LAB: How fast can you react to a stimulus?

Introduction

A dark blur against the ice marks the path of the hockey puck as it sails toward the goal at 80 km per hour. In a fraction of a second, the goalkeeper must plot the puck's course and move to block it. The time required to sense a stimulus, analyze its meaning, and respond appropriately is called the reaction time. What factors affect reaction time? Do you respond to all stimuli with equal speed? Can your reaction time be improved? How does the use of alcohol, tobacco, or other drugs affect your ability to react?

Every person must be able to respond to stimuli in the environment. In many cases, the speed at which you react is not important. In other instances, reaction time makes the difference between success or failure and even life or death.

Prelab Questions –Write out all your answers on a Investigation Report.

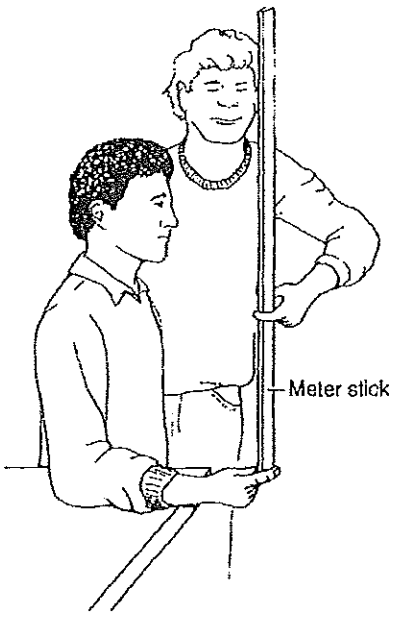
1. **Describe at least 3 experiences that have occurred during the last week when your reaction time has been important.**
2. **A motorist swerves the car to avoid a dog that has run into the road. Which parts of the nervous system are involved in the reaction and what is the function of each part?**
3. **How might tobacco, alcohol, and other drugs affect reaction time? Read the procedures for Steps A—G. The procedure described in Steps A—C will be used to obtain a measure of your reaction time.**
4. **Why is it necessary to work with a partner and not perform the experiment by yourself?**

Procedure

Part I: Reaction Time to a Visual Stimulus

You must work with a partner to complete the following procedures. One of you will act as the recorder while testing your partner's reaction time. After completing Steps A through C, exchange roles and repeat the procedure.

A. Place your forearm on the surface of the table with your hand extended over the edge. Have your partner position the zero end of the meter stick between your thumb and forefinger, as shown in the picture to the right.



B. Determine your reaction time by catching the meter stick between your fingers after your partner releases it without warning.

5. **In your data table, record the distance that the meter stick falls. Use the distance versus time table, to convert the distance of fall to reaction time. Use the distance on the table that is closest to your distance of fall value.**

C. Repeat the procedure for a total of 20 trials.

6. **Record your data after each trial in your data chart.**

7. **Calculate the average distance of fall. Use this number, referring again to the distance versus time table, to determine the average reaction time. Record these figures in your data table.**

8. **Converting the average distance of fall to the average reaction time gives a better measure than averaging the reaction times for the 20 trials. Why is this true?**

Distance vs Time	
Distance of Fall (cm)	Time of Fall (sec)
0.2	.02
0.8	.04
1.1	.05
1.7	.06
2.4	.07
3.1	.08
3.9	.09
4.9	.10
7.0	.12
9.6	.14
12.5	.16
15.8	.18
19.5	.20
23.6	.22
28.9	.24
33.0	.26
38.2	.28
43.9	.30
48.8	.32
56.4	.34
63.5	.36
70.8	.38
78.4	.40
86.4	.42
94.8	.44
103.7	.46
112.9	.48
122.5	.50

Reaction Time to an Auditory Stimulus

D. Position the meter stick as described in Step A. Close your eyes. As the meter stick is released, your partner will say, "Go." React to this auditory stimulus as quickly as possible by closing your fingers on the meter stick.

9. **Record your data in your data table as in Step B.**

10. **Repeat the process for a total of 20 trials, recording your results for each trial. Then find your average reaction time to an auditory stimulus as in Question 7.**

Reaction Time with Distractions

11. **How might reaction times be affected when a person is distracted and less prepared to receive a stimulus?**

E. Two teams should work together to test the effect of distractions on reaction time. While one person is tested, a second will act as the recorder, and the 2 others will act as distractors. Follow the procedure in Step D for testing reaction time to an auditory stimulus, except for the following changes. The distractors will select a previously studied chapter from your biology textbook. During the testing procedure, the distractors will ask the person being tested questions from the Review section at the end of the chapter. The person being tested is expected to respond to these questions while waiting for the "Go" signal from the recorder.

12. **Record your results for 20 trials in your data table and determine your average reaction time, as in Question 7.**

F. Exchange roles and repeat the procedure to test all members of your team.

13. **Record the data after each trial.**

14. **You and your partner should each use separate sheets of graph paper to prepare graphs showing your own data for the 3 types of stimulus. Label the horizontal axis of the graph "Trial Number and the vertical axis "Reaction Time." Make sure that you and your partner use the same scales on your graphs so that you can compare data. Plot your data for each type of stimulus separately. Use different colored lines or different symbols in your graph to distinguish between the types of stimuli. (*Refer to the Model Bar Graph for help*)**

15. **In what way does this graph tell you more about your reaction time than the number calculated as "Average Reaction Time"?**

16. **Does your reaction time remain constant over 20 trials or is there any variation? Is there any evidence at a trend toward faster or slower reaction times over the 20 trials? What might account far such trends?**

17. **How does your reaction time to an auditory stimulus compare to that for a visual stimulus? What might account for this difference?**

18. **How does your reaction time compare to that of your partner? What might account for this difference?**

Part II: Class Data

G. Pool the data for the entire class. Your teacher will fill in the figures on an enlarged copy of the table on the chalkboard.

H. Work as a class with your teacher to make a bar graph showing the variation among the average reaction time of all class members to the 3 forms of stimuli.

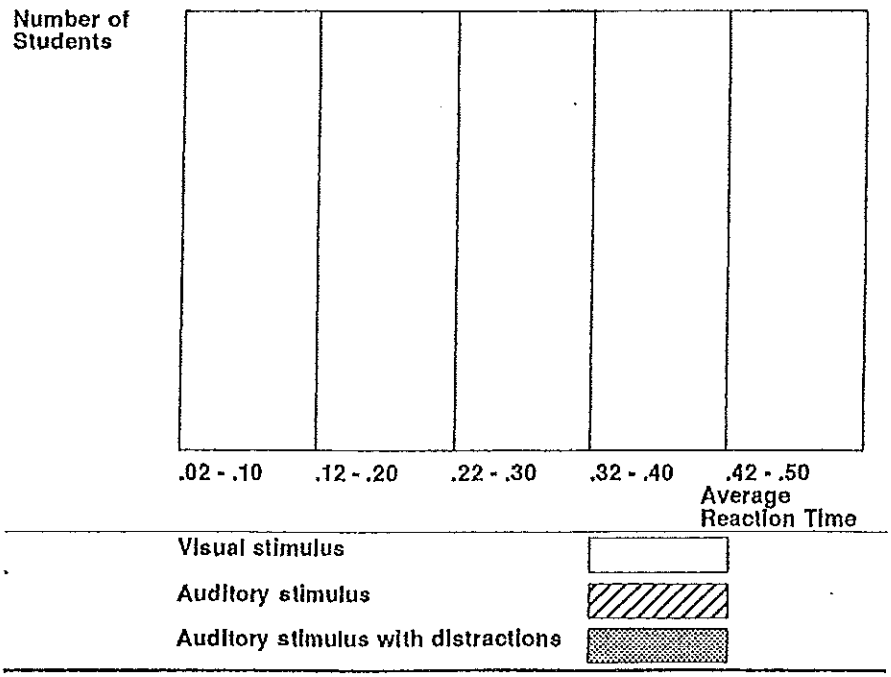
19. **How does your reaction time compare to that of the class? What could account for any differences?**

20. **Why might psychoactive drugs affect a person's reaction time? How does the data collected in Step E indirectly relate to the effect of psychoactive drugs on reaction time?**

21. **Briefly speculate on how each type of psychoactive drugs might affect reaction time.**

22. **What types of activities would be adversely affected because of the influence of psychoactive drugs on reaction time?**

Model Bar Graph



N3

Investigation Report

1. _____

_____

2. _____

_____

_____

3. _____

4. _____

5.–7. Enter your answers on the data table on the next page.

8. _____

9.–10. Enter your answers on the data table on the next page.

11. _____

12.–13. Enter your answers on the data table on the next page.

14. Make a graph on a separate sheet of paper.

15. _____

16. _____

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17. _____

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18. _____

_____

19. _____

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20. _____

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N4

21. _____

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22. _____

Student Data - Reaction Times

Visual Stimulus			Auditory Stimulus			With Distractions		
Trial	Distance of Fall (cm)	Reaction Time (sec)	Trial	Distance of Fall (cm)	Reaction Time (sec)	Trial	Distance of Fall (cm)	Reaction Time (sec)
1			1			1		
2			2			2		
3			3			3		
4			4			4		
5			5			5		
6			6			6		
7			7			7		
8			8			8		
9			9			9		
10			10			10		
11			11			11		
12			12			12		
13			13			13		
14			14			14		
15			15			15		
16			16			16		
17			17			17		
18			18			18		
19			19			19		
20			20			20		
Avg.			Avg.			Avg.		

N5