**Nervous System Lab**

**Introduction:** The human nervous systems I composed of the brain and spinal cord (Central Nervous System) and the nerves which branch out from the CNS, the Peripheral Nervous System (PNS). Sensory neurons of the PNS carry information to the CNS. Signals from the brain are carried to motor neurons (PNS), which carry out responses by muscles.

***In this lab, you will be comparing the rate at which sensory neurons, working through the brain, can elicit responses via motor neurons, and mapping out the density of sensory neurons on the skin.***

Part 1: Reaction Time

**Materials**: 1 meter stick per group

1. **Arm and Shoulder:** Have one group member stand upright with their arms extended straight out in front of the body, palms of the hands facing each other. The palms should be 10 cm apart. Place the meter stick exactly in the middle of the palms with the 50 cm mark at the TOP of the index finger. The meter stick should be oriented so that “0” end is down and the “100” end is up.

The other group member should hold the top of the stick and then let it go without telling the person. That person should stop the meter stick’s fall by bringing the arms together and catching it with the palms of their hands.

In the table below, record the distance that the stick fell by looking at the measurement lines on the meter stick that align with the index fingers as the palms hold the stick. Be sure to include units.

**Final Position (cm) – 50.0 cm = Distance Traveled (cm)**

Repeat this process three more times for each group member then calculate the average.

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| --- | --- | --- | --- | --- | --- |
| **Arm and Shoulder: Fall Distance in Centimeters (cm)** | | | | | |
| **Name** | **Trial #1** | **Trial #2** | **Trial #3** | **Trial #4** | **Average** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **Group Average:** | | | | |  |

1. **Thumb and Index Finger:** Have one group member stand upright with their right arm extended straight out in front of the body with the thumb and index finger separated by 10 cm. As before, place the meter stick at the 50 cm mark between the finger and thumb with the 50 cm mark aligned with the TOP of the index finger. The other group member should release the stick, then measure and record the distance traveled in the table below.

Repeat this process three more times for each group member then calculate the average.

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| --- | --- | --- | --- | --- | --- |
| **Thumb and Index Finger: Fall Distance in Centimeters (cm)** | | | | | |
| **Name** | **Trial #1** | **Trial #2** | **Trial #3** | **Trial #4** | **Average** |
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|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **Group Average:** | | | | |  |

Part 2: Mapping Nerve Endings

**Materials**: 2 pencils, metric ruler (cm)

Try and determine the distance between sensory neurons on several areas of the skin. Have each group member take turns sitting in a chair with their eyes closed. Touch (don’t poke) the skin in each of the areas below with the two pencils, beginning with the tips 1 cm apart. They should be able to feel that there are two pencils touching them at this time.

**BE SURE TO TOUCH THE PENCIL TIPS TO THE SKIN AT THE SAME TIME.**

Lift the pencils and reduce the distance between the pencil tips until the person (eyes still closed) says they only feel one pencil touching their skin. In the tables below record this distance between the pencil tips in millimeters. Repeat this procedure three more times for each group member, and for each area of skin. Calculate the average distance between sensory neurons for each group member.

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| --- | --- | --- | --- | --- | --- |
| **Pad of Right Index Finger: Distance Between Sensory Neurons (mm)** | | | | | |
| **Name** | **Trial #1** | **Trial #2** | **Trial #3** | **Trial #4** | **Average** |
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|  |  |  |  |  |  |
| **Group Average:** | | | | |  |

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| --- | --- | --- | --- | --- | --- |
| **Back of Upper Arm: Distance Between Sensory Neurons (mm)** | | | | | |
| **Name** | **Trial #1** | **Trial #2** | **Trial #3** | **Trial #4** | **Average** |
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|  |  |  |  |  |  |
| **Group Average:** | | | | |  |

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| --- | --- | --- | --- | --- | --- |
| **Back of Neck: Distance Between Sensory Neurons (mm)** | | | | | |
| **Name** | **Trial #1** | **Trial #2** | **Trial #3** | **Trial #4** | **Average** |
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|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **Group Average:** | | | | |  |

Part 3: Questions

*Answer the following questions in complete sentences.*

1. How does your Arm and Shoulder average reaction time compare to that of your group member(s)? (2 points)
2. How does your Thumb and Index Finger average reaction time compare to that of your group member(s)? (2 points)
3. How do the Arm and Shoulder average reaction times compare to the Thumb and Index Finger average reaction times? (2 points)
4. What do you think might account for similarities and differences in reaction time data? (2 points)
5. How do the distances between your sensory nerve endings compare to that of your group member(s)? (2 points)
6. Which areas of skin have the smallest distance between nerve endings? Which areas of skin have the largest distance between nerve endings? Why do you think there is a difference? (4 points)
7. In what ways do you think scientists could use an understanding of reaction time or sensory nerve endings in the study and development of robots? Explain. (3 points)