1 Introduction

We conduct a study in which we measure the influence of the circle appearance with single stimulus and mental demand on a participant's reaction time. In condition one, the participants have to react to a visual stimulus. For this purpose, they should press the space bar as soon as they see a green circle on the screen. For the measurement of the influence of mental demand on reaction time, we show the participant circles with numbers from one to three in them and they only should press the space bar if the correct number appears. We further consider how this task affects the reaction time.

2 Experimental Setup

2.1 Apparatus

The study was conducted at home using a Tuxedo notebook (InfinityBook Pro 14 v5) with its built-in keyboard. The screen has a size of 14 inches and a resolution of 1920 x 1080 pixels. We installed and started a Python script which displays the circles in a window and logs the key presses. The size of the widget was 800 x 600 pixel.

2.2 Design

The study contains two conditions: Condition one is that participants should press the space bar as soon as they see a circle. In condition two, test persons should press the space bar when the circle with a correct number appears which is randomly selected from a range from one to three.

The study was conceptualised as a within-subject design with 10 repetitions for each condition.

Our hypothesis was that reaction time will increase when participants are mentally challenged. Thus the dependent variable is the reaction time which was measured in milliseconds via key logging. The independent variables are the visual stimulus (circle) and the task for the mental demand (circle with random number). As control variables the used key board, the display and window size were documented.

2.3 Procedure

First, the participant was asked about his/her age, occupation and his/her gender was noted. The procedure of the study was explained to him/her and any questions were clarified. We then started the program in which the participant first received a short instruction on the first turn (single stimulus). S/he had to press the space bar to start and then whenever a green circle appeared.

The intervals between the appearance of the circles were randomly chosen in the range of 2000 to 5000 milliseconds so that the participant would not be prepared and thus learning effects might be diminished. After ten circles had appeared, the first round terminated.

The second run with ”mental demand” also started with a short instruction which included a random number between one and three for the participant to remember. By pressing the space bar, the participant started this round. The difference to the first run consisted in the fact that the circle additionally contained random numbers. The participant should only press the space bar if the circle contained the number randomly chosen in the instruction. If a circle did not contain the correct number it disappeared after two seconds. The number in the circles and the interval between them were randomised to reduce learning effects. The turn was finished after the circle with the correct number had appeared ten times and the user had reacted to them with the space bar. In total, 20 rounds were conducted where half had condition one and the other condition two.

All user inputs were logged, i.e. which key s/he pressed, when s/he pressed it, whether it was the right key, whether s/he pressed it when a circle was visible and whether s/he pressed it when the number was correct.

Based on the time stamps, the reaction time was calculated and stored in a CSV file, together with the logging data. Thereby, a table for ”single stimulus” and a table for ”mental demand” was created for each participant. For an easier evaluation, an additional column named ”is_correct_reaction” was inserted, which combines the conditions ”correct key”, ”circle was visible” and ”correct number” into one variable. We also recorded the number of circles displayed because the total number of circles varied in the second condition.

We conducted a pilot study and based on that we decided to log the number of circles displayed as well, since due to the random selection this varied with the second condition.

3 Participants

Due to the current pandemic situation the selection of participants is limited to our roommate and us. Thus, we had only two female and one male participant who each contributed to the study twice. The participants were two media informatics master students and one software developer with the ages of 22, 25 and 38.

4 Preliminary results

Throughout the study, it seemed that the participants were slightly slower in the second condition. Unfortunately, the results are not obvious, as the second condition overall took longer due to the randomly chosen numbers, thereby biasing the perception. No wrong reactions could be observed in the first condition but in the second condition the space bar was pressed three times when the wrong number was displayed. Statistical tests should be used to provide more accurate statements. However, since the number of participants was so small the results will not be meaningful.