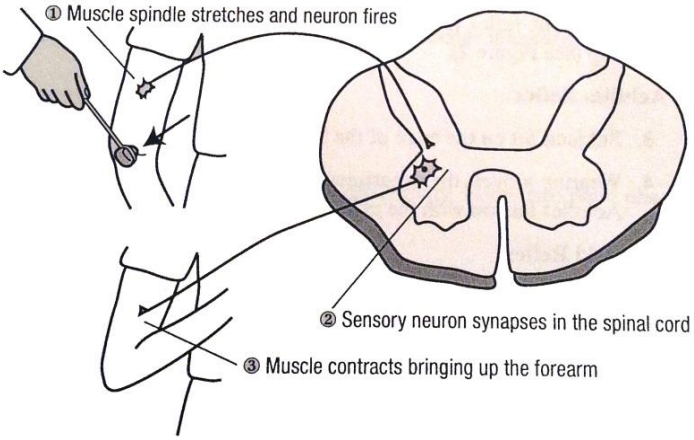
Human Reflex Study

A reflex is a response to a stimulus that works to return the body to homeostasis. Reflexes can occur both consciously and subconsciously. An example of a conscious reflex would be quickly removing your hand from scalding water. A subconscious reflex would be the pancreas increasing or decreasing enzyme secretion in response to changes in the concentration of the enzyme.

In order to understand reflexes, it is crucial to examine the structure and function of the nervous system. The nervous system has three continuous functions – sensory neural input, integration, and motor output. Sensory neurons in skin gather external information from the environment and internal information from organs and muscles. The sensory receptors convey the information to interneurons in the central nervous system (CNS). The CNS then interprets the signal. Motor output nerves conduct the signal from the CNS to the muscle or gland cells to execute the CNS response to the original stimuli.



The simplest reflexes to study are the *monosynaptic stretch reflexes*. Monosynaptic stretch reflexes involve only two neurons – the sensory neuron from a muscle spindle and the somatic neuron to the muscle. The knee jerk patellar reflex, biceps reflex, and triceps reflex are classic examples of monosynaptic stretch reflexes.

To perform a test of the knee jerk reflex, the subject sits on the edge of a table so that his or her lower legs hang freely. The patellar tendon below the knee cap is lightly struck with a reflex hammer causing the quadriceps muscle to stretch. As this muscle stretches, sensory fibers send a message to the CNS. In response, the CNS sends a signal to the motor neurons that control the contraction of the quadriceps muscle. This signal causes the quadriceps to contract and we observe the lower leg kicking outward.

Flexion reflexes are pathways that trigger us to avoid painful stimuli such as a hot stove or sharp object. When a bare foot steps on broken glass, the pain receptors in the foot send the sensory message to the spinal cord portion of the CNS. The signal diverges into multiple interneurons. Some interneurons activate motor neurons which trigger withdrawal from the painful stimulus. Other interneurons send the signal to the brain for additional processing. For safety reasons, flexion reflexes will not be tested in this activity.

Purpose

To observe the innate reflexes our body performs to maintain homeostasis

Pre-Lab

This must be completed in your lab notebook before you will be allowed to begin lab

1. Describe the three continuous functions for the nervous system.
2. Briefly describe the steps that lead to the kicking action of the patellar reflex.
3. In normal, non-experimental conditions, describe how the patellar reflex would be useful.
4. Some diseases affect the reflex pathways. Why might this be dangerous?

Materials

- cotton ball
- gloves
- reflex hammer
- clock w/ second hand
- transparency sheet

Safety

- Exercise caution when performing these activities
- Do not strike your partner with excessive force when using the reflex hammer
  - If a reaction is not observed, try again in a slightly different location but do not hit harder
- Do not throw any other objects besides cotton balls at the transparency sheets
- Wash hands before leaving the lab

Procedure

Reflex hammers may need to be shared among the groups
Observe each reaction and record the responses in the data table

Patellar Reflex

1. *Subject*: Sit on the edge of the lab table with your legs hanging freely over the edge
2. Using the reflex hammer, the experimenter strikes the tendon of the subject just below the knee cap as shown in figure 2 at the right

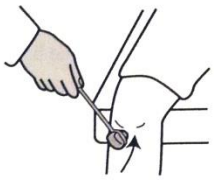


Figure 2.

Achilles Reflex

3. *Subject*: Sit on the edge of the lab table and remove your left shoe and sock
4. Wearing gloves, the experimenter holds the bottom of the subject's left foot while striking the Achilles tendon with the reflex hammer as shown in figure 3

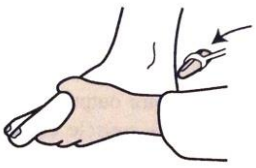


Figure 3.

Babinski Reflex

5. *Subject*: Sit on the lab table and remove your left shoe and sock
6. Wearing gloves, the experimenter holds the subject's ankle with their left hand
7. Experimenter will stroke the heel towards the ball of the partner's foot as shown in figure 4

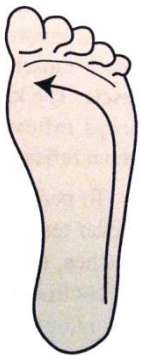


Figure 4.

Pupillary Reflex

8. *Subject*: Close one eye for one minute
9. After one minute has passed, the experimenter should look at both of the subject's eyes *(one open, the other still closed)*
10. Experimenter should instruct the subject to open the closed eye

Blink Reflex

11. *Subject*: Hold a transparency sheet in front of their face
12. Experimenter throws a cotton ball towards the subject's eyes
    Do not throw any objects other than cotton balls at the transparency sheet

Observations

Data Table: Reflex Study	
Reflex	**Observed Response**
Patellar	
Achilles	
Babinski	
Pupillary	
Blink	

Analysis and Conclusions

1. Identify the type of reflexes studied in this lab. Briefly explain how these reflexes function.

2. In this laboratory activity external and observable reflexes were tested. Identify two reflexes that occur internally and explain how they help the body maintain homeostasis.

3. There are many more observable reflexes in the body than were tested in this laboratory activity. Name two other *observable* reflexes.

4. Provide a real-life example of a time where the blink reflex might occur but is not necessary.

5. Based on the pupillary reflex observed in this lab, describe the reason that ophthalmologists use a chemical to dilate patient's eye before examination.

6. What do you predict would happen if the patellar reflex test was performed while standing? Explain.

7. Explain why reflex tests are useful to doctors in diagnosing disorders or injury. Provide at least one example using specific reflexes discussed in class or demonstrated in this lab.