Reaction Time

Test the speed of your neuromuscular system!

STEM
UNITED STATES NAVAL ACADEMY

VISUAL

1. The subject dangles their dominant hand off the edge of a table.
2. The tester holds the top of a ruler between two fingers, with the 0 mark touching the subject's index finger.
3. The tester releases the ruler. The subject must grab the ruler as fast as possible when they SEE the tester release it.
4. Record the measurement (cm) where the subject grabs the ruler. Record 4 trials in the table.

AUDITORY

1. The subject closes their eyes for this test.
2. The tester simultaneously says "release" and lets go of the ruler. The subject must grab the ruler as fast as possible when they HEAR the word "release".

TACTILE

1. The subject closes their eyes for this test.
2. The tester simultaneously touches the subject's non-dominant shoulder and lets go of the ruler. The subject must grab the ruler as fast as possible when they FEEL their shoulder being touched.

	Visual	Auditory	Tactile
Trial 1 (cm)			
Trial 2 (cm)			
Trial 3 (cm)			
Trial 4 (cm)			
Average (cm)			

- Which stimulus has a faster reaction time?
- Try comparing reaction time for your dominant and non-dominant hands.

Fast As Lightning

Reaction time is a measurement of how quickly you respond to a stimulus. In this experiment, test how quickly you respond to visual, auditory and tactile sensory input. The input is sent through the nervous system to your brain, where it is processed and decisions are made about how to respond. The brain then sends signals to various muscles to react appropriately.

NAVY NOTES

Naval aviators need to have fast reaction times. Preparation includes many hours of flight training in the air and in virtual flight simulators.

Learn more at backyardbrains.com/experiments/reactiontime

Reaction Time
Data Analysis

- Determine how long it took (in seconds) for the ruler to fall a certain distance (in centimeters).

$$y = \frac{1}{2} g_0 t^2$$

y = the distance you measured (cm)
g_0 = acceleration due to gravity (980 cm/s^2)
t = time (s)

Solve for t: $t = \sqrt{\frac{2y}{g_0}}$

- Use the formula above to convert each distance measurement (cm) to seconds. This is your reaction time (s) to catch the ruler. Alternatively, use the conversion charts below.

Distance (cm)	Time (s)
3.0	0.08
4.0	0.09
5.0	0.10
6.0	0.11
7.0	0.12

Distance (cm)	Time (s)
8.0	0.13
9.0	0.13
10.0	0.14
11.0	0.15
12.0	0.16

Distance (cm)	Time (s)
13.0	0.16
14.0	0.17
16.0	0.18
18.0	0.19
20.0	0.20

Distance (cm)	Time (s)
22.0	0.21
24.0	0.22
26.0	0.23
28.0	0.24
30.0	0.25

Use the average (cm) values from your original data table.

	Visual	Auditory	Tactile
Distance (cm)			
Time (s)			

Full Speed Ahead
Neurons use **electrochemical signals** to trigger muscle contractions. An action potential travels down a neuron and triggers the release of chemical neurotransmitters at the **neuromuscular junction**. This signal triggers the muscle to contract or relax. The average nerve conduction velocity speed is approximately 20-80 m/s.

Fast Acting
The average reaction time for humans is 0.25 s to a visual stimulus, 0.17 s for an audio stimulus, and 0.15 s for a touch stimulus!

NAVY NOTES

Factors that can affect response time include physical fitness, age, fatigue, distraction, and alcohol. The Navy upholds physical readiness standards in order to ensure that members maintain high fitness levels.

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