

Sensory Perception

Objectives:

1. Know examples of reflex arcs and the main structural components.
2. Understand the structure of the eye from a model and/or diagram and the function of the different components.
3. Understand the structure of the ear from a model and/or diagram and the function of the different components.
4. Be able to explain the different demonstrations of reflex arcs, vision, and balance.

Introduction:

Humans and other animals interact with the environment in many different ways. Stimuli are received by **receptors** (sense organs). These in turn initiate transmission of messages via **nerves** to the **central nervous system**. There the messages are coordinated and integrated and instructions are sent via nerves to **effectors** (muscles which function by contracting and glands which function by secreting hormones). The integration and coordination of these impulses by the brain and spinal cord is sensory perception which is the focus of this exercise.

Simple Reflex Arcs in Humans

A simple reflex consists of the effects of a stimulus on a receptor which causes transmission of a message through parts of the nervous system and which in turn leads to an automatic response by an effector. For this and some of the subsequent activities each student should work with a partner.

1. The patellar (knee jerk) reflex: Sit down on the table to, relax, and close your eyes. Have your partner tap the area between the 2 bumps of your knee with the edge of his hand. Describe what happens and the different components of a reflex arc necessary for this action.
2. The blink reflex: Hold a clear, plastic sheet in front of your face and have your partner throw a crumpled up paper towel towards your eyes. Keep your eyes opened and focused on the paper wad during the demonstration. Describe what happens. Can you override this reflex? What is the purpose of this and other reflexes?

Structure and Function of the Human Eye In a model or diagram of the human eye identify and know the function of the structures assigned by your instructor.

Human Vision Demonstrations

1. Blind Spot- In each of your eyes you have a “blind spot” where no receptors for vision are located. To demonstrate this, hold this page about 20 inches from your face with the cross in the diagram below directly in front of your right eye. When you close your left eye and cover it with your left hand you should be able to see both the cross and the circle. Now, keeping your left eye closed slowly bring the page closer to your face while looking directly at the cross. **Never take your eye from the cross!** At a certain distance the circle will disappear from your field of vision because its image falls upon the blind spot.



Describe exactly where the blind spot is in your eyes. Why don't we normally see two blind spots in our field of vision? Check out the other blind spot demonstrations to help you answer this question.

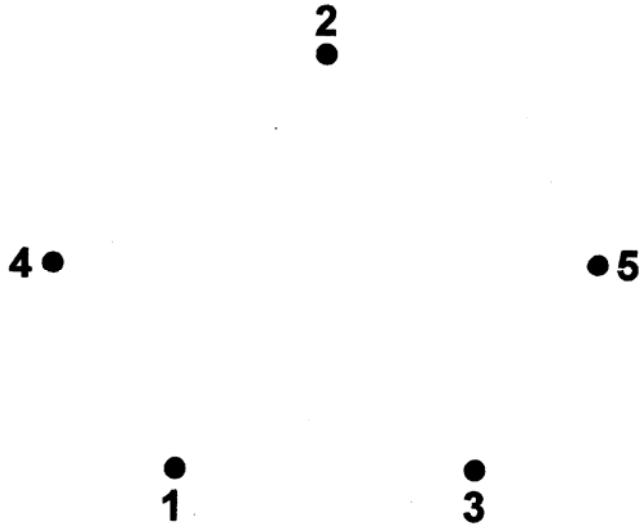
2. Depth Perception- Being able to perceive how far away an object is can be very important to our survival. What factors are important in visual depth perception? To help answer this question we will perform a simple experiment. You will need a test tube and pen or pencil. Have your partner face you while holding the test tube within your reach. Attempt to quickly place the pen or pencil in the test tube with both eyes open. Have your partner move the test tube to a different position between each try. How successful were you? Now place your hand over one eye and repeat

the same procedure. Were the results the same compared to both eyes open? With both eyes open you have what is called binocular vision which is important to judging distance. Explain this phenomenon in terms of the visual field for each eye.

3.Hole in the Hand- In addition to giving you depth perception, binocular vision also widens your visual field. What happens to this information in the brain? The following demonstration will illustrate one aspect of this question. Hold a paper tube to one eye and place your hand, palm open, next to the tube so you block the vision in the other eye. Your hand should be a few inches from your eye. Now, with both eyes open, look through the tube and at your open hand but focus your attention on your open hand. What do you see? Is what you are seeing real? Explain this phenomenon in terms of the visual field for each eye and where visual perception actually occurs.

4.Fixation- The lens in your eye focuses the image on the retina by changing shape to accommodate for objects at different distances. Under what conditions will your eyes focus on an object? While facing your lab partner, hold one of the mirrors provided slightly below your eye level so that you can look directly into your own eyes. While you are focusing on the image of your eyes reflected in the mirror, your lab partner will be carefully observing your eyes by looking across the top of the mirror. Now alternately shift your focus from one eye to the other quickly moving both eyes back and forth several times. Are you able to see your eyes moving? What conditions are necessary to focus on an image?

5.Hand-Eye Coordination- Past experiences or learning are important in vision. How does this help us in everyday tasks? One area where it is very important is in hand-eye coordination. Use the diagram below with numbers and dots. Place the diagram on the table top and hold a mirror in back of it so you can see the numbers and dots. Your partner will hold a card between the diagram and your eyes so you can only see the dots in the mirror. Take a pen or pencil and attempt to connect the dots in numerical order with straight lines as quickly as possible. Remember, look only at the mirror image of the numbers and dots while performing this task. How successful were you at connecting the dots? What does this say about vision and learning?



6. Optical illusions- An optical illusion is defined as a false interpretation by the mind of a visual perception. In simple terms, our mind is fooled into thinking that we see something that is not real. This is possible because what we expect to see based on past experience is important in visual perception. Examine the three examples of optical illusions in lab and for each explain what expectation based on prior experience has contributed to the illusion.

Structure and Function of the Human Ear In a model or diagram of the human ear identify and know the function of the structures assigned by your instructor.

Factors affecting balance- The semi-circular canals are positioned at different angles and filled with fluid. As the fluid moves in the canals, sensory receptors pick up this information and send it to the brain. The brain interprets this sensory input and sends nerve impulses to various skeletal muscles to help you maintain your balance. What else may be important in maintaining balance?

Stand up straight and hold your right foot off the floor with your right hand so that your entire weight is on your left foot. Look straight ahead for about 10 seconds and notice any difficulty you may have maintaining your balance. Repeat this procedure but now tilt your head back and look at the ceiling. Is it more difficult or easier to maintain your balance? Repeat this procedure but this time close your eyes. Did you have more difficulty maintaining your balance? What is your conclusion concerning the importance of vision to balance?