REACTION TIME

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Description:
The time it takes an average human to react to a stimulus is very quick, due to the speed at which nerve impulses travel around our nervous systems, around 100m/sec. A very simple apparatus can be used to determine the speed of our reaction times – a very spectacular demonstration especially if it is made to be a competitive style activity. This demonstration also acts as a great introduction to experimental design and investigation of various factors that influence reaction time.

Time: 10-20 min

Short and sweet: A ruler is used to determine reaction time.
Keywords: reaction, time, ruler, nerve, speed, replication, visual, auditory, tactile, stimulus
Subject areas: biology, physics

MATERIALS AND METHOD

Materials:

- 1 metre ruler
- Blindfold

Method:

1. The subject should sit or stand next to a bench or desk with their forearm resting on the table with their hand overhanging the edge.
2. The investigator holds the ruler so the 0cm mark is level with the subjects thumb and forefinger.
3. The subject watches the investigators hand, and when the investigator drops the ruler, the subject catches it using **only** their thumb and forefinger.
4. Record the distance the ruler has travelled – this is proportional to the reaction speed or time
5. Repeat the experiment 10 times and average results.
6. Can compare left/right hands, and auditory, visual and tactile stimuli.

SAFETY/DISPOSAL

- If the subject misses the ruler, there is a chance that the ruler can bounce off the floor and back into the subject or investigator. Eye protection is recommended.
- Ensure that the ruler has no rough or sharp edges, so that the subject does not get cut or splinters as they catch it.

EDUCATIONAL CONCEPTS & REACTIONS/ANALYSIS

- Reaction speed/time
- Speed of a falling object – convert distance travelled into a reaction time using acceleration = 9.8 m/sec/sec
- Experimental design – testing for factors that influence reaction time

HOW THE DEMONSTRATION COULD BE USED

- Biology – reaction time, speed of nerves, processing time
- Biology – experimental design, comparing factors
- Physics – distance converted into time due to gravitational acceleration

INVESTIGATIONS/VARIATIONS

- Compare left and right hands – which has a better reaction time.
- Compare visual (watch the ruler drop), auditory (blindfold, told when ruler is dropping or click), or tactile (touched when ruler is dropped) stimuli.
- Compare reaction time when a tactile stimulus is a touch on the head compared to a touch on the hand.
- How could other stimuli be tested, such as smell, taste?
- How could the effects of alcohol, caffeine, distractions such as noise/visual, tiredness be tested?
- Physics – compare a heavy ruler and a light ruler – is there a difference? Should not be due to two masses fall at the same speed/acceleration!
- Can also test reaction time in other ways such using a rubber band or length of elastic attached to the end of the ruler. The elastic is attached to a table leg at floor level, and the ruler pulled back stretching the elastic a measured distance. When released, the ruler is pulled horizontally along the floor.
    i. Test the reaction time using a hand to stop the ruler by pressing down on it.
    ii. Test the reaction time using a foot to stand on the ruler to stop it – this is comparable to reaction time to stop a car due to a visual, auditory or tactile stimuli.