GENERAL SCIENCE LABORATORY 1110L
Experiment 1
Human Response Time

Objective: To determine the human response time of a visual motor system by using a body in free falling motion. (Meter stick) We will also study the phenomena using statistics to analyze the errors.

Apparatus: Meter stick, masking tape.

Theory: The time between stimulus and response is called the response time. In this experiment one measures his or her response time by catching a falling meter stick and measuring the distance the meter stick has traveled

The stimulus in this lab is your visual system (your eye) seeing the meter stick moving and you your response is moving your fingers to catch the falling meter stick. (Your motor system is your muscles)

The meter stick will be a free falling body once it is released. This means that the only force acting on it will be gravity. The time of its fall (The response time) is related to the distance traveled by the following equation:

$$d = \frac{1}{2} g t^2 \qquad \textbf{(1)}$$

Where d is the distance fallen in meters, t is the time in seconds, and g is the acceleration of gravity in m/s^2

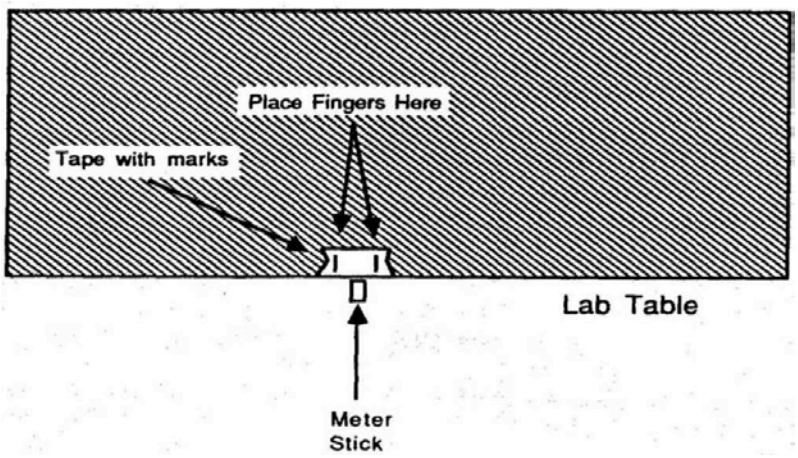
We can re-arrange equation (1) to solve for t, which is our response time.

$$t = \sqrt{\frac{2d}{g}} \qquad \textbf{(2)}$$

Where t is in seconds if d is measured in meters and g = $9.80 m/s^2$

Procedure: Record your own response time only. **You will however, have to help you partner carry out their part on the experiment. (See format of data table at the end of the lab handout).**
All data is to be recorded directly in your lab notebook. No scratch paper is to be used.
Use only the front side of the pages in your lab notebook for your lab report. Nothing on the back side of the pages in the notebook will be graded.

1. **Place two strips of masking tape at the edge of the lab table so the inside edges are 2.5 cm apart. (See Below)**



2. The inside edges of the tape will help you place your fingers at the same position for each trial, thus reducing the size of the statistical error.

3. Your partner will hold the meter stick loosely with their thumb and fore finger at the end of the meter stick (The end with the highest numbers should be towards the ceiling) and let it hang down, making sure that the 50.0 cm mark is even with the top of the lab table.

4. Place the bottom of your thumb and fore finger on top of the table so that they are even with the inside edges of the tape, but not touching the meter stick. Your thumb and fore finger should be pointing from the outside edge of the lab table towards the middle of the lab table and not from the middle towards the edge,

5. Without any warning your partner will release the meter stick and you will try to catch it as soon as you notice any movement of the meter stick. Make sure the person dropping the meter stick waits a different amount of time before releasing the meters stick for each trial so the person catching the meter stick will NOT anticipate when it will be dropped for each trial.

6. Record the position where the meter stick is caught to the nearest mm (0.1 cm, 0.001m) in your data table. (The bottom edge of your thumb or forefinger that is facing the scale will be used to record the position where the meter stick was caught.

Remember the bottom edge of your thumb or fore finger is the reference point for your measurements.

7. Repeat steps 4-6 twenty times.

8. Switch places with your partner and help him or her measure his or her response time by repeating steps 4 -6.

Data Analysis:

1. **Calculate d_i the distance the meter sick falls for each trial and record the result in the correct column of your data table.**

$$di = Xi - Xo \qquad \textbf{(3)}$$

2. **Calculate $d_{average}$, the average distance the meter stick falls.**

$$d_{average} = \sum_{1}^{20} \left(\frac{di}{20} \right) \qquad \textbf{(4)}$$

3. **Calculate the average response time using the following form of equation (2).**

$$avg\ responce\ time\ t = \sqrt{\left(2\,\frac{d_{\,average}}{g}\right)} \quad \textbf{(2A)}$$

4 Compare you response time to the class average which is 0.162 seconds using the following equation:

$$\%\ difference = \left(\frac{0.162\,(s) - t_{\exp}}{0.162\,(s)}\right) X\ 100\% \quad \textbf{(5)}$$

Lab Report Format:

Your lab report for this experiment should contain the following sections:

1. Title of experiment in center of the first page. Date to the left of the title. Experimenters name with partners name(s) under experimenters name to the right of the title.

2. Objective

3. Apparatus

4. Original Data: Neatly filled out data page.

5. Sample calculations: For this lab an example (ONE) needs to be shown for each of the following calculations: d_i, $d_{average}$, average response time t, and the % difference.

6. Results: State your results (in the form of a **very short** sentence). Make sure the numerical results are properly rounded and have the correct number of significant digits. Compare your result to the class average by stating the percent difference. Is your response time faster or slower than the class average? Say so in a short sentence.

7. Conclusions: Address the answers to the three discussion questions below.

Questions:

1. What is the most important type and source of error in this experiment?

2. How did we reduce the size of this error in this experiment? See page one of the hand out on Data Analysis.

3. Looking at the 20 values of d_i do you see any trend in these distances? Do they get smaller larger or are the all over the place about the average value for d?

PROPER MATERIALS, ETC. FOR YOUR REPORTS

1. ALL DATA IS TO BE RECORDED DIRECTLY IN YOUR LAB NOTEBOOK**. NO SCRATCH PAPER IS TO BE USED.**

2. YOU ARE TO USE BLUE OR BLACK INK ONLY FOR RECORDING DATA AND DOING YOUR REPORTS IN YOUR NOTEBOOK.

3. REMEBER, ONLY THE FRONT OF THE PAGES IN YOUR LAB NOTEBOOK ARE TO BE USED FOR DOING YOUR LAB REPORT. I WILL NOT LOOK AT ANY INFORMATIION ON THE BACKSIDE OF THE NOTEBOOK PAGES.

4. DO NOT TEAR OUT ANY PAGES FROM YOUR NOTBOOK.

4. **DO NOT ERASE OR USE WHITEOUT FOR MISTAKES!!!!**
   All observations taken under the same experimental condition are equally valid and should be retained for analysis. Do not erase readings. If you must change a reading, draw a single line through it and then record the new measurement next to the old one.

Format for Suggested Data Table in your lab notebook.

Xo = 50.0 (cm)

Trial Number	Position that stick falls to Xi (cm)	Distance sticks falls di=Xi-Xo (cm)
1		
2		
3		
4		
5		
+		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

$\sum$di= _____cm

$d_{average}$ =_____cm =_____m

Response Time =_____ (s)