Reaction Time and Practice

A Carolina Essentials™ Activity

Overview

Use this short, engaging activity to introduce students to reflexes and reactions, the nervous system, or learning theory. Students work in pairs on 2 different sorting tasks and time their successive attempts. Data can be analyzed by an individual student, student pairs, or at the class level, depending on the time available. If the class size is very large, 3 to 4 students can be selected as test subjects to complete the sorting tasks.

Life Science

Grades: 6–12

Essential Question

What factors affect reaction time?

Activity Objectives

1. Identify reaction times for 2 card sorting activities.
2. Determine if practice and complexity of task influence reaction time.

Next Generation Science Standards* (NGSS)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.	**LS1.A: Structure and Function** • Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through postitve feedback) or discourage (negative feedback) what is going on inside the living system.	**Systems and systems models** • Models (e.g., physical, mathmatical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

Safety Procedures and Precautions

Ensure that students understand and adhere to safety practices. Know and follow all federal, state, and local regulations as well as school district guidelines for the disposal of laboratory wastes. Students should not eat, drink, or chew gum in the lab and should wash their hands after entering and before exiting the lab.

Teacher Preparation and Disposal

Place a deck of cards and timer at each student station. If not using timers, ensure each pair of students has access to a smartphone or classroom clock.

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TIME REQUIREMENTS

PREP	ACTIVITY
10 min	15-20 min

Teacher Prep: 10 min
Student Activity: 15-20 min

SAFETY REQUIREMENTS

No PPE required

MATERIALS

1 deck of cards

1 timer or smartphone

HELPFUL LINKS

Human Body Systems

REFERENCE KITS

Carolina® Reflexes and Reactions Kit

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Activity Procedures

Student Procedure

Sort 1/Student 1—Color

1. The subject holds a deck of shuffled playing cards face down.
2. The observer starts the timer and tells the subject to begin.
3. The subject turns over the playing cards, **one at a time**, and places them in a **red pile** or a **black pile**, depending on the color of the card.
4. After all the cards have been classified, the observer stops the timer and records the trial time on the data table.
5. The subject shuffles the cards and repeats the procedure twice.

Sort 2/Student 2—Suit

1. The second subject holds the deck of cards face down.
2. The observer starts the timer and tells the subject to begin.
3. The subject turns over the playing cards, **one at a time,** and separates them into **4 piles according to suit: hearts, diamonds, clubs, and spades.**
4. After all the cards have been classified, the observer stops the timer and records the trial time on the data table.
5. The subject shuffles the cards and repeats twice.

Teacher Preparation and Tips

Before handing out decks of cards to students, count to ensure all cards are present.

To save time, place cards on student desks or tables prior to the activity.

Talk about precision of measurement and the use of timers. You may want to agree to time to the tenths decimal place or whole seconds. Make sure students are being consistent.

You may project an online timer if individual timers or smartphones are not available.

One student completes 3 sorts of the same trial.

If time permits, every student can complete 3 trials of each sort and analyze a class data set.

Have students count the cards in the deck before returning them.

Data and Observations

Sort	Time 1 (s)	Time 2 (s)	Time 3 (s)
Color			
Suit			

Student answers will vary but 2 trends should be evident. Practice and additional trials should reduce the time for sorting. Sorting by suit should take more time since the task is more complex.

Analysis and Discussion

1. Describe, step-by-step, the reaction process necessary to sort the deck of cards by color.

   First, your eyes must see the card. The message that the card is red or black must then be sent by the optic nerve to the brain. The thalamus within the diencephalon of your brain then processes the information, allowing you to discriminate separate colors, and sends a message back to your arm muscles, telling them to move. Your muscles then contract and relax, and you sort the cards by color.

2. Describe, step-by-step, the reaction process necessary to sort the deck of cards by suit.

   The process is the same as above, but there are 4 pieces of information to be interpreted. Color discrimination may take place first and then shape discrimination allows for sorting into 4 piles.

3. Based on the steps listed above, which reaction was more complex? Does the time data support your answer? Explain why or why not.

   Sorting by suit is more complex. It should take more time to sort into 4 piles because 4 different shapes must be interpreted by the brain.

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4. Is there a trend for time within each sort? How can you explain the trend?

   Time to sort should decrease with practice. Practice is the key to reaction time. By repeating the same movements, they become almost automatic. These actions aren't reflexes, but with so much practice, movements almost mimic a reflex. They are motor skills that have been etched into your nerves and brain so that those motor pathways are almost reflexive.

5. Imagine you're training a 100-meter sprinter and devise a plan to help improve how quickly the sprinter leaves the starting block. Be descriptive and specific.

   Answers will vary but should include repeated practice leaving the starting block over varying sets of conditions.

TEACHER NOTES