

SUGGESTED REFERENCES

- Neville G. Sutton
**Injuries of the Spinal Cord:
The Management of Paraplegia**
- Bonnie B. Strickland
**The Gale Encyclopedia of Psychology:
Central Nervous System**
Gale Group 2nd Edition, November 2000
- *Christopher Reeve Paralysis Foundation*
<http://www.apacure.com>
- *Encarta Online*
<http://www.encarta.msn.com>
key word: nervous system
- *Four Patients Now Responding to Landmark
Paralysis Treatment*
Weizmann Institute, Department of Neurology
<http://www.weizmann.ac.il/>
- *The Miami Project to Cure Paralysis*
<http://www.miamiproject.miami.edu/>

NATIONAL SCIENCE EDUCATION STANDARDS

K - 4

Science and Technology

Understanding about science and technology

History and Nature of Science

Science as a human endeavor

5 - 8

Science and Technology

Abilities of technological design

Life Science

Structure and function in living systems

*Source: *National Science Education Standards, 1996, National Academy Press*

CREDITS

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SCIENCE SCREEN REPORT

FOR KIDS

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THE SPINE : BODY'S CONTROL



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SYNOPSIS

For centuries, scientists have been fascinated with the human body. This intricately designed machine is capable of performing tasks and maneuvers upon demand. Often, a task such as walking is taken for granted. The ability to walk is engineered by the spinal cord and the spinal column. But, what happens when spinal cord injuries occur?

This edition of SCIENCE SCREEN REPORT looks at the design of the spinal cord and the medical advances in treating spinal cord injuries. Scientists are researching paralysis in an effort to one day find a cure. Studies and experiments range from physical therapies to computer chips implanted in the spine. With the continuation of research and the courage of volunteer patients, rehabilitation is hopeful.

CURRICULUM UNITS

- ANATOMY
- BIOLOGY
- HEALTH
- PHYSICS

RUNNING TIME

15:10

BACKGROUND

The spinal cord has fascinated scientists for centuries. The spine enables us to walk and move about. However, spinal cord injuries account for nearly 11,000 injuries each year, of which most result in paralysis. Day in and out, we exert our body while fulfilling physical demands. Each movement is possible with the flexibility of the spinal column. The spinal cord, along with the brain, makes up the central nervous system. Together, a highway of nerves transmits messages that guide our movements. Unfortunately, injuries do occur to the spinal cord causing paralysis.

The spinal column begins at the bottom of the skull and ends at the pelvis, creating a path of nerves that guide our movements and transmit sensations. The adult spinal column is approximately 28 inches 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 disks and held together by tough bands of tissue called ligaments. The spinal column provides stability and flexibility by absorbing shock and relieving pressure on the nerves during movement. Where the spinal column and pelvis meet, the vertebrae become fused together providing more stability.

When an injury to the spinal column occurs, the vertebrae are often fractured, crushing the cord and damaging the nerves. This injury results in paraplegia, which includes paralysis of the lower body and both legs. When complete paralysis occurs the body is unable to move from the neck down. Paralysis often occurs between ages 16 to 30, commonly caused by vehicle or sports accidents, violence, and falls.

During the twentieth century, scientists have made significant progress in understanding paralysis. At the University of Miami unique physical therapy programs are developed. One program titled, "Miami Project", consists of a pair of walking trousers called "Freddy" that stimulate paralyzed muscles using electrical impulses.

In other parts of the world scientists continue to develop ways to help cure paralysis. Some medical advances include an antilocker that is injected into the spine to destroy a protein in our body that keeps nerve cells from regenerating. Another experiment involves the implantation of a computer chip that will contribute to receiving messages for damaged nerve cells.

Healing paralysis is a challenge. The first thirty minutes after an accident occurs is critical when determining whether somebody will be paralyzed. With today's research and technology, scientists are drawing closer to a cure. Until that day, research will continue so that one day walking again will no longer be a dream, but a reality.

ADVANCED ORGANIZERS

Prior to showing this video students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press, which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 1: The Nature of Science

Section C - The Scientific Enterprise

Know by Grade 8

- Clear communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world.

Benchmark 6: The Human Organism

Section C - Basic Functions

Know by Grade 5

- The brain gets signals from all parts of the body telling what is going on there. The brain also sends signals to parts of the body to influence what they do.

Benchmark 8: The Designed World

Section E - Information Processing

Know by Grade 8

- One of the values of computers is that they are able, on command, to reorganize information in a variety of ways, thereby enabling people to make more and better uses of the collection.

Section F - Health Technology

Know by Grade 5

- Technology has made it possible to repair and sometimes replace some body parts.

*Benchmarks can be found at www.project2061.org/tools/benchol/bolintr.htm

CRITICAL THINKING EXERCISES

After viewing the program, ask your students the following:

1. Read a book about paralysis aloud. An example is *How Willy Got His Wheels*, by Deborahne Turner, about a paralyzed dog that gets a set of wheels for mobility. www.Wheelywilly.com
2. Draw a diagram and identify the parts of the central nervous system.
3. To learn about paralysis visit websites such as actor Christopher Reeve's www.apacure.com
4. Show students the parts of the skeletal system using a model or a diagram. Pass out strips of paper with skeletal vocabulary words. Have students come up and label parts of the skeleton.
5. Write an expository essay depicting this research and preventative measures that can be taken against such injuries.
6. Create a visual to accompany the essay that demonstrates possible prevention for paralysis. For example, a student can create a poster about when jumping into water, be sure to jump feet first; and wear a seatbelt while in a car.
7. Paired with a partner have students explain the difference between paraplegia and quadriplegia.
8. Have students speculate what it would be like to be disabled after having the ability to use one's body. Students can use a wheelchair for a given amount of time and document their experience. What impact did it have on simple tasks? Were they looked upon differently? Did people offer assistance? Was access to common entrances available?

VOCABULARY

- Central nervous system** . All the nerve cells and nervous system tissues in an organism, including, in the vertebrates, the brain, spinal cord, ganglia, nerves, and nerve centers
- Disk** A layer of fibrous connective tissue with small masses of cartilage among the fibers, occurring between adjacent vertebrae
- Invertebrates** Lacking a backbone or spinal column
- Ligaments** A band of tough tissue connecting bones or holding organs in place
- Paralysis** Partial or complete loss, or temporary interruption, of a function
- Paraplegia** Motor and sensory paralysis of the entire lower half of the body
- Quadriplegia** Total paralysis of the body from the neck down
- Spinal column** The series of jointed vertebrae forming the axial support for the skeleton; spine; backbone
- Spinal cord** The thick cord of nerve tissue of the central nervous system
- Vertebra** Any of the single bones or segments of the spinal column

CAREER POSSIBILITIES

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