Lab #3 – Reaction Time can be a measure of the speed of neural transmission and the cognitive complexity of tasks.

Background Information:

Individual differences in reaction time were discovered by astronomers who realized that people differed in their observations of the time at which celestial objects crossed the middle of their instruments. Eventually, instruments were developed to precisely measure reaction time so that these individual differences could be taken into account. In this lab exercise, we will use a very crude measure of reaction time to demonstrate the following principles:

1. The speed of neural transmission is a physical process within your body that can, like the speed of other physical processes, be measured.

2. Even simple mental processing takes a measurable amount of time.

3. As the complexity of mental tasks increase, more neural processing is required and more time is required for more complex tasks.

Instructions:

1. Everyone in the lab section will stand and form a line. Each person in the line will close his or her eyes and place the right hand on the right shoulder of the person in front of them.

2. The TA will begin by squeezing the right shoulder of the last person in line. The last person in line will then squeeze the shoulder of the person in front of him/her. When that individual feels the squeeze, he/she will squeeze the shoulder of the person in front of them, and so on throughout the line. When the last person in line feels the shoulder squeeze, he/she will raise the right arm

3. The TA will record (with a stopwatch) the amount of time it takes for the "squeeze" to be passed through the entire group. By dividing the total time by the number of students in the group, you will be able to get a crude measure of the average simple reaction time for the students in the group.

4. The procedure will be repeated with a slight variation to get a measure of discrimination reaction time. In this case, everyone will place BOTH hands on BOTH shoulders of the person in front of them. The TA will start the process by squeezing one of the shoulders of the person at the end of the line. If you feel your right shoulder being squeezed, you must squeeze the right shoulder of the person in front of you. If the left shoulder is the one that is squeezed, squeeze the left shoulder of the person in front of you. The last person in line will raise the arm attached to the shoulder that has been squeezed. Making the discrimination as to which shoulder is being squeezed requires more time – hence, the groups discrimination reaction time should take longer than the simple reaction time did. You can figure out just how much longer by subtracting the group's average simple reaction time from the group's average discrimination time.

5. To demonstrate that a more complex task requires even more processing time, you will next compute a choice reaction time. In this case, you must not only perceive a source of stimulation and discriminate where it is coming from, but you must make a complicated choice about the response you will make. Once again, you will stand in line with both hands on the shoulders of the person in front of you. Now, when you feel a squeeze on one of your shoulders, you must squeeze the OPPOSITE shoulder of the person in front of you. For example, if your right shoulder is squeezed, you must squeeze the left shoulder of the person in front of you. The last person in line must raise the hand OPPOSITE of the shoulder that was squeezed. You can figure out how long this additional processing takes by subtracting the group's average discrimination reaction time from the group's choice reaction time.

6. In order to demonstrate that neural transmissions that have to travel longer distances actually do take longer, one final simple reaction time will be recorded. This time, form a line sitting side-by-side on the floor or in chairs. With your right hand, grasp the LEFT ANKLE of the person to your right. Keep your eyes closed. Once again, the TA will begin a wave of stimulation by squeezing the ankle of the person at one end of the line. The last person in line will raise his or her right hand when his/her ankle is squeezed. Because the neural message has to travel farther in this trial (all the way from the ankle to the brain rather than from the shoulder to the brain), you should find that the group's reaction time was significantly slower than it was in the very first simple reaction time situation that was measured in your group.

The Lab Report:

In the lab report for this exercise, you must report the actual times that were reported for your group. There should be two different simple reaction times (shoulder and ankle), a discrimination reaction time, and a choice reaction time. After you report these measures, write a brief report in which you address the following questions.

1. Did the different reaction times show the expected pattern? If so, how much time did it take to make a discrimination? How much time did it take to make a choice?

2. If the reaction times did not show the expected patterns, can you come up with a hypothesis of what might have gone wrong? Is it possible that practice effects played a role in that you got faster at doing this task with each successive trial?

3. Why did you have to keep you eyes closed? Would the results have been different if your eyes had been opened?

4. Did you find that reacting to an ankle squeeze took longer than reacting to a shoulder squeeze? If not, how might you possibly explain this?

5. Did you subjectively feel as if the transmission of this sensory and motor information was taking noticeable time, or did it feel as if it were an instantaneous process?