

The 8th International Young Naturalists' Tournament

Problem № 21
«Reaction time»



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The task

Measure your reaction time by asking a colleague to drop an object between two almost closed fingers or hands and trying to grab it. Is it possible to detect differences in the reaction time between members of your team?

Hypothesis

If you change people, the object, the height of the fall of the object, the distance between the hands or fingers and the type of catching then the result will change.

Aim of the study

Study the dependence of various parameters on the reaction time.

Theory

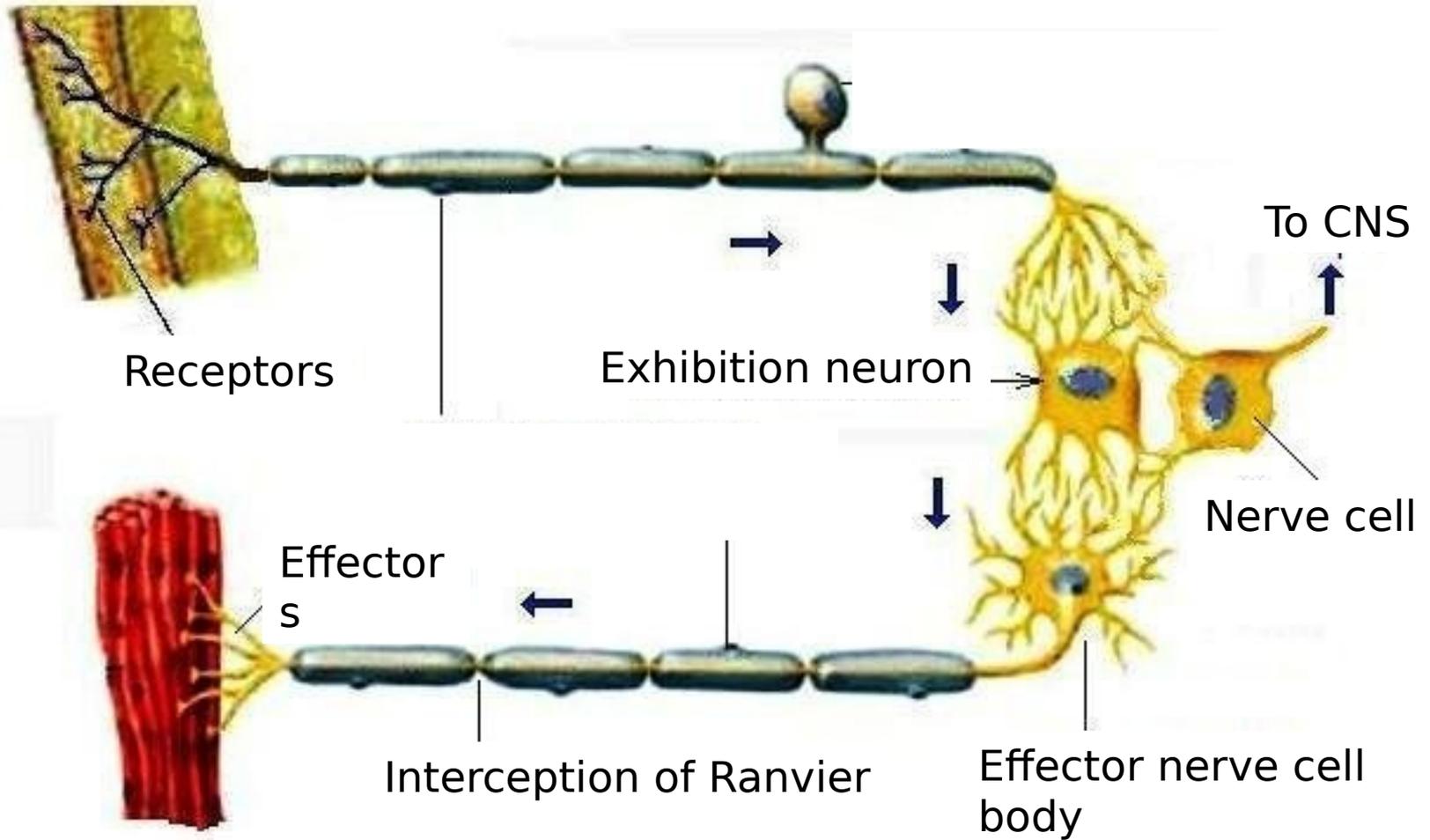
Reaction time- the main behavioral parameter in experimental psychophysiology. Estimates the time from stimulus to reaction (usually the moment of onset).

Theory

Divided into three phases:

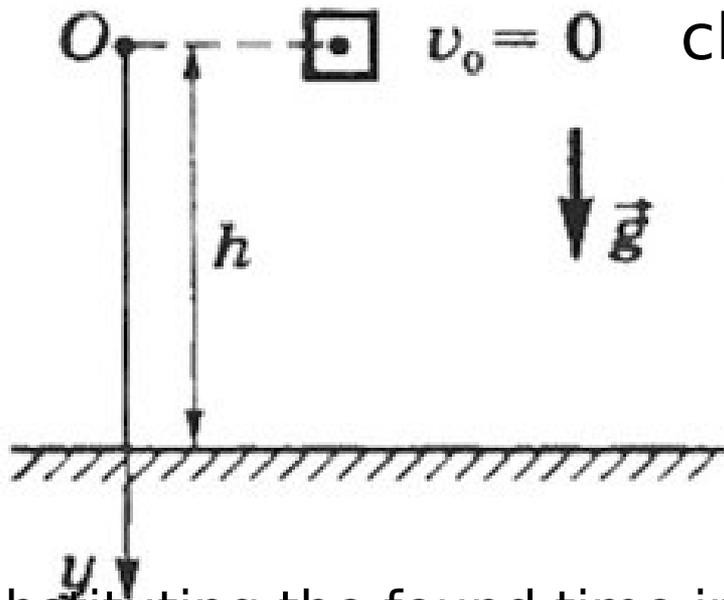
1. transit time of nerve impulses from the receptor to the cerebral cortex;
2. the time it takes to process nerve impulses and get a response in the central nervous system;
3. the response time of the organism.

Theory



Theory

Free fall without initial velocity ($v_0 = 0$)



The body motion along the chosen coordinate system is described by the

equation

$$v_y = gt, y = \frac{gt^2}{2}.$$

From the last formula, we can find the time of body falling from height

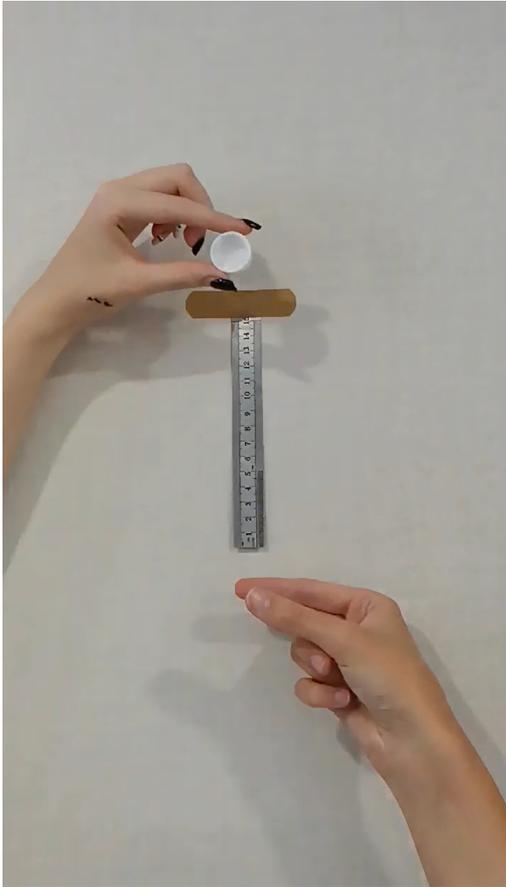
$$t = \sqrt{\frac{2h}{g}}$$

substituting the found time into the formula for the velocity, we obtain the modulus of the body's velocity at the moment of falling

$$v = \sqrt{2gh}$$

Experiment 1

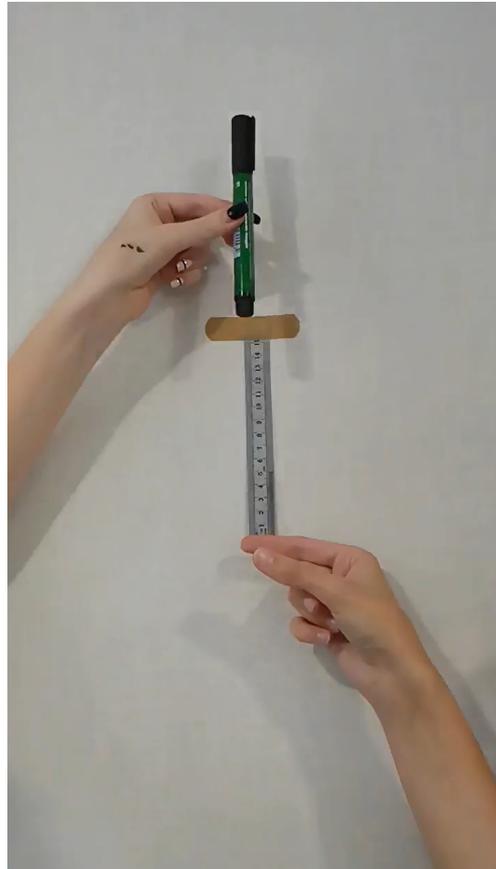
Purpose: Dependence reaction time on distance



Conclusion: Then higher distance than harder it is to catch

Experiment 2

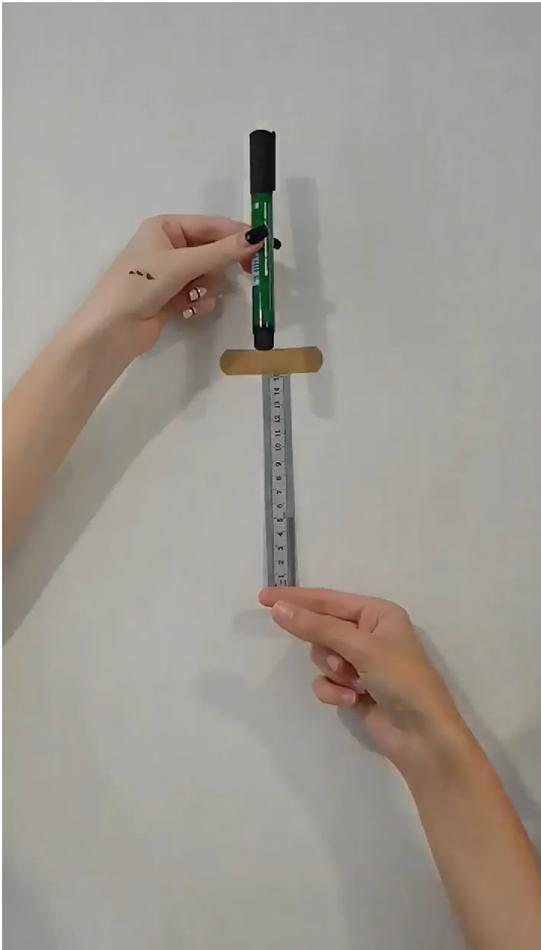
Purpose: study the dependance of reaction time on type of catch



Conclusion: easier to catch with hands, as the surface of the palms is larger

Experiment 3

Purpose: study the dependance of reaction time on type of object



Conclusion: then longer the object then easier it is to catch, range of reaction time for catch is longer

Experiment 4.1

Purpose: study the dependance of reaction time on human activity



Conclusion: for different people reaction time should be different

Experiment 4.2

Purpose: study the dependance of reaction time on human activity



Conclusion: for different people reaction time should be different

Other method to measure time of reaction

Purpose: improve measurement accuracy



Distance at which the object was caught, sm	Reaction time, s
10	0,447
13	0,5
12	0,49
10,5	0,454
11	0,469
12	0,49
13,5	0,52
Average:	Average time:
11,7	0,48

Conclusion: measurement accuracy is greater than previous method

Conclusions

- 1. the longer the object then easier it is to catch, range of reaction time for catch is longer**
- 2. for different people reaction time should be different**
- 3. easier to catch with hands, as the surface of the palms is larger**
- 4. the higher distance then harder it is to catch**

References

- The textbook "Physics-10", M. Peryshkin. Enlightenment, 2017
- <http://optikarf.ru/lenses/>
- <http://chem21.info/>