What Is 120/80?

Introduction

The heart is a pump that keeps blood flowing through the arteries and veins. The pressure of the blood is not steady—pressure surges with each heartbeat. When the heart beats, the blood pressure in the vessels is the highest. When the heart relaxes, the blood pressure is lowest. Knowing your blood pressure is as important as knowing your weight and height. High blood pressure (hypertension) is associated with an increased risk for heart attacks, strokes, ruptured blood vessels, and kidney failure. In this activity, you can measure your blood pressure.

Concepts

- Systolic pressure
- Diastolic pressure
- Pulse

Materials

Sphygmomanometer (sfig´-mō-me-näm´-et-er)
Stethoscope (steth´-e-skōp´)

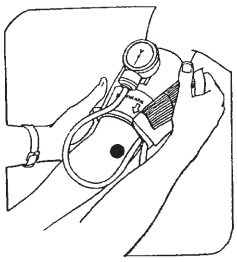
Safety Precautions

If you have a heart or other health problem, please consult with the school nurse or a physician before doing this activity. If you participate and you begin feeling faint, stop immediately and inform your teacher. Follow the directions carefully on how to inflate the cuff. The cuff should not stay inflated for more than 30 seconds.

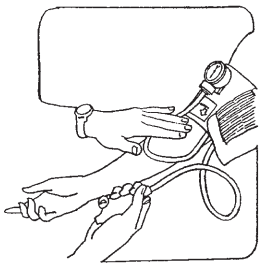
Procedure

Part I: Taking Your Blood Pressure

1. *Examine the parts of the blood pressure kit.* Work in pairs. Examine the parts of the sphygmomanometer. A sphygmomanometer is a device used to measure blood pressure. Note that it consists of a cloth-covered rubber cuff with two objects attached to it by rubber tubes. One tube leads to a hand bulb. The other tube leads to a pressure gauge. A stethoscope also is needed to measure blood pressure.

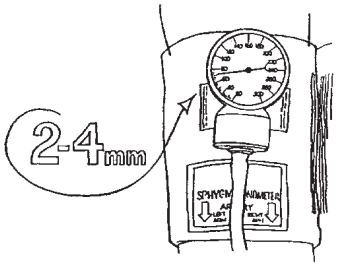


2. *Position the pressure cuff.* Have the person whose blood pressure you are taking roll up his or her right sleeve past the elbow. Also have the person extend his or her right arm, palm up. Be sure the arm is at the same level as the heart whether the person is sitting or lying down. Wrap the deflated cuff evenly and snugly around the upper arm, so that the lower edge of the cuff is about an inch above the elbow. Before wrapping the cuff, locate the large artery near the hollow of the elbow (as indicated by the dot in the diagram). You can find this artery by feeling for the pulse of the artery. Wrap the cuff until the self-sticking tape holds the cuff securely.



3. *Inflate the cuff.* Feel the pulse of the artery with your fingertips. Turn the valve on the bulb clockwise until it is closed. Squeeze the bulb and inflate the cuff until you can no longer feel the pulse. Keep your fingertips on the artery and deflate the cuff by turning the valve on the bulb counterclockwise. Watch the gauge as you do that. Note the point at which you once again feel the pulse in the artery. Allow the cuff to deflate completely. Wait 30 seconds. Repeat this procedure. Close the valve and inflate the cuff until you reach the point on the gauge that you noted before. Continue to inflate the cuff an additional 30 millimeters (30 mm).

4. *Slowly deflate the cuff.* Place the earpieces of the stethoscope in your ears and the flat side of the stethoscope evenly and firmly over the artery. Slowly open the valve on the bulb by turning it counterclockwise. Practice doing that until you can get the pressure to drop 2 to 4 mm (1 to 2 marks on the gauge) with each heartbeat. This usually means a drop of 1 to 2 marks on the gauge every second. This rate of deflation is important for an accurate reading. Remember, the pressure of the cuff has shut off all blood flow to the arm. *Do not leave the cuff fully inflated any longer than absolutely necessary.*



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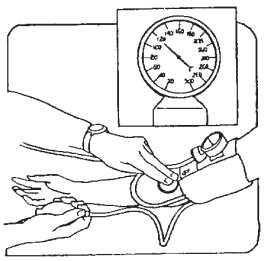
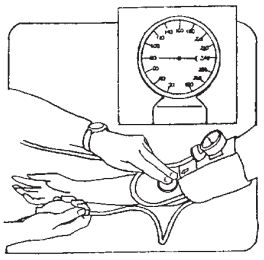
5. *Systolic pressure.* Listen carefully as you open the valve (turn counterclockwise) and let blood return to the arm. As soon as you clearly hear faint rhythmic tapping or thumping sounds, note the reading on the gauge. This number is the systolic (upper) blood pressure reading.
6. *Diastolic pressure.* Allow the pressure to continue to drop at the same rate as before—about 2 to 4 mm per second. Listen carefully with the stethoscope. The sounds you hear with the stethoscope will change. The first sharp tapping sounds will soften to blowing or swishing sounds. Listen carefully and watch the falling gauge needle. At the exact point when you can no longer hear any sounds, read the gauge. This number is the diastolic (lower) blood pressure reading.
7. *Immediately record your readings.* Blood pressure is written as a fraction with systolic pressure over diastolic pressure, for example, 115/70 or 120/80.





Part II: Blood Pressure and Exercise

After the technique of measuring blood pressure is mastered, carry out the following activity. Record your measurements on the record sheet.

Note: If you have heart or other health problems, consult a physician before doing this activity. If you participate and begin feeling faint, stop immediately and inform your teacher.

Take turns with your partner. Determine your partner's blood pressure after 5 minutes of rest in a sitting position. Next, have your partner run in place (2 steps per second) for 2 minutes. Immediately measure her or his blood pressure. Repeat the measurements 2 minutes after exercise, and every 2 minutes thereafter until the blood pressure measurements return to what they were at the resting stage. Enter the blood pressure readings on the record sheet.

If you would like to observe the effects of exercise on the heartbeat rate (pulse) and the breathing rate, in addition to blood pressure, you might work in larger groups and record your results on your record sheet. Pulse is usually measured by locating a beat at the wrist. Heartbeats are counted for 15 seconds and then multiplied by 4 to give the pulse rate per minute. Respiration is measured in the number of breaths per minute.

Record Sheet: Blood Pressure

Time	Blood Pressure (Systolic/Diastolic)	Pulse (Beats per Minute)	Respiration (Breaths per Minute)
Before exercise			
Immediately after exercise			
2 minutes after exercise			
4 minutes after exercise			
6 minutes after exercise			
8 minutes after exercise			

Tips

- Check student health records with the school nurse or other health personnel to be sure all students are in good health and do not have any pre-existing conditions that would preclude doing this activity.
- Although the suggested procedures for determining blood pressure are accurate, proficiency in measuring blood pressure precisely requires much skill and practice. Blood pressure measurements made by students may not be accurate. Any blood pressure readings obtained during this activity are for teaching purposes only and should ***not*** be used for diagnosis.

Discussion

Blood pressure is the force exerted by the blood against the inner walls of the blood vessels. Although this force occurs throughout the vascular system, the term *blood pressure* most commonly refers to systemic arterial pressure, or the pressure in the arteries.

The arterial blood pressure rises and falls in a pattern corresponding to the phases of the cardiac cycle when the ventricles contract and relax. The walls of the ventricles squeeze the blood inside their chambers and then force it into the pulmonary trunk and aorta. As a result, the pressure in these arteries rises sharply. The maximum pressure achieved during ventricular contraction is called the *systolic pressure*. When the ventricles relax, the arterial pressure drops, and the lowest pressure that remains in the arteries before the next ventricular contraction is termed the *diastolic pressure*.

Arterial blood pressure can be measured using an instrument called a sphygmomanometer (sfig´-mō-me-näm´-et-er). Sphygmomanometers are calibrated in pressure units that indicate the amount of pressure necessary to raise a column of mercury (Hg) a distance measured in mm. (A pressure of 100 mm Hg, for example, would be enough to force the mercury column upward for a distance of 100 mm.) The results of a blood pressure measurement are reported as a fraction, such as 120/80. In this notation, the upper number indicates the systolic pressure (SP) in mm Hg, and the lower number indicates the diastolic pressure (DP) in mm Hg.

To measure blood pressure, the cuff of the sphygmomanometer is usually wrapped around the upper arm so that it surrounds the brachial artery. Air is pumped into the cuff until the pressure exceeds the pressure in the brachial artery. As a result, the vessel is squeezed closed, and its blood flow is stopped. When listening with a stethoscope, no sound can be heard in the brachial artery because the blood flow has been stopped. As air is slowly released from the cuff, the air pressure inside it decreases. When the cuff pressure is approximately equal to the systolic blood pressure within the brachial artery, the artery opens enough for a small amount of blood to spurt through. This blood movement produces a sharp sound that can be heard through the stethoscope or detected electronically. The pressure when this first tapping or slamming sound is heard is the systolic pressure (SP).

As the cuff pressure continues to drop, a series of increasingly louder, periodic "whoosh" sounds can be heard. Then the sounds become abruptly muffled and finally disappear. The pressure when the sound becomes abruptly muffled represents the diastolic pressure (DP).

These two numbers 120/80 (SP/DP) are then noted as a blood pressure reading and are used by medical personnel as one measure of cardiac condition and health. Interpreting the significance and/or treating abnormally "high" or "low" blood pressure should be done by a physician. The 120/80 recording (often termed normal or average) is merely a guidepost—many factors can affect these numbers.

The main factors that influence arterial blood pressure are heart action, blood volume, peripheral resistance and blood viscosity. If either the stroke volume or the heart rate increases, so does the cardiac output, and as a result, the blood pressure rises. Conversely, if the stroke volume or the heart rate decreases, the cardiac output and blood pressure also decrease.

The blood pressure is directly proportional to the volume of the blood within the cardiovascular system. For example, if blood volume is reduced by a hemorrhage, the blood pressure drops. Friction between the blood and the walls of the blood vessels creates a force called peripheral resistance which hinders the blood flow. Consequently, any factors that alter the peripheral resistance of blood flow can cause changes in the blood pressure. The resistance within the circulatory system can also be affected by the viscosity of the blood. Any biochemical changes in the body that can affect the thickness of the blood will affect the blood pressure.

One of the major concerns relative to cardiac health is high blood pressure or *hypertension*. This condition is characterized by persistently elevated arterial pressure. The consequences of prolonged, uncontrolled hypertension can be very serious and may lead to an enlarged and weakened heart. The treatment or prevention of hypertension may include regular exercise, controlling body weight, reducing stress, and limiting the diet to food low in sodium and high in potassium. Treatment may also involve the use of drugs, such as diuretics and/or inhibitors of sympathetic nerve activity.

NGSS Alignment

This laboratory activity relates to the following Next Generation Science Standards (2013):

Disciplinary Core Ideas: Middle School
MS-LS1 From Molecules to Organisms: Structures and Processes
LS1.A: Structure and Function

Disciplinary Core Ideas: High School
HS-LS1 From Molecules to Organisms: Structures and Processes
LS1.A: Structure and Function

Science and Engineering Practices
Analyzing and interpreting data
Constructing explanations and designing solutions

Crosscutting Concepts
Cause and effect
Structure and function
Stability and change

Blood Pressure Materials are available from Flinn Scientific, Inc.

Catalog No.	Description
AB1211	Blood Pressure Set, Student
AB1212	Blood Pressure Set, Teaching
AB1246	Aneroid Sphygmomanometer
AB1247	Digital Blood Pressure/Pulse Monitor
AB1248	Digital Blood Pressure, Monitor, Automatic
AB1249	Stethoscope, Bowles
AB1250	Stethoscope, Economy
AB1251	Stethoscope, Ford
AB1252	Stethoscope, Teaching

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.