Reaction time: Experiment design

Introduction

The goal of the experiment is to measure the reaction time of participants under two different conditions. We want to find out whether there is a difference in the reaction time between an easy and a demanding stimulus.

Experimental setup

The experiment is performed on a computer. As soon as the subjects are shown a stimulus on the screen, they are asked to press a predefined computer key in order to measure the subjects' reaction time, the time between the display of the stimulus on the screen and the pressing of the key. The study is a within-subjects design, i.e., the subjects received both parts of the experiment and the reaction time was measured for both stimuli.

The first condition requires the participant to press the spacebar on the keyboard when the window changes its color from white to orange.

The second part of the experiment shows a random number between 1 and 3 on the screen and the participant must press the corresponding button on their keyboard as quickly as possible.

This allows us to measure reaction times to both a very simple stimulus as well as a slightly more demanding one and compare the results to see how much the decision making process of the second task affects the total reaction time.

In order to collect enough data per participant without fatigue, ten repetitions per condition were performed. Depending on the participant number, the experiment was started with stimulus one or stimulus two. This randomized order of the stimuli was intended to prevent a possible sequence or learning effect.

Participants

The experiment was performed on two subjects. Due to the pandemic situation, it is not that easy to recruit study participants. Since it is necessary to run a Python program on a Linux machine for the trial, we decided to test ourselves.

As a result, one man and one woman were tested each. The average age of the test subjects is 28 years. Both test subjects are master students of media informatics at the University of Regensburg.

Due to technical reasons, both test subjects performed the experiment three times each.

Preliminary Results

The mentally less demanding stimulus (M = 317.75, SD = 64.00, n = 60) has on average a shorter reaction time than the second stimulus (M = 506.50, SD = 101.31, n = 60) with slightly more mental demand, t = -12.10, $p < 0.001$.

The difference in reaction time between the two stimuli is therefore highly significant. The reaction time after the demanding stimulus is on average about 59.4% slower than reaction time after the less demanding stimulus.

Limitations

Differences in the latency between the start of the experiment and the shown results on the screen are possible due to the execution of the experiment on different computers.

Performing the tests directly at the test subjects's homes has the advantage that they are in a familiar environment - however, it cannot be ensured that the test subjects are not distracted by external stimuli. In a suitable test environment, external stimuli can usually be prevented.

Other confounding variables can arise from the use of different computers - for example, the keyboard layout could have an effect on reaction speed, or how familiar the test subject is with the keyboard.

For subsequent experiments, these limitations should be kept in mind. In this case, however, the experiment is already severely limited by the number of subjects alone. Therefore, the presented results may explicitly be considered as preliminary results only and have to be consolidated by further testing.