

SUGGESTED REFERENCES

- *Central Nervous System*
The Gale Encyclopedia of Psychology, 2nd Edition
Gale Group, 2001

WEBSITES

- Encarta Online Deluxe
<http://encarta.com/find/print>
Keyword: Nervous System
- Weizmann Institute, Department of Neurology
Four Patients Now Responding to Landmark Paralysis Treatment
<http://www.jrep.com/Reporter/Article-0.html>
- *Nervous System: Anatomy and Function*
Encyclopedia.com
<http://www.encyclopedia.com/articles>

NATIONAL SCIENCE EDUCATION STANDARDS

- Science Content Standards:
- 5 - 8 Abilities of Technological Design
Structure and Function in Living Systems
Diversity and Adaptation of Organisms
 - 9 -12 Interdependence of Organisms
Matter, Energy, and Organization in Living Systems
Behavior of Organisms
Abilities of Technological Design

CREDITS

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THE SPINE - COMMAND CENTRAL



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SYNOPSIS

The human body is an intricately designed machine that is capable of performing tasks and maneuvers upon demand. Routine tasks, like walking, are taken for granted. However, the ability to walk would not be possible without precisely engineered efforts of the spinal cord and the spinal column.

This edition of SCIENCE SCREEN REPORT looks at the design of the spinal cord, how injuries to the spinal cord effect movement, and medical advances in treating spinal cord injuries. Scientists all over the world are researching paralysis in efforts to find a cure. Their studies and experiments range from physical therapies to development of computer chips that are implanted in the spine. With the continuation of research and the courage of volunteer patients, rehabilitation of injured patients looks very promising.

CURRICULUM UNITS

- ANATOMY
- BIOLOGY
- NEUROLOGY
- PHYSICS
- BIOENGINEERING

RUNNING TIME

12:33

BACKGROUND

On a daily basis, the body is exerted while fulfilling physical demands. Flexibility and coordination of the spinal cord and spinal column make each movement possible. These two delicate mechanisms, along with the brain, make up the central nervous system. Together, they include a highway of nerves that transmits messages to guide the body's movements. However, injuries can occur to the spinal cord causing paralysis - the loss of mobility in one's body. In fact, spinal cord injuries account for nearly 11,000 injuries each year, and most of these injuries result in paralysis.

This issue explores the composition of the spinal cord and spinal column, what can happen to the body when an injury occurs, and some of the medical advances that are increasing the possibility of rehabilitation from paralysis.

The spinal cord begins at the bottom of the skull and ends at the pelvis, creating a path of nerves that guide body movements and transmit sensations. An adult spine is approximately 71 centimeters long, and forms a double S shape. The spinal cord is protected by the spinal column, a group of 24 bones known as vertebrae or the backbone. Each bone is linked by discs that are held together by tough bands of tissue called ligaments. The spinal column provides stability and flexibility during movement by absorbing shock and relieving pressure on the nerves. Where the spine and pelvis meet, the vertebrae become fused together providing more stability.

When an injury to the spinal column occurs, the vertebrae often fracture, crushing the cord and damaging the nerves. This results in paraplegia that includes paralysis of the lower body and both legs. When complete paralysis occurs, the body is unable to move from the neck down. Paralysis occurs most often between ages 16 to 30. Common causes include vehicle or sports accidents, violence, and falls.

During the late twentieth century, scientists made significant progress in understanding paralysis. They have learned that after an accident occurs, the first thirty minutes are critical when determining if someone will be paralyzed. At the University of Miami unique physical therapy programs have been developed. One program titled, "Miami Project", consists of a pair of walking trousers called "Freddy" that stimulate paralyzed muscles with electrical impulses.

In other parts of the world, scientists continue to develop ways to help cure paralysis. Some medical advances include an antblocker that is injected into the spine to destroy a protein that keeps nerve cells from regenerating. In another experiment a computer chip is implanted to receive messages for damaged nerve cells.

Healing paralysis is a challenge. With today's research and technology, scientists are drawing closer to a cure. Until then, research will continue so that walking again becomes a reality.

ADVANCED ORGANIZERS

Prior to showing the program:

1. Have students research the different types of spinal injuries and their causes.
2. Visit websites such as actor Christopher Reeve's: www.apacure.com to learn about paralysis.
3. Identify the parts of the central nervous system.

CRITICAL THINKING EXERCISES

After showing the video, ask your students the following:

1. Distinguish between paraplegia and quadriplegia.
2. Create a timeline of treatments for paralysis.
3. Identify safety laws created to help prevent spinal cord injuries.
4. Research and identify the American Disabilities Act (ADA).
5. Have students discuss what it would be like to become disabled. Students can use a wheelchair for a given amount of time and document their experience. What impact did it have on performing tasks? Did people offer assistance? Was access to common entrances available?
6. Describe the role of the central nervous system in the human body.
7. Research and collect statistics on spinal cord injuries and display information in a graph. Record information such as:
 - a | Number of injuries in a period of time
 - b | Type of injury
 - c | Type of paralysis
8. Invite a spokesperson for paralysis to school to discuss spinal injuries.

VOCABULARY

Central nervous system
Discs
Ligaments
Lumbar vertebra
Paralysis

Paraplegia
Quadriplegia
Spinal column
Spinal cord
Vertebrae

CAREER POSSIBILITIES

- BIOLOGIST
- CHIROPRACTOR
- ENGINEER
- NEUROLOGIST
- OCCUPATIONAL THERAPIST
- ORTHOPEDIC PHYSICIAN
- PHYSICAL THERAPIST