

SKILL-BASED ACTIVITY **Bicycle Helmet Function**

Timeframe

Beginner: up to 15 minutes **Intermediate**: up to 10 minutes Advanced: up to 10 minutes

Objective

At the conclusion of the activity, the student will be able to:

1. Accurately describe how a properly fitted bicycle helmet protects the brain, as measured by successful completion of the Bicycle Helmet Function worksheet. (Cognitive)

National Standards Standard 2

Standard 4

Equipment

- · A cracked helmet from a previous crash (optional)
- · Consumer Product Safety Commission (CPSC) brochure: Which Helmet for Which Activity?
- http://www.cpsc.gov//PageFiles/122399/349.pdf
- · A bicycle helmet with Consumer Product Safety Commission (CPSC) safety label
- A multi-use helmet with CPSC label (optional)
- · Pencils
- Bicycle Helmet Function worksheet

Teacher Overview This activity helps students understand what happens to the brain when it is injured and how bicycle helmets are constructed to help prevent injuries. A visual demonstration of the effectiveness of a bicycle helmet in protecting the brain from injury can be performed as part of this activity to reinforce discussion points.

Preparation

- 1. Determine if there is a state or local bicycle helmet law/regulation/ordinance that affects students and include in the lesson. For state laws see: http://www.bhsi.org/mandator.htm; for local laws, search for bicycle laws and your county or contact local law enforcement.
- 2. Make appropriate number of copies of Bicycle Helmet Function worksheet.

Directions

1. Introduce this activity using the following prompt:

Today, we will be learning how a helmet works and how it helps protect your brain. To better understand why it is so important to protect your brain from injury, we are also going to learn what can happen if your brain is injured.

2. Use the following sample questions to prompt students' thinking about the content in this activity.

Q: What is the purpose of a bicycle helmet?

A: Any of the following:

- · A bicycle helmet reduces the risk of a brain injury.
- · Other answers may be accepted.

Q: How does a helmet protect your head if you crash?

A: Any of the following:

- The helmet absorbs the crash forces instead of your brain.
- · Other answers may be accepted.

Q: Why should you wear a helmet every time you ride?

A: Any of the following:

- A crash can happen at any time regardless of rider skill or length of a trip.
- · Other answers may be accepted.
- Discuss brain injuries and the importance of prevention. The information provided supports this discussion; adjust as needed based on the age/developmental level of the students. The point to emphasize to students is for them to tell an adult or have a friend tell an adult, if they hit their head. Additional information about brain injuries and how to prevent them can be obtained from the Centers for Disease Control and Prevention at: http://www.cdc.gov/TraumaticBrainInjury/index.html.

How does the brain get hurt?

Most brain injuries in children occur because of falls, car crashes and bicycle/sports injuries. Sometimes a child hits his head hard enough to hurt the brain inside. The brain can be damaged if it bounces against the inside of the skull. When this happens a person can have trouble doing things they were able to do before.

What happens if your brain is hurt?

Anytime your brain is hurt, your ability to do things you normally do will be affected. If a brain injury is suspected, you need to go to the emergency room so a medical professional can assess you. You might need special pictures taken like a CT (computed tomography) scan or an MRI (magnetic resonance imaging) to make certain you do not have a serious injury like a fracture or bleeding in your brain. Brain injuries can be very serious and may result in death if not treated. Even if you do not have a serious brain injury, you may have a concussion. A concussion is also an injury to the brain, but to a lesser degree and often there is no visible sign of injury to the head. Loss of consciousness may or may not happen. The best treatment for a concussion if rest. The brain can be hurt so seriously that you could be unconscious for several hours, days or permanently. This is a called a coma.

What happens after a brain injury?

Since your brain controls everything you think and do, a brain injury may cause your brain to "forget" how to do some things, like talk, walk, eat, remember things, understand other people's conversations or do physical activities – like riding a bicycle. Your brain sends messages to the rest of your body to allow it to carry out these skills; sometimes these skills have to be relearned following a brain injury. Most people fully recover from a "mild" brain injury like a concussion. Recovery from moderate to severe brain injuries can take many months to years. With very severe brain injury, a person can die. Most people who die from head injuries resulting from bicycle crashes were not wearing a helmet at all or were wearing it incorrectly. The best way to protect your brain is to wear a properly fitted helmet every ride.



Is It a Concussion?

www.cdc.gov/concussion/signs_symptoms.html

SYMPTOMS OF CONCUSSION USUALLY FALL INTO FOUR CATEGORIES:

Thinking/ Remembering	Physical	Emotional/ Mood	Sleep
Difficulty thinking clearly	Headache Fuzzy or blurry vision	Irritability	Sleeping more than usual
Feeling slowed down	Nausea or vomiting (early on) Dizziness	Sadness	Sleep less than usual
Difficulty concentrating	Sensitivity to noise or light Balance problems	More emotional	Trouble falling asleep
Difficulty remembering new information	Feeling tired, having no energy	Nervousness or anxiety	

Some of these symptoms may appear right away, while others may not be noticed for days or months after the injury or until the person starts resuming their everyday life and more demands are placed upon them.

What to do if a concussion is suspected:

- · Stop the activity
- · See a medical provider for evaluation
- In rare cases, a dangerous blood clot may form on the brain in a person
 with a concussion and crowd the brain against the skull. Seek immediate
 help from a health care professional or emergency department if any of
 the following danger signs appear after a bump, blow or jolt to the head
 or body.
- Serious symptoms requiring immediate medical attention (contact a medical professional) include:
 - · Headache that gets worse and does not go away.
 - · Weakness, numbness or decreased coordination.
 - · Repeated vomiting or nausea.
 - · Slurred speech.
 - · Looks very drowsy or cannot be awakened.
 - One pupil (the black part in the middle of the eye) larger than the other.
 - · Convulsions or seizures.
 - · Cannot recognize people or places.
 - · Getting more and more confused, restless or agitated.
 - · Unusual behavior.
 - Loss of consciousness (a brief loss of consciousness should be taken seriously and the person should be carefully monitored).
- 3. Discuss the different types of helmets.

The following information is meant to support this discussion. Adjust what is shared as needed for the age /developmental level of the students.

- Helmets for Different Activities: There are different types of helmets for different types of activities. Helmets are specifically designed to protect the brain from injuries associated with specific sports. It is important to use the right helmet for the right sport to protect the brain appropriately from injury. You would never wear a football helmet to go bicycling. Some multi-use helmets are suitable for use with bicycling. The manufacturer's label will state this specifically.
- For additional information see the Consumer Product Safety Commission (CPSC) brochure: Which Helmet for Which Activity at: www.cpsc.gov//PageFiles/122399/349.pdf



Helmet Effectiveness Demonstration. Performing a demonstration of the effectiveness of a bicycle helmet in protecting the brain from injury can be included in this activity to visually reinforce the information that has been provided to students. Several examples of projects to accomplish this can be found in the NHTSA Demonstrating Helmet Effectiveness—A How-to Guide at: www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811110.pdf.

4. Discuss safety certifications used for bicycle helmets.

Share age/developmentally appropriate information regarding bicycle helmet safety standards, including the minimum safety standard established by the Consumer Product Safety Commission (CPSC). For additional information about bicycle helmet safety standards, see the Bicycle Helmet Safety Institute (BHSI) at: http://www.bhsi.org/.

Consumer Product Safety Commission (CPSC) Safety Standard:

Beginning in March 1999, all bicycle helmets sold and manufactured in the U.S. have to meet the Consumer Product Safety Commission (CPSC) bicycle helmet safety standard, to ensure a minimum level of protection against head injury. This safety standard addresses:

- · Head impact protection in a crash: G-forces must be below 300g.
- Instruct students to always look for the sticker that says the helmet meets CPSC safety standards.
- · Show students a helmet with the sticker and have students find the sticker on their helmet.
- Children's helmets and head coverage: CPSC standard has two categories of helmets:
 helmets intended for persons older than one year and helmets intended for persons
 older than five years. The first category applies to young children and the second to
 older children and adults. The only difference in the requirements for these two
 categories is in head coverage. The helmets intended for young children are subject to
 impact testing over a greater area of their surface.
- · Chin strap strength
- Helmet stability
- Peripheral vision
 - 5. Discuss replacing helmets.
 - Bicycle helmets are designed to be replaced after a crash, even if you can't see the damage.
 - If a helmet has even slight damage and is not replaced, it will not protect the brain from injury if the user is in a crash.
 - Slight damage or small cracks may not be noticeable to the naked eye. If you fall and hit your head, replace the helmet.
 - **6.** Discuss how helmets are constructed to protect the brain from injury.

The information below is meant to support this discussion. Adjust what is shared as needed for the age/developmental level of the students. To reinforce the construction of the bicycle helmet, an option is to show students a bicycle helmet that has been involved in a crash, if one is available.

• Front and back of helmet: The front and back of the helmet protect the various parts of the brain (the frontal lobe, occipital lobe and the cerebellum) from impact. Make sure the helmet is level on the head and low on the forehead, no more than two finger widths above the eyebrow, to fully protect the frontal lobe.



Reminder: Crash and Trash or One and Done.

Other Helmet Safety Standards

skating, skiing and downhill bicycle racing.

American Society for Testing Materials (ASTM): Prior to the CPSC standard, the ASTM1447 standard was the most widely used bicycle helmet safety standard in the U.S. Both standards are basically identical except that the ASTM standard is voluntary. Manufacturers can label the helmet as meeting the ASTM1447 standard without having to verify with independent testing. Bicycle helmets are often still labeled as meeting the ASTM1447 standard in addition to having the CPSC label. The ASTM standard for biking and recreational inline skating are identical. Aggressive skating and skateboard helmets have their own ASTM standard designed for multiple hits with lesser impact severity. ASTM has other standards that are currently used for helmets for other activities such as

American National Standards Institute (ANSI): The ANSI standard for bicycle helmets was a common standard in the mid-1980s through the early 1990s. However as of 1995, the ANSI standard was considered to no longer be a valid certification standard. Some helmets may continue to be labeled as meeting the ANSI standard, however it is best practice to ignore these labels and look for one of the currently recognized standards.

Snell Memorial Foundation (Snell): Snell helmet safety standards have stricter head impact levels higher than other standards for helmets for a variety of different activities such as motorcycle, bicycle, equestrian, ski and others. Snell also collects helmets from the retail setting for additional follow-up testing to ensure the standard is being followed as a manner to ensure quality control. Manufacturers pay additional money for Snell testing, which is then passed on to the consumer. The Snell standard is usually found on higher-end helmets and generally considered to be a stricter standard. However, there is debate over the types of impact best suited for those helmets with the Snell standard. In order to perform at higher head impact levels the foam needs to be quite stiff resulting in less protection at lower impact levels where the stiffer foam may not crush at all. Ultimately, the type of bicycle riding that will occur should be a good indicator of the necessary standard. There are three basic Snell bicycle helmet standards.

- 1. Snell B90: This standard is very similar to the CPSC standard.
- 2. Snell B95: This standard resulted from a revision to the B90 standard in that it requires more head coverage and has slightly higher head impact drop heights.
- 3. Snell B94: This standard is a true multi-sport standard for non-motorized activities that involve speed, balance and agility. A helmet certified for only bicycling will not provide the necessary protection for activities such as aggressive in-line skating and skateboarding. The opposite is true as well because of the different types of potential injuries with each of these activities. However, the N-94 standard requires that the helmet pass multiple impact tests to the back of the helmet as well.

- Shell: The outer shell of a helmet should be smooth, hard and slick to limit sliding resistance with the road. This will help to decrease the risk of spinal cord injury that may occur if the helmet does not slide smoothly on the road surface.
- Foam: The foam reduces the peak energy of a sharp impact to the head and brain by crushing in on itself. As the foam crushes, it converts a small part of the crash energy to heat and, most importantly, slows the stopping process. When the foam is crushed to its limit, the rest of the impact energy is passed on to the head and brain. The foam does not bounce back because this would make the impact worse. Crushing the cell walls destroys the impact management ability for most stiff foams, so the helmet has to be replaced after a single impact, even if there isn't visible damage. The foam can also recover some of its thickness over a period of hours, but not its ability to manage impact. Helmets should always be disposed of after a single impact.
- Straps, adjuster and chin buckle: The bicycle helmet straps, adjuster and chin buckle keep the helmet from moving during a crash and exposing the head to impact. If the straps and adjuster are not positioned properly, the bicycle helmet will not stay in the correct position on the head.
- Pads and universal fit mechanism: The pads and/or universal fit
 mechanism are used to ensure that the helmet fits on the head snugly.
- **Vents**: The bicycle helmet vents encourage air flow, to help prevent overheating.

7. Explain helmet laws.

Use the information below supplemented with information about the existence/non-existence of bicycle helmet laws specific to the location in which the lesson will be taught. Adjust what is shared as needed for the age/developmental level of the students.

- State Law: Bicycle helmet laws vary among states and cities.

 A state may have a statewide helmet law for certain ages; or cities may have local ordinances with stricter laws. Know your law. For the most updated list of laws, see: http://www.helmets.org/mandator.htm
- Local Law: Discuss with students if there is/is not a law/regulation/ordinance that requires people of a certain age to wear a bicycle helmet. Note: Local laws can be enacted in the absence of a state law or can be stricter than the state law. Schools can also require students bicycling to school to wear helmets. Discuss with students, in the absence of helmet laws for adults, why adults should also wear a helmet every ride.





For specifics to your state laws, use a search engine for bicycle helmet laws plus your state.

Helmet Law Limitations

Bicycles are associated with more injuries and deaths than any other consumer product other than the automobile. This suggests the important role that safety plays when riding a bicycle. You can play a pivotal role in reducing injuries and deaths associated with bicycle crashes, by reinforcing the use of a bicycle helmet by everyone, every ride. Bicycle helmet laws predominantly address children under 16 years of age. States and localities often enact child-specific laws because they tend to pass easier and adults are more likely to support laws designed to protect children. Unfortunately, this often gives the false impression that only young children are at risk for a bicycle-related injury. This continues to be reinforced as helmet usage tends to decrease with age. Everyone regardless of age and skill level should always wear a bicycle helmet on every ride. You may wish to initiate a be a "Roll" Model campaign to encourage youth to engage their peers and their parents/adults to be "roll" models when bicycling and driving around bicyclists.

For more information on this campaign see NHTSA's site: www.nhtsa.gov/Driving+Safety/Bicycles/Be+a+Roll+Model.

Assessment

Divide students into groups of two to three.

Instruct students to work in groups of two or three to complete the *Bicycle Helmet Function* worksheet.

Safety

None

Differentiating Instruction

Adapted

· Discussion should be sensitive to students who may have a brain injury.

Beginner

 The visual demonstration may help younger or visual learners and beginner bicyclists better appreciate the need to properly wear a bicycle helmet.

Intermediate and Advanced

Incorporate information on how bicycle safety standards are tested.

Best Practices

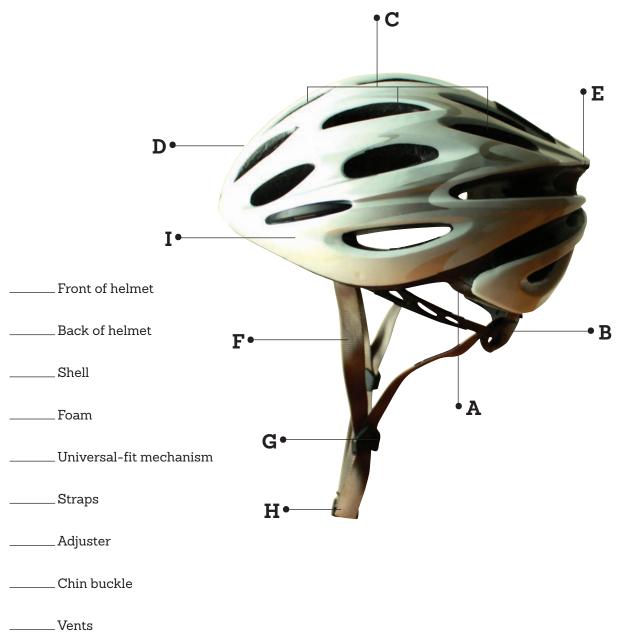
- **1**. Teach this activity during health to provide more time for on-the-bike instruction in the physical education classroom/gym.
- **2.** Discuss the importance of always removing helmets prior to play on playground equipment to prevent serious injury.
- 3. For additional information, see:
 - Consumer Product Safety Commission warning www.cpsc.gov/CPSCPUB/PREREL/PRHTML99/99065.html
 - Which Helmet for Which Activity www.cpsc.gov/PageFiles/117293/349.pdf
 - CPSC Safety Alert about Bicycle Helmets and Playgrounds www.cpsc.gov/en/Newsroom/News-Releases/1999/After-Recent-Death-CPSC-Warns-Against-Wearing-Bike-Helmets-on-Playgrounds

BICYCLE HELMET FUNCTION WORKSHEET



Student Date

Directions: Please correctly label the bicycle helmet parts by matching the letter on the helmet with the part listed on this worksheet. After labeling, please explain the function of each part of the helmet.



BICYCLE HELMET FUNCTION WORKSHEET

ANSWER KEY

- A Foam
- **B** Universal-fit mechanism
- **C** Vents
- **D** Front of helmet
- E Back of helmet
- F Straps
- **G** Adjuster
- H Chin buckle
- I Shell

