

Section 9

Aerobic Capacity

KidsHealth

Your Heart & Circulatory System

Did you give your friends valentines and little heart-shaped candies on Valentine's Day? Do you ever cross your heart when making a promise that you really, really mean? Or turn on the radio to hear a guy singing about his broken heart?

We see and hear about hearts everywhere. A long time ago, people even thought that their emotions came from their hearts, maybe because the heart beats faster when a person is scared or excited. Now we know that emotions come from the brain, and in this case, the brain tells the heart to speed up. So what's the heart up to, then? How does it keep busy? What does it look like? Let's find out.

Working That Muscle

Your heart is really a muscle. It's located a little to the left of the middle of your chest, and it's about the size of your fist. There are lots of muscles all over your body — in your arms, in your legs, in your back, even in your behind.

But the heart muscle is special because of what it does. The heart sends blood around your body. The blood provides your body with the oxygen and nutrients it needs. It also carries away waste.

Your heart is sort of like a pump, or two pumps in one. The right side of your heart receives blood from the body and pumps it to the lungs. The left side of the heart does the exact opposite: It receives blood from the lungs and pumps it out to the body.

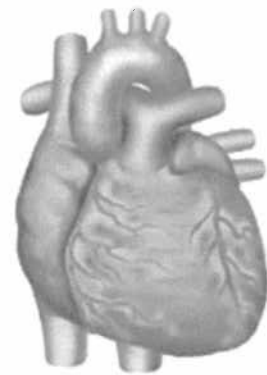
We Got the Beat

How does the heart beat? Before each beat, your heart fills with blood. Then its muscle contracts to squirt the blood along. When the heart contracts, it squeezes — try squeezing your hand into a fist. That's sort of like what your heart does so it can squirt out the blood. Your heart does this all day and all night, all the time. The heart is one hard worker!

Heart Parts

The heart is made up of four different blood-filled areas, and each of these areas is called a chamber. There are two chambers on each side of the heart. One chamber is on the top and one chamber is on the bottom. The two chambers on top are called the **atria** (say: **ay**-tree-uh). If you're talking only about one, call it an **atrium**. The atria are the chambers that fill with the blood returning to the heart from the body and lungs. The heart has a left atrium and a right atrium.

The two chambers on the bottom are called the **ventricles** (say: **ven**-trih-kulz). The heart has a left ventricle and a right ventricle. Their job is to squirt out the blood to the body and lungs. Running down the middle of the heart is a thick wall of muscle called the **septum** (say: **sep**-tum).



The septum's job is to separate the left side and the right side of the heart.

The atria and ventricles work as a team — the atria fill with blood, then dump it into the ventricles. The ventricles then squeeze, pumping blood out of the heart. While the ventricles are squeezing, the atria refill and get ready for the next contraction. So when the blood gets pumped, how does it know which way to go?

Well, your blood relies on four special valves inside the heart. A valve lets something in and keeps it there by closing — think of walking through a door. The door shuts behind you and keeps you from going backward.

Two of the heart valves are the **mitral** (say: **my-trul**) **valve** and the **tricuspid** (say: try-**kus**-pid) **valve**. They let blood flow from the atria to the ventricles. The other two are called the **aortic** (say: ay-**or**-tik) **valve** and **pulmonary** (say: **pul**-muh-ner-ee) **valve**, and they're in charge of controlling the flow as the blood leaves the heart. These valves all work to keep the blood flowing forward. They open up to let the blood move ahead, then they close quickly to keep the blood from flowing backward.

It's Great to Circulate

* You probably guessed that the blood just doesn't slosh around your body once it leaves the heart. It moves through many tubes called arteries and veins, which together are called **blood vessels**. These blood vessels are attached to the heart. The blood vessels that carry blood away from the heart are called arteries. The ones that carry blood back to the heart are called veins.

* The movement of the blood through the heart and around the body is called **circulation** (say: sur-kyoo-**lay**-shun), and your heart is really good at it — it takes less than 60 seconds to pump blood to every cell in your body.

* Your body needs this steady supply of blood to keep it working right. Blood delivers oxygen to all the body's cells. To stay alive, a person needs healthy, living cells. Without oxygen, these cells would die. If that oxygen-rich blood doesn't circulate as it should, a person could die.

* The left side of your heart sends that oxygen-rich blood out to the body. The body takes the oxygen out of the blood and uses it in your body's cells. When the cells use the oxygen, they make carbon dioxide and other stuff that gets carried away by the blood. It's like the blood delivers lunch to the cells and then has to pick up the trash!

* The returning blood enters the right side of the heart. The right ventricle pumps the blood to the lungs for a little freshening up. In the lungs, carbon dioxide is removed from the blood and sent out of the body when we exhale. What's next? An inhale, of course, and a fresh breath of oxygen that can enter the blood to start the process again. And remember, it all happens in about a minute!

Listen to the Lub-Dub

When you go for a checkup, your doctor uses a stethoscope to listen carefully to your heart. A healthy heart makes a lub-dub sound with each beat. This sound comes from the valves shutting on the blood inside the heart.

The first sound (the lub) happens when the mitral and tricuspid valves close. The next sound (the dub) happens when the aortic and pulmonary valves close after the blood has been squeezed out of the heart. Next time you go to the doctor, ask if you can listen to the lub-dub, too.

Pretty Cool — It's My Pulse!

Even though your heart is inside you, there is a cool way to know it's working from the outside. It's your pulse. You can find your pulse by lightly pressing on the skin anywhere there's a large artery running just beneath your skin. ~~Two good places to find it are on the side of your neck and the inside of your wrist, just below the thumb.~~

You'll know that you've found your pulse when you can feel a small beat under your skin. Each beat is caused by the contraction (squeezing) of your heart. If you want to find out what your heart rate is, use a watch with a second hand and count how many beats you feel in 1 minute. When you are resting, you will probably feel between 70 and 100 beats per minute.

When you run around a lot, your body needs a lot more oxygen-filled blood. Your heart pumps faster to supply the oxygen-filled blood that your body needs. You may even feel your heart pounding in your chest. Try running in place or jumping rope for a few minutes and taking your pulse again — now how many beats do you count in 1 minute?

Keep Your Heart Happy

Most kids are born with a healthy heart and it's important to keep yours in good shape. Here are some things that you can do to help keep your heart happy:

- Remember that your heart is a muscle. If you want it to be strong, you need to exercise it. How do you do it? By being active in a way that gets you huffing and puffing, like jumping rope, dancing, or playing basketball. Try to be active every day for at least 30 minutes! An hour would be even better for your heart!
- Eat a variety of healthy foods and avoid foods high in unhealthy fats, such as saturated fats and trans fats (reading the labels on foods can help you figure out if your favorite snacks contain these unhealthy ingredients).
- Try to eat at least five servings of fruits and vegetables each day.
- Avoid sugary soft drinks and fruit drinks.
- Don't smoke. It can damage the heart and blood vessels.

So now you know that your heart doesn't look like a valentine, but it sure deserves to be loved for all the work it does. It started pumping blood before you were born and will continue pumping throughout your whole life.

Reviewed by: Gina Baffa, MD

Date reviewed: June 2008

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Your Lungs & Respiratory System

What's something that you do all day, every day, no matter where you are or who you're with?

- (a) think about what's for lunch tomorrow
- (b) put your finger in your nose
- (c) hum your favorite song
- (d) breathe

It's possible that some kids could say (a) or (c) or that others might even say — yikes! — (b). But every single person in the world has to say (d). Breathing air is necessary for keeping humans (and many animals) alive. And the **two** parts that are large and in charge when it comes to breathing? If you guessed your lungs, you're right!

Your lungs make up one of the largest organs in your body, and they work with your respiratory system to allow you to take in fresh air, get rid of stale air, and even talk. Let's take a tour of the lungs!

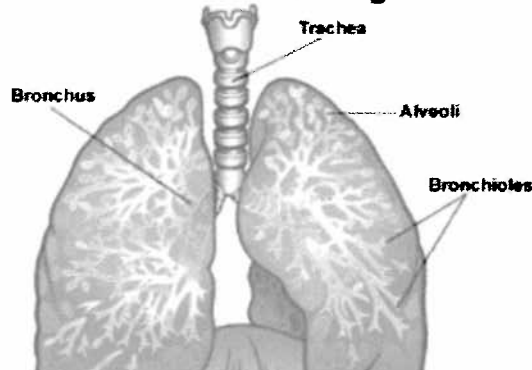
Locate Those Lungs

Your lungs are in your chest, and they are so large that they take up most of the space in there. You have two lungs, but they aren't the same size the way your eyes or nostrils are. Instead, the lung on the left side of your body is a bit smaller than the lung on the right. This extra space on the left leaves room for your heart.

Your lungs are protected by your rib cage, which is made up of 12 sets of ribs. These ribs are connected to your spine in your back and go around your lungs to keep them safe. Beneath the lungs is the diaphragm (say: **dy**-uh-fram), a dome-shaped muscle that works with your lungs to allow you to inhale (breathe in) and exhale (breathe out) air.

You can't see your lungs, but it's easy to feel them in action: Put your hands on your chest and breathe in very deeply. You will feel your chest getting slightly bigger. Now breathe out the air, and feel your chest return to its regular size. You've just felt the power of your lungs!

A Look Inside the Lungs



From the outside, lungs are pink and a bit squishy, like a sponge. But the inside contains the real lowdown on the lungs! At the bottom of the **trachea** (say: **tray**-kee-uh), or windpipe, there are two large tubes. These tubes are called the main stem **bronchi** (say: **brong**-kye), and one heads left into the left lung, while the other heads right into the right lung.

Each main stem bronchus (say: **brong**-kuss) — the name for just one of the bronchi — then branches off

into tubes, or bronchi, that get smaller and even smaller still, like branches on a big tree. The tiniest tubes are called **bronchioles** (say: **brong**-kee-oles), and there are about 30,000 of them in each lung. Each bronchiole is about the same thickness as a hair.

At the end of each bronchiole is a special area that leads into clumps of teeny tiny air sacs called **alveoli** (say: al-**vee**-oh-lie). There are about 600 million alveoli in your lungs and if you stretched them out, they would cover an entire tennis court. Now that's a load of alveoli! Each **alveolus** (say: al-**vee**-oh-luss) — what we call just one of the alveoli — has a mesh-like covering of very small blood vessels called **capillaries** (say: **cap**-ill-er-ees). These capillaries are so tiny that the cells in your blood need to line up single file just to march through them.

All About Inhaling

When you're walking your dog, cleaning your room, or spiking a volleyball, you probably don't think about inhaling (breathing in) — you've got other things on your mind! But every time you inhale air, dozens of body parts work together to help get that air in there without you ever thinking about it.



As you breathe in, your diaphragm contracts and flattens out. This allows it to move down, so your lungs have more room to grow larger as they fill up with air. "Move over, diaphragm, I'm filling up!" is what your lungs would say. And the diaphragm isn't the only part that gives your lungs the room they need. Your rib muscles also lift the ribs up and outward to give the lungs more space.

At the same time, you inhale air through your mouth and nose, and the air heads down your trachea, or windpipe. On the way down the windpipe, tiny hairs called **cilia** (say: **sill**-ee-uh) move gently to keep mucus and dirt out of the lungs. The air then goes through the series of branches in your lungs, through the bronchi and the bronchioles.

Thank You, Alveoli!

The air finally ends up in the 600 million alveoli. As these millions of alveoli fill up with air, the lungs get bigger. Remember that experiment where you felt your lungs get larger? Well, you were really feeling the power of those awesome alveoli!

It's the alveoli that allow oxygen from the air to pass into your blood. All the cells in the body need oxygen every minute of the day. Oxygen passes through the walls of each alveolus into the tiny capillaries that surround it. The oxygen enters the blood in the tiny capillaries, hitching a ride on red blood cells and traveling through layers of blood vessels to the heart. The heart then sends the oxygenated (filled with oxygen) blood out to all the cells in the body.

Waiting to Exhale

When it's time to exhale (breathe out), everything happens in reverse: Now it's the diaphragm's turn to say, "Move it!" Your diaphragm relaxes and moves up, pushing air out of the lungs. Your rib muscles become relaxed, and your ribs move in again, creating a smaller space in your chest.

By now your cells have used the oxygen they need, and your blood is carrying carbon dioxide and other wastes that must leave your body. The blood comes back through the capillaries and the wastes enter the alveoli. Then you breathe them out in the reverse order of how they came in — the air goes through the bronchioles, out the bronchi, out the trachea, and finally out through your mouth and nose.

The air that you breathe out not only contains wastes and carbon dioxide, but it's warm, too! As air travels through your body, it picks up heat along the way. You can feel this heat by putting your hand in front of your mouth or nose as you breathe out. ~~What is the temperature of the air that comes out of your mouth or nose?~~

With all this movement, you might be wondering why things don't get stuck as the lungs fill and empty! Luckily, your lungs are covered by two really slick special layers called **pleural membranes** (say: **ploo**-ral **mem**-branes). These membranes are separated by a fluid that allows them to slide around easily while you inhale and exhale.

Time for Talk

Your lungs are important for breathing . . . and also for talking! Above the trachea (windpipe) is the **larynx** (say: **lair**-inks), which is sometimes called the voice box. Across the voice box are two tiny ridges called vocal cords, which open and close to make sounds. When you exhale air from the lungs, it comes through the trachea and larynx and reaches the vocal cords. If the vocal cords are closed and the air flows between them, the vocal cords vibrate and a sound is made.

The amount of air you blow out from your lungs determines how loud a sound will be and how long you can make the sound. Try inhaling very deeply and saying the names of all the kids in your class — how far can you get without taking the next breath? The next time you're outside, try shouting and see what happens — shouting requires lots of air, so you'll need to breathe in more frequently than you would if you were only saying the words.

Experiment with different sounds and the air it takes to make them — when you giggle, you let out your breath in short bits, but when you burp, you let swallowed air in your stomach out in one long one! When you hiccup, it's because the diaphragm moves in a funny way that causes you to breathe in air suddenly, and that air hits your vocal cords when you're not ready.

Love Your Lungs

Your lungs are amazing. They allow you to breathe, talk to your friend, shout at a game, sing, laugh, cry, and more! And speaking of a game, your lungs even work with your brain to help you inhale and exhale a larger amount of air at a more rapid rate when you're running a mile — all without you even thinking about it once.

Keeping your lungs looking and feeling healthy is a smart idea, and the best way to keep your lungs pink and healthy is not to smoke. Smoking isn't good for any part of your body, and your lungs especially hate it. Cigarette smoke damages the cilia in the trachea so they can no longer move to keep dirt and other substances out of the lungs. Your alveoli get hurt too, because the chemicals in cigarette smoke can cause the walls of the delicate alveoli to break down, making it much harder to breathe.

Finally, cigarette smoke can damage the cells of the lungs so much that the healthy cells go away, only to be replaced by cancer cells. Lungs are normally tough and strong, but when it comes to cigarettes, they can be hurt easily — and it's often very difficult or impossible to make them better. If you need to work with chemicals in an art or shop class, be sure to wear a protective mask to keep chemical fumes from entering your lungs.

You can also show your love for your lungs by exercising! Exercise is good for every part of your body, and especially for your lungs and heart. When you take part in vigorous exercise (like biking, running, or swimming, for example), your lungs require more air to give your cells the extra oxygen they need. As you breathe more deeply and take in more air, your lungs become stronger and

better at supplying your body with the air it needs to succeed. Keep your lungs healthy and they will thank you for life!

Reviewed by: Laura Inselman, MD

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The KidsHealth logo is centered at the top of the page. It consists of the word "KidsHealth" in a white, sans-serif font, set against a dark grey, rounded rectangular background that has a slight shadow effect.

What's Blood?

* You know what blood is — it's that red stuff that oozes out if you get a paper cut. The average person has about 1 to 1½ gallons (4-6 liters) of it. But what is blood, really, and where does it come from?

How Does the Body Make Blood?

It's not made in a kitchen, but blood has ingredients, just like a recipe. To make blood, your body needs to mix:

- **red blood cells**, which carry oxygen throughout the body
- **white blood cells**, which fight infections
- **platelets**, which are cells that help you stop bleeding if you get a cut
- **plasma**, a yellowish liquid that carries nutrients, hormones, and proteins throughout the body

* Your body doesn't go to the store to buy those ingredients. It makes them. Bone marrow — that goopy stuff inside your bones — makes the red blood cells, the white blood cells, and the platelets. Plasma is mostly water, which is absorbed from the intestines from what you drink and eat, with the liver supplying important proteins.

Put all these ingredients together and you have blood — an essential part of the circulatory system. Thanks to your heart (which pumps blood) and your blood vessels (which carry it), blood travels throughout your body from your head to your toes.

Let's find out more about each ingredient.

Red Blood Cells

Red blood cells (also called erythrocytes, say: ih-**rith**-ruh-sytes) look like flattened basketballs. Most of the cells in the blood are red blood cells. They carry around an important chemical called hemoglobin (say: **hee**-muh-glow-bin) that gives blood its red color.

Blood and breathing go hand in hand. How? The hemoglobin in blood delivers oxygen, which you get from the air you breathe, to all parts of your body. Without oxygen, your body couldn't keep working and stay alive.

White Blood Cells

White blood cells (also called leukocytes, say: **loo**-kuh-sytes) are bigger than red blood cells. There are usually not a whole lot of white blood cells floating around in your blood when you're healthy. Once you get sick, though, your body makes some more to protect you.

There are a couple types of white blood cells that do different things to keep you well:

Granulocytes

You know how your skin gets a little red and swollen around a cut or scrape? That means the granulocytes are doing their jobs. They have a lot to do with how your body cleans things up and helps wounds heal after an injury. Granulocytes also help prevent infection by surrounding and destroying things that aren't supposed to be in your body and by killing germs.

Lymphocytes

There are two types of lymphocytes, B cells and T cells. B cells help make special proteins called antibodies that recognize stuff that shouldn't be in your body, like bacteria or a virus you get from a sick friend. Antibodies are very specific, and can recognize only a certain type of germ. Once the antibody finds it, it gets rid of the germ so it can't hurt you.

The really cool part is that even after you are better, B cells can become memory cells that remember how to make the special antibody so that if the same germ infects you again, it can kill the germ even faster! T cells also battle germs that invade the body, but instead of making antibodies, they work by making special chemicals that help fight the infection.

Monocytes

Monocytes are white blood cells that fight infection by surrounding and destroying bacteria and viruses.

Platelets

Platelets, also called thrombocytes (say: **throm**-buh-sytes) are tiny round cells that help to make sure you don't bleed too much once you get a cut or scrape. Cuts and scrapes break blood vessels. If a platelet reaches a blood vessel that's been broken open, it sends out a chemical signal that makes other nearby platelets start to stick together inside the vessel.


After the platelets form this plug, they send out more chemical signals that attract clotting factors. These clotting factors work together to make a web of tiny protein threads. The platelets and this web of protein come together to make a blood clot. The clot keeps your blood inside the vessel while the break in the blood vessel heals up. Without platelets, you'd need more than a bandage to catch the blood when you scrape your knee!

Plasma

Plasma is a yellowish liquid that is mostly water. But it also carries important nutrients, hormones, and proteins throughout the body. Nutrients are chemicals from the food you eat that give your body energy and other things your body's cells need to do their work and keep you healthy.

Hormones carry messages throughout your body, telling it what to do and when. An example of a hormone is growth hormone. It gets your bones and muscles to grow. Many proteins in plasma are really important to your body, like the clotting factors that help you stop bleeding if you get a cut or a scrape.

Plasma also carries away cell waste — chemicals that the cell doesn't want anymore. Nutrients, hormones, proteins, and waste are dissolved in the plasma — kind of like the cocoa mix that dissolves in a cup of hot water. What are the marshmallows? The blood cells — they float in the plasma.



Big, Bossy Stem Cells

In the bone marrow, there are hematopoietic (say: **hee** muh-toh-poh-**ee**-tik) stem cells. These cells are like the mother of all blood cells. If the body needs some more red blood cells, it tells the stem cells to make red blood cells. If the body needs some more white blood cells, it makes the stem cells produce white blood cells. And if the body needs some more platelets, it makes the stem cells produce - you guessed it - platelets.

Hey, What's Your Type?

Everybody's blood is red, but it's not all the same. There are eight blood types, described using the letters A, B, and O. Those letters stand for certain proteins found on the red blood cells. Not everyone has the same proteins.

In addition to getting a letter or two, a person's blood is either "positive" or "negative." That doesn't mean one person's blood is good and another person's blood is bad. It's a way of keeping track of whether someone's blood has a certain protein called Rh protein. This protein is called "Rh" because scientists found it while studying Rhesus monkeys. If your blood is positive, you have this protein. If it's negative, you don't. Either way is totally fine.

People have one of these eight different blood types:

1. A negative
2. A positive
3. B negative
4. B positive
5. O negative
6. O positive
7. AB negative
8. AB positive

Blood types are important if a person ever wants to donate blood or needs a blood transfusion. Getting blood of the wrong type can make a person sick. That's why hospitals and blood banks are very careful with donated blood and make sure the person gets the right type.

People might need blood transfusions when they're sick or if they lose blood. Without enough healthy blood, the body won't get the oxygen and energy it needs. Healthy blood also protects you from germs and other invaders.

Now that you know how important blood is, what can you do? Kids generally aren't allowed to donate blood, but when you're older consider giving the gift of life!

Reviewed by: Steven Dowshen, MD

Date reviewed: August 2009

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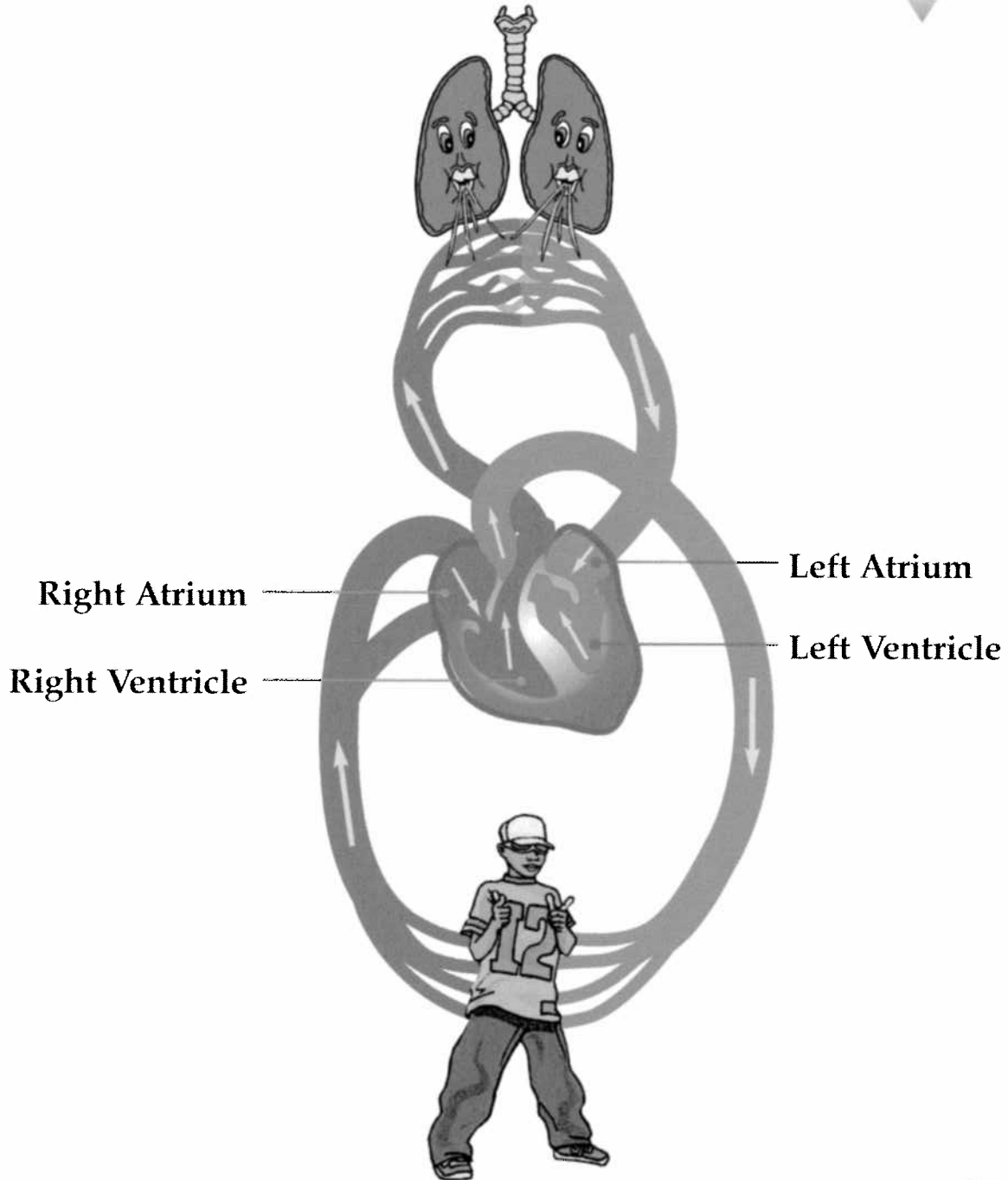
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Human Body Circulation Transparency



PULMONARY CIRCULATION



SYSTEMIC CIRCULATION



This lesson idea is from PE Central (pecentral.org), the premier Web site for Physical Education Teachers. *Sponsored by S&S Worldwide (ssww.com)*

Name/Title: Oxygen Cycle

Purpose of Event: To have students understand and experience the concept that when we exercise our bodies work harder. This makes our hearts beat faster requiring more oxygen that causes us to breathe harder.

Prerequisites: Students need to be comfortable running in a designated pathway in the gym.

Suggested Grade Level: K-2

Materials Needed: 1. Three objects, per student, which are small enough to carry in one hand. (i.e., beanbags); 2. Two big buckets or four small ones that will hold all the small objects.; 3. Three large signs. One should say, "Mouth", one should say, "Heart", and one should say, "Muscle".; 4. About 30 cones.

Description of Idea

Students run clockwise around a track in the gym, pretending they are the blood that carries oxygen through the body.

- * First of all, students go to the "mouth" station where they take three big breaths and pick up an object that represents oxygen (i.e., beanbag).
- * Secondly, they run to the "heart" station and contract their whole body (see the explanation below), pretending to be a heart.
- * Third, they run to the "muscle" station where they put their beanbag into a bucket and perform a designated exercise (i.e., 10 jumping jacks).
- * Fourth, the students have "run out of oxygen" and must go back to the mouth to get more.

Remind students that they must stay in the track because it is like the arteries in the body.

Teach the students that when they exercise they begin breathing harder, and that when we breathe we take oxygen into our bodies. (Have everyone take three deep breaths.)

Remind the students that when they exercise their heart beats faster, which makes the oxygen go through their whole body. (Have everyone simulate the heart pumping by having them stand with their arms up and then contract their whole body. An alternative to this is to have them lay on their back while they contract their whole body. Say, "Oxygen helps me exercise.") Ask them if they can think of any examples of exercise. (They'll probably say jumping jacks, pushups, etc.) Then have everyone perform 5-10 of that particular exercise.

After they understand what to do at each station, ask for a couple of volunteers to run the course so everyone can watch.

You can vary the number of breaths they take at the mouth, the number of compressions at the "heart" station, the number or type of repetitions at the "muscle" station, or the type of movement to use when moving through the "artery" (the running path).

Teaching extension for older children: As children understand how the blood flows within in their body, set up cones inside the "artery" to represent cholesterol. Cholesterol buildup makes it hard for the blood to flow freely through the arteries. Students cannot go through the cones or over them; they must go around them.

Assessment Ideas:

During the debriefing time, hold up a beanbag and ask, "What does your body need so that it can perform exercise?" Or, right after they get done running, ask, "A lot of you are breathing hard. Why is that?" Point out that running, jumping jacks or pushups are examples of exercises that use their muscles. Ask the students what their muscles need to work hard?

Have the students spread out. Call out the words, "mouth", "heart" and "muscle" in random order, and when they hear the word they perform the activity for that station.

Adaptations for Students with Disabilities:

Peer-pairing as needed.

Submitted by Ben Malan who teaches at Circle Rock Preparatory School in Chicago, IL. Thanks for contributing to PE Central! **Posted on PEC: 9/6/2006.** Printed 4142 times since 3/23/2006.

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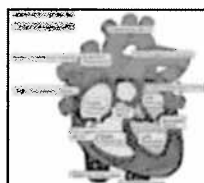
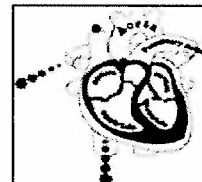
Heart	Lungs	Videos	Lessons	Tools
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About Your Heart

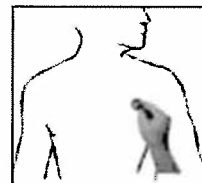
Heart Animations and Interactives

Animation: [Your heart valves at work->](#)



Interactive: [View the heart with interactive labels](#)

Interactive: [Find the heart with a virtual stethoscope->](#)



Animation: [See the flow of blood to and from the heart->](#)



Lessons About the Heart

[Pulse of Life](#) | [Keeps on Pumpin'](#) | [Under Pressure](#) | [Sounds of the Heart](#) | [Lub Dub \(Valves\)](#) | [Heart As a Pump](#) | [Go With the Flow](#)

Amazing Heart Facts

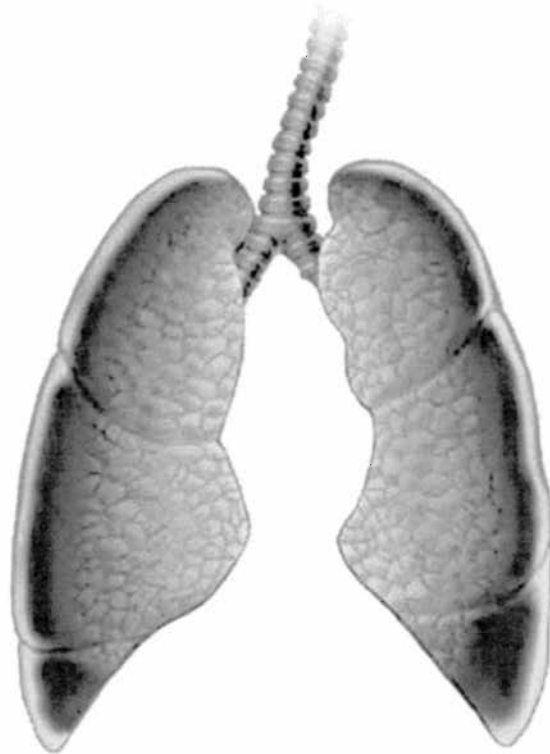
- Your heart is about the same size as your fist.
- An average adult body contains about five quarts of blood.
- All the blood vessels in the body joined end to end would stretch 62,000 miles or two and a half times around the earth.
- The heart circulates the body's blood supply about 1,000 times each day.
- The heart pumps the equivalent of 5,000 to 6,000 quarts of blood each day.

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About Your Lungs

Lungs Animations and Interactives

Interactive: [View the lungs from the outside and the inside](#)



Interactive: [View the entire vascular system](#)

Animation: [View a working respiratory system->](#)



Lessons About Your Lungs

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Amazing Lung Facts

- At rest, a person breathes about 14 to 16 times per minute. After exercise it could increase to over 60 times per minute.
- New babies at rest breathe between 40 and 50 times per minute. By age five it decreases to around 25 times per minute.
- The total surface area of the alveoli (tiny air sacs in the lungs) is the size of a tennis court.
- The lungs are the only organ in the body that can float on water.
- The lungs produce a detergent-like substance which reduces the surface tension of the fluid lining, allowing air in.

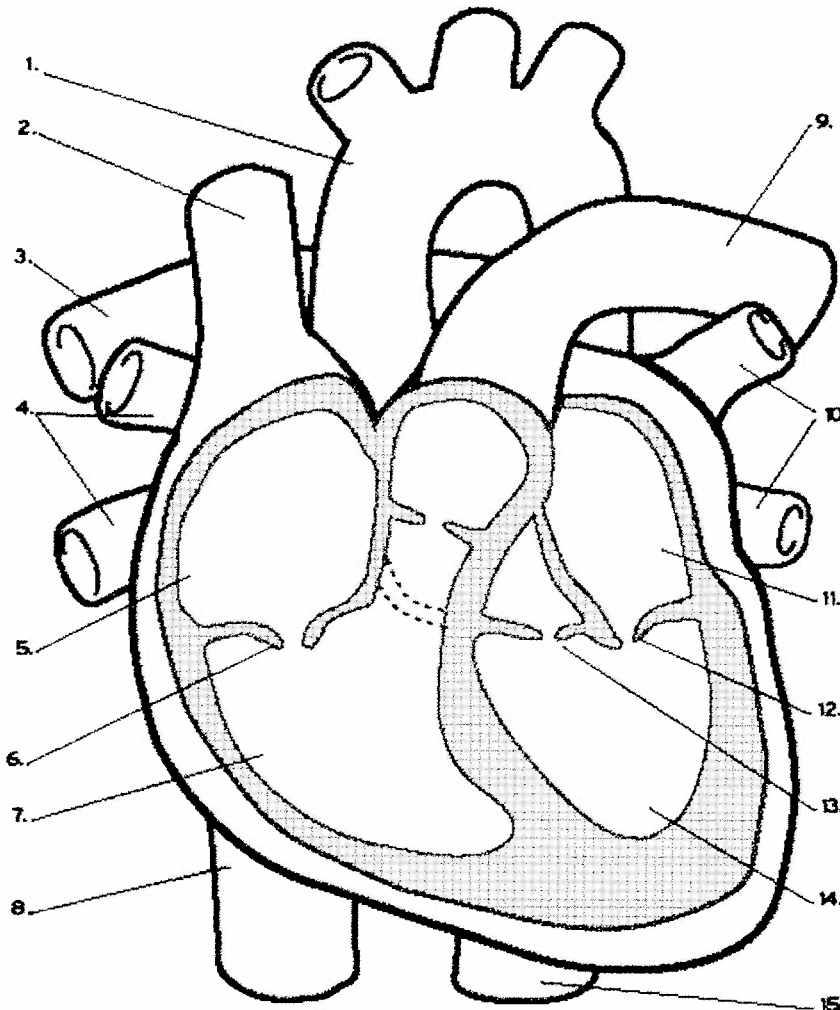
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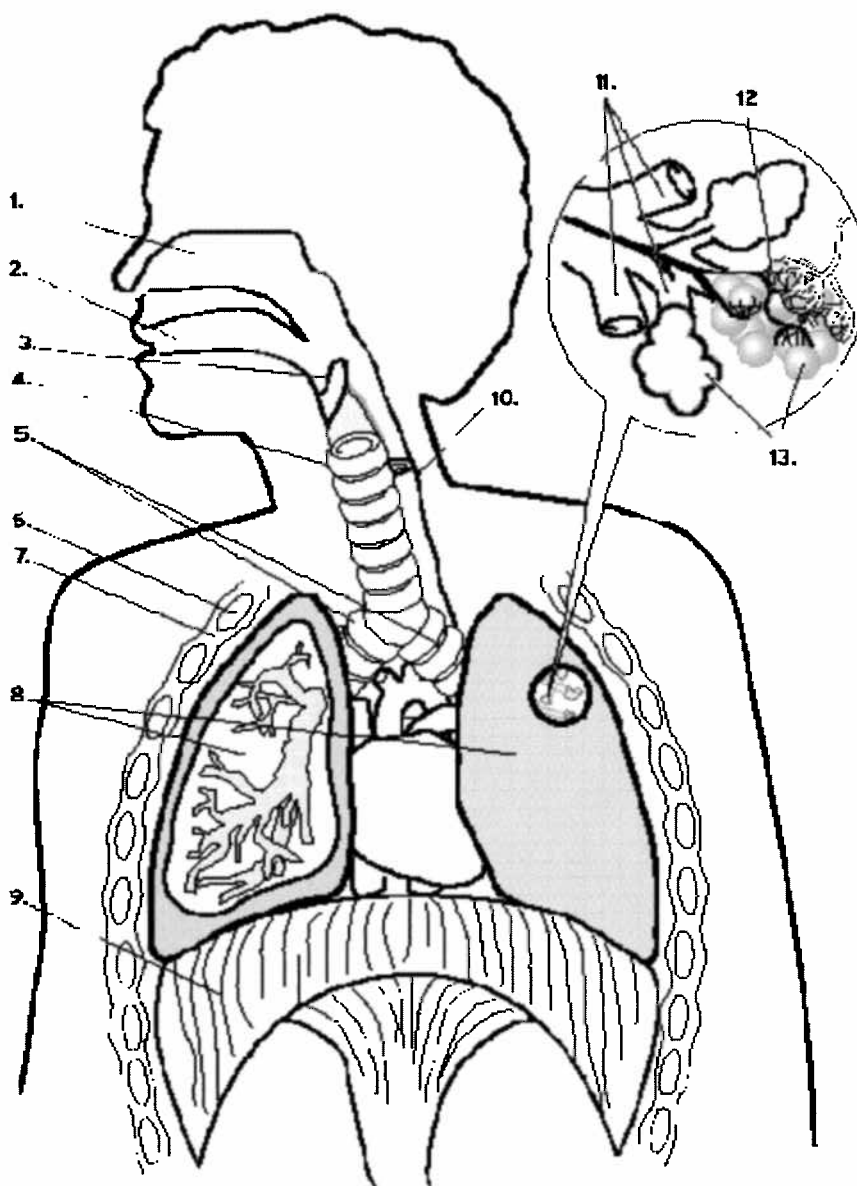
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Lung Diagram



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About.com Sports Medicine

Rating of Perceived Exertion Scale

A simple way to determine exercise intensity

By Elizabeth Quinn, About.com Created: March 09, 2004

About.com Health's Disease and Condition content is reviewed by the [Medical Review Board](#)

There are a variety of methods for determining exercise intensity levels. Common methods include the [talk test](#)¹, the [target heart rate range](#)² and the Borg Rating of Perceived Exertion (RPE).

The following article, from the CDC, provides an explanation of the Rating of Perceived Exertion (RPE).

Perceived exertion is how hard you feel your body is working. It is based on the physical sensations a person experiences during physical activity, including increased heart rate, increased respiration or breathing rate, increased sweating, and muscle fatigue. Although this is a subjective measure, a person's exertion rating may provide a fairly good estimate of the actual heart rate during physical activity* (Borg, 1998).

Practitioners generally agree that perceived exertion ratings between 12 to 14 on the Borg Scale suggests that physical activity is being performed at a moderate level of intensity. During activity, use the Borg Scale to assign numbers to how you feel (see instructions below). Self-monitoring how hard your body is working can help you adjust the intensity of the activity by speeding up or slowing down your movements.

Through experience of monitoring how your body feels, it will become easier to know when to adjust your intensity. For example, a walker who wants to engage in moderate-intensity activity would aim for a Borg Scale level of "somewhat hard" (12-14). If he describes his muscle fatigue and breathing as "very light" (9 on the Borg Scale) he would want to increase his intensity. On the other hand, if he felt his exertion was "extremely hard" (19 on the Borg Scale) he would need to slow down his movements to achieve the moderate-intensity range.

*A high correlation exists between a person's perceived exertion rating times 10 and the actual heart rate during physical activity; so a person's exertion rating may provide a fairly good estimate of the actual heart rate during activity (Borg, 1998). For example, if a person's rating of perceived exertion (RPE) is 12, then $12 \times 10 = 120$; so the heart rate should be approximately 120 beats per minute. Note that this calculation is only an approximation of heart rate, and the actual heart rate can vary quite a bit depending on age and physical condition. The Borg Rating of Perceived Exertion is also the preferred method to assess intensity among those individuals who take medications that affect heart rate or pulse.

How to Use the Perceived Exertion Scale

While doing physical activity, we want you to rate your perception of exertion. This feeling should reflect how heavy and strenuous the exercise feels to you, combining all sensations and feelings of physical stress, effort, and fatigue. Do not concern yourself with any one factor such as leg pain or shortness of breath, but try to focus on your total feeling of exertion.

Look at the rating scale below while you are engaging in an activity; it ranges from 6 to 20, where 6 means "no exertion at all" and 20 means "maximal exertion." Choose the number from below that best describes your level of exertion. This will give you a good idea of the intensity level of your activity, and you can use this information to speed up or slow down your movements to reach your desired range.

Try to appraise your feeling of exertion as honestly as possible, without thinking about what the actual physical load is. Your own feeling of effort and exertion is important, not how it compares to other people's. Look at the scales and the expressions and then give a number.

6 No exertion at all

7 Extremely light

8

9 Very light - (easy walking slowly at a comfortable pace)

10

11 Light

12

13 Somewhat hard (It is quite an effort; you feel tired but can continue)

14

15 Hard (heavy)

16

17 Very hard (very strenuous, and you are very fatigued)

18

19 Extremely hard (You can not continue for long at this pace)

20 Maximal exertion

Paige Waehner. About.com's guide to exercise, offers a simpler, light-hearted version of the RPE³ on her site.

This About.com page has been optimized for print. To view this page in its original form, please visit:

<http://sportsmedicine.about.com/cs/strengthening/a/030904.htm>

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Links in this article:

1. http://www.cdc.gov/nccdphp/dnpa/physical/measuring/talk_test.htm
2. http://www.cdc.gov/nccdphp/dnpa/physical/measuring/target_heart_rate.htm
3. <http://exercise.about.com/cs/fitnesstools/l/blperceivedexer.htm>

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Target Heart Rate Zone Versus Perceived Exertion Level

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Target Heart Rate and Borg's Perceived Exertion level scale are both a means to gauge exercise intensity. Both methods are equally important in determining whether you are exercising at a level, which will optimally provide improvement in cardiovascular conditioning and keep a safe range. The question here is which method would be most appropriate for you to monitor how much effort you are expending during cardiovascular exercise. Using one or both of these methods is a means to enable you to see improvements in your resting heart rate, and response to exercise.

To start, a definition of each method is necessary to understand as how they are applied according to fitness and health levels:

Target Heart Rate Zone (THR): Range with in which the heart is beating to get the optimum cardiovascular effect. It is recommended that an appropriate range for most healthy individuals to exercise at a level between 55-85 percent of your Maximum Heart Rate. In some cases, your health care provider may decrease persons Heart Rate Zone depending on your health

Borg's Rate of Perceived Exertion Level (RPE): Developed by Gunner Borg in early 1980's, the Perceived Exertion is a subjective method based on how hard you feel like your body is working during exercise. Based on a person's experiences during exercise it gives a correlation between perceived exertion and actual heart rate. RPE is a good estimate of actual heart rate during exercise.

Instructions for determining THR zone: there are two types of determining THR the first is the Kamoven formula and the second it the Simplified Method.

Kamoven Formula

220-age=maximum Heart Rate
Maximum Heart Rate - Resting Heart Rate = Intensity
Intensity x .55 (minimum intensity) + Resting Heart Rate = THR zone

This is what it looks like with real numbers plugged into the formula: For instance take a 43 year old with a resting Heart rate of 60. Below is how the calculations would look like.

$$220 - 43 = 177$$

$$177 - 60 = 117$$

$$117 \times .55 = 64 + 60 = 124$$

$$117 \times .85 = 99 + 60 = 159$$

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This gives a range of **55%-85%** of a THR zone.

Simplified Method

220 - Age = Maximum Heart Rate

MHR x .55 = Minimum THR Zone

MHR x .85 = Maximum THR Zone

This is what it would look like with numbers plugged in.

220 - 43 = 177

177 x .55 = 97

177 x .85 = 150

Comparing the Karvonen Formula to the Simplified Method, you can see what an impact that adding in a Resting Heart can make on the training range.

Instructions for determining Rate of Perceived Exertion:

While exercising you will rate how hard, you are working. This is your perception and this feeling should reflect how strenuous the exercise feels to you. This is very helpful in self-monitoring through out an exercise training session. First introduced as a scale of 6-20 it has since been revised to 0-10.

The 20-Point Scale:

- 6- No exertion at all
- 7-
- 8- Extremely light
- 9- Very light
- 10-
- 11- Light
- 12-
- 13- Somewhat hard
- 14-
- 15- Hard
- 16-
- 17- Very hard
- 18-
- 19- Extremely Hard
- 20- Maximal Exertion

Using the 6-20 point scale a rating of 12 would correspond to approximately .55 % of THR zone and 16 to approximately .85% of THR zone.

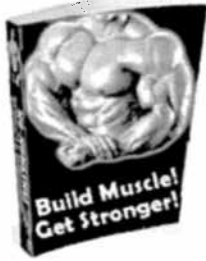
The revised 10-point scale:

- 0 - Nothing
- 0.5 - very, very light
- 1.0 - very light
- 2 - Light
- 3 - Moderate
- 4 - Somewhat hard
- 5 - Heavy
- 6 -
- 7 - Very heavy
- 8 -
- 9 -
- 10 - Very, Very Heavy

The talk test is also a good indicator of measuring exercise intensity. You should be able to carry on a conversation and still breathe comfortably, but not be able to sing. If you can sing the exercise, intensity may be too easy and take it up a notch.

Whichever method(s) you choose, be sure to work within your comfort level. It is not recommended to exercise above 85% of your maximum heart Rate due to increased risk of both

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cardiovascular and orthopedic risks. Always check with your health care provider prior to starting an exercise program, they can best help you determine your Heart Rate Range. If working with a Fitness professional they too can assist you in determining your best method of calculating your Target Heart Rate Zone. If you are a beginner to exercise, start out gradual and build up to a level that is tolerable to you. If too strenuous, slow down to reduce the risk of injury. If it does not feel right to you change your level of effort. Exercise according to how you feel and above all else enjoy what you are doing! The results that you so yearn for will transpire before your eyes and improvements to your overall health will be apparent.

By Cathy Jackson

5 Tips to Lose Stomach Fat

1. Ab exercises such as crunches and situps do nothing to burn belly fat. Try these unique exercises instead.

2. Some foods you thought were "healthy" may really be increasing your stomach fat.

Try these fat burning foods instead.

[Read this article here for tips to start losing stomach fat](#)

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