



Heart Pounding Action

Investigate the impact basketball and other high-pressure activities have on our hearts and bodies.

Have you ever wondered why you feel a thumping in your neck and other parts of your body while playing basketball? Have you ever felt this sensation even after the game was over? Let's investigate and find out why.

HERE'S WHAT YOU'LL NEED:

- Play-Doh or modeling clay
- Dry spaghetti noodles
- Stopwatch
- Pencil
- Notebook

SUGGESTED SUPPLIES FOR OVERTIME ACTIVITY

- Vinyl tubing or cardboard tube
- Balloons
- Funnels, plastic caps, plastic bottles or other recyclables
- Tape
- Scissors
- Stethoscope

WARMUPS

If you are currently sitting and have not recently come in from recess or another high-energy activity, your heart is probably beating at a normal rate. We call this a resting heart rate. There are several places on your body where you can easily feel the pulse of your heartbeat, including your wrist, your neck, under your knee, and even on top of your foot.

Let's start by trying the location on your wrist. Rest your hand, palm up, on a table or desk. Place two fingers (not your thumb) on your wrist on the side nearest your thumb. Be still. What do you feel? Do you notice a pattern or a rhythm?

What do you think is causing this pattern or rhythm?

Look closely at your wrist. Can you find any visual evidence of the rhythm you felt? Do you see your skin move?

Let's make something to try to see this rhythm more easily.

1. Shape a small piece of Play-Doh or clay into a thick pancake-like shape about the size of a quarter.
2. Take a dry spaghetti noodle and break off a piece about the length of your thumb.
3. Find the place on your wrist where your heartbeat is easiest to feel. Place the Play-Doh over that spot and stick the short spaghetti noodle in the center of the disk.
4. Watch it closely. Does the spaghetti move? If not, adjust the position of the Play-Doh until you find the placement that makes it easy to see.



Now that we can see the rhythm of your heart, let's use it to find your heart rate.

You will need your Play-Doh disk, spaghetti noodle, a stopwatch, journal, pencil and a friend to help for this part.

1. Place the Play-Doh disk and noodle on the spot of your wrist where the movement is easy to see.
2. Once you're satisfied with its position, count the number of times the noodle vibrates during a period of 15 seconds. Have your friend use a stopwatch to monitor the time and tell you when to start and when to stop.
3. Record the number in your journal.
4. To find your resting heart rate, multiply the number of times the noodle moves in 15 seconds by the number 4. The resulting number is the amount of times your heart beats in 60 seconds or one minute.

$$(\text{Number of heartbeats in 15 seconds}) \times 4 = \text{number of beats per minute (bpm)}$$

GAME TIME

How does being active affect your heart rate? Let's get a little exercise and find out.

In this activity you will perform an exercise for one minute, quickly check your heart rate and then exercise for an additional minute before you check it again. What do you think will happen? How much faster or slower do you think it will be?

1. Find an open area to work in, but keep your Play-Doh disk and your journal nearby.
2. Have your friend use a stopwatch to monitor the time and tell you when to start and when to stop.
3. When he or she says go, start doing jumping jacks or running in place. After one minute, stop.
4. Do you feel a difference in your heartbeat? Locating the spot on your wrist you used previously, place the Play-Doh disk on top and look for the vibrations.
5. With the help of your friend and the stopwatch, count the number of times your heart beats in 15 seconds and record the results in your journal.
6. Run in place or do jumping jacks for one minute more and then check and record your heartbeat again.
7. Rest for one minute and check and record your heartbeat again.
8. Rest for another minute and check one more time.
9. Convert each of your 15 second rates to beats per minute by multiplying each number by 4.
10. Create a table that will allow you to compare your resting, active and recovering heart rates. Include the data you've collected and any observations about the way you felt while you were doing each step. Did it feel as though your heart was really pounding or just beating normally?
11. Switch places with your friend and have them complete the activity while you monitor the stopwatch.



ANALYZE THE REPLAY

What happened?

- Compare your resting, active and recovering heart rates with your friends. Did they get similar results?
- Based on what you've learned so far, what do you think causes your heart rate to change?
- Do you notice any other physical changes when your heart rate increases? Why do you think this happens?

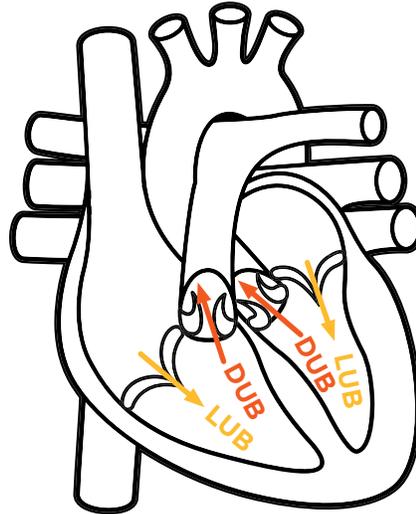
Think about playing basketball. When does your heart beat the fastest? Have you ever been nervous before a game, while preparing to shoot a free throw, or when you are about to take the game-winning shot? Did that feeling affect your heartbeat? Record these observations in your journal.

OVERTIME

Let's take it further

In this activity you have been recording and observing the effects of your heartbeat. Being aware of the work your heart is doing can be very helpful when understanding our own health. To get a more accurate assessment of a patient's heart rate, doctors will often use a special instrument called a stethoscope.

A stethoscope amplifies sound and helps the doctor listen for the two parts of a healthy heartbeat. The first sound, often referred to as the "lub" sound, is caused by the closing of valves in your heart as blood moves from the upper to lower chambers. The second sound, the "dub" sound, is caused by other valves closing as blood leaves your heart. Because your heart works continuously, blood keeps moving into, through and out of it. As these valves open and close the "lub-dub" sound repeats.



If you look closely at the picture of a stethoscope, you can see it is made up of several different parts that work together to help guide these sounds directly to your ears. Pay close attention to the shape and material of each piece. See if you can determine what purpose or function each piece has.



Using what you have learned, work with a partner or a small group of friends to design your own stethoscope or listening device out of available household or recycled materials. Think about the stethoscope's design and how it enhances the faint sound of a heartbeat and directs it to your ears.

After you have created your stethoscope or listening device, listen to your heart. Can you hear the "lub-dub" sound? What would you change to improve your stethoscope's design?



COACH'S CORNER

Additional information and explanations for parents and educators

Powering your circulatory system is the hardest working muscle in your body—your heart! It beats regularly, more than 100,000 times each day, to pump about 5 liters of blood throughout your body. That is a lot of pumping, because if you were to imagine all of the blood vessels in your body were lined up end to end they would stretch about 60,000 miles! As blood is pumped through your body, vessels that carry it get bigger as the blood is being pushed through and then grow smaller again. This expanding and contracting is what causes your pulse, the ability to detect your heartbeat.

You can feel your pulse in places where your arteries run close to the surface of the skin. Your wrist houses the radial artery, a large artery very close to the surface, which makes it great for feeling a pulse. When you placed the Play-Doh and spaghetti noodle on your wrist over your radial artery, it wiggled as your heart forced blood through your body. Though you used your wrist in this activity, there are other places where arteries run close to the surface of your skin. These places include the temple on the side of your head, behind your knee, on the side of your neck, and even the top of your foot.

Though we are focusing on the heart with this activity, it is important that we also discuss the role lungs play in the circulatory system. When we breathe in, our lungs allow us to collect the oxygen our body needs, and when we breathe out, our lungs allow us to get rid of all the gasses that our body does not need including carbon dioxide. Our heart and lungs work together to provide our body with oxygenated blood and to help us carry all the gasses our body does not need back to the heart and lungs to exhale it. Besides oxygen, blood carries nutrients and other things your body needs to the cells throughout your body.

Your heart makes up the cardiovascular part of the circulatory system and your lungs make up the pulmonary part. The systemic or third major part of the circulatory system is made up of the superhighway of arteries, veins, and vessels that deliver blood throughout the body and back to the heart.

Very physically fit athletes, like professional basketball players, do a lot of exercise. Much of this exercise is cardiovascular exercise. By increasing the heart rate through exercise, the heart which is a muscle grows stronger and physically changes. The heart of the athlete can actually deliver more blood with each pump, delivering oxygen and other nutrients

DO YOU WANT TO LEARN MORE?

Research: circulatory system, cardiovascular, pulmonary, ventricle, atria, aorta, artery

OKLAHOMA ACADEMIC STANDARDS - SCIENCE

STANDARD		4 TH GRADE	5 TH GRADE	6 TH GRADE
PS4-1	Waves and Their Applications in Technologies and Information Transfer	●		
LS1-1	From Molecules to Organisms: Structure and Processes	●		
MS-LS1-3	From Molecules to Organisms: Structure and Processes			●

OKLAHOMA ACADEMIC STANDARDS - MATH

STANDARD		4 TH GRADE	5 TH GRADE	6 TH GRADE
4.A.2.2	Algebraic Reasoning and Algebra	●		
4.D.1.1	Data and Probability	●		
5.A.1.1	Algebraic Reasoning and Algebra		●	