2023

REPORT STROOP TASK

INTRODUCTION TO PROGRAMMING (SEMINAR NO: 127050)

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08.03.2023

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Introduction

The Stroop task is a psychological test used to measure the delay in reaction times when a color word and its font color are mismatched. The Stroop effect can be calculated by subtracting the reaction times in congruent trials from incongruent trials.

Methods

Before we started programming the task, we divided the script between all members of our group to ensure a similar workload for everyone. Lucy created the structure of the MATLAB script (see appendix). She created a function called *stroop (subNo)* that can be called with the respective subject number and will then start the task. The script was divided into the following subsections: 1) *Setting up* the task, including experimental parameters like the number of trials and initiating a result file; 2) *creating and shuffling stimuli lists*; 3) *setting up Psychtoolbox* (PTB); 3) *experiment* with 3a) a *block loop* for the test block and the experimental blocks with corresponding trial loops and 3b) a section where the *results are calculated and presented*; 4) a final *clean up*. The experiment and the clean-up were implemented in a try-catch-statement to end the experiment automatically in the case of a PTB error.

Ayesha and Kainat were responsible for creating stimulus lists and randomizing them for each block. The overall layout of how it had to be done was discussed with Lucy. They divided the task into five parts: 1) a list of words for the four different colors (Red, Green, Blue and Yellow) and a separate list for the font colors was created; 2) both lists were combined into one and matched in order to create a congruent list; 3) half of the trials in each block had to be congruent and half incongruent which is why the trials were divided between the two; 4) for the incongruent trials, the words and font colors had to be mismatched – this was done by excluding the color matching the word for each incongruent trial; 5) finally, the two lists were combined and shuffled so that every block was random.

Bouchra was responsible for the presentation of the stimuli using PTB, creating the result matrices, and the presentation of the results to the participants. For each trial, the fixation cross was created, then the stimulus list was turned into images that were displayed for 3 seconds, and a 15 seconds break was set at the end of each experimental block. The experimental block was composed of 16 trials while the test block was composed of 8 trials. Additionally, the button presses as well as the timing were collected. In the same while loop the key presses were converted to 1 if the answer was correct, and 0 if it was incorrect. At the end of each trial, a message on the screen was displayed to the participant in order to let them know whether their answer was correct or incorrect.

The result matrix was created and filled throughout the experiment depending on the stage. Originally, there was going to be one matrix with all the information collected from all the participants. However, this was not possible since the experiment was conducted on three different laptops. Therefore, a separate result matrix was created for each participant. The information stored in the matrix is the number of the participant, the number of the blocks and the number of the trials as well as whether the answers of the participant were correct or incorrect, whether the trial was congruent or incongruent, and their reaction time in each trial.

Finally, at the end of the experiment, the participants were presented with the results: 1) number of correct answers; 2) the percentage of correct answers; 3) the average reaction time; 4) the average reaction time for congruent, then incongruent trials; and 5) the Stroop effect.

Even though at first, every member of our group was responsible for one specific section of the task, we ended up doing error correction and troubleshooting together. One problem that Ayesha and Kainat encountered when creating the stimuli lists was the randomization of the colors and respective font colors – a problem that was solved later on together with Lucy. We further struggled with different keyboard layouts, as the letter Y is on a different key on German keyboards than on other keyboards. As participants were told to press Y whenever they saw a yellow font color, this led to inconsistent results. We decided to simply change the respective section in the script depending on which laptop the task is running on to solve this problem.

Results

For the data analysis, Lucy created another MATLAB script (see appendix). The percentage of correct answers, the average reaction time, as well as the Stroop effect, which constitutes the time loss in incongruent trials, were calculated as the descriptive features of our analysis. On average, the percentage of correct answers was 86.11%, with the mean of reaction times being 914 ms. However, the averages of the congruent and incongruent trials were different, with the average of the former being 804 ms and the latter 1023 ms. This resulted in a Stroop effect of 218 ms.

To test for the significant difference between congruent and incongruent trials, a paired t-test analysis was conducted. This test revealed a significant difference between the two conditions (t= -9.78, df = 575, p < .001), illustrating that participants' reaction time was significantly lower in congruent trials compared to incongruent trials.

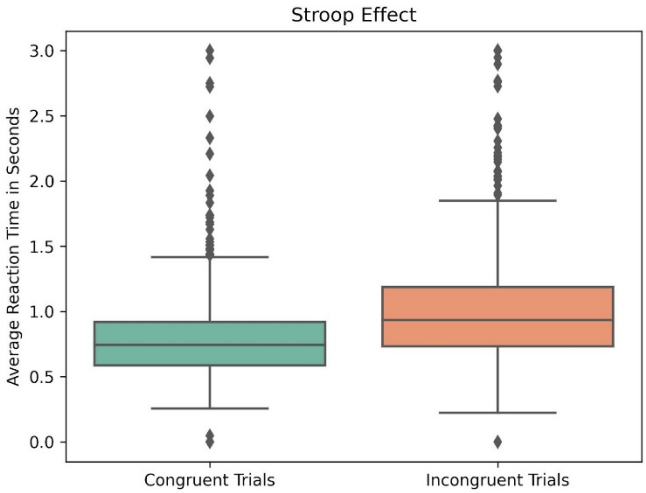

Figure 1. The boxplot shows that the data was normally distributed and is symmetric. The median reaction time in congruent trials is less than the median reaction time in incongruent trials. The whisker length is 1.5 times the interquartile range from the lower and upper bounds of the box.

Finally, a correlation analysis between the trials and the average reaction time was conducted, based on the assumption that later trials could be correlated with higher – due to boredom – or lower – due to training – reaction times. The result showed a negative, although small, correlation between the two variables (r = -0.378, p = .002), meaning that participants were faster during later trials (see figure 2).

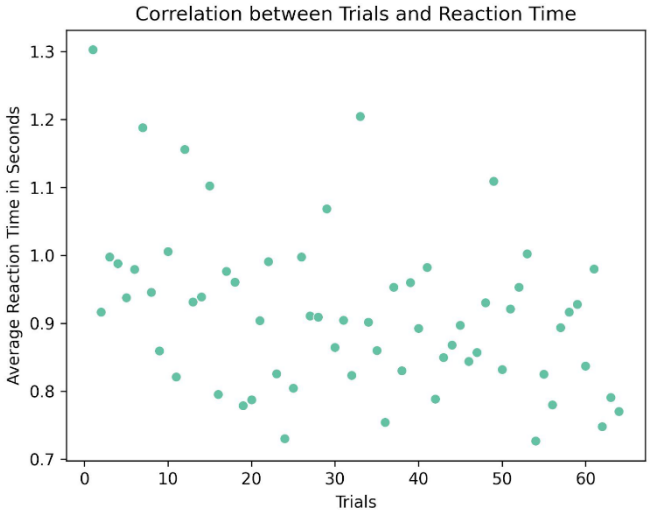

Figure 2. The scatter plot visualizes the significant negative correlation between the trials and the average reaction times. Participants' reaction times were smaller with increasing repetitions of trials, suggesting a possible training effect.

Appendices

Appendix A. Matlab Script Stroop Task

Appendix B. Matlab Script Data Analysis

Appendix C. Python Script Plotting