

Name:

Date:

Class:

Post Assessment Answer Key

Instructions: You have connected regions of the brain to specific muscle activities in your homunculus drawing. Use the preliminary homunculus map that you have drawn to answer the following questions:

1. When you move your finger and wrist to make the beating heart bigger, from which part of your brain are neurons recruited for this purpose?

The cerebellum controls hand and wrist movement; the motor cortex controls finger movement.

2. Why was this region of the brain involved? Give one physiological example from your experiment.

This part of the brain was involved because the function of the motor cortex is to plan, control, and execute voluntary movements.

When the finger or wrist were used in the experiment, it was a voluntary movement. Signals were sent from the brain to make movements as needed for the experiment (faster or slower beating heart).

3. When you made the beating heart smaller, from which part of your brain were neurons recruited for this purpose? Was it the same area as the first question? Why or why not?

Motor cortex. Yes, because it controls voluntary hand movement.

4. What happened when you made a small or large diamond or square? How were the movements of the finger and wrist different? Why?

The movements to make a large or small diamond or square involved a different number of movements from the finger and wrist, with different recruitment of neurons as needed. Movements of the finger were quicker, while the wrist was slower, so more and fewer neurons were needed.

5. If you created your own animation, what happened? Were the movements of wrist and finger different? Why or why not?

The answer to this question can vary depending on what students did. In general, they need to connect the recruitment of neurons to the animation they made: How many times did they move the finger? The wrist? The movement of finger and wrist will be different depending on the student's range of motion, and they may make larger or smaller movements based on their ability.

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6. Describe in a few sentences what you understand from drawing the homunculus. How does the homunculus help your understanding of how neurons are recruited for specific muscle activity? Give examples.

Drawing the homunculus should help students understand that the motor cortex is responsible for hand and wrist movement. They should be able to figure out that the faster they move their wrist or finger, the more the recruitment of neurons, and vice versa. Examples can include the animations from the experiment, or making the beating heart larger or smaller, and how they had to move finger and wrist differently to do it., which reflects the recruitment of neurons for that activity.

7. Describe how the pressure exerted by your finger and wrist changes as you change the animation in this experiment. Can you think of any physics principle that supports this evidence?

Pressure is defined as force divided by area. The more exertion the students make, the more force they exert, and if the area is the same, the force applied might be different as well, depending on the individual strength of the students.

In the experiment, students use force to change the size of the beating heart and to create their own animations, as required. This changes the pressure their finger or wrist exerts in the experiment.

Some principles of physics that apply could be Pascal's principle (pressure applied is relayed to every point of the system without change in magnitude) and Bernoulli's principle (decrease in pressure causes increase in speed).

If they mention any other principles, make sure they can explain their observations.

8. What is your understanding from this experiment of some factors that influence how the neurons are recruited for muscle activity? Give at least two examples.

The amount of pressure applied dictates the recruitment of neurons. Other factors would be the efficiency of the micro:bit, the individual strength of the person's fingers and wrist, and their flexibility, which affects how many neurons need to be recruited.