

PROTECT YOUR BRAIN

LESSON PLAN

Title: Protect Your Brain

Setting: In Classroom

Subject: Biology - Neuroscience

Grade Level: K-5

Time Frame: 30 Minutes

Paired Dana Foundation Fact Sheets:

3rd-5th Grade How Does the Brain Work?

Next Generation Science Standards:

Meets 4-LS1-1

STUDENT OBJECTIVES

- Learn about the ventricular system.
- Discover the various protective factors for the brain.
- Understand the importance of providing extra protection for such a sensitive and important organ.

BACKGROUND

The brain and spinal cord make up the central nervous system (CNS), and the CNS regulates everything that we do. It controls all of our motor and respiratory functions, mediates our senses (sight, smell, hearing, taste, touch), and allows us to form memories and process complex thoughts and emotions. This important system is highly sensitive to injury, but a few properties exist to help protect it, one of which is cerebrospinal fluid (CSF).

This popular and engaging Mr. Egghead activity teaches kids the importance of our two levels of protection for the brain—the skull and the cerebrospinal fluid. The raw egg in this exercise represents our brain while the specimen cup is our skull. One “brain” will be surrounded by water, which acts as the cerebrospinal fluid cushion, while the other will lack this protective barrier. Student volunteers will be asked to demonstrate the significance of the CSF in keeping the brain safe during sudden impact to the head.

MATERIALS

- Printed copies of 3rd-5th grade Dana Foundation fact sheet, “How Does the Brain Work?” **Downloadable here:** www.dana.org/factsheets
- Audio and visual capacities for a PowerPoint presentation.
- Two raw eggs
- Two specimen containers with lids. **You can search Amazon for “Specimen Cups with Lids 4 oz.”**
- One cup of water

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TEACHER BACKGROUND INFO

WHAT TO KNOW BEFORE YOU TEACH

* Note: This content is primarily for the instructor's reference; the accompanying PowerPoint presentation will be for the students.

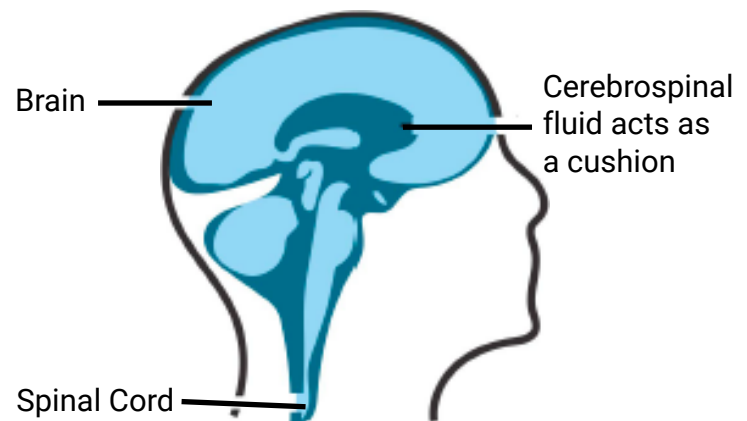
The Ventricular System

What is cerebrospinal fluid (CSF)? CSF is a clear, colorless fluid that is produced by the brain. It helps cushion the central nervous system (CNS) and protect it from mechanical and immunological injuries. For instance, the CSF acts as a shock absorber for the brain when you sustain sudden impact, minimizing damage incurred to your soft brain tissue from the hard bony ridges of your skull.

Common Neurological Injuries

Concussion: a common traumatic brain injury that occurs when the brain is hit so hard that the CSF cannot protect it from knocking into the skull. Symptoms can range from a headache to loss of consciousness and have short- and long-lasting consequences on memory, mood, and sleep.

Hematoma: a bleed within the brain or in the space between the brain and the skull often caused by direct impact to the head. A computed tomography (CT) scan is typically used to detect a hematoma and symptoms can vary from headache to paralysis depending on which region of the brain is affected.



Shearing: occurs as the axons that make up the brain's "white matter" are torn or stretched, causing brain damage including swelling and cell death. Shearing happens when the brain moves or rotates quickly inside the skull. Axons are the part of the brain cell that communicates messages from one cell to another, so these injuries can have the most devastating consequences on prognosis.

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PROCEDURE

- [1] Each student reads 3rd-5th grade Dana Foundation fact sheet, “How Does the Brain Work?” (5-10 minutes).
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- [2] Briefly introduce the exercise and give the accompanying PowerPoint presentation about protecting your brain (10 minutes).
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- [3] Place one egg directly in a specimen container and close the lid (1 minute).
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- [4] Place second egg in the other container, but fill it to the top with water before closing the lid (2 minutes).
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- [5] Recruit two student volunteers to produce “injury” to the brains by vigorously shaking the specimen containers (5 minutes).

ADDITIONAL RESOURCES

- More fun experiments and brain facts can be found at the University of Washington website: <http://faculty.washington.edu/chudler/neurok.html>
- A collection of neuroscience puzzles and fact sheets for kids in grades K-12 that are available for download (PDF): <https://www.dana.org/share-science/resources-for-educators/>

* The “Protect Your Brain” activity was originally developed by Eric H. Chudler, Ph.D., University of Washington, and was adapted by Elizabeth Weaver, M.S. and Linda Qi Beach, Ph.D. for the Dana Foundation.