BRAIN REACTION TIME RULER "*CATCH A RULER* "

Demonstration

Number of Participants: (1-10)

Audience: Highschool (ages 14+)

Duration:(10- 20)min

Difficulty: LEVEL 1

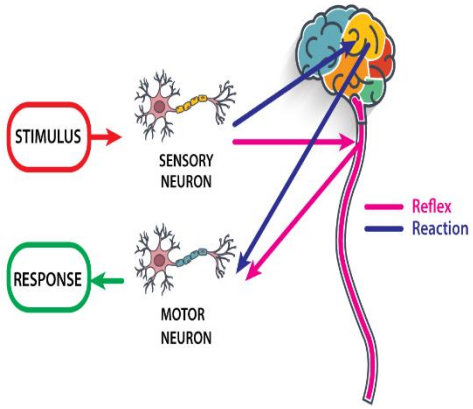


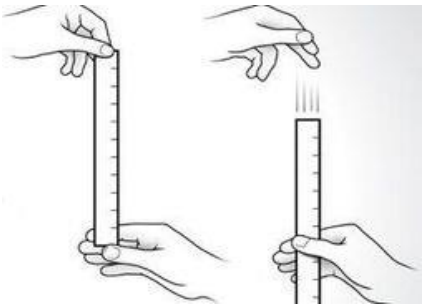
Figure-1

Material required:

1- 30cm Ruler

Setup: One person should hold the ruler at the top, and the one who is being tested should hold their hand near (but should not touch the ruler) then the one who holds the ruler should drop the ruler. The other one should catch the ruler to show their reaction time (Record the centimeter mark (d)). ***Figure-2***

The recorded distance of the ruler converted to time using the formula $T = \sqrt{\frac{2y}{g}}$



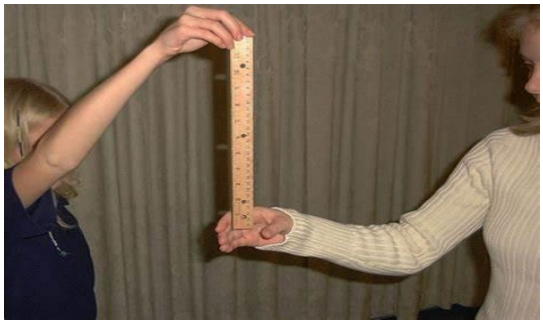


Figure-2

Presenter brief: A ruler can be used to measure the Reaction Time while dropping the ruler from height and to measure how the other person will respond to catch this ruler, so it describes how a person can respond fast or slowly depending on this human reaction time, The distance of ruler when it falls which can be converted to time using formula while you need to be familiar with the equation of kinematics with constant acceleration.

Vocabulary:

1- **Reaction time:** the time it takes for a person to respond to a stimulus
2- **Stimulus:** a signal that triggers a response in an individual
3- **Response:** the action taken by this individual in response to a stimulus
4- **Ruler:** the object needed to measure length which is used to measure the time taken for a reaction

Physics & explanation

High school (ages 14+):

Human reaction time (RT) works by having a nervous system recognize the stimulus. The neurons then relay the message to the brain. The message then travels from the brain to the spinal cord, which then reaches the person's hands and fingers. The motor neurons then tell the hands and fingers how to react. ***(Figure 3)***. The reaction time ruler is one of the simplest

experiments to measure human reaction time or how fast a human can react to a visual stimulus. Which involves dropping a ruler from a height and catching the ruler as soon as possible. The distance the ruler falls before you catch it can be used to calculate your reaction time. Reaction time can vary depending on many factors, such as age, gender, fatigue, attention, and practice. The physics behind this experiment is based on the equations of motion for constant acceleration. When the ruler is dropped, it accelerates downward due to gravity, which has a value of about 9.81 m/s^2. The distance that the ruler falls before being caught depends on how long it takes for the person to react and close their fingers around the ruler. d is the distance that the ruler falls in meters, a is the acceleration due to gravity in m/s^2, and t is the reaction time in seconds.

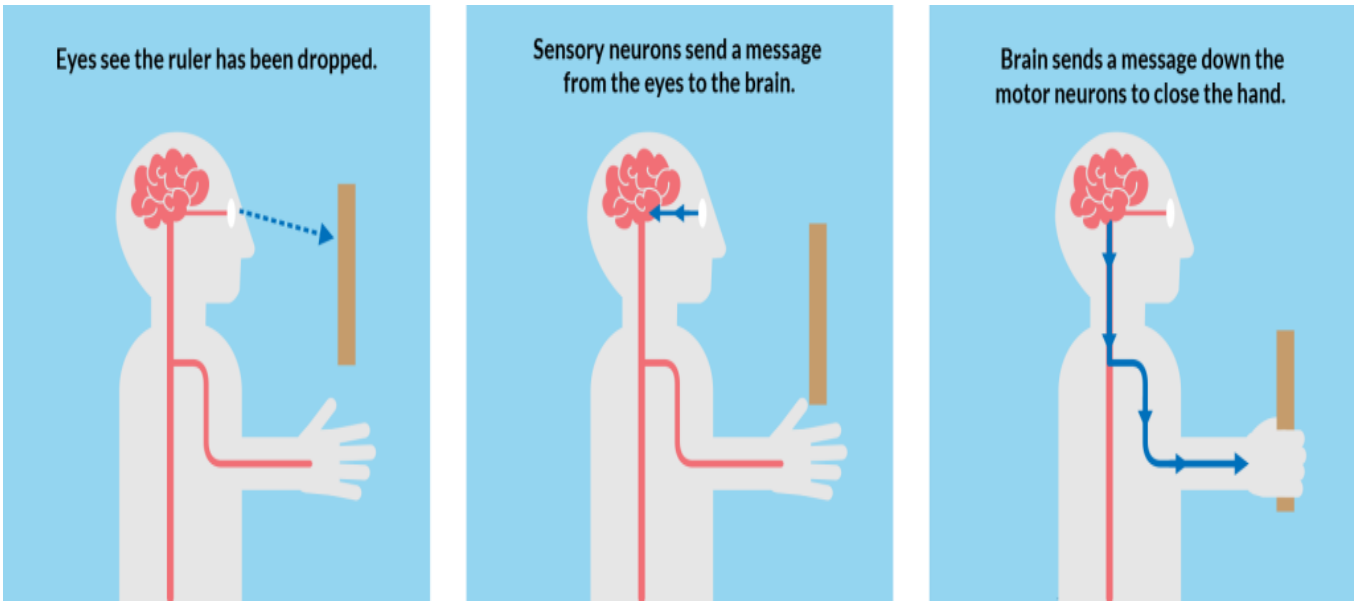


Figure-3

Additional Resources:

1. University of Washington | Faculty of Education | Neuroscience for Kids
2. Test reaction time with ruler worksheet | Teaching Resources
3. Lab: Reaction Ruler (serpmedia.org)
4. https://www.youtube.com/watch?v=7yhH5trTFj8&t=38s

Useful Equations:

The equation of kinematics with constant acceleration and zero initial velocity	
	$y = \frac{1}{2} g T^2$
then;	$T = \sqrt{\frac{2y}{g}}$

Variables and constants:

y is the recorded distance of the ruler in meter

g is gravitational acceleration in units of meters per second squared

T is calculated reaction time in seconds.