



Curiosity Guide #304

Football Science

Accompanies Curious Crew, Season 3, Episode 4 (#304)

Design a Helmet for a Water Balloon

STEM Challenge

Description

Design, test, and improve protection for your water balloon!

Materials

- Water balloons
- Syringe
- Water
- Marker
- Cardboard
- Cotton balls
- Styrofoam cup
- Egg cartons
- String
- Rubber bands
- Tape
- Paper towels
- Bubble Wrap
- Foam peanuts
- Tissues
- Halves of plastic eggs

Procedure 1: Designing and making the prototype

- 1) Using a syringe, fill up several water balloons with 40 ml of water.
- 2) Tie the balloons closed.
- 3) Draw a face on each water balloon with a marker.
- 4) Design and make a helmet and chin strap that will protect the water balloon when dropped or crushed. The face must be visible.

Procedure 2: Testing and adjusting the design

- 1) Take your water balloon and helmet outdoors.
- 2) Strap on the helmet and drop it from different heights.
- 3) Did your design work? Could you prevent the water balloon from breaking?
- 4) Try redesigning the helmet prototype to improve its efficiency.

My Results

Explanation

Can you imagine a football game without helmets? The first players wore no protection at all. The first helmets were made of leather in 1893 and were worn by Navy players in the Army-Navy game. Leather head harnesses were created in 1896. Helmets didn't really catch on until 1939, when players were required to wear them.

Plastic helmets were used after World War II, but these were brittle. Players could go through as many as nine helmets in a season! In time, engineers used better plastics, added facemasks, chin straps, and internal padding to try to protect the players during the game.

Football helmets are intended to protect the players by preventing concussions, teeth being knocked out, and cuts to the face. Today's helmets have a hard, outer shell that deflect some of the force during a collision. The soft padding helps to absorb that force. Sometimes the force is absorbed with small air bags or elastic materials. To protect the face, the helmet is fastened with a facemask. Finally, a good chinstrap will keep the helmet secure.

The player's position determines the style of the facemask. Some players, like the quarterback, need to see well but still need to protect their jaws, while linemen need their entire faces covered. Does your water balloon helmet have similar features?

More to think about: Like many sports, players must be careful about getting hurt during a football game. One potential injury is from a concussion. This happens when a player hits his head and the brain continues to move forward, striking the bones of the skull. Such an injury can hurt the brain, and requires the player to come out of the game.

One way scientists are monitoring such collisions is with shock sensors in the player's helmet. During a collision, the sensor sounds an alarm so that the player and coaches know he should see the sports doctor. It's great that science can help more football players stay healthy!

Curious? Find out more: Use the search function in your computer's browser to learn more about football helmets and player injury. Type in words like "concussion football helmet" and "football helmet sensors" to explore the world of head protection and football.

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