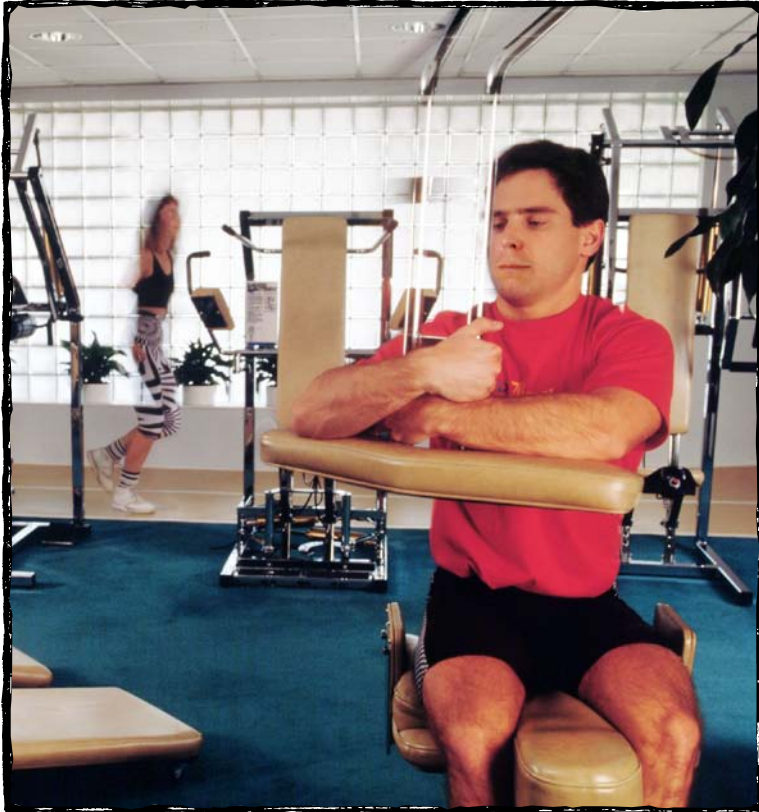


Get Moving! All About Muscles

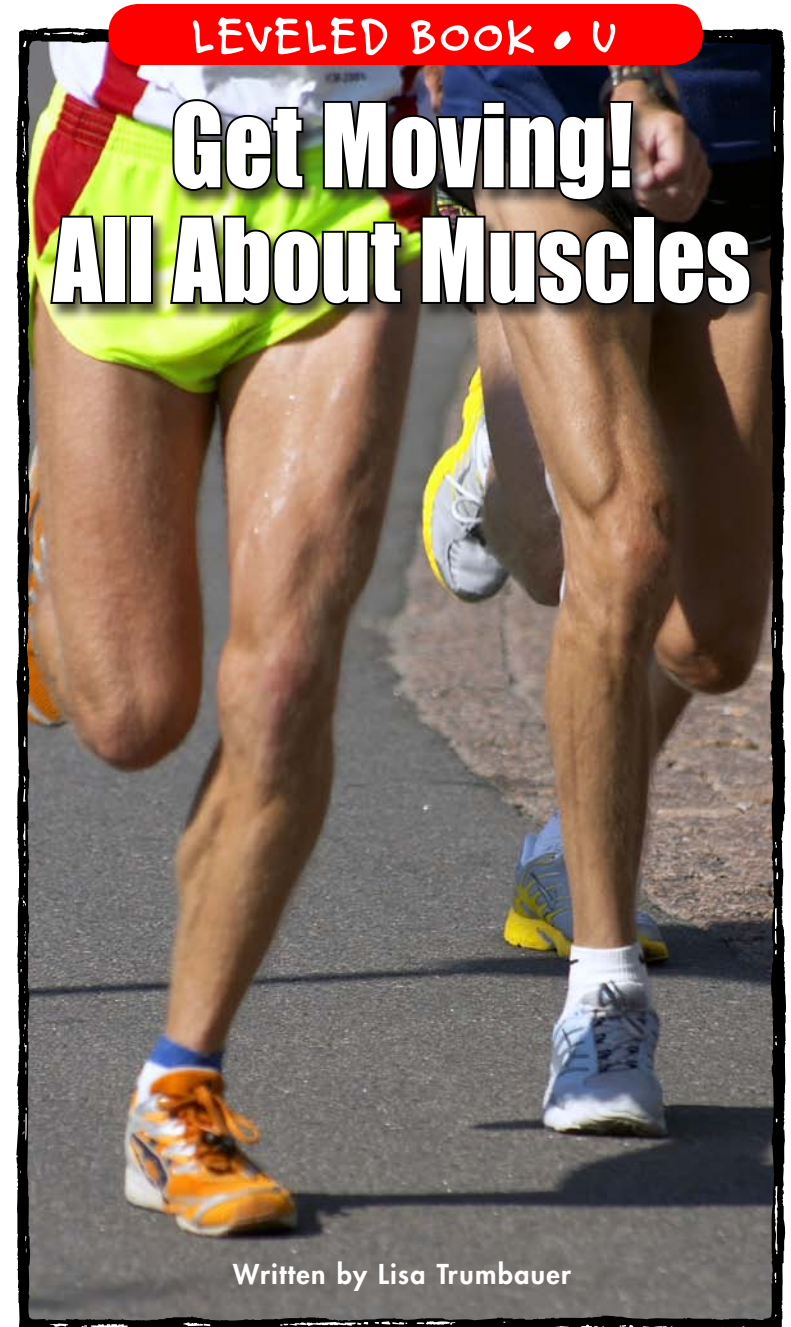
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Get Moving! All About Muscles

Written by Lisa Trumbauer

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A Moving Machine

Have you ever walked by a gym and watched people lifting weights? Maybe you even have weight training in school. Running, bending, twisting—these are all forms of training your body and “shaping up.” But what, exactly, are you



This woman lifts weights to keep her arm muscles in shape.

training? What are you shaping? What is all this lifting and grunting and straining about? It's about your muscles.

Muscles are the parts of the body that allow you to move. If you didn't have muscles, you wouldn't be able to lift or jump or walk, or even write or smile or chew. Your muscles make your body a moving

machine. Shaping up, or getting into shape, means shaping your muscles so they are strong and powerful. Strong, powerful muscles make your body move more efficiently.

The human body is loaded with muscles of many different sizes—more than 600 muscles in all. Although all muscles help your body move, muscles are divided into three main types: the skeletal muscles, the smooth muscles, and the cardiac muscle. Two of these muscle types—the smooth muscles and the cardiac muscle—are **involuntary muscles**. That means that they move on their own, without our telling them to move. Skeletal muscles, in contrast, are voluntary, which means they move because we want them to. Most of the muscles in your body are skeletal muscles.

So let's get moving, and see what the skeletal muscles are all about.

A Muscle Minute

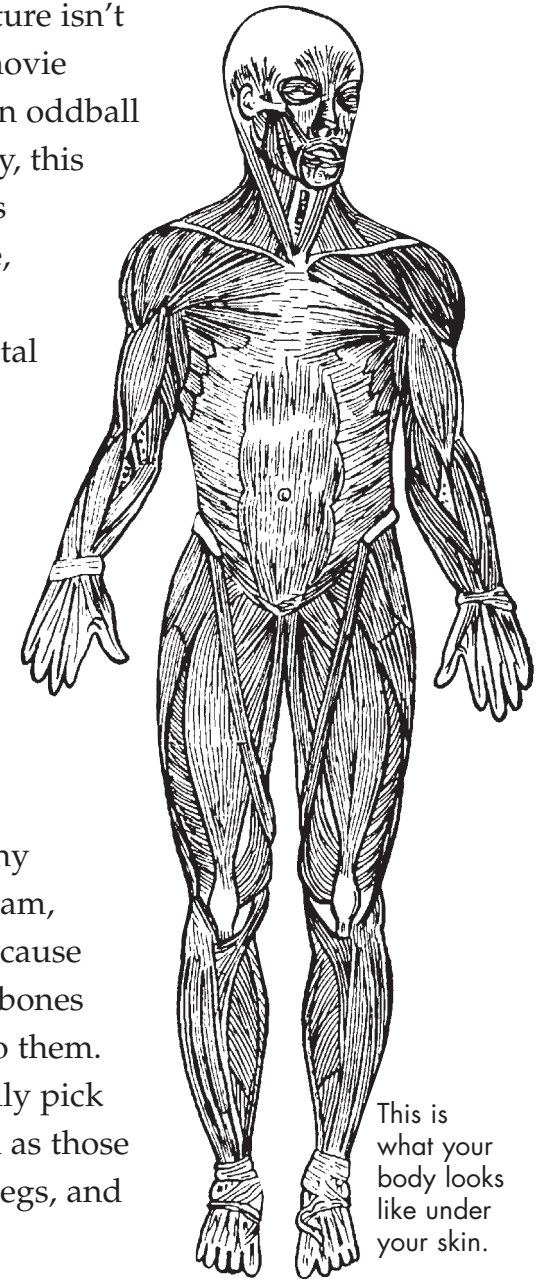
You're getting ready to turn the page, aren't you? As you do, think of all the muscles you use just to do this one small task. Muscles lift your arm, and muscles move your hand and fingers, which enable you to flip the page. You could say that muscles made you do it!



Muscle Monster

This scary creature isn't the latest creepy movie monster, or even an oddball superhero. Actually, this creature is you. It's what you look like, under your skin, with all your skeletal muscles in place. The dark, stringy-looking things are the muscles, and the whitish parts are the tendons. Tendons are fibers that attach muscles to bones.

You can't see any bones in this diagram, can you? That's because muscles cover the bones and are attached to them. The muscles literally pick up the bones, such as those in your arms and legs, and make them move.



This is what your body looks like under your skin.

Here's how these muscles work. If you want to move, you form the thought in your brain. Your brain then sends a signal to the muscles needed to make the movement you are thinking about. You might wiggle your toes, or snap your fingers, or even lift your eyebrows.

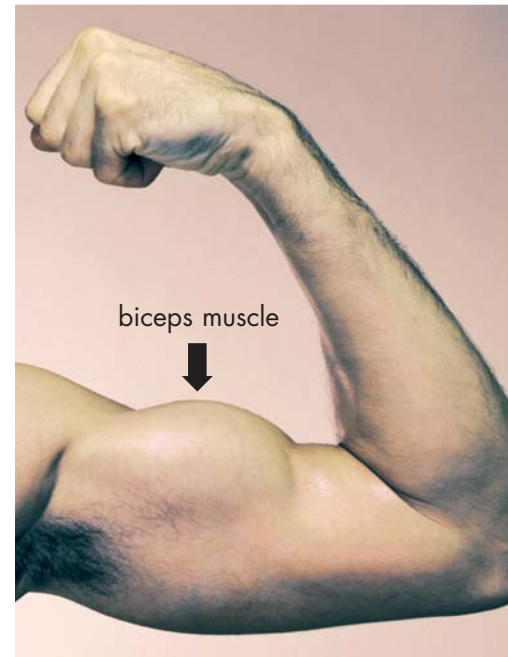
Once the signal reaches the muscles, your muscles begin to move. Each muscle pulls on the bone to which it is attached, and this pulling puts your body in motion. Because your brain must tell these muscles to move, these movements are voluntary. The **voluntary muscles** are your skeletal muscles.



Your brain tells your leg muscles to kick a ball.

Make a Muscle—the Skeletal Muscles

Have you ever asked anyone to “feel your muscle”? What did you do? You probably made a fist, lifted your forearm toward your shoulder, and pointed to the bulge that formed on your upper arm. Good job! You’ve just provided a good example of how muscles work.



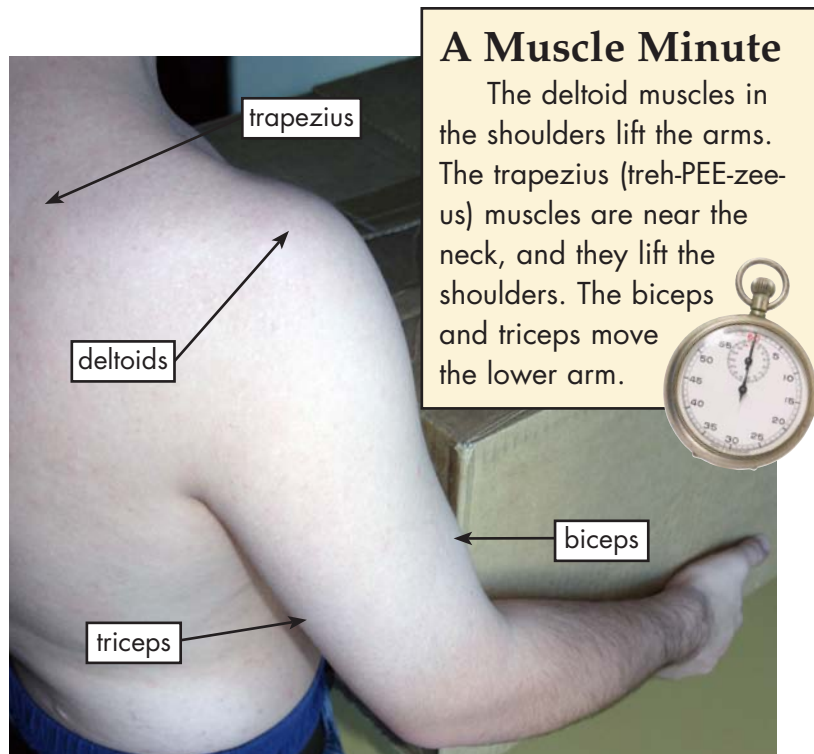
The biceps muscle contracts to pull up the forearm.

When you pulled your arm upward, the muscle in your upper arm, the **biceps**, contracted. It pulled on the bone, causing your forearm to lift. You can feel the contracted biceps muscle bulging under your skin.

Although muscles allow us to do all kinds of movements, pulling is the only movement that muscles themselves can do.

In order for you to lower your arm, another muscle must get into action. This muscle is the **triceps** muscle, and it lies on the underside of your upper arm. When you lower your arm, the biceps muscle relaxes, and the triceps muscle contracts—it pulls your forearm down.

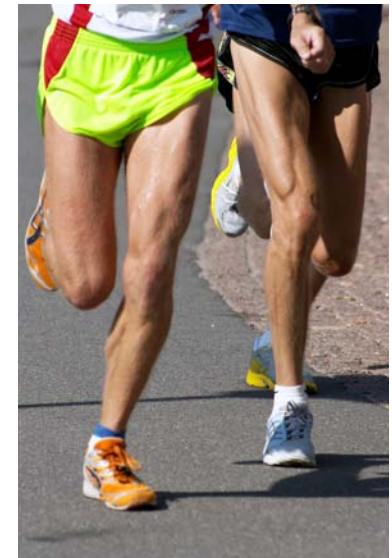
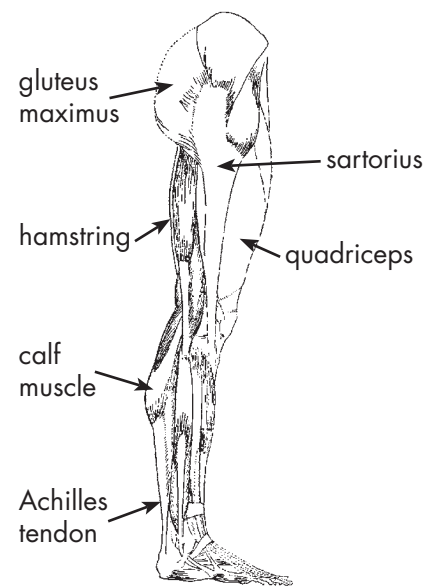
In most cases, therefore, your muscles must work as a team. One muscle pulls, or contracts, so that you can move in one way; then another muscle must pull, or contract, so your body can move in the opposite way.



Muscles work as a team so this man can lift the box.

Muscles in your legs move your legs in a similar way as the muscles in your arms. Try this: sit down, stretch out your leg, and feel the top of your thigh. The muscle you feel here is the **quadriceps** (KWAD-ri-seps), which enables you to lift your leg. If you bend your knee toward you, you might feel a muscle on the back of your thigh. This is the **hamstring**, which makes your knee bend.

A big muscle bulges on your lower leg, at the back. You might call this your calf muscle, but its more scientific name is the gastrocnemius (gas-trok-NEE-mee-us). Stand up, and lift your foot behind you. This is the function of the calf muscle—to pull up the heel of your foot.



Runners use their leg muscles.



The sartorius muscle allows this runner's knee to bend so she can stretch her leg muscles.

Run your hand down from the back of your calf to the top of your heel. Do you feel that **flexible** part, just above your ankle? This is actually a tendon, called the **Achilles** (eh-KIL-eez) **tendon**. It is your body's longest and strongest tendon, connecting your calf muscle to the bone in your heel.

A few other important muscles are found in your legs, such as the sartorius (sahr-TOR-ee-us). It is your body's longest muscle, and it is responsible for allowing your leg to twist and bend at the knee.

A Muscle Minute

Achilles was a warrior in Greek myth whose only weak spot was his heel. The tendon that connects the calf muscle to the heel bone is called the Achilles tendon after him.



Then there's the biggest muscle of all—the **gluteus maximus** (GLEWT-ee-us MAK-seh-mus). This is the muscle that you feel in your butt.

Mirror, Mirror

Take a look at yourself in the mirror, and make a bunch of funny faces. Wiggle your eyebrows, move your lips, blink your eyes. How is your face able to make all these expressions? Once again, your skeletal muscles made you do it.

In fact, the muscles of your eye are the most active muscles in your body. Scientists think that these muscles move more than 100,000 times a day.

The skull is the bone that makes up most of your head, and it is largely covered with muscles. Only one bone on your face actually moves—your jaw, or the mandible (MAN-dih-bul). Only two muscles on your face are needed to raise and lower your jaw. The temporalis is connected to your temple, and the masseter (ma-SEET-er) is connected to your cheekbone.



Your jaw muscles help you bite and chew food.

So what do the other muscles on your face move? They move other muscles, which are attached to the skull. As the muscles move under your skin, your face shows different expressions.

For example, some muscles of your face help you to smile and frown. Muscles that help you smile are attached to your cheekbone on one end and to your lips on the other. When the muscles contract, your lips move up. Other muscles are attached to the chin and the lips. These muscles pull your lips down into a frown.



You can use your muscles to make unusual faces.

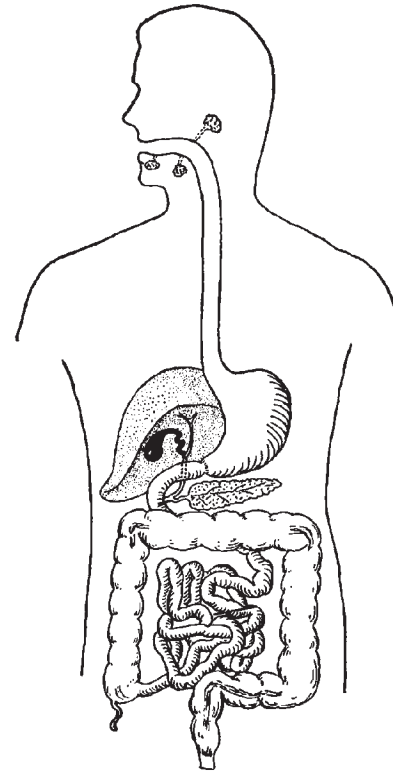
A Muscle Minute

How many muscles are needed to make you smile? Seventeen! That's nothing, though, compared to how many muscles are needed to form a frown—forty! That's more than double the amount needed to smile. So it really does take less effort to smile than to frown.



Don't Think About It—the Smooth Muscles

Every time you eat, you set a variety of muscles into motion. A few of those muscles are skeletal, because they move your jaw up and down. Other



Involuntary muscles keep your food moving through your body.

muscles move inside your body to help move food through your system. These muscles move without any instructions from you. Moving all on their own, or involuntarily, these muscles are called smooth muscles.

Smooth muscles are generally smaller and thinner than skeletal muscles. They are responsible for the small ways in which the organs inside your body move. Smooth muscles push food to your stomach; then smooth muscles push food from your stomach into your intestines. Eventually, smooth muscles push the unused food out of your body.

Blood vessels also have smooth muscles, and these muscles are found inside the vessels' walls. These smooth muscles help push blood through the vessels and ultimately through your body.

Smooth muscles are also important for breathing. Once the air enters your body, smooth muscles push the air downward and into your lungs. Without smooth muscles, you wouldn't be able to breathe, your blood would not be able to flow, and your food would not pass into your stomach and out again.

Try This

The Eyes Have It

Another important smooth muscle is in your eye. The black part of your eye is called the pupil. It gets bigger when you are in the dark to let in more light, and it gets smaller when you are in the light to limit the light. How does the pupil get bigger and smaller? Muscles pull the pupil open and closed.

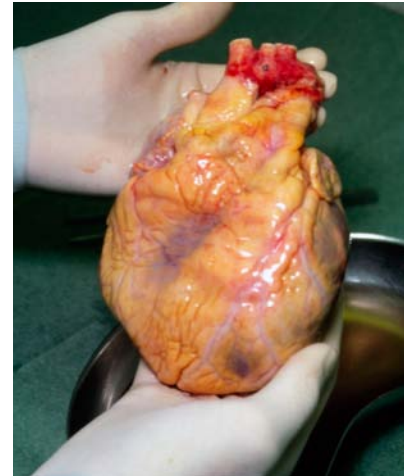
What you need: A flashlight, mirror, and dark room.

1. Put your face close to the mirror. Look into the mirror with the flashlight off. See how large your pupils are.
2. Turn on the flashlight. Shine the light toward your eyes, but not directly in them, and watch your pupils get smaller.



One More—the Cardiac Muscle

Your body has one more type of muscle, and it is the only one of its kind. It is the cardiac muscle, or your heart. Like the smooth muscles, your heart muscle is always in motion, even though you



A doctor holds a human heart removed during transplant surgery.

haven't asked it to do anything. It is an involuntary muscle, pumping and pushing blood through your body, every minute, every second, of every day.

Your heart keeps your body running smoothly by pumping blood throughout your body.

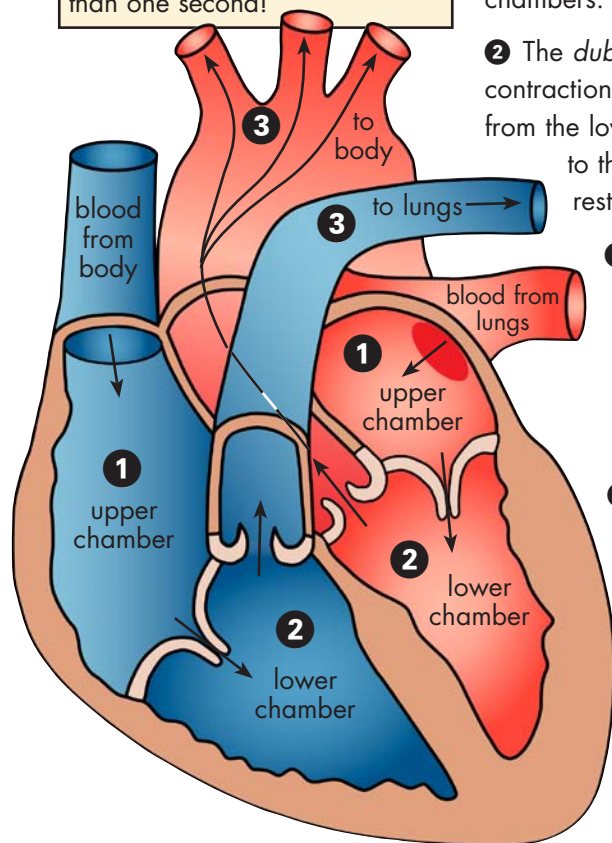
The heart has openings that control the flow of blood moving through it. These openings, called valves, are controlled by smooth muscles, which open and close the valves. In fact, the shutting of the valves is the sound of your heart beating. When smooth muscles inside your heart contract, blood moves from one section of the heart to the other.

Your heart might not be the biggest muscle in your body, but it is definitely the most important.

How the Cardiac Muscle Works

When doctors listen to your heart they hear your cardiac muscle contracting. The sound it makes is *lub-dub*. The *lub* is the cardiac muscle contracting the upper chambers of the heart. The *dub* is the cardiac muscle contracting the lower chambers of the heart.

The average adult heart beats 72 times per minute. One beat is one *lub-dub*. That means each *lub-dub* and rest happens in less than one second!



- 1 The *lub*, or first contraction, pushes blood from the upper chambers of the heart to the lower chambers.
- 2 The *dub*, or second contraction, pushes the blood from the lower chambers out to the lungs and the rest of your body.
- 3 Then the cardiac muscle rests, which allows the upper chambers to fill with blood again.
- 4 The next *lub-dub*, or pair of contractions, happens without you having to think about it.

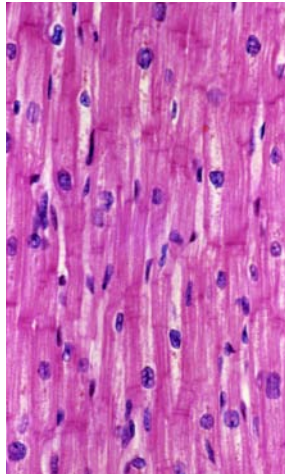
A Closer Look

You've probably noticed that skeletal muscles appear to be dark and rather stringy. Muscles are made up of special cells called fibers, and the fibers are, indeed, very long. In addition, each muscle fiber is made up of smaller fibers, called myofibrils. Long muscle fibers are bound together in groups called fascicles. All the fascicles are held together by tissues, and the fascicles and tissues make up one strand of muscle. So one muscle can have several thousand fibers, and many more myofibrils.

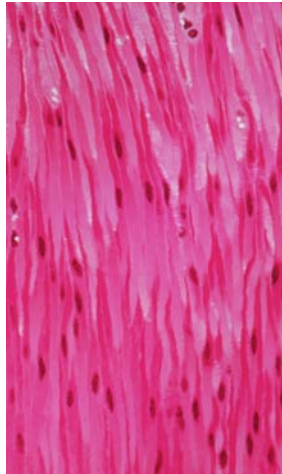


Protein Power

Protein is an important building block for muscles. Eating protein replenishes the protein in your muscles, keeping your muscles strong. Luckily, you can get all the protein you need from almost any food that isn't "junk food," including grains, vegetables, meat, eggs, and legumes (beans, peas, soy, lentils, and peanuts).



Cardiac
muscle cells



Smooth
muscle cells



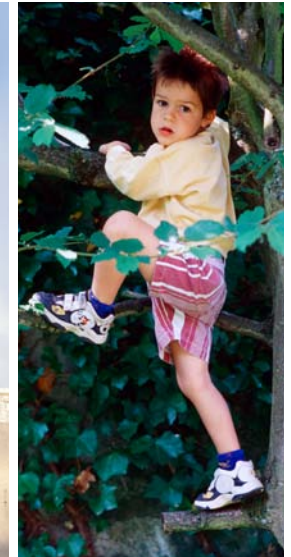
Skeletal
muscle cells

A Muscle Minute

The smallest muscle in your body is a smooth muscle, and it is in your ear. It is called the stapedius, and it controls the movement of a bone in your ear. You would need a microscope to see this muscle—it is only 0.01 inches (0.0254 cm) long.



If you compare the three types of muscles under a microscope, you can see other ways in which skeletal, smooth, and cardiac muscles differ. The cells of the skeletal muscles appear separate and straight. Smooth-muscle cells are also straight, but they are more firmly connected. The cells of the cardiac muscle, or the heart, are more wavy and branching.



Different ways to exercise your skeletal muscles

Muscle Building

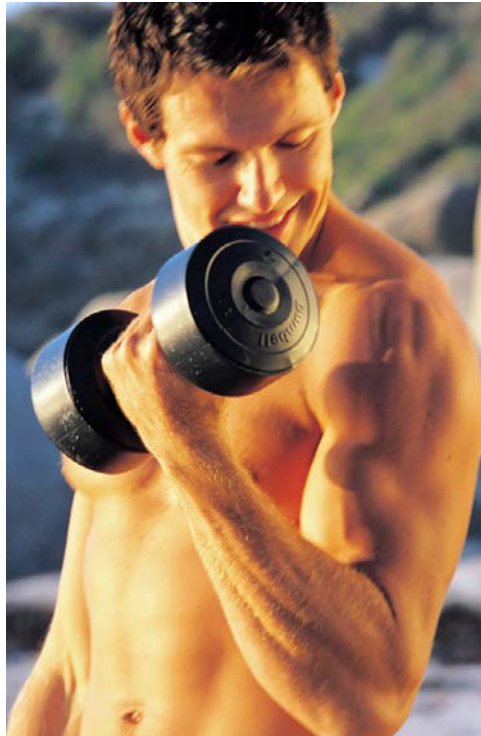
Your smooth muscles and your cardiac muscle are constantly moving, so you don't need to exercise them. Your skeletal muscles, however, need you to take care of them. Your muscles adjust to the way your body uses them. If you use your muscles a lot, your muscles remain strong and may even become stronger. Health experts tell us to exercise to keep our muscles working properly.

Muscles also become tired. Unlike your smooth and cardiac muscles, which never rest, your skeletal muscles do need to rest. It takes a lot of oxygen to keep these muscles moving. Rest helps the muscles regain their strength.

However, when you are not very active, your muscles are not active. Slowly, they adjust to being inactive, becoming weaker and weaker. Weak muscles don't allow you to do as many activities; for example, you won't be able to run very far or for very long, and you won't be able to lift heavy objects.

That's where "bodybuilding" comes in. Bodybuilding is really muscle building. People "build" their bodies by making their muscles bigger and stronger. As they lift weights, their muscles adjust to the activity and become more powerful, so more and more weight can be lifted each time. At first, the muscles will not be able to lift very heavy loads. Over time and with constant training, the muscles build and become strong.

Bodybuilders lift weights to build muscles.



Sometimes people can actually stretch their muscles too far. When this happens, a doctor will say they have "pulled a muscle." Often when a muscle has been pulled, some muscle fibers have torn. The muscle usually hurts, and it might even feel a little tight. Rest will help the muscle to heal and rebuild its broken fibers.

Muscles also weaken if you break a bone. Broken bones are healed by preventing the bones from moving. If the bones don't move, then the muscles don't move either. When a cast comes off, the broken bone will be stronger, but the muscles will be weak. Doing slow, moderate exercise will strengthen the weakened muscles.

Conclusion

Your body is a muscle machine. To keep your muscles working, the muscles need to remain active. Doctors stress the importance of exercise for keeping muscles strong, and they're right. Exercise not only strengthens your skeletal muscles, but it keeps your heart pumping and your blood flowing.

Your muscles react to the messages you send to your brain. Tell your muscles to move, and they will. Exercise your muscles daily, and they'll work more efficiently.

So go on—get moving, and mind your muscles!

Glossary

Achilles tendon (<i>n.</i>)	a tendon that connects the calf muscle to the heel bone (p. 11)
biceps (<i>n.</i>)	the muscle in the upper arm that lifts the forearm (p. 8)
gluteus maximus (<i>n.</i>)	the muscle in butt and upper thigh that helps humans stand up straight (p. 11)
flexible (<i>adj.</i>)	able to bend without breaking (p. 11)
hamstring (<i>n.</i>)	muscle on back of thigh that makes the knee bend (p. 10)
involuntary muscles (<i>n.</i>)	muscles that move without you having to tell them to (p. 5)
quadriceps (<i>n.</i>)	the muscle on top of thigh that lifts the leg (p. 10)
triceps (<i>n.</i>)	the muscle on the underside of the upper arm that pulls the forearm down (p. 9)
voluntary muscles (<i>n.</i>)	muscles that move when you tell them to (p. 7)



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