



## Heart-Health Science ♥ ♥ SPECIAL ISSUE

### Make Your Own 'Bucket and Tubing' Model of the Heart

*A driveway science project offers students hands-on exploration of the cardiovascular system*

Knowing that a healthy cardiovascular system is what enables us to live long, active lives is different than **seeing firsthand** what it means for the cardiovascular system to be healthy -- and what it looks like when things start to go wrong.



In a person with heart disease, cholesterol, fat, calcium, and other substances build up inside the lining of an artery, which reduces the amount of room available for blood to flow through. In the [Modeling the Human Cardiovascular System: The Factors That Affect Blood Flow Rate](#) project, students build a model of the heart and the arteries using a bucket, tubes, and water to investigate the relationship between blood-flow rate and the diameter of the arteries. *How important is it to keep arteries free of buildup?*

### Website for Students

#### Got Rhythm? Knowing the "Beat" Might Save a Life

Continuous chest compression cardiopulmonary resuscitation (CPR) is a hands-only technique that can be as effective as mouth-to-mouth CPR. But successful hands-only CPR requires 100 compressions per minute. That's more than one compression per second!



According to the American Heart Association (AHA), **having a go-to heart-saving song in your head** can help you keep the beat if you ever end up in a life-saving situation. You can find a list of up-tempo songs on the [Be the Beat!](#) website. From the aptly named "Staying Alive," by the Bee Gees, to tracks by artists ranging from the Black Eyed Peas to Bon Jovi, find a favorite CPR-friendly song and keep it in mind!

The AHA's Be the Beat! website, sponsored by a \$1 million grant from Medtronic, offers activities, videos, comics, music, and games designed specifically to teach teens about sudden cardiac arrest (SCA), cardiopulmonary resuscitation, and the use of an automated external defibrillator (AED).

In addition to fun and games for students, the Be the Beat! website has [educational materials for teachers](#).

### Heart-Smart Careers

#### Biomedical Engineering A hot combination for science and math students

Biomedical engineers like Medtronic's Katie Hilpisch use **math, medicine, and biology** to help find ways to improve the lives of patients with heart problems. For Katie, working in the area of heart health is rewarding, a constant challenge, and **an exciting mix of data analysis, problem-solving, lab research, and testing.**



- Read [Katie's story](#) on the Science Buddies blog.
- Learn more about the in-demand [Biomedical Engineer](#) career.

#### Software Engineering Keeping a heart-health application running smoothly

For Jeff Hagen, an Engineering Manager at Medtronic, working on Medtronic's CareLink application requires putting the engineering method to work every day -- all in the name of helping patients!

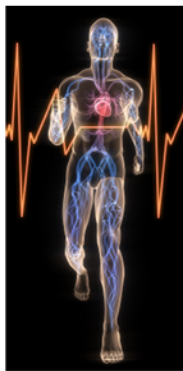
- Read [Jeff's story](#) on the Science Buddies blog.
- Learn more about the popular [Computer Software Engineer](#) career.



## A Pulse on Heart Health

### The Heart-Rate Connection

Your "heart rate" is an indicator of how your heart is responding to what you are doing, and one way to monitor your heart rate is through your pulse. The number of times your heart beats per minute, however, changes over the course of a regular day and in response to various activities.



*What happens to your heart rate when you exercise? Is the response the same for every person? What variables make a difference? What is a healthy range for heart rate? Learn how to take your pulse and explore heart-rate issues with these Science Buddies Project Ideas:*

- [A Day in the Life of Your Heart](#)
- [Heart Health: How Does Heart Rate Change with Exercise?](#)
- [Heart Rate Recovery Times](#)

### Giving Your Heart a Video Game Workout



In recent years, gaming platforms like the Wii, and arcade games like Dance Dance Revolution, have gotten gamers off the couch and into motion. Tennis, soccer, and boxing are just a few of the game-based sports you can play indoors, with a remote in hand, and in front of a TV. Give an "exergame" a try, and you might just work up a sweat. But are you working your heart enough to call it "exercise"? Put video game workouts to the test with the [Sweating the Score: Can Video Games Be a Form of Exercise](#) project.

## THE HEART

Did you know that your heart will beat more than 2.5 billion times during your lifetime? Or that it circulates all of your blood through your *entire* body more than 3 times per minute, providing life-sustaining oxygen to your cells?

## Medtronic Cares



### The HeartRescue Project Wants Communities to Know: 'Every Second Counts. Every Action Matters.'

Sudden cardiac arrest (SCA) happens to almost **300,000 Americans every year**. Unfortunately, most SCAs occur away from medical professionals, and **92 percent of victims die** before they reach the hospital.

In response to this alarming statistic, Medtronic Foundation created the [HeartRescue Project](#), an initiative to improve SCA training in the "chain of response" -- a chain that begins with public bystanders and continues on to emergency personnel and hospitals. By increasing public awareness and helping communities coordinate their emergency response, Medtronic Foundation's HeartRescue Project aims to increase cardiac arrest survival rates by 50 percent in five pilot states (Arizona, Minnesota, North Carolina, Pennsylvania, and Washington) over the next five years.

### Fast Action Saves Lives of Student Athletes

Sudden cardiac arrest is the leading cause of death among young athletes, *often occurring in individuals who seem to be healthy*. Knowing that immediate CPR and defibrillation dramatically improve chances of survival, Medtronic Foundation created the [Anyone Can Save a Life](#) program. Through educational materials and action-plan worksheets, Anyone Can Save a Life helps schools prepare to respond effectively to an SCA emergency.

### Free 'Science Matters' Publication for Classrooms

Medtronic's 16-page booklet, [Science Matters](#), is full of hands-on activities, career profiles, and other information designed to get kids excited about science and the possibility of a STEM career! *Copies are available free to teachers and youth leaders while supplies last.*





## Exploring Heart Numbers

### Student Blood Pressure: The Age Connection *Is 120/80 right for everyone?*

Blood pressure is a measure of the **force** of the blood pushing against the walls of the arteries as the heart pumps blood to various parts of the body. Monitoring and interpreting blood pressure is a numbers game, and "higher" numbers can indicate heart problems. But age plays a role in determining what's "normal." In the [Under Pressure: Does a Child's Blood Pressure Depend on His or Her Age?](#) project, students learn to take blood pressure readings using a sphygmomanometer and then investigate how blood pressure differs between students in two distinct age groups.

## Family-Friendly Science Activity

### Make Your Own Stethoscope *Families and classes can all get in on the heart-health action with this hands-on, creative exploration*



The [Make Your Own Stethoscope](#) project guides students in creating working stethoscope models out of everyday materials and then comparing the different designs to see which is most effective -- and why. Students will see firsthand how stethoscopes work and how changes in design can make a difference in how *well* a tool works.

## A Model System

### The Caffeine Factor: A Study of Water Fleas



Groggy-eyed grownups are not the only ones who now and then crave a jolt of caffeine. Some student soft-drink favorites also carry a caffeine kick, and more caffeine may be exactly what you don't need! Students can explore the relationship between caffeine and cardio health in the [Caffeine and Heart Rate: A Pharmacological Study Using \*Daphnia magna\*](#) zoology project.

Because *Daphnia magna* ("water fleas") are semi-transparent, you can "see" the beating of their hearts, which enables students to observe changes in heart activity when various levels of caffeine are introduced. This project -- and investigating pharmacological effects on a model system like the *Daphnia magna* crustacean -- might also be adapted to simulate the ways other ingredients and additives affect heart rate.

## LEARN CPR

Sudden cardiac arrest, an abrupt loss of heart function, causes an estimated 300,000 deaths in the U.S. each year. CPR within the first five minutes can mean the difference between life and death.

## The Medtronic Story

### Medtronic began with an engineer who wanted to help a cardiologist

From its origin in 1949 as a medical equipment repair shop, Medtronic's history is one of applying engineering and technology to help transform the way chronic diseases are treated. The company's first life-changing device was a wearable, battery-powered cardiac pacemaker. That pacemaker, based on the principle of a musical metronome, set the stage for Medtronic's innovative approach to helping use technology to treat more than thirty chronic diseases, improving the lives of millions of people. To find out more about Medtronic's history, visit: <http://www.medtronic.com/about-medtronic/our-story/index.htm>.

## Supplies in a Box: Science Buddies Introduces Project Idea Kits

***Kits make it even easier to get started on a science project!***

When you order a Science Buddies kit through the AquaPhoenix Education website, you'll receive everything you need to perform the experiment (with minor exceptions, like perishable items). We hope you'll find the new kits a convenient way to gather your materials so you can spend more time on your science project and less time worrying about shopping for supplies. [See a full list of available kits.](#)



## Looking for a Perfect Project for You?

Our [Topic Selection Wizard](#) can help guide you to a science project that fits your areas of interest *and* meets science fair requirements. Give it a try today!



## What's Your Favorite?

Do you have a heart-health story to share? What 100-beat song do you keep in your head just in case you find yourself in a life-saving situation? [Let us know!](#)

*This Special Issue of the Science Buddies Project Roundup Newsletter has been sponsored by the [Medtronic Foundation](#).*



*Daphne magna* photo: [PLoS Genetics](#), March 2011

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