MAPPING YOUR HOMUNCULUS

Background:

Human skin possesses several different sense receptors. One type is capable of sensing tactile stimuli. When these receptors respond to tactile stimulation, they send messages via nerve cells to the spinal cord and the brain. The somatosensory cortex, of the brain then processes the information. Each part of the somatosensory cortex is made up of densely packed neurons that are grouped together to respond to tactile stimuli from several parts of the body. One part of this "headband" might assess information from the lips while another part assesses information from the elbow. The specific amount of neurons in the brain dedicated to assessing each body part is proportional to the density of the sensory receptors in that area of the body. For example, if the elbow has very few sensory receptors, only a small section of the somatosensory cortex will be associated with it. Also, recall that the left side of the brain assesses information from the right side of the body and vice versa. By doing a series of tactile tests on your partner, you will be able to "map" out your somatosensory cortex. The resulting picture of the body on the brain cortex is called a "homunculus", meaning "little person".

Materials:

You write

Procedure:

1. Choose 1 partner
2. Decide who will be the "guinea pig" for this experiment
3. Put together your toothpick/ruler apparatus following teacher instructions
4. Spread the toothpicks far apart along the ruler. When your partner is not looking, touch the toothpicks to the scalp. They should feel two points of contact.
5. Move the toothpicks closer together 0.5cm at a time until your partner only feels one point of contact (even though there are two toothpicks). STOP! When this happens, the toothpicks are both within the same receptive field of one sensory receptor and so they cannot be identified separately from each other by this receptor.

6. Record the distance between the toothpicks in cm at this point
7. Continue the tactile tests using the same method in #4-6 on all the body parts in the data chart.
8. When you have finished the tactile tests, calculate the inverse value of your distances for each body part.
9. Since the inverse values are low, multiply each value by a factor of 10 and record the new value.
10. Use this new inverse value to map out your homunculus on graph paper. The inverse value will tell you how many boxes on the graph paper to use for each body part. If your thumb has a value of 10, you will make a finger 10 boxes long, if the inverse value is 2, you will use 2 boxes and so on. Trust me – your brain sees you differently than others do – you will NOT look very "normal".

Data and Conclusions:

1. Table
2. Graph

Conclusions and Questions:

1. What is the somatosensory strip and where is it located? What does it do?

2. Using your data and your graph, list all the parts of the body that are associated with large areas of the somatosensory cortex.

3. Using your data and your graph, list some body parts that are obviously of very little concern to your somatosensory cortex.

4. Choose one body part that is associated with a large section of the somatosensory cortex and give an explanation as to why this might be the case. Use specific examples to backup your statements.

5. Use your knowledge of anatomy to explain why some areas on the body were really sensitive to the toothpicks and could easily detect that there were two of them and why others were not as sensitive. What is going on?

Final Summary – make sure you discuss the main concepts and vocab!