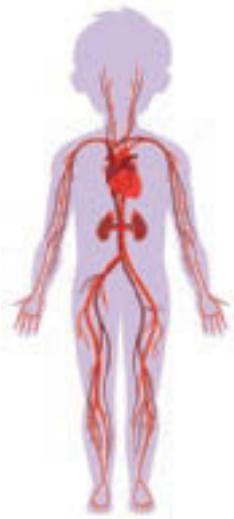
Core Knowledge® SCIENCE

Human Body Systems

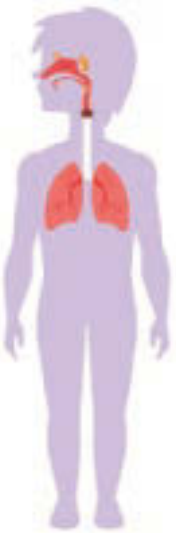
muscular system

nervous system

skeletal system



circulatory system



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Core Knowledge®

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CHAPTER
1

Graceful Grace

Grace is looking forward to school today. She gets to wear her gymnastics clothes. Today at school is show-and-tell day. On show-and-tell day, students each get to share something with the class. They can bring an object from home to show. Or they can tell something that they know how to do.

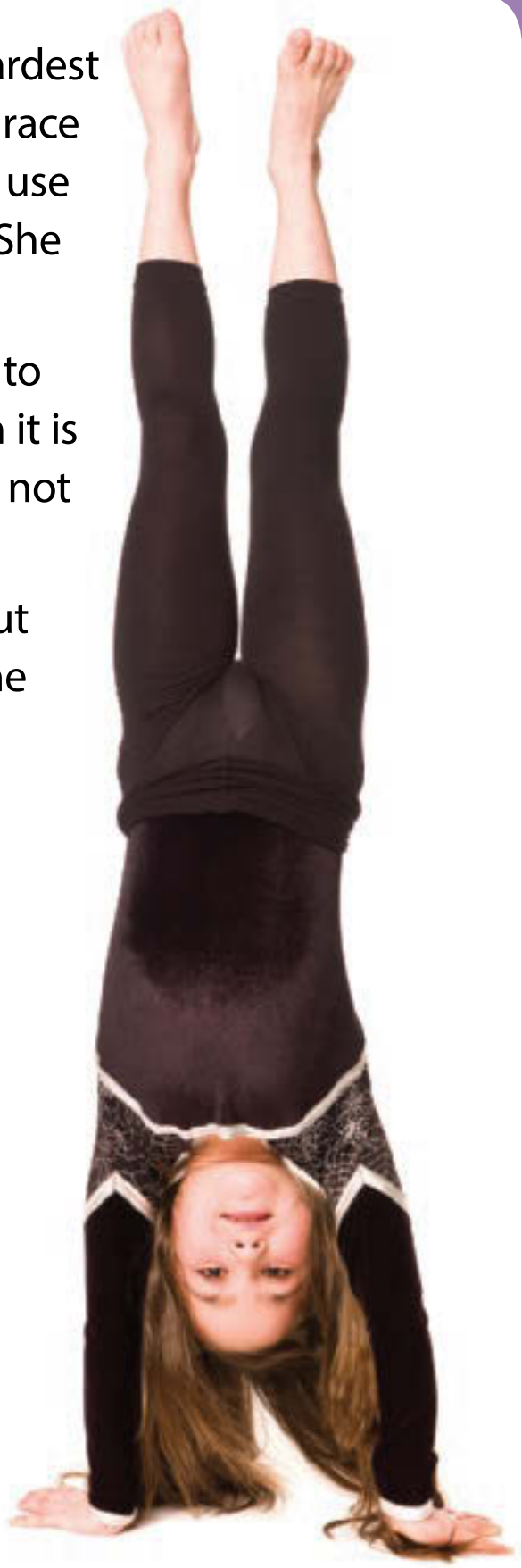
Last month for show-and-tell, Grace brought a big seashell she found at the beach. Today, instead of bringing an object to school, she shows something she can do. Grace does a backbend!

Grace learned to do a backbend in her gymnastics class. She has taken gymnastics lessons since she was small. She practices every day so she will be ready to compete soon. Her practice makes her body strong and flexible.

Mr. Brown asks, “Grace, what is the hardest gymnastics skill you have learned?” Grace answers right away, but she does not use words. Instead, she shows everyone. She does a handstand.

Grace returns to her feet. “It is harder to hold your body up on your arms than it is on your legs,” she explains. “Arms are not as strong as legs.”

Mr. Brown asks the class to think about how Grace’s body is working while she does a handstand.



CHAPTER
2

Bones

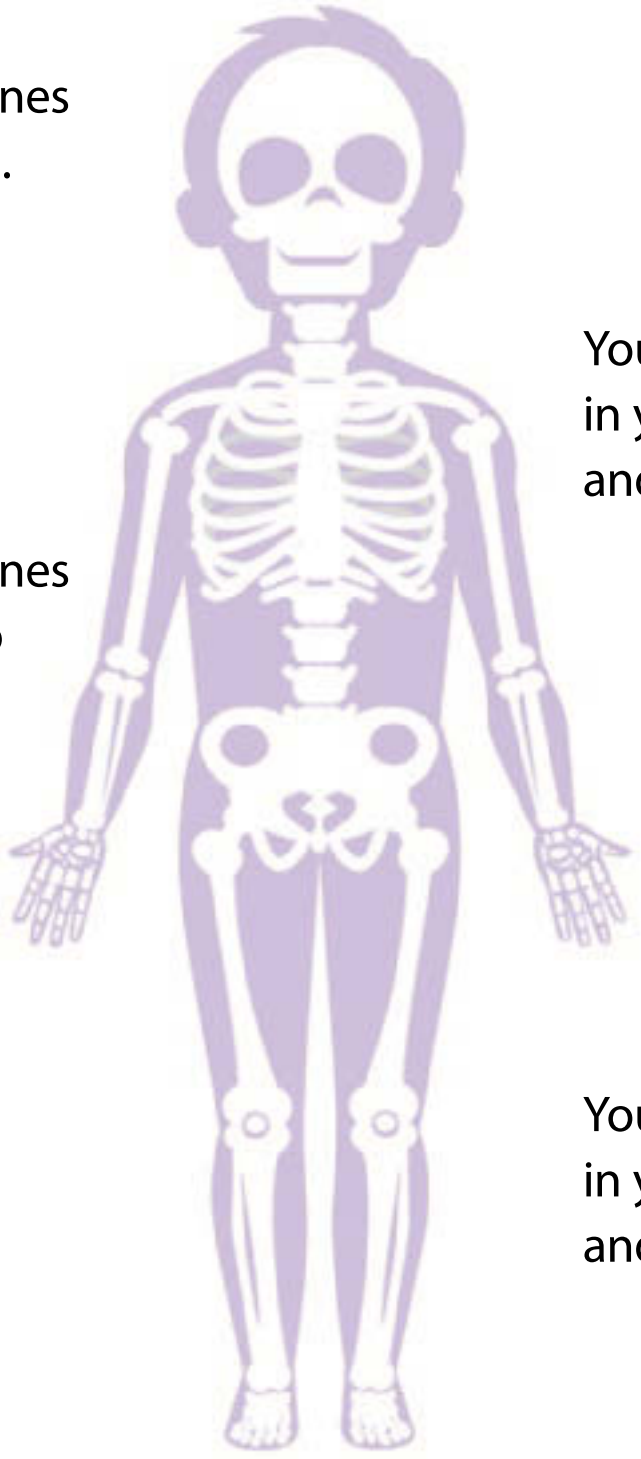
Grace performed a backbend and handstand at show-and-tell. The skills took many tries for her to learn. When Grace learns new gymnastics skills, she moves her body in ways that are hard at first. Many of the movements she can do take a lot of practice. She exercises to get stronger. She stretches to become more flexible.

Though Grace is very flexible, her body can only bend in certain ways. Your body can only bend at joints. Joints are the places where bones are connected together. Bones themselves do not bend.

Your body has over two hundred bones. The bones make up your skeleton. Your skeleton is your body's frame.

Separate parts that work together are called a system. Your bones make up your skeletal system.

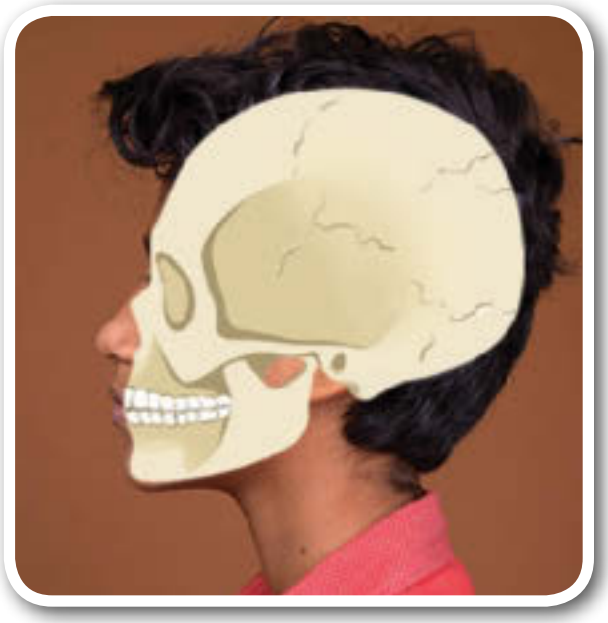
You have bones in your head.



You have bones in your arms and hands.

You have bones in your torso and back.

You have bones in your legs and feet.



All the bones in your head form your skull. Your hard skull protects your soft brain.

Your rib cage is a set of bones that protects your heart and lungs.

Bend and straighten your fingers. Can you count how many bones each finger has?

To grow and stay healthy, bones need nutrients from your diet. Calcium is a nutrient in certain foods, especially in dairy, spinach, and kale. It is important to get enough calcium in your diet, especially while your bones are growing.

Bones do not bend, but they can break. A doctor uses an X-ray picture to see if a bone is broken.

A broken bone takes a long time to heal. The bone must be held in place the whole time it is healing so that it does not bend at the broken spot. The hard bandage that protects a broken bone is called a cast.

CHAPTER
3

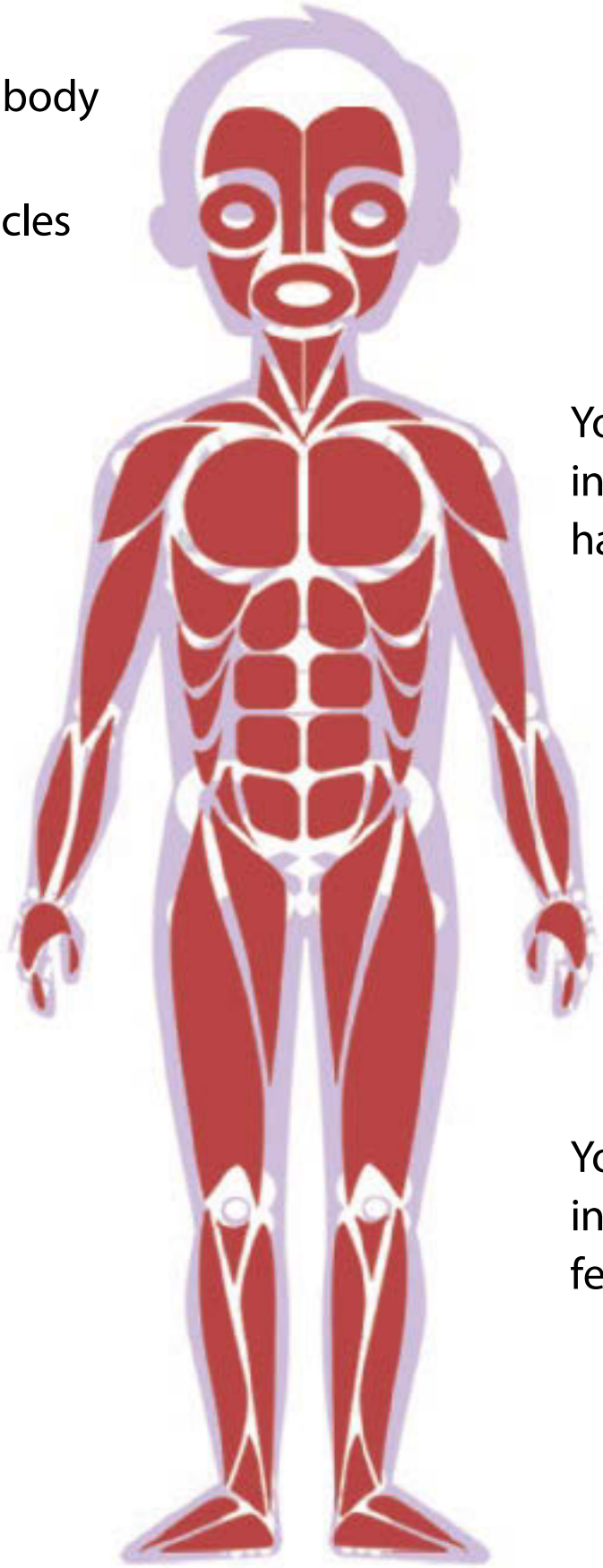
Muscles

Gymnastics involves body movements. Grace can do many different kinds of movements. The parts of her body that produce motion are muscles. Grace's gymnastics coach teaches her exercises to make her muscles stronger. She learns to stretch to make her muscles more flexible.

Your muscles make up your muscular system. Some of your muscles are called skeletal muscles. These are muscles that attach to your bones. They also attach to each other. Muscles make your body bend and straighten at the joints.

Muscle is soft body tissue.

You have muscles in your face.



You have muscles in your arms and hands.

You have muscles in your torso and back.

You have muscles in your legs and feet.

Muscles work by contracting and relaxing. Contracting means shortening. Relaxing means lengthening. Any time you bend or straighten part of your body at a joint, muscles are contracting or relaxing to move your bones. Contracting a muscle is also called flexing. When you bend your leg, some muscles contract to bend it. Then others contract to make your leg straight again.

Exercising muscles until they are tired makes them stronger when they rest and recover. Repeated exercise can build strong muscles.

Running is good exercise for leg muscles.

Push-ups are good exercise for arm muscles.

Leg lifts are good exercise for abdominal muscles.

Some other kinds of muscles aren't attached to bones. Your heart is a muscle. When you feel your heartbeat, you are feeling your heart muscle contract. Exercise that makes your heart beat fast for a short time is good for your heart muscle. It helps keep you fit and healthy.

Growing and building strong muscles requires a diet of healthful foods in addition to exercise.

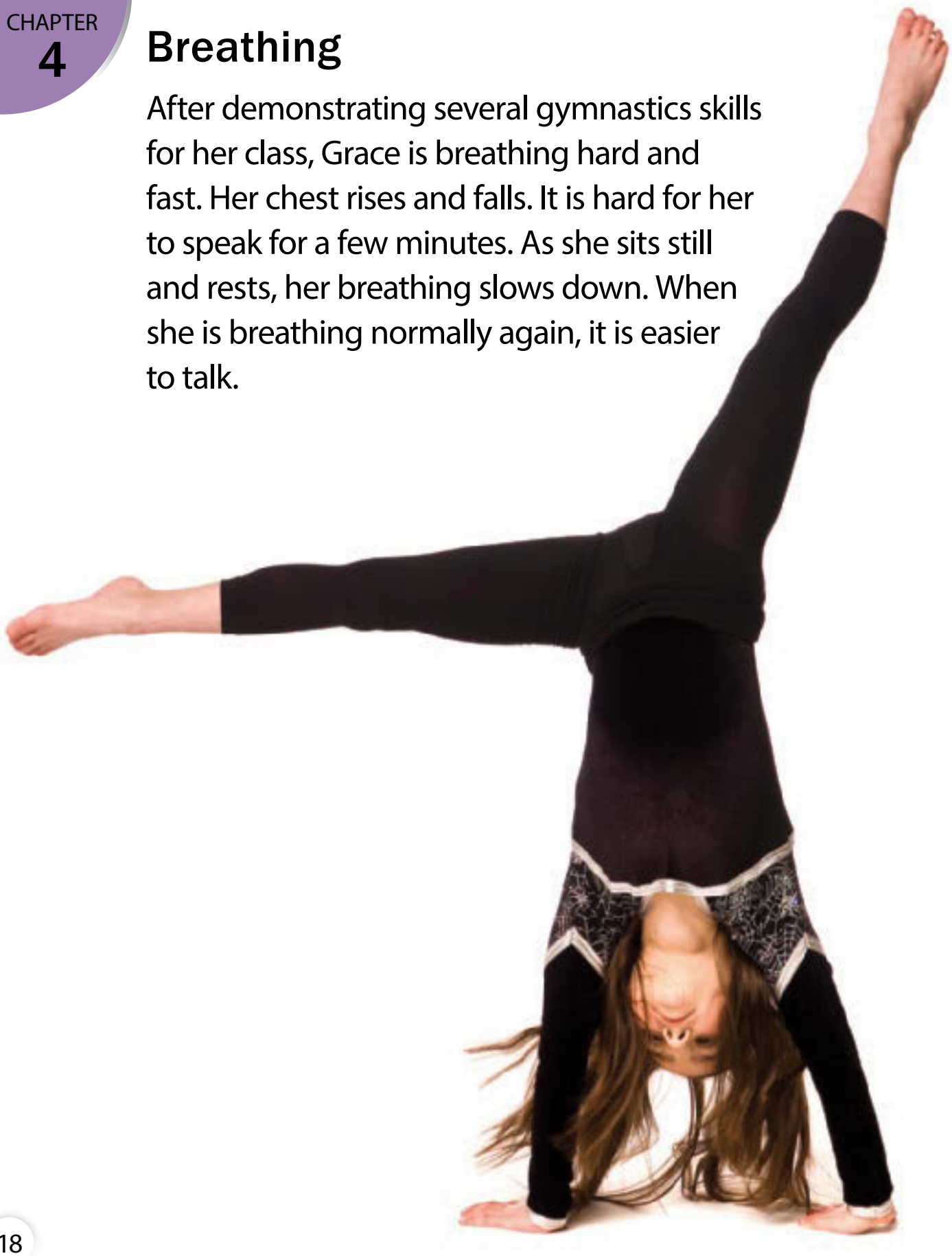
Over time, after lifting a certain amount of weight, muscles become stronger and can lift more.

Also over time, after repeating a motion, muscles can stretch farther. Muscles can get hurt if we stretch them too far or too fast. A pulled muscle can be very painful. To be able to do something like splits, Grace needed to move toward the position again and again, gently and gradually.

CHAPTER
4

Breathing

After demonstrating several gymnastics skills for her class, Grace is breathing hard and fast. Her chest rises and falls. It is hard for her to speak for a few minutes. As she sits still and rests, her breathing slows down. When she is breathing normally again, it is easier to talk.

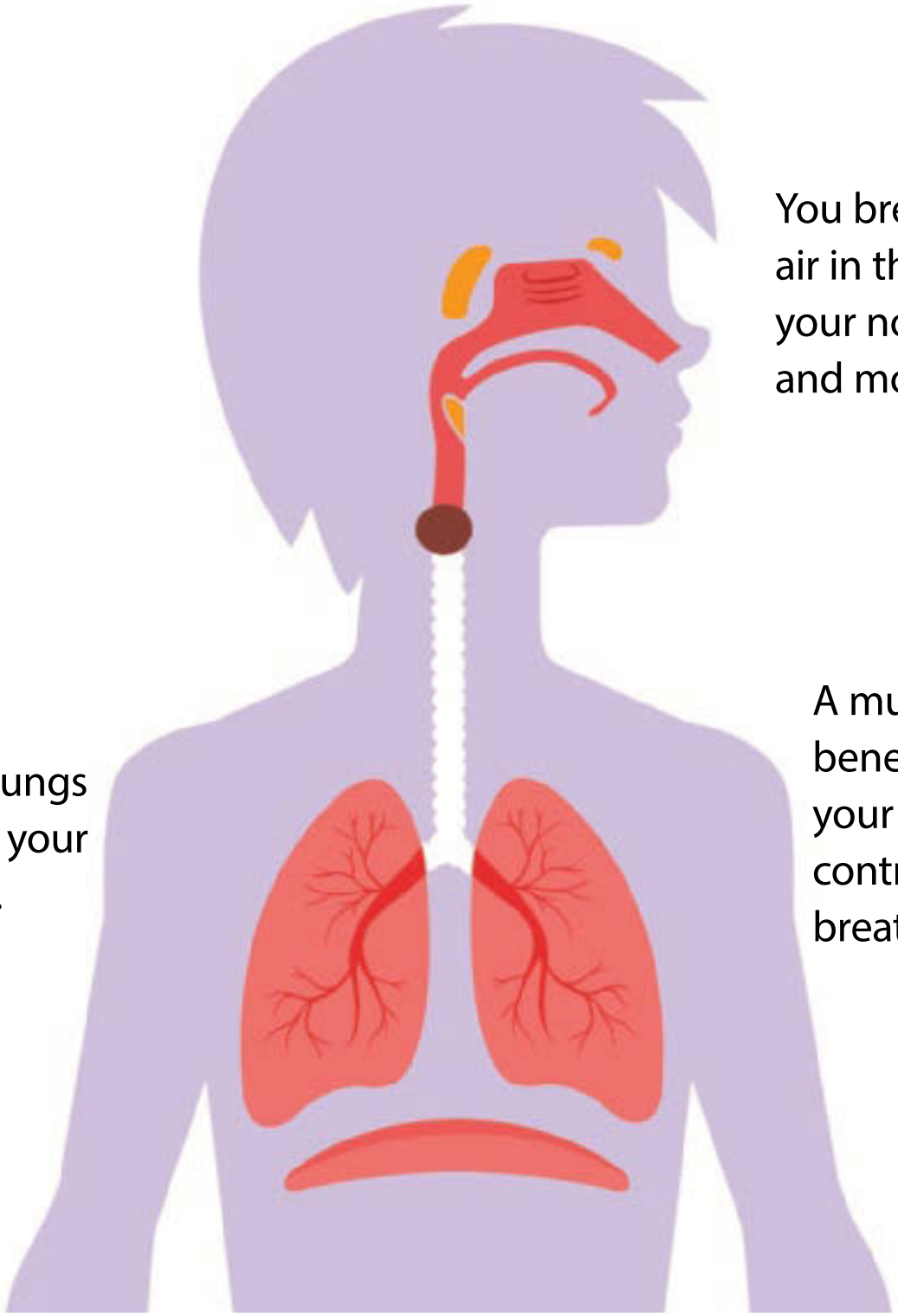


Your body needs air to stay alive. Breathing is the body's process of taking in air. Your body breathes automatically, whether you think about it or not. Breathing continues when you are not aware of it. You breathe the whole time you are asleep. When you are awake, you can notice your breathing and partially control it. You can temporarily hold your breath.

Take a deep breath, and let it out. Breathing in is called inhaling. When you breathe in, you inhale. Breathing out is called exhaling. When you breathe out, you exhale.

Notice how your chest swells when you inhale. Your lungs inside your chest are filling with air. Notice how your chest and belly shrink back in when you exhale. Your lungs push the old air out. You take fresh air in again with your next breath.

Your body parts that take in and release air make up your respiratory system.



You breathe air in through your nose and mouth.

Your lungs are in your chest.

A muscle beneath your lungs controls your breathing.

While you are active, your body needs more air. You breathe faster and more heavily.

While you are resting, your body needs less air. You breathe slower and less deeply.

Your lungs need clean, fresh air. Even though you can't see it, air can be dirty and contain harmful particles or germs. When dirty air or germs get into your respiratory system, they can make you sick. When you have a cold, germs have infected the breathing passages in your head and chest.

Smoke contains particles that make air dirty. Breathing in smoke is harmful to your lungs.

CHAPTER 5

Pumping Blood

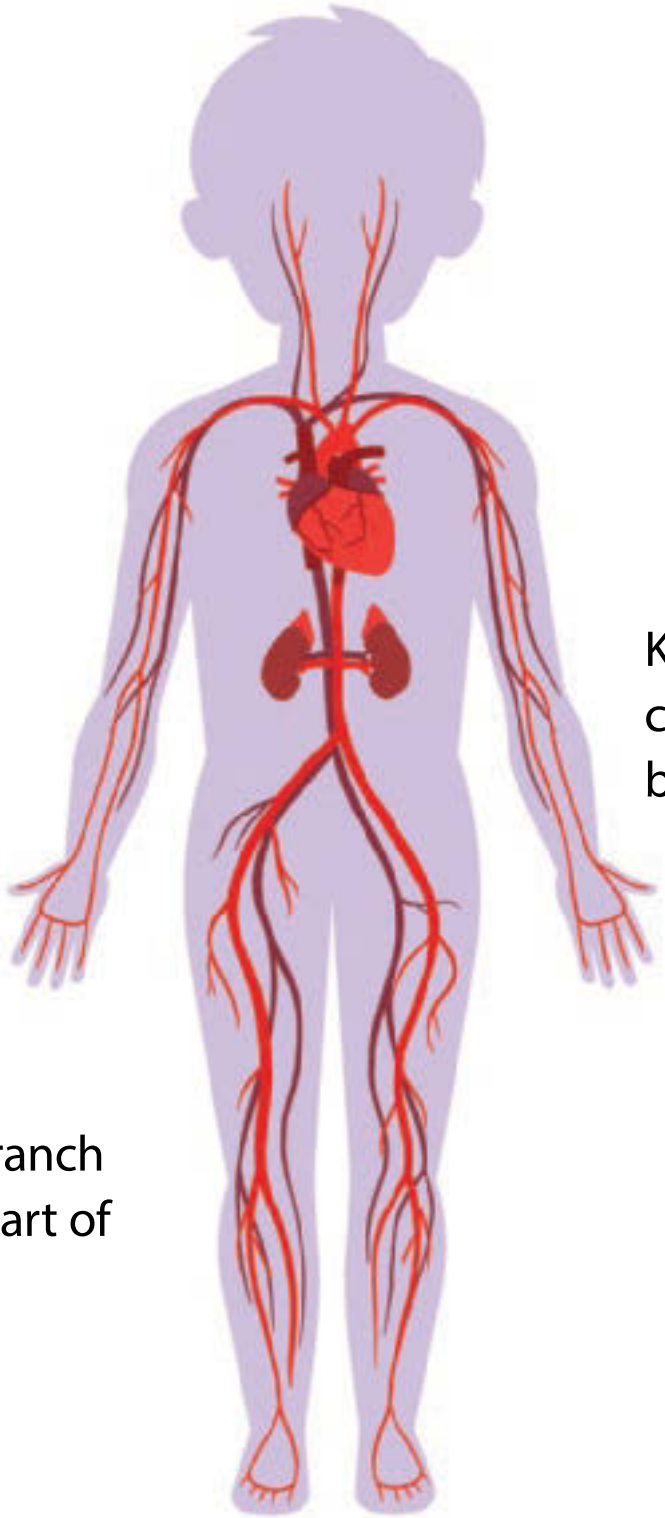
When Grace is breathing heavily from her gymnastics exercises, she can also feel her heart pounding in her chest.

Like her breathing, her heartbeat also becomes more rapid when she is active. As she sits still and rests, her heartbeat slows down.

Your heart beats all the time you are awake and all the time you are asleep. Like breathing, your heart beats continuously for your entire life. Unlike breathing, you cannot control your heartbeat when you notice and think about it.

Your heart is part of a system that moves blood throughout your body. The body parts that move your blood make up your circulatory system.

Your heart is in your chest.



Kidneys help clean your blood.

Blood vessels branch out into every part of your body.

All the parts of your body need materials that come from food and air. Your blood carries these materials to your body parts. The blood moves through blood vessels. Blood vessels are like hoses. They form a network of tubes throughout your body. Veins and arteries are names for two types of blood vessels.

A heartbeat is the contraction, or squeezing, of your heart muscle. When your heart contracts, it squeezes blood out and pushes the blood through your blood vessels.

You can feel your blood being pushed through some of your blood vessels with each heartbeat. This is called your pulse.

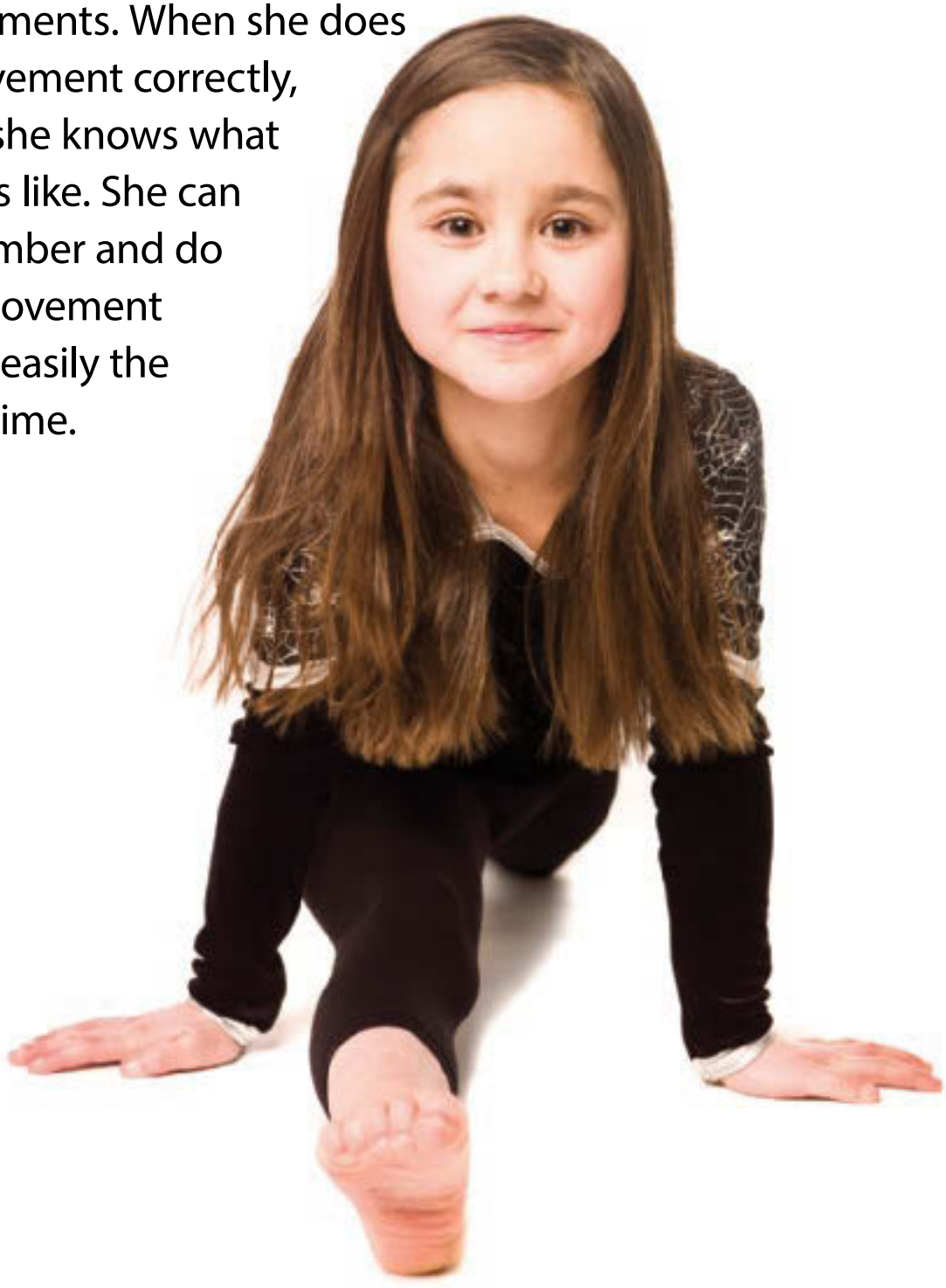
Exercise and proper eating help keep your heart healthy. Too many foods that are oily or fatty can be harmful to your heart and blood vessels.

Drinking plenty of water also helps keep your blood and your circulatory system healthy.

CHAPTER
6

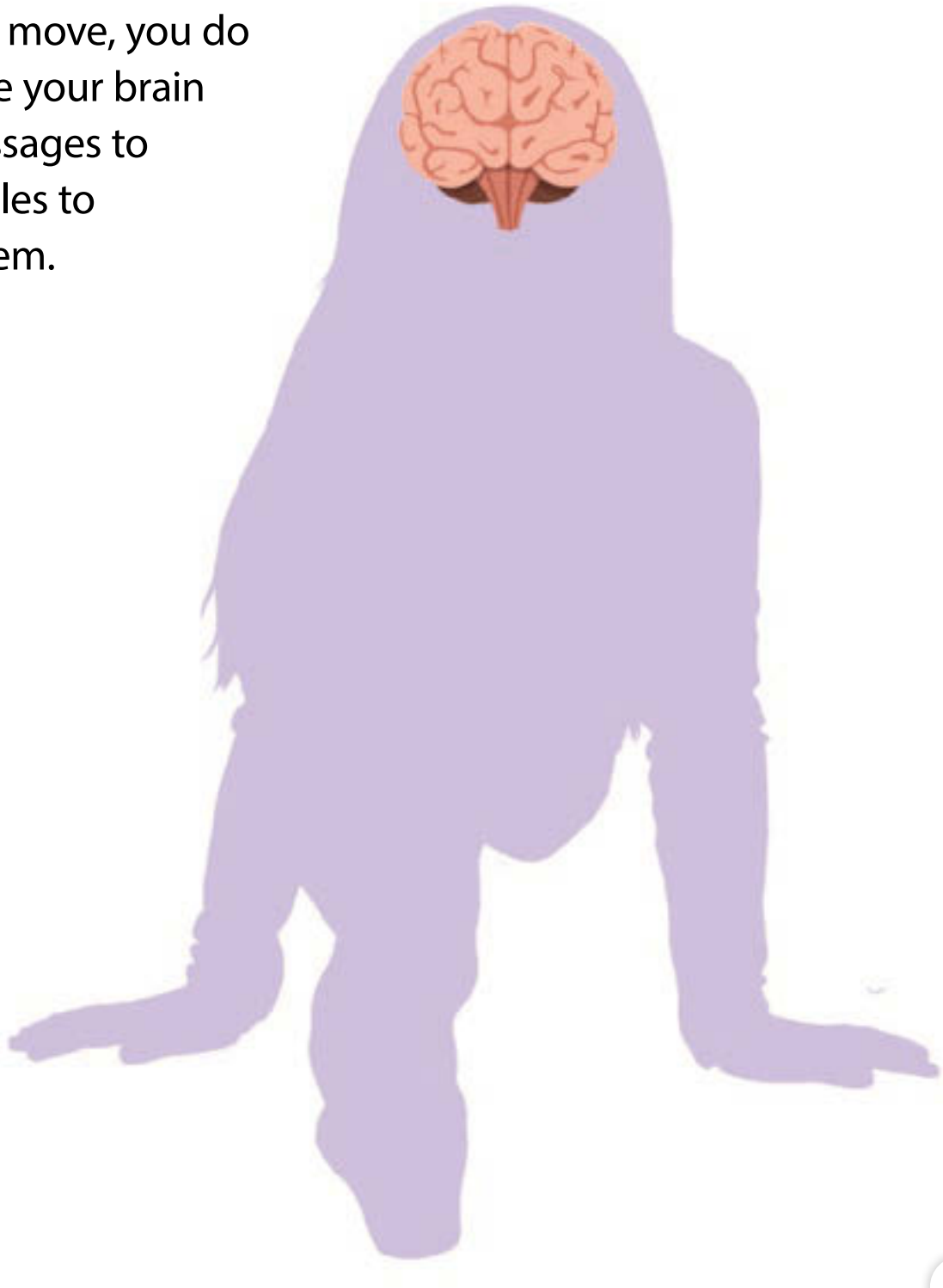
Body Control

Grace is learning skilled control of her body. Her gymnastics exercises make her muscles strong and flexible. She can perform graceful muscle movements. When she does a movement correctly, then she knows what it feels like. She can remember and do the movement more easily the next time.



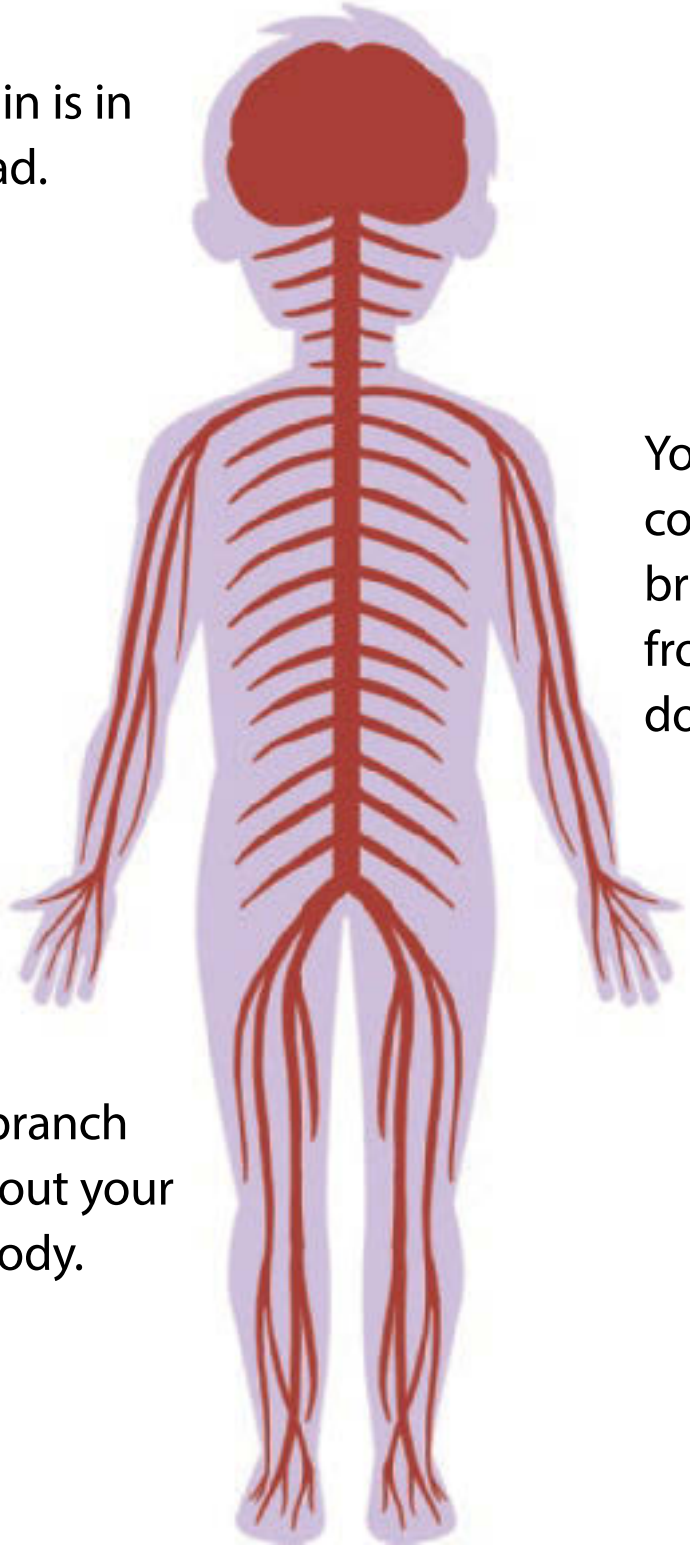
Your brain controls all the things your body does. It controls the things you think about, like movement. It also controls the things you don't think about, like your breathing and heartbeat.

When you move, you do so because your brain sends messages to your muscles to control them.



Messages between your brain and your body parts are carried by nerves. The nerves in your brain and body make up your nervous system.

Your brain is in your head.



Your spinal cord connects your brain to nerves from your neck down.

Nerves branch throughout your whole body.

Your spinal cord carries information to and from your brain. Nerves branch out from your spinal cord to the rest of your body. Your spinal cord is protected inside your spine. Your spine is the set of backbones from your neck to your tailbone.

Nerves connecting your brain to muscles control movement and balance. Your senses, like vision and hearing, also rely on nerves. Nerves carry information from your body to your brain. This lets you see, hear, smell, taste, and feel.

Brain and spine injuries are serious and dangerous. When you are playing sports, riding a bike, or doing other rugged activity, it is important to wear the proper safety equipment. Helmets help protect your head from a brain injury.

CHAPTER 7

Science in Action

Physiologists and Anatomy

Grace will soon be old enough to compete in gymnastics competitions. She is becoming an athlete. When athletes compete in sports, they make unusual demands of their bodies. Young athletes must have coaches to teach them skills. Their coaches must also be sure that the sports do not harm the athletes' growing bodies.

One of the adults who works with Grace is not a coach. She is called a sports physiologist. She keeps track of Grace's growth and fitness. She measures the strength of Grace's different muscles. If Grace needs to strengthen a muscle, the physiologist teaches her an exercise that works right to develop that muscle.

Exercise physiologists can help anyone who needs to learn how to make their body more fit through movement. But they do not work only with athletes.

Physical therapists help people regain or improve their ability to move. Many things can make it more difficult for a person to move their body. For example, an illness, injury, or surgery can make it hard for a person to move. Muscles and nerves need time to recover. Physical therapists show people ways to rebuild strength while they heal and recover.

Some injuries or conditions are temporary. The body heals, and its parts move the way they did before.

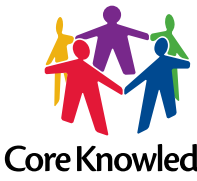
Other conditions are permanent. Illness or injury can make bones, muscles, or nerves work differently. When something limits body movement, a person can find different ways to do things. Physical therapists help people figure out new ways to do all the things they need to do.

Staying healthy and having strong muscles also means avoiding diseases. You might know that viruses cause colds and flu. Some viruses can also affect muscles and nerves. One dangerous virus causes a disease called polio. Viruses that cause polio can damage a person's spinal cord. The infected spinal cord can't work with the body's other nerves to control muscle movement. Polio can leave people unable to walk.

A vaccine can prevent polio. A vaccine is a medical treatment, usually a shot. The polio vaccine prevents the polio virus from hurting the body.

Jonas Salk

Jonas Salk was a medical doctor. Dr. Salk developed the first safe and effective vaccine against polio. The vaccine was first used in the United States in 1955. Dr. Salk became a national hero for his important work. It became routine for everyone to get the vaccine in childhood. By the late 1970s, polio was rare in the United States.



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