

Chapter 35 Nervous System**Observing Nervous Responses****Introduction**

The nervous system runs to all parts of the body. Like a computer network, the nervous system carries impulses between the brain, the sensory organs, the muscles, and the glands.

A reflex action is a little different. It begins with a stimulated nerve, but does not rely on the brain to produce the response. Your body performs many types of reflex actions. Sneezing is a reflex action in response to irritation of your nose. When you touch a hot object, you immediately pull your hand away. You might be aware of a reflex action occurring, but you are unable to stop or control it.

How do these reflex actions occur? When your hand touches a hot object, for example, heat receptors in the skin send an impulse to the muscles of the arm to contract. The impulse travels along the sensory neurons, to the spinal cord, across a synapse, and stimulates a motor neuron. The impulse leaves the spinal cord, passes through a nerve, and back to the arm muscles, causing them to contract and pull your hand away. This pathway is called a reflex arc. Because a reflex arc involves only the spinal cord and not the brain, a reflex action occurs in a matter of a fraction of a second. You are not able to control a reflex—it happens automatically.

In a nonreflex response, an impulse must travel to the brain. The brain interprets the stimulus and produces a response. This process takes longer than the time required for a reflex arc. A person's reaction time can be measured by how quickly he or she can perceive a stimulus and then react to it. Driving a car and playing tennis are examples of activities in which reaction time is very important.

In this investigation, you will observe reflex actions and measure your reaction time.

Problem

Can you control reflex actions? How can you measure reaction time?

Pre-Lab Discussion

Read the entire investigation. Then, work with a partner to answer the following questions.

1. What will you be comparing in this investigation?

2. Predict what will happen to your knee when it is tapped.

4. Where should you point the light in step 8 of the procedure? Why should you avoid shining it in the eyes?

5. What do you think will happen to the pupils when one eye is covered and the other is exposed to a bright light?

5. If you concentrate, do you think you will be able to prevent a reflex from occurring? Why do you think that?


Safety

This investigation involves physical activity. Be careful not to injure yourself or others during this lab. Note all safety alert symbols next to the step in the Procedure and review the meaning of each symbol by referring to Safety Symbols on page 8.

Materials (per group)

pen light
eye patch or eye cover
meterstick

Procedure

1. Sit on a chair or stool
2. Cross your left leg over your right.
3.  Have a member of your group tap your knee firmly, slightly below the knee cap, with the side of his or her hand, as shown in Figure 1. **CAUTION:** Be sure the knee is not hit hard. A firm, quick tap is sufficient. Avoid this experiment if a physical problem in the knee exists. Record your observations.

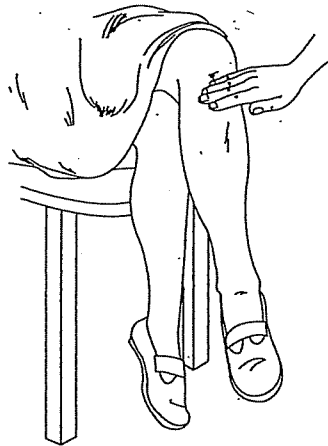


Figure 1

4. Repeat steps 1 to 3. This time, try to stop your knee from jerking. Record your observations.
5. Reverse roles and repeat steps 1 to 4.
- ~~6.~~ Sit on a chair or stool.
- ~~7.~~ Close one eye and cover it with the eye patch. Keep the other eye open.
- ~~8.~~ Have a group member shine the pen light close to the open eye for about 10 seconds. **CAUTION: Do not shine light directly into the eye.**
- ~~9.~~ Quickly remove the patch from the other eye.
- ~~10.~~ Have a group member observe what happens to the pupils of both the eye exposed to light and the eye that remained in darkness. Record the observations in Data Table 1:

~~Data Table 1~~

Stimulus	Observations
Light	X
Dark	X

- ~~11.~~ Reversing your roles, repeat steps 6 to 10.
12. Rest your elbow on a table and extend your arm over its side as shown in Figure 2.

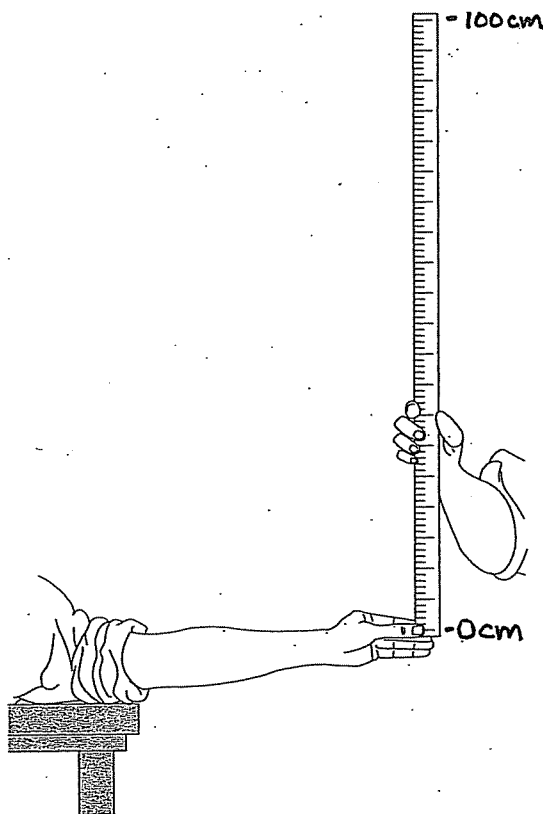


Figure 2

13. Have a group member hold a meterstick in the air, with the 0-cm line between the thumb and index finger of your extended hand.
14. Have the group member drop the meterstick without advance notice. Try to catch it between your thumb and index finger as quickly as possible.
15. In Data Table 2, record in centimeters the position of your thumb and index finger. This is the distance the meterstick fell before you caught it.
16. Repeat steps 12 to 14 three times.

Data Table 2

Trial	Distance (cm)
1	
2	
3	
4	

Analysis and Conclusions

1. **Observing** What happened to your knee when it was tapped?

2. **Observing** What happened when you tried to stop your knee from jerking?

X **Observing** What happened when one eye was exposed to light and the other was covered?

4. **Comparing and Contrasting** Compare catching the meterstick with the knee jerk response.

5. **Analyzing Data** Which of the responses tested in this lab were you able to control?

6. **Drawing Conclusions** Which of the responses tested in this lab do you think are reflex responses?

7. **Inferring** What are some other examples of reflexes?

8. **Drawing Conclusions** Suggest some possible ways that reflex arcs could be advantageous to a species.

Going Further

Do the senses of sight, smell, hearing, taste, and touch also affect our reflex actions? Why does your mouth water when you are hungry and see a picture of a delicious meal? Ivan Pavlov, a Russian biologist, carried out many experiments on conditioned reflexes. What are conditioned reflexes? How are stimulus and response related? Find out more about conditioned reflexes. Share your findings with the class.

* Brain Pop
Video