

Unit 11 Reflex Arcs Laboratory

You are required to submit a formal lab write-up for this lab.

Reflexes allow animals to respond quickly to environmental threats and to coordinate complex muscular contraction patterns that are important for movement. In this lab you will investigate your reflexes or those of a volunteer. You will submit your report with your section assignment.

Resource Details

To perform this experiment, you will need a volunteer to assist you for about 30 minutes. They need to be willing to bare their feet and leg. You will need a stool or bench that is high enough to allow the volunteer to sit with his or her feet dangling, and you will need a reflex hammer (a large wooden spoon will work).

You should be familiar with the process of preparing a lab write-up, here are the key elements that must be included in your report:

- Hypothesis: stated as an If...then statement
- Procedure: explanation of what you did, so that others can repeat the experiment
- Observations: data collected during the experiment
- Results: discussion of observations and/or answers to questions posed in the lab assignment
- Conclusion: statement of support or refute of hypothesis

Hypothesis:

Begin by using these words to write a hypothesis: "If the correct stimulus is applied to reflex sensory neurons then..."

Procedure:

For this lab, choose three of the following reflexes and perform each as described. Observe whether or not the reflex occurs and summarize your results in a simple table, indicating the results with a + or -. You should perform and observe each test three or four times to establish a pattern of response.

Reflex examples:

Ankle jerk reflex: Ask your volunteer to sit so his or her feet are suspended off the floor, with shoes and socks removed. Have your volunteer bend one foot upward as far as possible. Gently but sharply strike the back of the Achilles tendon on the back of the lower leg with a blunt object, such as a large wooden spoon. The reflex response is for the foot to move downward. This procedure is used to test for injury to parts of the sciatic nerve that extends down the back of the leg.

Patellar reflex: This is a classic example of a reflex response. While the subject is sitting with legs dangling, sharply but gently tap the leg just below the knee cap. The lower leg will jerk forward from the knee. This reflex involves only three neurons. Try to decide where the effector muscle is located. The quadriceps muscle on top of the upper leg.

Accommodation reflex: Ask the subject to focus on a near object, such as the printing in a book. Then lower the book and ask the subject to focus on a distant object, perhaps through a

window. Sit in front of the subject and to one side. Observe the size of the subject's pupils as they change focus. You should observe a constricting of the pupils as they focus on near objects and enlargement as they shift to distant objects. This allows the eye to eliminate confusion of stray light on the sides of the field of view while viewing near objects. Make sure there is enough light in the room for the subject to read and for you to observe the pupils. In dim light, especially with dark-eyed subjects, pupil size is difficult to determine. Allow enough time, as least 20 seconds, for the pupil size to shift.

Withdrawal reflex: This is a reflex to pain. It allows a person to withdraw the affected part so the pain stops. You can initiate slight pain in one of two ways, either by gently poking the person with a sharp object, like a pin, or by gently pinching the skin. Don't tell the person where you will stimulate them, but tell them you will inflict a SMALL amount of pain. The reflex is best observed on the extremities – an arm or leg. If your volunteer is unwilling to do this, choose another reflex.

Gag reflex: It is best to do this experiment on yourself. In this reflex, the back of the throat is stimulated with a foreign object. Use your toothbrush to gently rub the throat as far back as you can reach. Don't over-stimulate it or you will get a nasty response. This response is designed to prevent foreign or large objects from being swallowed.

Observations and Results:

In the results section of your lab, describe your observations that did not match what you expected. Speculate on why the observations were unusual. Answer the following question in full sentences and include them in your write-up as well.

1. Choose one reflex and describe how it helps avoid injury or produces smooth muscular coordination. Answers vary but should include some detail of avoidance or usefulness in specific motions.
2. Describe the pathway of any one of the reflexes observed. Indicate which reflex you are describing. Answer should include the three neurons and specific information about the location of sensory receptor and effectors.
3. Explain how an observation of a reflexive action, or lack of action, can be used to judge the extent of injury. Since the pathway of the neurons for specific reflex arcs pass through known anatomical structures, damage to those structures' neurons can be inferred from the absence of a particular reflex. Conversely, specific responses may indicate a particular pathology.
4. Can the brain overpower the reflex? If you are not sure, try an experiment to ascertain your answers. For example, "Yes, it is possible to defeat the withdrawal reflex by refusing to jerk the extremity."
5. Explain why it is useful for the brain to overpower a reflex. Overcoming a reflex may be more important than responding in a particular way. For example, suppressing the urge to blink in situations where acute vision is critical can be useful.

Conclusion:

Write a brief conclusion consisting of one or two sentences, being sure to refer to the hypothesis.

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ASSESSMENT

Name: _____

Date: _____

Hypothesis	
Marks	Description
2	Written as an "if/then" statement, testable
1	Written as an "if/then" statement, not testable
0	Not written as an "if/then" statement, not testable

Procedure	
Marks	Description
6	Evidence of completion; table complete
3	Lacks evidence of completion; table incomplete
0	No evidence of completion; no data reported

Results	
Marks	Description
12	Discussion of unusual observations; questions answered in full, accurately
10	Questions accurately answered in full
5	Questions lacking answers or are inaccurate
0	Questions not attempted

Conclusion	
Marks	Description
2	Reflects observations; refers to hypothesis
1	Reflects observations
0	Improperly done – on reference to hypothesis, does not reflect observations

TOTAL MARKS	
Marks	Section
	Hypothesis
	Procedure
	Results
	Conclusion
	TOTAL MARKS