

# Protocol

## Estimation of heart rate

### Procedures

#### 1. Examination of pulse by palpation

Perform palpation in the arteria radialis, brachialis, carotis, femoralis and poplitea in three persons. If you have palpated the pulse, check the appropriate box in the table. Try all mentioned arteries.

#### 2. Resting heart rate according to a measured time interval

Resting heart rate is usually examined in a supine patient, but for this exercise a sitting position will do. After a sufficient rest, count the pulse according the second hand on the watch in intervals of 5, 10, 20, 30, and 60 seconds. Write down the results and convert them to minute values (beats per minute).

#### 3. Respiratory sinus arrhythmia

1. Attach the respiratory belt on the chest of the examined person and the finger pulse sensor on the distal phalanx.
2. Start the program PULSE by double clicking on its icon.
3. Set the sensitivity of the amplifier for pulse registration (PULSE – 1st channel) and respiratory movements (BREATHING – 3rd channel). Pulse frequency is calculated automatically from the 1st channel and can be observed in the middle channel (PF – 2nd channel).
4. Record the following situations:
  - resting breathing (1 minute)
  - slowed breathing for 1 min (e.g. 4 seconds inspirium – 5 s expirium)
  - faster breathing for 20 seconds.
5. Measure the pulse rate on top of inspirium and expirium from 5 breathing cycles at resting, slowed and fast breathing (pulse rate value is given by position of mouse cursor). Calculate average values of pulse rate on top of inspirium and expirium at resting, slowed and fast breathing.

#### 4. Heart rate in postural changes

1. Record the following situations
  - at least 3 minutes of rest in standing position
  - 2 minutes in supine position (lying on the bed)
  - 2 minutes of rest in standing position

Changes between positions have to be quick

2. Count average heart rate from
  - last 15 seconds of standing
  - first 15 seconds of lying
  - last 15 seconds of lying
  - first 15 seconds of second time standing

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- last 15 seconds of second time standing
3. Check the calculated values in the graph

## **5. Changes of heart rate after work load**

1. After a few minutes of sitting at rest the heart rate is measured.
2. Then the examined subject performs 30 deep squats at a frequency of one squat per second. Then we measure heart rate in sitting position each minute until initial values are reached.

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## Results

### 1. Examination of Pulse by Palpation

person	a. radialis dx	a. radialis sin.	a. carotis dx.	a. carotis sin.	a. brachialis	a. femoralis	a. poplitea
1							
2							
3							

Table 1: Place a tick where you have palpated a pulse.

Describe the differences in the quality of pulse between measured persons

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### 2. Resting heart rate according to the measured time interval

person	10 s	bpm	20 s	bpm	30 s	bpm	60 s = bpm
1							
2							
3							

Table 2: Write the number of pulses measured in time intervals (10, 20, 30 and 60 s) and convert them into bpm (beats per minute).

Why do heart rate values counted at intervals shorter than 1 minute differ from one another?

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Which time interval is long enough for estimation of heart rate?

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### 3. Respiratory sinus arrhythmia

Respiratory cycle	Resting breathing		Faster breathing		Slower breathing	
	inspirium	expirium	inspirium	expirium	inspirium	expirium
1						
2						
3						
4						
5						
average						

Table 3: Heart rate measured in inspirium and expirium during different frequencies of breathing.

Describe changes in heart rate depending on breathing.

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How do the frequency and depth influence the heart rate difference between inspirium and expirium?

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Name at least three possible causes of respiratory sinus arrhythmia formation.

- 1.....
  - 2.....
  - 3.....
- .....

### 4. Heart rate in postural changes

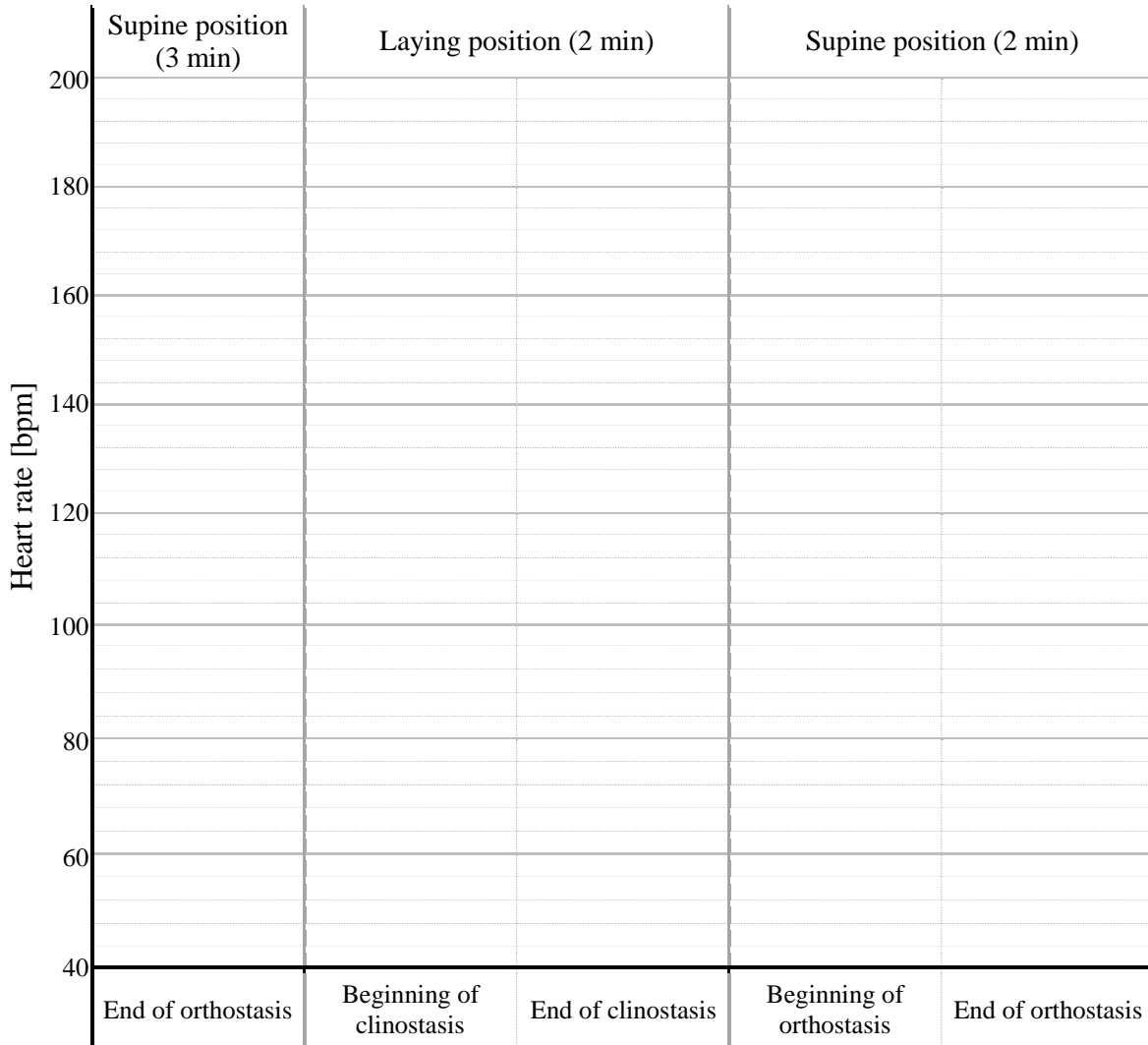


Table 4: Heart rate measured at the beginning and end of postural change. Mark the heart rate on the graph.

How do the postural changes influence heart rate?

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Which mechanism of neural blood pressure regulation changes the heart rate? (one word)

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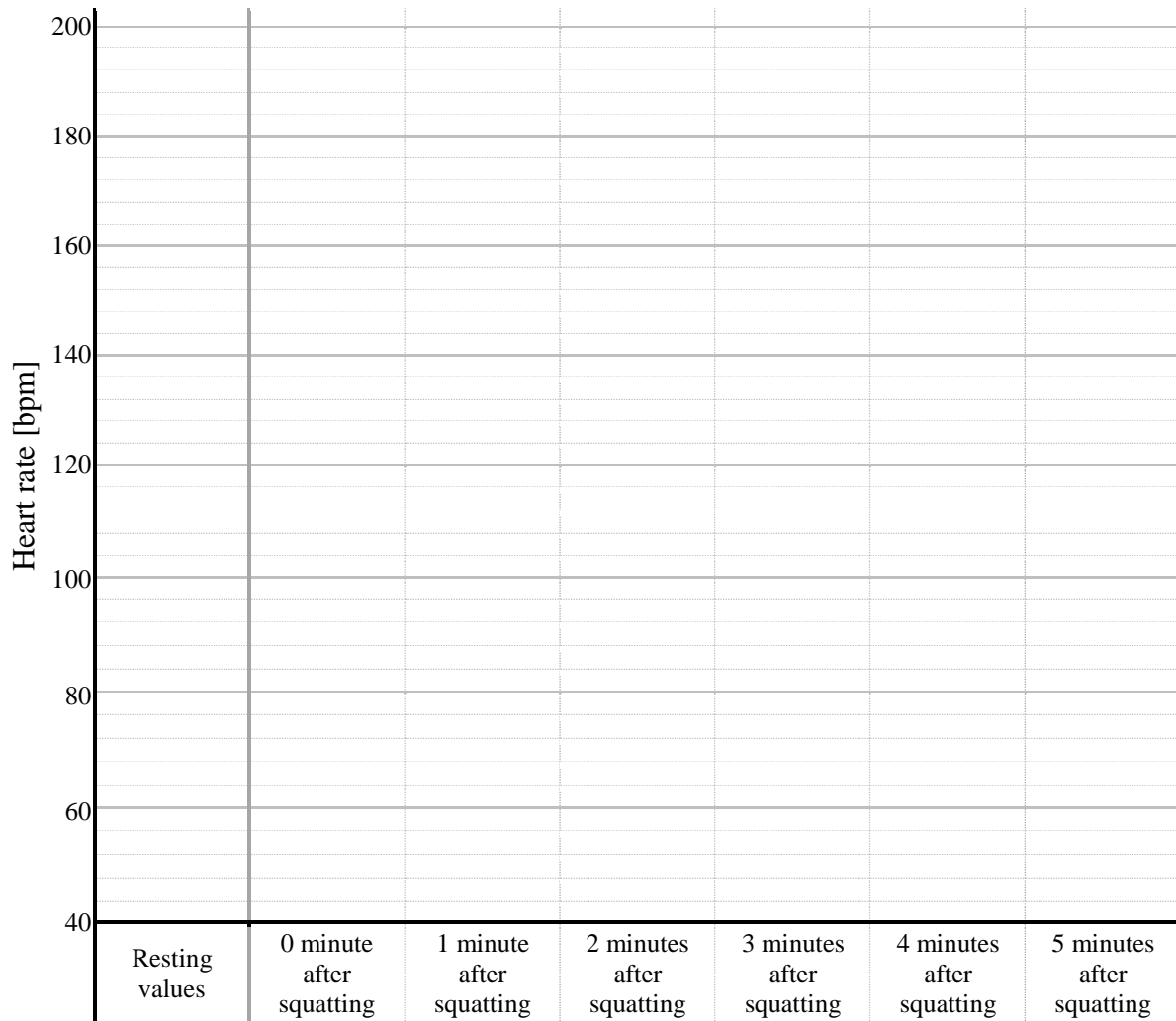
Which part of the autonomic nervous system increases its activity during orthostatic reaction?

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### 5. Changes of heart rate after work load



Graph 3: Heart rate changes at rest and after squatting. Mark the heart rate on the graph.

Describe changes of heart rate measured before and after physical activity.

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### Conclusion

Summarize heart rate changes observed under various physiological conditions.

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