**Reaction Time Lab**

**Review**

Reflexes are primarily intended to protect you. Things like blinking your eye, the

contraction of your pupil, or pulling your hand back from a hot surface are all reflex actions. Reflexes involve sensory and motor neurons of your peripheral nervous system and often inter-neurons of the spinal portion of your central nervous system. Reflexes don’t require higher brain activity. If you touch a hot surface, you will actually pull your hand back before your brain perceives the heat.

Reactions require higher brain function. Putting your foot on the brake of the car when the car in front of you slows or comes to a stop is an example of a reaction. You must first see the leading car’s brake lights; that information must be processed by your brain and a signal must be sent to the muscles of your back and legs. The signal not only tells you to step on the brake, but how hard to step on the brake.

**Baseball**

One of the toughest things in sports is supposed to be hitting a fastball in baseball. According to Charles Carlson of the Exploratorium Museum, a fastball thrown at 95 mph will cover the distance from the pitcher’s mound to home plate (60 ft. 6 inches) in about .4 seconds. For a batter to hit the ball, he must have a visual on the ball by the time it has traveled about 12 feet from the pitcher. During the mid-portion of the ball’s trip, the batter’s brain must measure the speed and decide when to swing. The swing has to start when the ball is about 25 to 30 feet from the plate. At that distance, the ball will reach the plate and the bat in about .0025 seconds. This is considered close to the limit of human reaction time.

If the batter is off by even a few thousandths of a second, the result will be a strike or a foul ball. Hitting high or low will determine if the ball is a grounder or a fly ball.

When Major League batters hit 3 out of every 10 at-bats, it is considered outstanding.

Let’s do an experiment to test your reaction time.

**Materials**

* Meter sticks
* Calculators
* Computer

**Introduction:**

A meter stick will be held perpendicular to the floor, dropped, and you will try to catch it to determine how far it falls before you can react. The slower your reaction, the farther the meter stick will fall. You can convert distance into times and measure reaction time. Then, you will compare how long it takes you to react to visual (what you see), auditory (what you hear), and tactile (what you feel) stimuli.

**Question:**

**Which type of stimulus (visual, auditory, or tactile) will allow for the fastest reaction times?**

**Procedure:**

1. On your Data Sheet, write your hypothesis for this experiment.

2. You will work with a partner on this experiment. Decide who will be “Student A” (experimental student) and who will be “Student B” (student scientist).

3. Student B will hold a meter stick vertically between Student A’s thumb and index finger. The stick should be held so that the 10 cm (.1 meter) mark is between the thumb and index finger. (This makes it easier on the student scientist.)

4. Student B will drop the meter stick and the experimental student must catch it between his/her thumb and index finger as quickly as possible. The distance the meter stick traveled before being caught will be measured and recorded on the

Data Table (remember to subtract the 10 cm that were below the finger level at the beginning of the experiment) for visual stimuli.

5. Repeat the procedure for a total of three trials and then determine the average reaction distance for visual stimuli, recording it on the Data Table.

6. Next, the reaction distance for auditory stimuli will be measured. Student A will close his/her eyes and the Student B will hold the meter stick as before. As the student scientist releases the meter stick he/she will say, “Now,” and the experimental student will catch the meter stick. The distance will be measured and recorded on the Data Table. After three trials, the average reaction distance for auditory stimuli will be calculated and recorded on the Data Table.

7. Finally, the reaction distance for tactile (touch) stimuli will be measured. This time the experimental student will close his/her eyes, and while the student scientist holds the meter stick in one hand, he/she places the other hand on the experimental student’s shoulder. When the student scientist drops the meter stick, he/she should simultaneously lightly squeeze the experimental student’s shoulder. After three trials, the average reaction distance for tactile stimuli will be calculated and recorded on the Data Table.

8. Now the reaction times will be calculated in seconds. The formula is:

**Time in seconds = .45√ distance in meters**

9. Student A will now be the student scientist and Student B will be the experimental student. Go back to step 2 and repeat the experiment with your roles reversed.

10. Go to the following website:

www.getyourwebsitehere.com/jswb/rttest01.html

You will be instructed to test your reaction time using a simulation of a stop light.

Complete the five trials and record your average time (seconds) on the Data Sheet.

**Reaction Time Lab – Data Sheet**

Names \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_

**Question:**

**Which type of stimulus (visual, auditory, or tactile) will allow for the fastest reaction times?**

**Hypothesis:**

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**Data Table: Student A**

**Data Table: Student B**

**Stoplight Simulation:**

Student A’s average visual reaction time (seconds) =\_\_\_\_\_\_\_

Student B’s average visual reaction time (seconds) =\_\_\_\_\_\_\_

**Analysis Questions:**

1. Specifically, which parts of the nervous system were used when the student responded to the dropped meter stick in the tests for visual stimuli?

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2. If you continued to repeat the test for visual stimuli, do you think you would get faster? Why or why not?

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3. What factors would ultimately limit your speed of response?

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4. How does a reaction differ from a reflex?

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5. Write a conclusion to explain what you learned from this experiment.

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6. How does your average reaction time calculated by the website compare to your

average visual reaction time calculated using the meter stick? Which do you think is more accurate, and why?

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