

Reaction Time 1

Overview

This activity is designed as an introduction to the nervous system. It asks students to think about how the body processes sensory inputs and generates responses.

Background

An organism's nervous system is a specialized group of cells that receive information from the organism's internal and external environment, process that information, and generate a response. This allows for sensing, basic motor skills, and internal regulation. In humans, the nervous system is divided into two basic anatomical parts, the central nervous system (CNS), which includes the brain and spinal cord, and the peripheral nervous system (PNS), which is all of the nervous tissue that lies outside of the central nervous system structures. PNS structures include sensory receptors, motor neurons, and the nerves that carry signals between them and the CNS. A *functional* definition of the nervous system divides it into the somatic and autonomic systems, with nerve cells in both the CNS and PNS working together. The somatic system coordinates activities under conscious control, such as the movement of arms and legs. The autonomic system coordinates involuntary activities like breathing and digestion.

Reaction time is a measure of how quickly the nervous system receives a signal and produces a response. The electrical and chemical nature of communication between nerve cells allows for a very quick response. A hand placed on a hot stove can be "told" to move before severe burning damage occurs. Mean response time to a visual stimulus is around 0.02 seconds. Depending on the task, reaction time can be a measure of the duration of mental processing also known as mental chronometry.

Materials

Materials for the whole class

- 1 Reaction Time CD and a way to show a Power Point presentation to the class
- A way to display class average data

Materials for individual students

- Reaction Time Data collection sheet
- Timer
- Science Notebook

Preparation

- Make sure that there is a visual presentation system that will run the CD so the whole class can see it.
- Make copies of the Reaction Time Data collection sheets.

Procedure

- This activity can be the start of the unit on the nervous system or the class can start with the *Here Are the Answers* sheet for the nervous system. Start by asking the students to share what they know about the nervous system:
 1. What are the parts?
 2. What does it do?
 3. How does it do its job?
- Introduce the functions of the timers and let the students play with them a bit. Ask the students to do ten trials with the timers of starting the timer and stopping it as quickly as they can. Have them calculate the average of these ten trials and record this value on their data sheet. This serves as a reaction time baseline.
- Have a discussion with the students about what the nervous and muscle systems have to do in order to press the timer and stop it quickly. What functions of the nervous system are involved?
- Explain to the students that they will participate in some trials of their reaction time. Stress that this is not a contest but rather a test of how they respond as individuals to the different conditions that might affect reaction time. They will compare their responses with the official time and with their earlier trials with the timer.
- The CD has two practice trials so the students can get used to the system. Be sure everybody understands how each trial starts. Be sure that all students have recorded their data before moving on to the next exercise. There are two parts to the reaction time trials, A and B, with 5 exercises each.
- Start the first exercise from Part A on the CD. Ask the students to record their time and to subtract the “real time” from this value and record this difference number. Be sure that all students have recorded data before proceeding to exercise 2. If a student’s watch does not stop or they stop the watch too early have them delete that trial and not use it in their average difference calculations.
- Ask the students to calculate the average difference between their time and the “real time” that is displayed on the slides. Start a discussion about what this difference means. Ask the students to diagram all of the steps that have to happen during a trial. Discuss what could be done to make the times smaller or greater.
- Conduct the Part B trials recording the student data just as in Part A.
- Ask the students to compare the different parts and to comment on the similarities and differences they noticed. Discuss their proposed explanations for any differences that they noted. Compile the class data for the different tests and see if the trends are similar for each class.

Reflection/Discussion

Explain that reaction time tests like these are used in labs to test reaction times under different circumstances—alcohol use, drug use, sleep deprivation, etc. Ask the students to describe situations where reaction time is critical and what factors can influence it.

Assessment

The Reaction Test Sequence Chart below can be used to assess students’ understanding of the stimulus-response system. In the chart, a box represents some

action and the arrows are indicators of what comes next. Ask the students to use the blank chart to record all of the things that the body must do to perform one of the reaction time trials. Ask them to be as detailed as possible. (They may or may not use all the boxes.) Teachers may have to give some examples to help the students get started. For example, students may not realize that seeing something is a multi-step process in which the eyes receive a signal and send it to the brain for recognition and processing.

Reaction Time Data Sheet

Initial Timer Trial

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____

Experiment A

	My Time	Actual Time	Difference
Trial 1	_____	_____	_____
Trial 2	_____	_____	_____
Trial 3	_____	_____	_____
Trial 4	_____	_____	_____
Trial 5	_____	_____	_____
Average	_____	Average Difference	_____

Experiment B

	My Time	Actual Time	Difference
Trial 1	_____	_____	_____
Trial 2	_____	_____	_____
Trial 3	_____	_____	_____
Trial 4	_____	_____	_____
Trial 5	_____	_____	_____
Trial 6	_____	_____	_____
	Average Difference		_____

Reaction Test Sequence Chart

