

Blood pressure measurement with Cobra SMARTsense



Students will learn how blood pressure measurement works and is interpreted.

Biology

Human Physiology

Cardiovascular system



Difficulty level

easy



Group size

2



Preparation time

10 minutes



Execution time

10 minutes



Teacher information

Application



Experiment setup

Blood pressure is the pressure exerted on the blood by the walls of the blood vessels. It is measured indirectly. A measurable pressure is created in a cuff placed around the upper arm, which consists of an outer, non-stretchable leaf and an inner, stretchable leaf, by pumping air between the two leaves of the cuff. This pressure presses the upper arm and with it the brachial artery (*brachial artery*) together.

When the pressure just slightly exceeds the value of the internal pressure of the artery, that is, blood pressure, the artery is completely closed, and blood flow is cut off.

Other teacher information (1/3)

PHYWE
excellence in science

Prior knowledge



Students should already be familiar with the blood and oxygen circulation and the importance of blood pressure in the human body in theory.

Scientific Principle



By measuring the pressure required to completely occlude the brachial artery, blood pressure is indirectly determined.

Other teacher information (2/3)

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Learning objective



Students learn how blood pressure measurement works and is interpreted.

Tasks



1. Students determine systolic and diastolic blood pressure.
2. The students determine the systolic and diastolic blood pressure under stress of the subject.

Other teacher information (3/3)

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Evaluation

The first deflection of the curve is the point at which the audible knocking sound (called the KOROTKOFF sound) would be audible with a stethoscope. This is recorded by the measureApp. It is caused by the fact that the value of the cuff pressure just falls below the blood pressure and the pressure peaks of the inflowing blood rhythmically open the compressed brachial artery and this collapses again and again.

The first curve deflection indicates the systolic blood pressure, which occurs during the contraction of the heart chambers - systole. The last value indicates the diastolic blood pressure exerted on the blood by the walls of the blood vessels during the dilation of the heart chambers - diastole. It is interesting to repeat the measurement in the same subject after exercise, for example, 5, 10 or 15 squats, and compare the results.

Safety instructions

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- Measurements taken in the classroom should never be used as medical indicators of subjects' health.
- The general instructions for safe experimentation in science lessons apply to this experiment.



Student Information

Motivation



Test setup

The first value displayed indicates the systolic blood pressure, which occurs during the contraction of the heart chambers, systole. The second value indicates the diastolic blood pressure exerted on the blood by the walls of the blood vessels during the dilation of the heart chambers, diastole.

It is interesting to repeat the measurement on the same subject after load, for example 5, 10 or 15 squats, and compare the results.

Tasks



1. Determine the systolic and diastolic blood pressure.
2. Determine the systolic and diastolic blood pressure under stress of the subject.

Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense - Blood Pressure, 0 ... 375 mmHg (Bluetooth + USB)	12944-00	1
2	measureAPP - the free measurement software for all devices and operating systems	14581-61	1

Structure (1/2)

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To measure blood pressure, you need the Cobra SMARTsense blood pressure sensor and the measureAPP. Check whether "Bluetooth" is activated on your device (tablet, smartphone) (the app can be downloaded free of charge from the App Store - QR codes below). Now open the measureAPP on your device.



measureAPP for

Android operating systems



measureAPP for

iOS operating systems



measureAPP for

Tablets and PCs with Windows 10

Structure (2/2)

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SMARTsense blood pressure sensor

- Turn on the SMARTsense blood pressure sensor by pressing and holding the power button.
- Connect the sensor to the device in the measureAPP under the item "Measure".
- The SMARTSense sensor is now displayed in the app.

Procedure (1/2)

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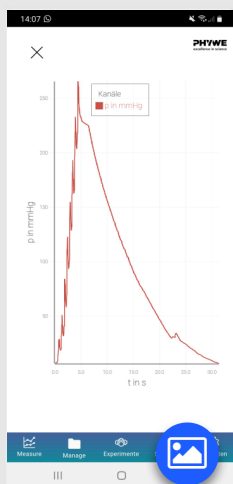
- The cuff of the blood pressure measurement combination (Fig. right) is placed around the upper arm of the test person in such a way that it lies loosely but non-slip above the elbow. The arm should be slightly bent and relaxed with the palm open on the table top. The microphone built into the cuff must be positioned exactly above the brachial artery.
- The adjusting screw on the blower of the blood pressure measurement combination is closed and so much air is pumped into the cuff that the pressure rises to about 240-267mbar (180-200 mm Hg).



The microphone built into the cuff must be positioned exactly above the brachial artery.

Procedure (1/2)

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Measuring curve

- The adjusting screw of the blower is then very slowly and carefully turned up again so that the cuff pressure only drops very gradually, observing the curve in the measureAPP.
- The gentle deflections in the curve represent the first indications for measuring blood pressure (Fig. left).





Report

Task 1

What do you call the two values that are of concern when measuring blood pressure?

- The first value measured indicates the systolic blood pressure, the second value indicates the diastolic blood pressure.
- The first value measured indicates the pulmonary blood pressure, the second value indicates the cardiac blood pressure.
- The first value measured indicates the diastolic blood pressure, the second value indicates the systolic blood pressure.

✓ Check

Task 2

What causes the value for diastolic blood pressure?

- Due to the pressure exerted on the blood by the walls of the blood vessels during the dilation of the heart chambers - systole.
- Due to the pressure exerted on the blood by the walls of the blood vessels during the dilation of the heart chambers - diastole.
- Through the air, which is present in the blood. So here the air pressure in the blood is measured.

✓ Check

Task 3

Where is the blood pressure in a normal, healthy adult?

- In normal blood pressure, the systolic value is 150 - 159 mmHg and the diastolic value is 100 - 104 mmHg.
- In normal blood pressure, the systolic value is 80 - 84 mmHg and the diastolic value is 120 - 129 mmHg.
- In normal blood pressure, the systolic value is 120 - 129 mmHg and the diastolic value is 80 - 84 mmHg.

✓ Check

Slide	Score/Total
Slide 16: Blood pressure measurement	0/1
Slide 17: Diastolic blood pressure	0/1
Slide 18: Typical blood pressure value	0/1

Total  0/3

 Solutions

 Repeat