Selective Letter Attention 2D Application

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*Abstract*—In this paper we present the technical underpinning and setup behind the selective letter attention test. It is created with the PsychoPy Framework, it is composed of three different scenarios where the distractor is visual, audiovisual and audio only. Each of the scenarios are composed by 1000ms Fixation cross, 200ms stimuli with filler letters and distractor, 5000ms whitespace, where the subject is able to answer what letter they have seen. Lastly, 500ms is used to provide feedback. Each of the scenarios are shown 12 times. In each trial the subject have to tell the system whether or not he/she has seen “p” or “b”, while being distracted by “p”,”b” or “g”. To avoid making the task too easy three filler letters together with the target letter are randomly assigned a predetermined position.

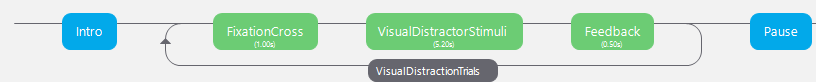
Keywords—Selective Attention, Letter Recognition, Python, 2D, PsychoPy)

# Introduction

Selective attention is the mechanism of selecting one elements out of many possible (**reference**). This process can be challenged by many factors (**reference**). In the context of letter recognition it will be other letters, which could influence the selective attention processes of the subjects. In the context of our studies, we have developed this test to closely match the look and feel of the following article (**reference** to article with numbers). Just like them, we intent to get a better understand of the developing selective attention processes in children. More so are we curious about this process in the context of letter recognition as it is newly acquired skill for children in the lower grades (**reference**). In the following sections we will dive into the development of the program behind the Selective Letter Attention test.

# Implementation

First the program is programmed in Python 3.0(**reference**) using the PsychoPy Framework (**reference**). The Psychopy Graphical User Interface (GUI) allows us to iteratively prototype, develop and test the experiment. The development consist of five distinctive sections called Routines: Intro, FixationCross, Stimuli (visual, audiovisual or audio), Feedback and Pause.



## Intro

The intro is comprised of an introduction text, which explains how to behave during the experiment:

*“Velkommen til Opmærksomheds testen.*

*Du vil blive præsenteret for bogstaver*

*hold øje med b og p.*

*En af dem vil være i højre eller venstre side af skærmen.*

*Hvis du ser p klik til venstre på musen*

*Hvis du ser b klik til højre på musen*

*Klik så snart du ved hvilke bogstav der kom frem”*

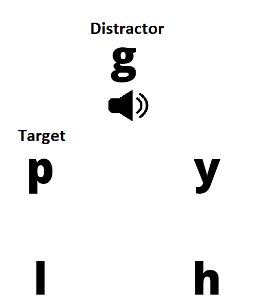
The text appears at the beginning of the experiment. It is before the subject as long as the subject desires. He/she can press the return key (Enter) to progress to the next part of the experiment

## FixationCross

In this routine a black X is shown in the middle of the screen surrounded by a white background. The System progresses by itself further to the Stimuli Stage.

## Stimuli

In the stimuli routine the stimuli is present together with either visual, audiovisual or audio only distractor.

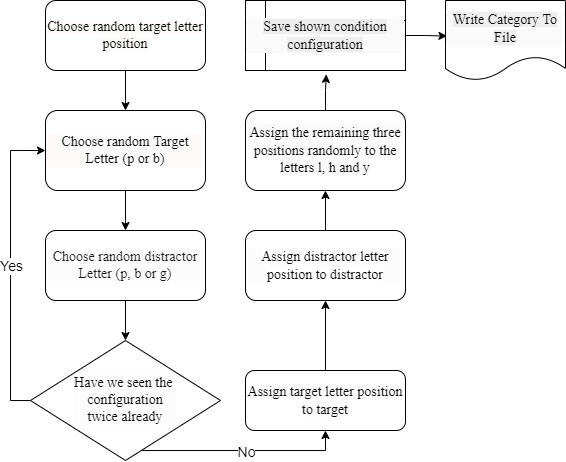


It is present for 200ms continued by 5000ms of blank white canvas. In all 5200ms the subject is able to press a mouse button corresponding to the target letter he/she saw. Left mouse click if it was “p” and right mouse click if it was “b”. The most interesting part of the stimuli is that it has to be shown 12 times within each of the conditions, within those 12 trials 6 different configurations have to be shown 2 times. But, the order is random and positioning of the letters within the 5 different places are random. The 6 different configurations are:

1. Stimuli Configurations

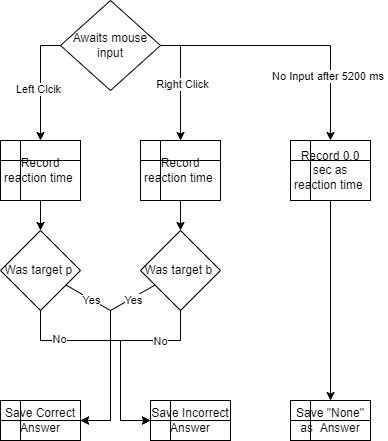
| Configurations | | |
| --- | --- | --- |
| Target | Distractor | Category |
| p | p | Congruent |
| p | b | Incongruent |
| p | g | Neutral |
| b | b | Congruent |
| b | p | Incongruent |
| b | g | Neutral |

In order to accommodate the random, yet controlled nature of the stimuli the following algorithm was devised.



In figure XX it shows that every time the stimuli is presented it ensures the configuration is saved in the program, thus after 12 trials all the wished stimuli configurations are shown.

After the stimuli has been chosen by the program it listens to the mouse for user input in order to determine how quickly the user responses to the 200ms stimuli, and whether or not it is correct. The flow of the program looks like the following :



From the diagram it is noteworthy to understand if the subject does not react within the time window of 5200ms the reaction will be recorded as “None” which will tell the system to prompt the user with a message expressing that the subject’s reaction shall be faster.

## Feedback

Based on the correctness of the reaction, recorded during the stimuli Routine. The feedback is present on the screen for 500ms. The following table elucidates the different feedback permutations:

1. Feedback permutations

| Permutations | | |
| --- | --- | --- |
| Answer | Feedback |  |
| Correct | C:\psychoPy\SelectiveAttention\graphic\happyface.png |  |
| Incorrect | C:\Users\tvh307\AppData\Local\Microsoft\Windows\INetCache\Content.Word\sadface.png |  |
| None | “Hurtigere” (Faster in Danish) |  |

If we look at figure XX we see that FixationCross, Stimuli and Feedback are embedded in a loop, which after 12 runs continuous to Pause

## Pause

This Routine is a break between two routine loops. It occurs after the first (visual distractor) and second routine loop (audiovisual distractor), but not after the third (audio distractor). When the third has ended the whole program stops and the data is saved as a CSV file ready to be interpreted. The pause routine is a simple text stating:

*“Pause*

*tryk på en tast når du er klar til at fortsætte”*

Which means that the subject can press any button in order to continue.

# Pilot Results

To confirm that the program indeed provided the data the study needs few initial pilot sessions where conducted on the involved researchers.

The aim were to elucidate whether or not all elements were present on the screen for the wished amount of time and whether or not all wished conditions were given. In the table below the expected time, average observed time and standard deviation is given.

1. Stimuli presentation

|  | Stimuli | | |
| --- | --- | --- | --- |
| Stimuli | Expected time in sec | Average Observed time in Sec | Standard deviation in Sec |
| Fixation Cross | 1.0 | 1.011519 | +/- 0.007092 |
| Letters | 0.2 | 0.207325 | +/- 0.004976 |
| Blank White | 5.0 | 5.054729 | +/- 0.009773 |
| Feedback | 0.5 | 0.480663 | +/- 0.026188 |

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*a**b* 

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* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
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1. Table Type Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
| copy | More table copya |  |  |

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7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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