Time Required** 45 minutes

**Group Size** 2

**Expendable Cost per Group** \$0 (common classroom and household items)

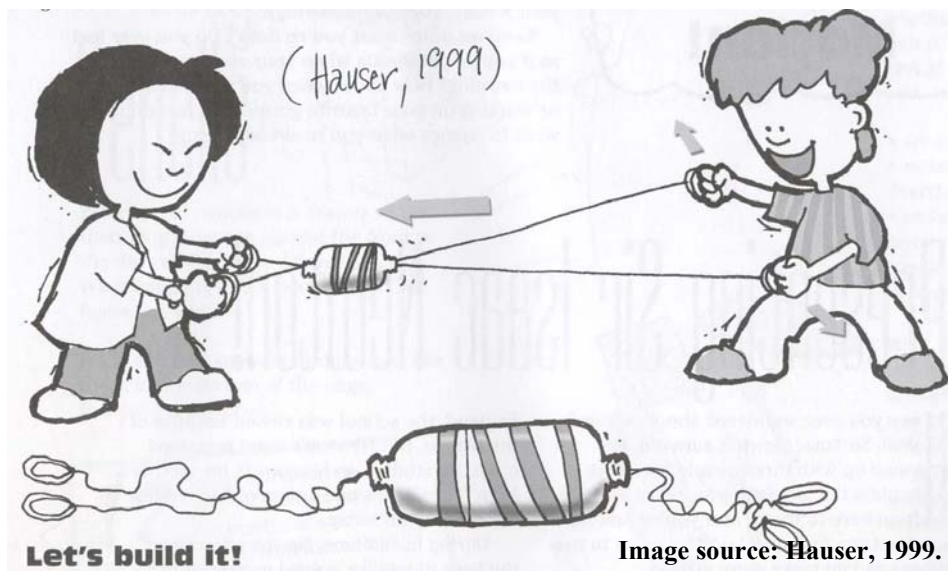
## Materials List

Each group needs:

- Two one-quart (1-liter) plastic soda bottles (ask students to bring them from home)
- Two 12-foot (2.4 m) lengths of string
- Two plastic-ring, six-pack holders (ask students to bring them from home)
- Colored construction paper and contrasting ribbons (optional)
- Scissors
- Masking tape

## Procedure

1. Cut the bottom off of all the soda bottles.
2. Tape the ends of two bottles together to form a football shape.
3. Pull two strings through the bottle so that they come through both necks.
4. Cut the six-pack holder rings apart to form four, two-loop handles.
5. If desired, the bottles can be covered with construction paper and ribbon spiraled around for decoration (tape to bottle).
6. Your zoom ball is ready to ZOOM!



7. Partners hold the two handles on each end of the string, pulling until it is tight (see diagram).

8. When the zoom ball is at one end of the string, the student pulls his/her hands apart to make the zoom ball slide down the string toward the other student. To move the zoom ball back, have the student hold his/her hands together. The students take turns moving their hands together and apart, causing the ball to zoom back and forth.
9. To illustrate the concepts of **Newton's second and third laws of motion**, have the students pull their hands apart at differing speeds; the faster they pull their hands apart, the greater the force exerted on the ball, which will make the ball zoom to the other end faster (second law: Force is equal to mass multiplied by acceleration). The third law of motion is also illustrated in that the action force they exert with their hands has an equal reaction force (the ball moving is the reaction).

### **References**

Hauser, Jill Frankel. Gizmos and Gadgets: Creating Science Contraptions that Work (and Knowing Why). Charlotte, VT: Williamson Publishing, 1999. (Activity adapted from Hauser.)