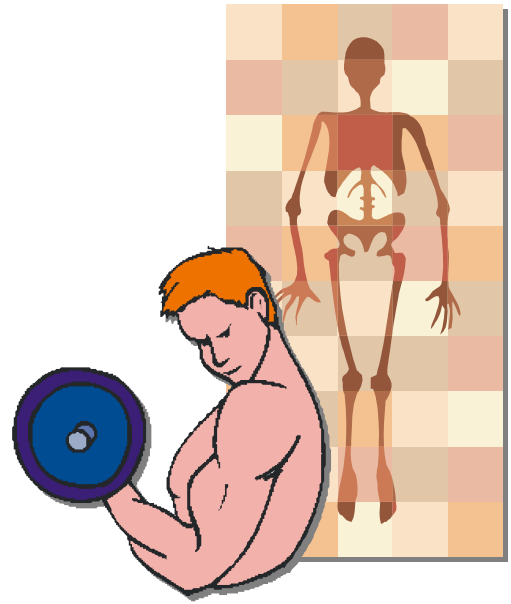


#9351

PHYSIOLOGY: MUSCLES AND BONES

ALLEGRO PRODUCTIONS
2000
Grade Levels: 4-8
14 minutes



DESCRIPTION

Athletes demonstrate their flexibility in this look at our ingeniously designed muscular-skeletal system. Discusses muscle and bone interaction, their structure, purpose, and function. Comments on technological studies on motion.

ACADEMIC STANDARDS

Subject Area: Life Sciences

- Standard: Understands the structure and function of cells and organisms
 - Benchmark: Knows that multicellular organisms have a variety of specialized cells, tissues, organs, and organ systems that perform specialized functions (e.g., digestion, respiration, reproduction, circulation, excretion, movement, control and coordination, protection from disease)

Subject Area: Physical Sciences

- Standard: Understands forces and motion
 - Benchmark: Knows the relationship between the strength of a force and its effect on an object (e.g., the greater the force, the greater the change in motion; the more massive the object, the smaller the effect of a given force)

INSTRUCTIONAL GOALS

1. To study how muscles are attached to bones and how they make people move.
2. To compare different muscles that are used to perform different body motions.
3. To research movements.
4. To examine why one muscle is stronger than another.
5. To demonstrate how computer animation helps engineers study motion.

BACKGROUND INFORMATION

Under the skin, every human being is supported by a skeleton made up of more than two hundred bones of various sizes and shapes. The skeleton provides a framework that is strong enough to protect the softer tissues of the body, yet allows mobility.

This video looks at the bones themselves, showing experiments that measure the force a bone can take before breaking, the results of calcium loss due to immersing a bone in acid, and

the effect of calcium removal on a bone. It also shows a comparison of the pressures required to bend hollow metal tubes versus solid metal rods, and demonstrates the superior strength that results from the physical structure of bones. This structure is imitated in engineering materials such as girders and roll bars that provide the greatest strength with the least mass.

To show how muscles are attached to bones and how they make us move, a chicken leg is examined and muscle contraction is explained. A gymnast demonstrates how antagonistic muscle pairs work together, and animation demonstrates how the biceps muscle contracts when the triceps relaxes.

Engineers will use artificial muscles to move robots, build artificial limbs, strengthen weak hearts, and even clean space dust off solar cells in orbit around the earth. The scientists and engineers of the future will work with materials that imitate nature in ways we've barely begun to imagine.

VOCABULARY

1. abdominal
2. antagonistic
3. architectural
4. compact bone
5. ligament
6. marrow
7. Newton
8. spongy bone
9. striated

AFTER SHOWING

Discussion Items and Questions

1. What is the purpose of our skeleton?
2. Describe how muscles work.
3. How can we test the strength of bones?
4. What characteristics of bones make them so strong?
5. Describe antagonistic muscle pairs and explain how the pairs work together.
6. Discuss the techniques scientists use to study athletic performance.
7. Discuss the interaction of muscles and bones and how they produce motion.
8. Discuss what it takes for an athlete to perform at his or her best, and compare athletics to performance in other fields.

Applications and Activities

1. Research sources of calcium and why it's necessary to healthy bones.
2. Have students videotape athletes and study their movements in slow motion.

RELATED RESOURCES



Captioned Media Program

- Muscular and Skeletal Systems #3272
- Our Flexible Frame: The Skeletal and Muscular Systems #2419



World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

- **KIDSHEALTH**

<http://www.kidshealth.org>

Get the "Big Story on Bones" and link to other helpful topics such as "Give a Hand to the Hand," "Love Those Legs," "Joy to My Joints," and more. Also, find all about "Your Multi-Talented Muscles" and link to other informative topics such as "Smooth Move," "Time for Tendons," and more!

- **DISCOVERYKIDS.COM**

<http://kids.discovery.com/kids/home.html>

Click on the "Yucky!" button then click on "Your Gross & Cool Body" to read how the body system works. Pick the "Muscular" and "Skeletal" systems from the drop-down menu to find out "What would happen if humans didn't have bones?" "Are your bones alive?" and more.

- **MEDLINEPLUS**

<http://www.nlm.nih.gov/medlineplus/>

With over nine million biomedical journal article abstracts, Medline is highly regarded by medical professionals. MEDLINEplus offers MEDLINE *plus* links for health topics, dictionaries, organizations, news, and more. From the National Library of Medicine.