

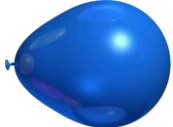



Activity: Low Cost Stethoscope

Materials

<ul style="list-style-type: none"> • 1 clear vinyl tube (2 ft., 5/16" OD)  • 1 funnel (4.75" x 3.88" x 4.38")  	<ul style="list-style-type: none"> • balloon 11"  • 1 stethoscope 
--	--

Introduction

A stethoscope is an acoustic medical device for listening to internal body sounds. Listening to these sounds helps doctors diagnose diseases in the lungs, heart, etc.

Today, you will explore how to build a low-cost stethoscope.

Activity Details: Use the materials in this activity kit and the instructions below to design, create, and test a stethoscope.

Test Process: Each participant should test the stethoscope on him/herself. You should be able to hear your own heart beats.



Part 1: Find your resting heart rate

Before building the stethoscope, measure your heart rate with your fingers.

1. Place your index and middle finger on either your radial or carotid artery and locate your pulse (as in the picture below).



Radial artery (wrist)



Carotid artery (neck)

2. When your instructor tells you to, begin counting your pulse. After 10 seconds you will be asked to stop.

3. Record this number below and multiply it by six. This is your resting beats per minute (BPM).

Resting Pulse: _____ X 6 = _____
Resting Beats (10s) *Resting Beats (1 min)*

4. Now stand up and get your heart beating fast. Do jumping jacks for 15-20 seconds. Be careful not to hurt yourself or anyone around you.

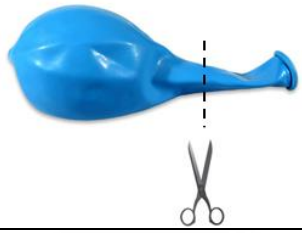

5. Sit down and measure your pulse again for 10 seconds. Record this number below and multiply it by six. This is your active BPM.


Active Pulse: _____ X 6 = _____
Active Beats (10s) *Active Beats (1 min)*

Compare your results with other members of your group. Did everyone have the same BPMs? Probably not! This is because our hearts are all different and BPMs are influenced by factors like the ones listed below. Draw an arrow pointing up ↑ next to the ones which you think cause you to have a higher heartbeat, and draw an arrow pointing down ↓ next to the ones that cause you to have a lower heartbeat.

Factor	↑ or ↓
Exercising	
Stress	
Sleeping	
Being overweight	
Being healthy	

Part 2: Build a low-cost stethoscope

1	Cut a piece of the balloon that is large enough to fit over the large opening of the funnel; cut about ¼ of the balloon from its opening.	
2	Completely cover the large opening of the funnel and make sure the balloon fits tightly.	

3	<p>Fit one end of the rubber tubing over or insert into the narrow end of the funnel (depending on the type of funnel you have). It should fit very snugly. You can use tape to help hold it better.</p>	
---	--	---

Your stethoscope should look like this:



Now, take the large, rubber covered end of the funnel, and place it on the left part of your chest, slightly centered.

Place the narrow end of the tube into your ear, being careful not to insert it too deep. Can you hear a thumping noise? That's your heartbeat!

Tip: *If you are wearing a sweatshirt, try removing it first to hear your heart better. If you still can't hear anything, do 10 jumping jacks and then listen again.*

- 1) What does the stethoscope tell you about the heartbeat that just holding your fingers on your pulse does not?

- 2) Try using a medical grade stethoscope to listen to your heart as well. What differences do you notice between it and your homemade model?

Acknowledgements: This Engineering World Health STEM module was developed in partnership with North Carolina State University (The Engineering Place), Duke University (Techxcite) and Biogen Idec.