

Section 2

Your Muscular System

Objectives

Before class begins, write the objectives on the board. Have students copy the objectives into their notebooks at the start of class.

1. Focus

Warm-Up Myth/Fact

Presentation
EXPRESS

After students complete the writing assignment, invite volunteers to share their responses. Then, challenge students to identify the underlying motivation for groups or individuals who advocate the “no pain, no gain” myth.

Teaching Transparency W37

Connect to
YOUR LIFE skeletal muscles

Section 2

Objectives

- ▶ **Describe** the functions of the three types of muscles.
- ▶ **Explain** how you can keep your muscular system healthy.

Vocabulary

- smooth muscle
- cardiac muscle
- skeletal muscle
- tendon
- muscle tone
- atrophy
- anabolic steroid
- strain
- tendonitis

Your Muscular System

Warm-Up

- **Myth** No pain, no gain.
- **Fact** Pain is not a sign of a good workout. Rather, pain is a signal from your body that you are working too hard or you have an injury. Continuing to exercise through the pain could lead to a more serious injury.
- **WRITING** Where do you think most teens get their information about muscles? How factual do you think their information is?



The Muscles in Your Body

To open this book and turn its pages, you use muscles in your arms and hands. Muscles move your eyes as you read the printed words. Muscles in your chest allow you to breathe, and muscles in your heart pump your blood. Every time your body moves, muscles are at work.

Types of Muscle Your body has three types of muscle tissue that perform different functions—smooth muscle, cardiac muscle, and skeletal muscle. Some of these muscle tissues are involuntary muscle, which means they are not consciously controlled. Other muscles are voluntary muscle, which means they can be consciously controlled.

- ▶ **Smooth muscle** is involuntary muscle that causes movements within your body. Smooth muscles in the walls of your esophagus and intestines push food through your digestive system. Other smooth muscles in your blood vessels help circulate your blood.
- ▶ **Cardiac muscle** is involuntary muscle that is found only in the heart. Throughout your life, cardiac muscle allows your heart to beat and pump blood throughout your body.
- ▶ **Skeletal muscles** are the muscles that you control to do activities, such as walk or play a musical instrument. As the name indicates, skeletal muscles are attached to the bones of your skeleton. A thick strand of tissue called a **tendon** attaches a muscle to a bone.

Connect to
YOUR LIFE Which type of muscle helps you move your jaw to chew your food?

WRITING and Health

L3 News Report

Instruct students to write a news story in which they report the functions of the three types of muscles. Students can choose to treat the story as breaking news

or a health update. In their stories, students should describe the three types of muscle tissue, the functions of each muscle tissue, and how muscles work.

2. Teach

L3 EL Reading/Note Taking 11-2

L2 Adapted Reading/Note Taking 11-2

The Muscles in Your Body

L3 Cooperative Learning

Give student pairs two strips of stiff paper or poster board, two lengths of string, paper fasteners, and a hole punch. Challenge students to use the materials to make a model of how skeletal muscles contract to move bones. Suggest they use the diagram of muscle pairs in Figure 6 as a guide. Then have students write a short description of how the model shows how skeletal muscles work.

L2 Visual Learning: Figure 6
Teaching Transparency 26

Refer students to the muscle pair shown in Figure 6. Encourage students to bend and straighten their arm at the elbow, feeling for the biceps and triceps contracting and relaxing. Ask: **Why are the biceps and triceps called a muscle pair?** (They are both needed to bend and straighten the arm at the elbow. As one contracts, the other relaxes.) Challenge students to identify what body part moves when the quadriceps contract. (The lower leg bends at the knee.)

Caption Answer the frontalis

L4 Building Media Literacy

Challenge students to analyze a television commercial that advertises fitness equipment. Students should describe what the television commercial is advertising and how the product is supposed to improve muscle tone or strength. Then using reliable sources, students should evaluate the claims made by the television commercial. Have students give reasons for or against purchasing the fitness equipment.

How Muscles Work All muscles do work by contracting, or becoming shorter and thicker. Muscle cells, which are often called fibers, contract when they receive a nerve message to do so. As you can see in Figure 6, many skeletal muscles work in pairs. One muscle in the pair contracts to move the bone in one direction. Then, the other muscle in the pair contracts to move the bone back.

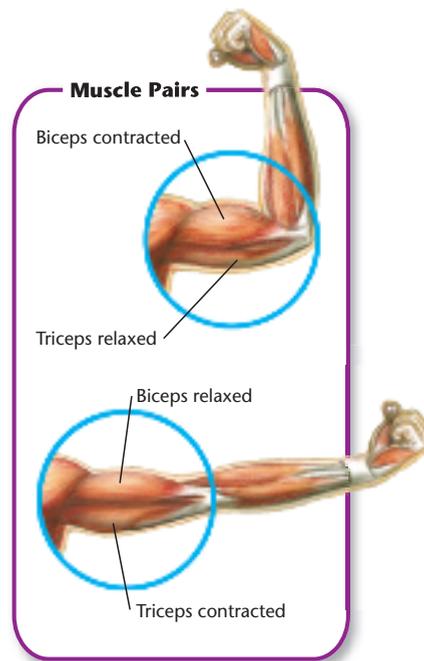
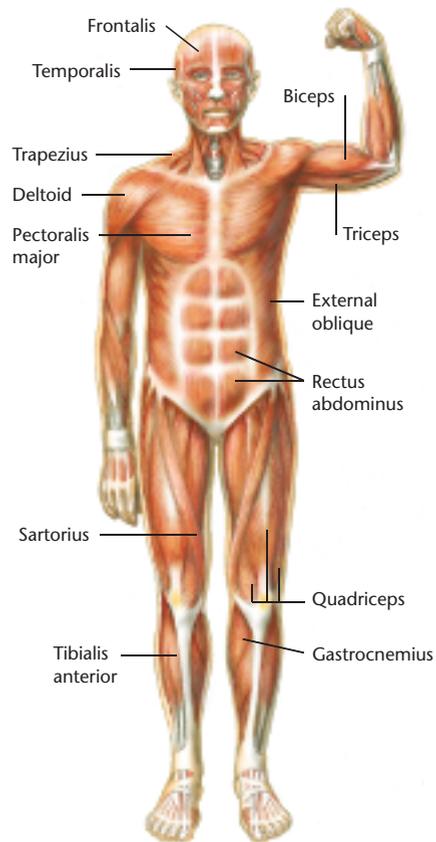
Muscle Tone Even when a skeletal muscle is not contracting to cause movement, a few of its individual muscle fibers are still contracting. These contractions are not strong enough to cause movement, but they do tense and firm the muscle. This slight tension is called **muscle tone**. For example, at any given moment the muscles in your neck contract just enough to keep your head upright, even when you are not moving your head. Muscle tone also keeps your muscles healthy and ready for action. Muscles that cannot contract due to injury, or are not used often, will weaken and shrink, a condition known as **atrophy**.

FIGURE 6 Skeletal muscles are attached to bones and participate in movement. Your biceps and triceps are an example of a muscle pair. When a biceps contracts and a triceps relaxes, your arm bends. Your arm straightens when a biceps relaxes and a triceps contracts.

Relating Cause and Effect

Which muscle contracts when you wrinkle your forehead?

The Muscular System



Movement and Coordination 273

Differentiated Instruction

L1 Special Needs

Smooth muscle movements are the most difficult for students to understand because they usually cannot feel these muscles move. Give students a cracker to eat. After they swallow the cracker, ask them to describe how it gets from their mouth to their stomach. Identify the location of the

stomach if necessary. Explain that the throat and esophagus have muscles all around them that squeeze the food down and into the stomach. Students can squeeze a tube of toothpaste to model this movement.

Keeping Healthy

L3 Content Update

Use the Web Code to access up-to-date information about stretching. Have students complete the Web activity.

L3 Building Health Skills

Setting Goals Have students assess their own exercise routine. They should list the activities they participate in and indicate whether these activities increase muscle strength or endurance. Also have students assess the amount of time they spend warming up and cooling down for these activities. Have students list in their journal the weaknesses in their exercise program. Then ask students to create an exercise plan that addresses these weaknesses and try it for two weeks. After two weeks, students should evaluate how well they implemented their plan and how their fitness improved.

L3 Cultural Connection

Discuss the perception of girls and exercise that may differ from culture to culture. Are girls expected to work out as hard as boys? Are they encouraged to strengthen their muscles in the same way as boys? Have students interview their parents and grandparents about how this trend has changed since they were your age.

Connect to YOUR LIFE Allow students to answer this question in their private journals.

Go Online HEALTH LINKS™

For: More on stretching
Visit: www.SciLinks.org/health
Web Code: ctn-4112

Keeping Healthy

Like your bones, your muscles get stronger when you use them often. But you must take care to avoid overuse and injury. **You can maintain a healthy muscular system by regularly participating in different types of exercise. To help prevent injuries, exercise sessions should include a warm-up and cool-down period.**

Working Your Muscles Some types of exercise, such as running, increase a muscle's endurance—how long it can contract without tiring. Other exercises, such as lifting weights, make individual fibers grow, which causes the muscles to thicken and increase in strength.

To increase muscle size and strength, some athletes are tempted to use **anabolic steroids**, artificial forms of the male hormone testosterone. Doctors prescribe these drugs to treat people with certain muscle disorders. When used illegally, anabolic steroids are dangerous and can cause serious damage to many body systems. You will read more about the dangers of steroid use in Chapter 13.

Connect to YOUR LIFE How many different types of exercise do you participate in?

FIGURE 7 Muscular strength and endurance are important in sports and in everyday activities.



274

Differentiated Instruction

L4 Gifted and Talented

Have students compare different local fitness centers, including some less-expensive ones such as Boys and Girls Clubs. Students should find out if the focus of each center is on muscle strength training or cardiovascular fitness; whether instructors have

training in physical education or physical therapy; and whether programs can be individually tailored to meet a person's needs and limitations. Students can make a chart to summarize their findings and present those findings to the class.

3. Assess

Evaluate

These assignments can help you assess students' mastery of the section content.

Section 3 Review

Answers appear below.

Teaching Resources

- Practice 11-2
- Section 11-2 Quiz



L2 Reteach

Have students make a table that lists the three types of muscle tissue in the muscular system, the functions of each muscle tissue, and where the muscle tissue is found in the body.

L4 Enrich

Teaching Resources

- Enrich 11-2

Health at School

Martial Arts Class Advise students that they should speak with an instructor first to get permission for observing a class. Suggest that students tell the instructor they wish to observe how martial arts helps build muscular strength and endurance.

Avoiding Muscle Injuries You likely have felt muscle soreness immediately after exercise or in the days that followed. Some muscle soreness is normal, but pain can be a sign of a more serious injury.

- ▶ **Strains** A muscle **strain**, or a pulled muscle, is a painful injury that may happen when muscles are overworked or stretched too much or too quickly. Sometimes muscle fibers rip, resulting in a torn muscle.
- ▶ **Tendonitis** Overuse of tendons may lead to painful swelling and irritation called **tendonitis** (ten duh NY tis). Tennis elbow, which consists of pain in the forearm, is one example of tendonitis. Excessive use of a hand-held control while playing video games can also lead to tendonitis. You should not play video games for more than one hour without taking a break.

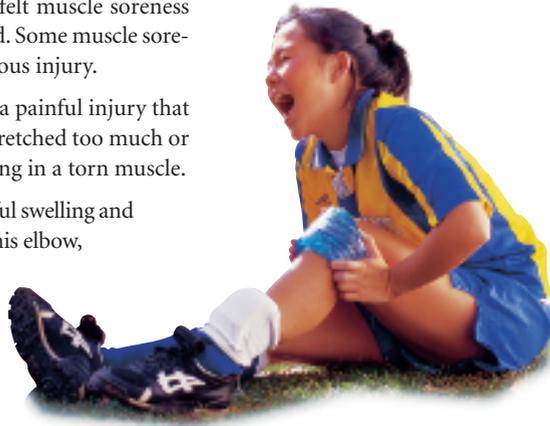


FIGURE 8 To help prevent muscle and tendon injuries, you should warm up properly and rest from exercise if you feel pain.

Treatment for muscle injuries usually includes rest, over-the-counter pain medication, and ice packs. If the injury is severe, surgery may be required.

Regular strengthening and stretching exercises can help you prevent injuries. Vary your exercise routine so that you are not always using the same muscles. Warm up before vigorous exercise, and include a cool-down period of mild exercise. Also, stop exercising if you feel sharp or sudden pain.

Preventing Muscle Cramps Have you ever felt a sudden, sharp pain in your leg or arm? If so, you may have experienced a muscle cramp, which is a strong, uncontrolled muscle contraction. To relieve a cramp, try massaging the affected area and exercising the limb gently. Stretching and drinking plenty of water before and during exercise can help you avoid muscle cramps.

Section 2 Review

Key Ideas and Vocabulary

1. Identify the three types of muscles and describe the location and function of each.
2. What is a **tendon**?
3. Explain what causes **muscle tone**. What causes the condition known as **atrophy**?
4. What can you do to prevent muscle injuries?
5. What is the cause of a muscle **strain**?

Critical Thinking

6. **Evaluating** Why is it an advantage that you do not have control over all of your muscles?

Health at School

Martial Arts Class Find out whether classes in martial arts such as judo, kendo, or tae kwon do are offered in your community. If so, observe a class. Then in a paragraph, describe to your classmates how the activity can help build muscular strength and endurance. **WRITING**

7. **Applying Concepts** Describe how a muscle pair in your thigh would work to bend and straighten your knee.

Movement and Coordination 275

Section 2 Review

1. Smooth muscle is found in many organs. It causes involuntary movements, such as pushing food through the digestive system. Cardiac muscle is found only in the heart and pumps blood through the body. Skeletal muscle is attached to bones and causes all skeletal movements.
2. A tendon attaches muscle to bone.
3. Muscle tone is caused by the slight tension of individual muscle fibers. Atrophy is caused when muscles weaken and shrink due to injury or disuse.
4. regular strengthening and stretching exercises, warming up and cooling down, and stopping exercise when feeling a sharp or sudden pain

5. muscles are overworked or stretched too quickly
6. Muscles that cause important body functions, such as digestion or circulation, continue to act without your control.
7. When the quadriceps at the top of the thigh contract and the muscles at the back of the thigh relax, the knee straightens. When the muscles at the back of the thigh contract and the quadriceps muscles relax, the knee bends.