Pressure in Motion

Use paired measurements to investigate circulation and feedback.

HAP.8.b "Carry out an investigation exploring the link between blood pressure and heart rate and include the role of baroreceptors and chemoreceptors in the explanation of results."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline causes and effects, circle the two receptor names, and number the steps in the body's response to standing.

What Changes When Maya Moves?

1. During an investigation, Maya tests how posture and activity affect circulation. She uses the same upper-arm cuff on one volunteer and measures blood pressure and heart rate at set times. The volunteer sits quietly for three minutes before the first reading, then stands and later performs two minutes of easy step-ups. Each reading is a snapshot, not a continuous record.

2. Standing shifts blood toward the legs, reducing blood return to the heart. Baroreceptors in the carotid arteries and aorta detect falling arterial pressure and signal the brainstem. The brainstem raises heart rate and tightens blood vessels. Maya's standing readings show lower pressure and a faster pulse at one minute, followed by a move toward the seated values.

MAYA'S MEASUREMENTS

Condition and time	Blood pressure (mmHg)	Heart rate (beats/min)
Seated, after 3 min	118/76	70
Standing, after 1 min	108/74	88
Standing, after 3 min	114/76	78
Standing, within 1 min after step-ups	130/78	116
Seated, after 3 min recovery	120/76	80

3. During step-ups, muscles use more oxygen and produce more carbon dioxide. Chemoreceptors detect increased blood carbon dioxide, increased acidity, or low oxygen and can alter breathing and circulation. Exercise also raises heart rate through signals from muscles and the brain. Maya did not measure blood gases, so her blood pressure and pulse readings alone cannot establish chemoreceptor activity.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare the seated reading with the reading after one minute standing. How could baroreceptors help explain both changes?

2. What changed between one and three minutes standing? Explain how a baroreceptor response could contribute.

3. The reading after step-ups shows a faster heart rate than the seated reading. Why can't Maya conclude from these measurements that chemoreceptors caused the increase?

4. Compare the reading after step-ups with the seated reading. Do these measurements support a rule that blood pressure and heart rate always change in opposite directions? Explain.

3 YOUR TURN

Your own words

With a partner and a digital cuff, measure blood pressure and heart rate after three minutes seated and again after one minute standing. If you cannot stand comfortably, use a willing partner's measurements. In one paragraph, report both pairs, explain a possible baroreceptor response, and state what additional evidence you would need to make a claim about chemoreceptors.

ANSWER KEY

Pressure in Motion

PART 1 · READ AND MARK

Underline causes and effects, circle the two receptor names, and number the steps in the body's response to standing. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare the seated reading with the reading after one minute standing. How could baroreceptors help explain both changes?	**Systolic pressure fell from 118 to 108 mmHg while heart rate rose from 70 to 88 beats/min. Baroreceptors detect falling pressure and signal a response that raises heart rate.**
2	What changed between one and three minutes standing? Explain how a baroreceptor response could contribute.	**Systolic pressure rose from 108 to 114 mmHg while heart rate slowed from 88 to 78 beats/min. The response to falling pressure can help restore pressure toward its seated value.**
3	The reading after step-ups shows a faster heart rate than the seated reading. Why can't Maya conclude from these measurements that chemoreceptors caused the increase?	**Heart rate rose from 70 to 116 beats/min, but Maya did not measure blood gases or acidity. Signals from muscles and the brain can also raise heart rate during exercise.**
4	Compare the reading after step-ups with the seated reading. Do these measurements support a rule that blood pressure and heart rate always change in opposite directions? Explain.	**No. Systolic pressure rose from 118 to 130 mmHg, and heart rate rose from 70 to 116 beats/min.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My sample seated readings were 116/74 mmHg and 72 beats/min. After one minute standing, they were 110/72 mmHg and 86 beats/min. Blood may have shifted toward the legs, lowering pressure. Baroreceptors could detect that drop and signal an increase in heart rate. These readings do not show whether chemoreceptors responded. I would need measurements of blood carbon dioxide, acidity, or oxygen to investigate that possibility.

Accept answers that use the relevant paired readings and describe baroreceptors as part of a response to falling arterial pressure. A change in pulse alone does not establish chemoreceptor activity.