The Hammer Demonstration

Target Audience: Youth, Grades 7–12

The Hammer Demonstration
Target Audience: Youth, Grades 7–12

Description:
The Hammer demonstration is an inexpensive and shocking way to show bicycle helmet effectiveness. In this demonstration, a piece of wood represents a head.

The Hammer demonstration consists of striking a piece of wood two times. In the first strike, the piece of wood is struck with a hammer, leaving a divot in the wood. In the second strike, a piece of polystyrene foam (representing the protection of a helmet) placed over a piece of wood is struck with a hammer, causing the foam to break or crush, but protecting the wood from damage. (Image 1)

Objectives:
By the end of this session, student will be able to:
- ✓ Discuss the importance of wearing a bicycle helmet;
- ✓ Explain what the experiment taught them; and
- ✓ Explain why they should wear properly fitted bicycle helmets each time they ride a bicycle.

Room Set-up:
Gather students in a semicircle or to the side of the demonstration area. Allow an open space of at least 8' x 8' for the demonstration.

Materials:
- ✓ Bicycle helmet that is in good shape with no cracks, with Consumer Product Safety Commission (CPSC) sticker
- ✓ One hammer
- ✓ Eye protection for the person doing the demonstration (safety goggles)
- ✓ 3 inch × 3 inch × 1 inch soft wood blocks
- ✓ 3 inch × 3 inch piece of polystyrene foam insulation available from a building-hardware supply or craft stores (approximately 1 to 2 inches thick). A section of a foam picnic cooler can be used as well.

- ✓ **Handouts:**
  - ➤ ***Easy Steps to Properly Fit a Bicycle Helmet:***
    English: www.nhtsa.dot.gov/people/injury/pedbimot/bike/EasyStepsWeb/index.htm
    Spanish: www.nhtsa.dot.gov/people/injury/pedbimot/bike/EasyStepsSpan/index.htm
  - ➤ ***The Bicycle Helmet Pledge*** **(click here)**

Demonstration Steps:
Step 1: Introduction

A. Engage the students by asking:
- ✓ Who rides a bike?
- ✓ Who wears a helmet? Always? Sometimes?
- ✓ Has anyone ever been involved in a bicycle crash or known someone to be involved in a bicycle crash? Was he or she wearing a helmet?

- ✓ Who knows someone who hit his or her head hard and has had a concussion? If yes—any discussion?

B. Discuss falling off a bicycle:

- ✓ Many bicycle crashes are due to falls; children young and old, adults, and even experienced riders can fall off their bicycles. You never know when a crash will happen and that's why it is important to always wear a helmet when riding.

- ✓ Examples of why bicyclists fall/crash:
  - ➤ Learning to ride a bicycle for the first time or getting used to a bike;
  - ➤ Riding over road hazards (debris, gravel, wet leaves, or sand), damaged sidewalks or roads (cracks, pot holes, uneven roads);
  - ➤ Bicycle failure (flat tire, bad brakes, etc.);
  - ➤ Bicyclist's inexperience riding;
  - ➤ Motorists' unsafe driving behavior; or
  - ➤ Bicyclists' unsafe riding behavior.

Motorists' unsafe driving behavior: Motorists' driving behavior causes some crashes with bicyclists. Some examples include:

- ➤ Driving too closely to a bicyclist;
- ➤ Distracted/not paying attention (cell phone, etc.);
- ➤ Turning directly in front of a bicyclist;
- ➤ Opening a car door in the path of a bicyclist; or
- ➤ Failing to see or yield for a bicyclist.

Bicyclists' unsafe riding behavior: Bicyclists' riding behavior causes some crashes between bicyclists and motor vehicles. Some examples include:

- ➤ Riding on the wrong side of the road;
- ➤ Not paying attention;
- ➤ Failing to stop and look left-right-left when entering street from a driveway
- ➤ Failing to see or yield (stop) to traffic at road signs or signals; or
- ➤ Failing to ride in a in a predictable way, i.e., straight versus weaving between traffic.

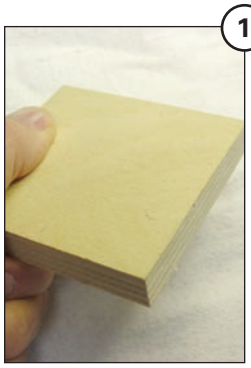
C. Discuss the purpose of the demonstration:

- ✓ Discuss why wearing a bicycle helmet is important, and
- ✓ Demonstrate how the helmet protects your head and brain.

Importance of wearing a bicycle helmet:

- ➤ Wearing a properly fitted bicycle helmet can protect your brain from injury and can possibly save your life.
- ➤ Helmets are 85- to 88-percent effective in reducing head and brain injury.
- ➤ Wearing a bicycle helmet is the single most effective way to reduce head injuries and fatalities resulting from bicycle crashes.
- ➤ A properly worn bicycle helmet cushions the head when it hits a hard surface such as a road or sidewalk; even from a hard impact on grass and dirt. The inner portion of a helmet is a crushable liner that absorbs and reduces the force of impact to the head.

- Always wear the proper helmet for bicycling; there are varying types of helmets for different sports. Each helmet is designed based on a particular sport. There are some helmets designed for multi-sport use; make sure the helmet label reads the helmet is suitable for bicycling.
- A proper bicycle helmet should include a manufacturer's label on the inside of the helmet stating the helmet meets the CPSC safety standards. (Image 1)



The demonstration will show:

- What can happen to your head and brain when you crash.
  - The piece of wood will simulate the human head—it is more fragile than one might think. (Image 2)
  - If your head hits a hard surface it could crack and your brain would be injured.
- How a bicycle helmet helps protect the head and brain from severe injury.
  - The helmet is represented by a piece of foam. (Image 3)
  - The foam will protect the board when it is struck.

Step 2: Pass Around Helmet

A. Pass a helmet around and point out the non-cracked hard outer skin and undamaged foam inner core. Explain that a properly worn bicycle helmet cushions and protects the head from damaging impacts with hard surfaces such as asphalt and concrete. The inner portion of a helmet is a crushable liner that absorbs and reduces the force of impact to the head. These features along with the helmet being properly fitted make up your best piece of safety equipment when riding a bike.

B. Helmets are 85- to 88-percent effective in reducing head and brain injury. Wearing a bicycle helmet is the single most effective way to reduce head injuries and fatalities resulting from a bicycle crash.

C. For a helmet to provide protection it must be worn properly.

Step 3: Ask for a Volunteer (optional)

Choose a volunteer who you think can safely use a hammer.

Step 4: First Strike (without foam "helmet")

A. Ask what do they think will happen when the block of wood is hit with the hammer? (Field the students' responses.) You could ask something like, "When you fall on your head it is like the street is hammering your head?"

B. Explain that the piece of soft wood represents a head.

C. Ask those in the class not wearing eyeglasses to put on their eye protection. If there are not enough goggles or other eye protection for the class (Image 4), ask students who are not protected to step away from the demonstration area. Lay out the wood block. Strike the wood hard with the hammer or have the volunteer do so.

D. Strike the wood. (Image 5)

Step 5: Discuss Outcome

A. The wood will have a depression in it. Pass around the wood so everyone can see and feel the depression. You can say something like, "That sure would do a lot of damage if it had been my brain." (Image 6)

B. Discuss that heads are fragile; when a head hits a hard object or surface it may crack, causing permanent brain damage. If there isn't a big divot in the wood, explain it doesn't mean that a head would not have been damaged or that it isn't severe. If we hurt the outside of our bodies, we may see some bleeding, or bruising that indicates there may be some bleeding underneath the tissue. While the head can bleed if you hit it, or swell if bumped on a kitchen cabinet, for example, this is different. The impact on your head is a lot more forceful when associated with an impact sport where helmets are worn, such as bicycling, hockey, or football. If your head hits during these sports, without the protection of a helmet, you may not see any damage to the outside; but there could be damage on the inside that isn't obvious. Untreated swelling inside the head can cause permanent brain damage or even death.

   Note: Anytime a young person hits his or her head hard an adult should be told, and a doctor should check the person out to see if there is swelling to the brain and a possible concussion. The doctor can instruct the adult on signs to look for at home for 24 hours after the impact that could indicate swelling and need for additional medical attention.

C. Discuss brain damage what it means and how it changes a life.

Step 6: Second Strike (with foam "helmet")

A. Turn the wood block over and show the clean surface to the class. (Image 7)

B. Explain that the lining of a bicycle helmet is made from a special plastic called expanded polystyrene foam.

C. This material is often used for coffee cups or protective packing material for things like TV sets and foam picnic coolers. It's filled with millions of little cells. When you push hard on it the crush slowly absorbs the energy being applied.

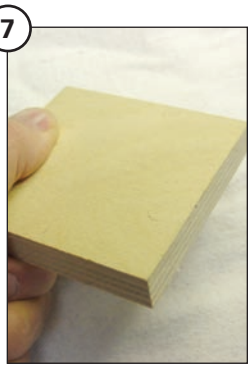
D. Explain that the foam will protect the wood just as the helmet will protect a head.

E. Place the foam over the wood. (Image 8)

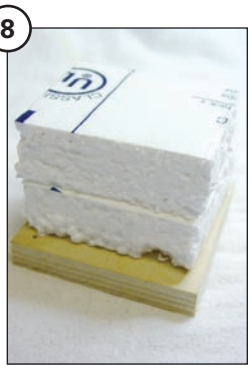
F. Repeat the first strike. (Image 9)

6

7



8



9


10

Step 7: Discuss Outcome

A. The foam will have broken or indented and the wood will not have a divot. If it does it will be very small.

B. Explain that this demonstrates how a head is protected by a helmet that absorbs the force of the hit. If the wood has a small divot you should note that even with a helmet, heads can get injured. The severity of the injury will be reduced by a helmet.

C. Explain that helmets are meant to absorb this kind of force only once. A helmet with compressed foam or cracks should be replaced because it will not protect your head. Replace any helmet that has been involved in a crash where the head hit a hard surface.


11

Step 8: Summary Discussion

A. Every person (young and old) riding a bicycle should wear a helmet on every ride.

B. A helmet should be worn and secured properly. Discuss the basics of properly fitting a bicycle helmet:
- ✓ Helmet should fit level on the head (one to two fingerbreadths above eyebrow). (Image 10)
- ✓ Helmet straps should form a "V" under the ears. (Image 11)
- ✓ Helmet straps must be buckled tight enough so no more than two fingers can fit between the chin and the strap. (Image 12)
- ✓ When adjusted, the helmet should not move more than about an inch in any direction. (Image 13)


12

C. Since the naked eye cannot always see crushed foam or a crack in a helmet, a helmet that has been involved in a crash where the head struck a hard surface should be replaced. For the most recent recommendations on helmet replacement go to: www.helmets.org/replace.htm.

Optional: Pass your helmet around to the class, pointing out the outside and inside of the helmet that protects the head. Both the inner and outer shell of the helmet needs to be inspected after a crash. If your helmet has been in a crash, the helmet needs to be replaced because partly crushed foam or small cracks in the lining reduce the protection for your head and brain. You should never use a cracked or otherwise damaged helmet because once damaged it isn't able to do its job to protect you.


13

D. Certified and Proper Helmets:
- ✓ The CPSC sticker tells the consumer that the manufacturer of the helmet certifies the helmet meets the safety standards established by the CPSC.
- ✓ There are different helmets for different sports.
  - ➤ Make sure the helmet you buy is for bicycling; there are varying types of helmets now for different sports. Each helmet is designed based on the particular sport.
  - ➤ Some helmets are designed for multi-sport use; read the label inside the helmet to make sure you are buying one suitable for bicycling.

Step 9: Discuss and Provide Handout Materials:

A. Easy Steps to Properly Fit a Bicycle Helmet: Include this handout in each child's take-home material for the day and encourage the child to share this with family and friends. This handout provides the child and parents/caregivers with step-by-step instructions on how to fit a bicycle helmet.
English: www.nhtsa.dot.gov/people/injury/pedbimot/bike/EasyStepsWeb/index.htm
Spanish: www.nhtsa.dot.gov/people/injury/pedbimot/bike/EasyStepsSpan/index.htm

B. The Bicycle Helmet Pledge: The helmet pledge serves as a commitment that students promise to wear bicycle helmets every time they ride. Everyone should encourage family members and friends to be safe as well.
   - ✓ Encourage them to make the commitment and to sign it before the end of the session.
   - ✓ Include a blank copy of this handout in each student's take-home material.

Step 10: Discussion of Properly Fitted Bicycle Helmet

A. Explain step-by-step how to properly fit a bicycle helmet, using the handout as your guide.

B. Emphasize that many who wear bicycle helmets wear them incorrectly. The most common mistakes are:
   - ✓ Wearing the helmet too high or too low on the forehead. The helmet should be no more than one to two fingerbreadths above the eyebrows (demonstrate based on picture in handout).
   - ✓ Not buckling the helmet.
   - ✓ The strap under the chin is not tight enough so the helmet doesn't remain in place when someone falls. (The strap should be tight enough so not more than one to two fingers fit under it when it is buckled.)

Other Helpful Resources:

A. How to Fit a Bicycle Helmet Streaming Video. This video shows how to select and correctly wear a bicycle helmet. Available on the NHTSA Web site at: www.nhtsa.dot.gov, under traffic safety, bicycles. Available in English or Spanish.

B. Ride Smart. It's Time to Start. This 10-minute video is part one of a two-part series. It discusses the importance of wearing a bicycle helmet and is presented by middle-school-age youth. The video may be viewed on NHTSA's Web site or ordered through e-mail: www.intraweb@nhtsa.gov.

C. Bike Safe. Bike Smart. This 10-minute video is part two of a two-part series. It discusses the importance of wearing a bicycle helmet and is presented by middle-school-age youth. The video may be viewed on NHTSA's Web site or ordered through e-mail: www.intraweb@nhtsa.gov.

Helmet Replacement:

For the most recent recommendation on helmet replacement see: www.helmets.org/replace.htm.

Bicycle Helmet Site:

For the most up-to-date information on bicycle helmets see the Bicycle Helmet Safety Institute: www.helmets.org.