



Curiosity Guide #507

Soccer Science

Accompanies Curious Crew, Season 5, Episode 7 (#507)

Knuckleball

Investigation #8

Description

Show

Materials

- Soccer ball
- Soccer field line
- A friend or camera with tripod

Procedure

- 1) Have a friend stand behind you or set up a camera in line with the field line.
- 2) Place the ball on the line and try to do a knuckleball. A knuckleball kick is a kick with very little spin. This causes the ball to travel in a zigzag trajectory.
 - a. Pace back four steps from the ball.
 - b. If you kick with your right foot, move two paces to the left. If you kick with your left foot, move two paces to the right.
 - c. Run up straight to the ball without curving.
 - d. Strike the ball just under its center, but not too low, to get an underspin.
 - e. Contact the ball with the 3 eyelets on top left of your shoe if you are kicking with your right foot; go for top right if you are a leftie.
 - f. Slightly lean your upper body over the ball during contact.

- g. Limit the contact with the ball so there isn't much follow-through.
- h. Ask your friend, "What did you notice about the path of the ball?" Or watch the footage from the camera and ask yourself the same question.

My Results

Explanation

The knuckleball is a pitch in baseball but works the same way with a soccer ball. The goal is to keep the ball from rotating when released or kicked. With careful foot placement, the ball will start off in a straight path, but then may move unpredictably through the air. As the ball travels through the air, the ball is colliding with air particles, some of which deflect around the ball in a nice laminar flow. Other air particles lift the ball or collide with the ball and its stitches, making the flow more turbulent. That turbulence subtly moves the ball in a different direction, even as much as the diameter of the ball itself.

The challenge for a goalie is being able to predict where the ball is traveling in order to intercept it. Try practicing the technique to see if you can perfect the knuckleball and improve your game.

Extend your learning. Who knew there was so much great science in soccer? From the concepts of juggling, throwing, parrying, kicking, and controlling ball spin, to running with traction and ball design, players interact with many different science principles. So, the next time you're watching or playing soccer, see if you can identify some of these science concepts yourself. Remember stay curious and keep experimenting!

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