Life Responds: Reaction Time Experiment

Background

The eagle and the rabbit are dependent for their survival on their nervous system response rate. Their eye, ear and skin sensors send the message along sensory neurons to the central nervous system. The message is transferred by interneurons to fire back a response along motor neurons demanding that the muscles move quickly.

How fast do you respond? Which sense do you think the rabbit should rely on: sight, hearing, or touch? Which one sends the message to the brain faster?

In this activity you will hypothesize which sense produces the quickest response and then test your hypothesis.

Pre-Experiment Preparation

1. Draw labeled diagrammatic representations of the following which include the major nerves and the parts of the brain involved:

   Pathway from eye to brain to finger muscles
   Pathway from ear to brain to finger muscles (include bones and hairs)
   Pathway from hand to brain to finger muscles

2. Define mechanical, electric, photon, and kinetic energy.

3. Add to your diagrams labels for where the energy is mechanical, photons, or electrical.

Materials Needed

Copies of the Distance vs. Reaction Time Conversion Graph and Recording Sheet
Meter Stick
Calculator
Dark knitted cap, sleeping mask, or blindfold – aluminum foil can also be used
The Human Body Book, Internet or biology textbook

Directions

1. Do this experiment in pairs.

2. Make a hypothesis based on the pre-experiment diagrams that you made.

   Is your reaction time going to be faster using your eyes, ears, or skin sensors?

3. Partner A will hold the meter stick: hold the meter stick with your thumb and index finger just above the 100 centimeter mark on the meter stick

4. The Partner B will place thumb and forefinger just at the 0 mark on the meter stick and about 1 centimeter out from each flat side.

5. When Partner A drops the meter stick, the second person attempts to catch it by closing the thumb and forefinger.

6. The first trials will be to test vision. Do 5-10 trials and record them on the Recording Sheet.

7. Add the trial data and divide by the number of trials to get your average score.

8. The partners should change roles and repeat to test the reaction time of the other partner.

9. Repeat this using a blindfold for hearing. The first person will say DROP when they let go of the meter stick. Record the results and determine the average score.

10. Repeat this using a blindfold for the skin response. The first person will touch the non-catching hand of the second person as they drop the meter stick. Record and average.

11. The reaction time and distance traveled are not a one-to-one relationship – they are not linear. The graph provided has the correct relationship and all you have to do is find the score along the x-axis (distance) on the bottom, follow up to the curve and left over to the y-axis (time). Record these times in the Recording sheet.

OR: Do this more accurately using a formula instead of the graph: $d = 0.5\ a\ t^2$
With a = acceleration due to gravity constant = 9.8 meters per seconds squared

12. What could be contributing to experimental error?

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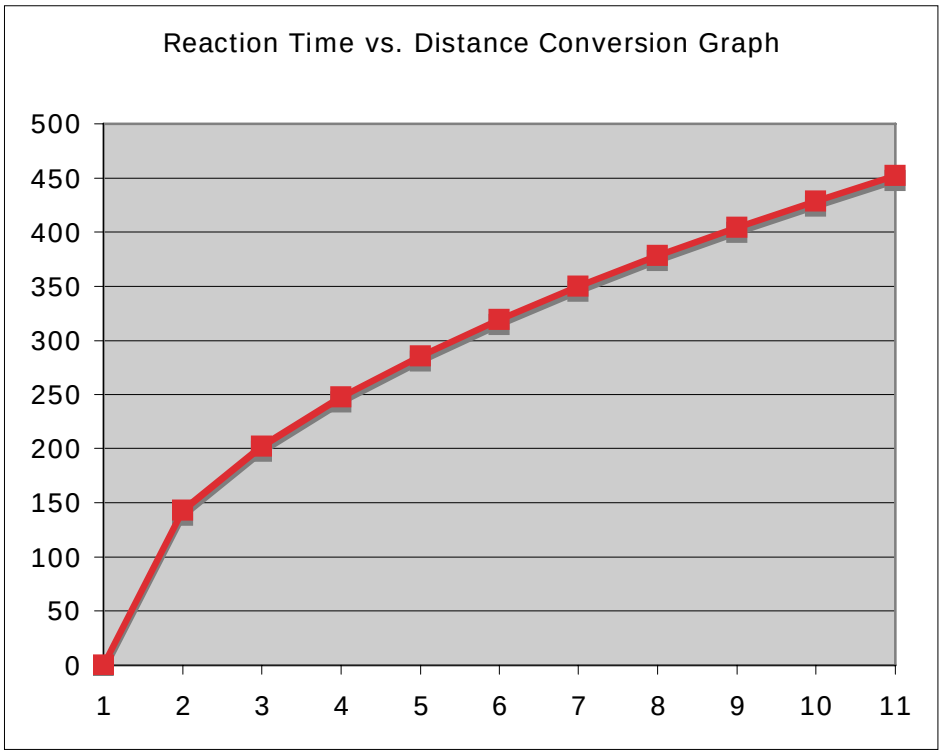
Recording Sheet

Trial #	Sight		Hearing		Touch	
	Partner A	Partner B	Partner A	Partner B	Partner A	Partner B
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Total d						
Average d/10 =						
Time t =						

Time in Milliseconds



Distance in Centimeters

Reflection

A. Did the data support your hypothesis?
Did the data disprove your hypothesis?
Was the data inconclusive?

B. Referring to the diagrams you made of the pathways, explain your results.

C. What other responses besides catching the meter stick did you notice?

Were you excited?

Was your heart beating faster?

D. How could you change the experiment to reduce the experimental error and record other responses?

E. Were there differences in the response time between men and women?