

# Protocol

## Estimation of pressure

### Procedures

#### 1. Non-invasive methods of blood pressure measurement

Measure blood pressure in three persons. The blood pressure of each person will be measured by palpatory, auscultatory and oscillometric methods. Check the counted values in the graph.

##### Palpatory (Riva-Rocci) method

1. The sphygmographic cuff is placed on the naked upper arm of the examined person tightly, but don't strangulate the arm. The lower margin of the cuff has to be placed 2.5 cm above the elbow region (the width of the cuff is 12.5 cm for adults).
2. The radial artery is palpated at the wrist of the same arm. The cuff is inflated to a pressure of 20–23 kPa (150–170 mmHg) using the rubber bulb the valve of which is closed. If the pulse is still palpable at this pressure, increase the cuff pressure by another 4–5 kPa (30–40 mmHg).
3. Opening slightly the valve, let the air slowly escape from the cuff. The first pulsation felt on the radial artery during the decrease of cuff pressure means that blood is just starting to flow through the compressed artery. At this moment, the cuff pressure is equal to the systolic pressure.

##### Auscultatory (Korotkow) method

2. The arm cuff is inflated to a higher pressure than is the supposed systolic pressure, and the stethoscope is applied over the brachial artery at the elbow region of an extended arm.
3. In opening slightly the valve, one allows the air to escape slowly from the cuff (2–3 mmHg) and observes the pressure indication on the manometer. Listen to the Korotkow sounds.

Five phases are distinguished: weak sounds – sounds – intensive sounds – sudden change of loudness – cessation of sounds. the first sounds heard over the artery mean a beginning arterial flow during the maximal BP and the cuff pressure read at this moment is thus the SBP. During a further slow decrease of cuff pressure the sounds of the oscillating arterial wall increase in intensity and after a certain maximum loudness attenuate a little. At a certain pressure the sounds, as yet distinctly audible, become almost inaudible if the pressure is slightly reduced (sudden change of loudness) and at a further decrease in pressure they disappear. At the moment of sudden lowering of loudness, which is caused by cessation of oscillations of the arterial wall, the cuff pressure is equal to DBP. Repeat the BP measurement at rest about 5 times, using both methods, register all results, and calculate the mean.

## Oscillometric measurement

During the measurement the experimental person sits calmly and does not speak.

Wrap the cuff around the naked arm of the experimental subject (the green coloured band is positioned 2–3 cm above the elbow on the inner side). Lay the arm on a table so that the cuff is approximately at heart level (below heart level the blood pressure measurement would be artificially high, while above the heart level it would be artificially low). Switch on the unit by pressing the O/I button.

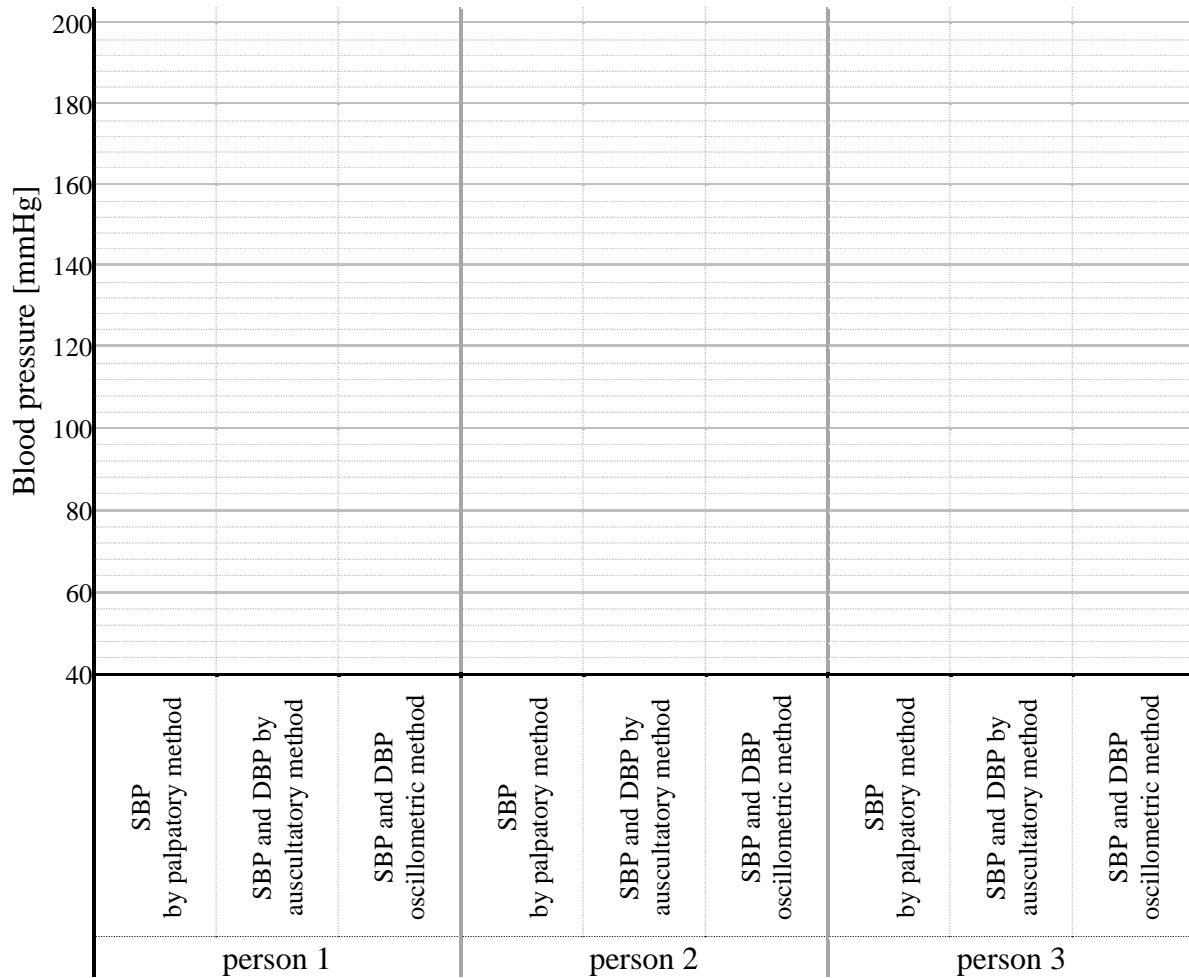
Wait until the heart symbol appears on the display. According to the type of instrument either push the START button or inflate the cuff using the rubber bulb. The instrument measures blood pressure and pulse, then the values are displayed. The arrow symbol announces the end of the measurement. If the measurement has finished, switch the device off by pressing the O/I button.

## 2. Changes of blood pressure after work load

1. After a few minutes of sitting at rest the SBP and DBP is measured.
2. Then the examined subject performs 30 deep squats at a frequency of one squat per second. Then we measure SBP, DBP and heart rate by automatic device in sitting position each minute until initial values are reached. During squatting the cuff is left on the arm, only the manometer is disconnected.

## Results

### 1. Non-invasive methods of measuring blood pressure



Graph 1: Blood pressure estimated by palpatory method (Riva-Rocci), auscultatory method (Korotkow) and oscillometric method in three persons. Mark values of systolic (SBP) and diastolic (DBP) blood pressure.

Which method of blood pressure measurement is the less exact? Why?

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Which method enables measuring diastolic blood pressure? (2 words)

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Which values of blood pressure (SBP, DBP, MAP) are really measured by the oscillometric method and which values are counted?

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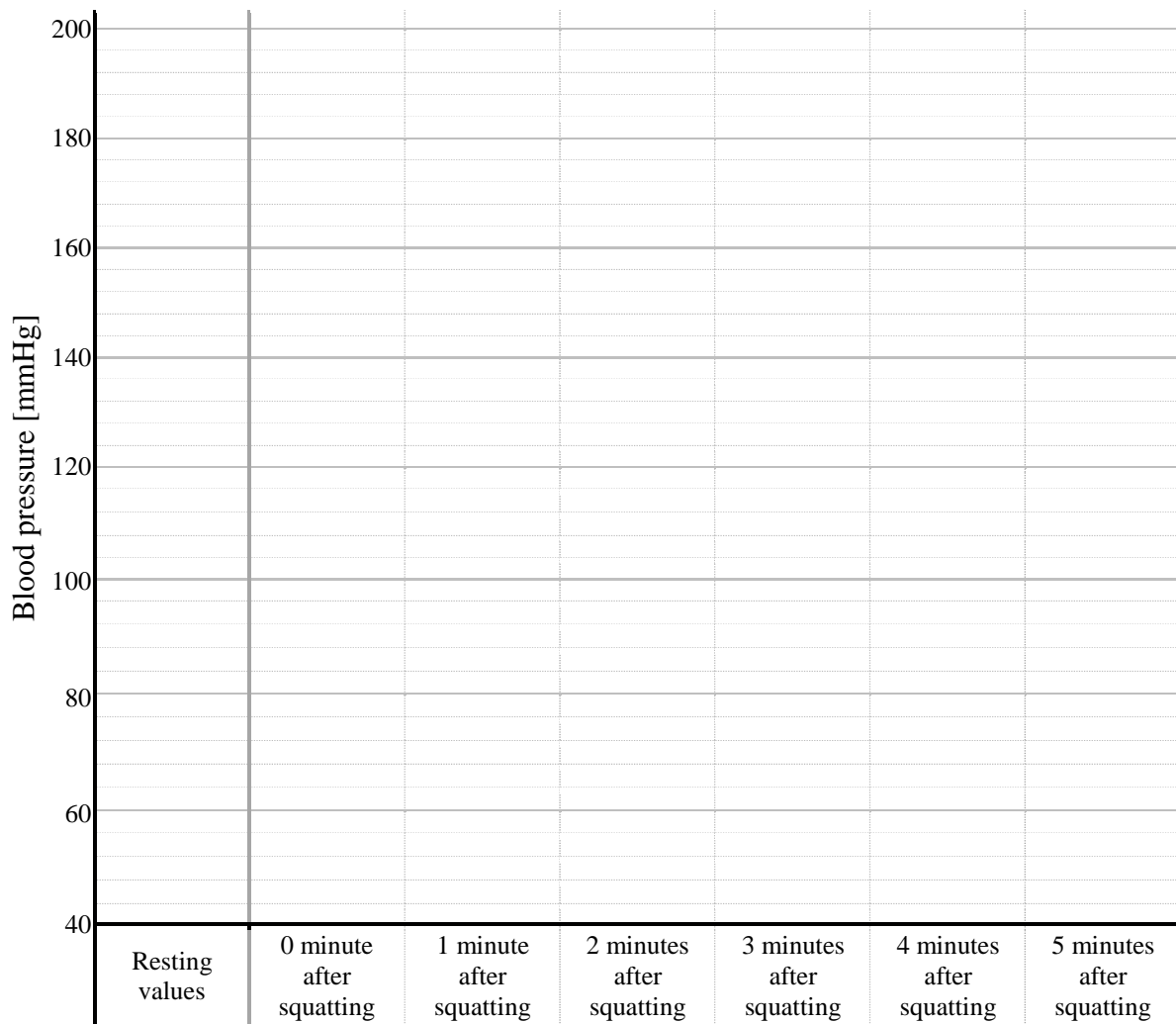
Which variables of cardiovascular system define mean arterial blood pressure? (3 variables)

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Name:

Study group:

## 2. Changes of blood pressure after work load



Graph 2: Blood pressure changes at rest and after squatting. Mark values of systolic (SBP) and diastolic (DBP) blood pressure.

Describe changes of SBP, DBP and heart rate measured after physical activity.

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Why is the SBP change greater than DBP change? (Explain in the context of cardiac output and total peripheral resistance changes induced by activity)

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Why does peripheral resistance decrease after physical activity? Which mechanism regulates blood flow in skeletal muscles?

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Name:

Study group:

## Conclusion

Summarize blood pressure changes observed under various physiological conditions.

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