Visual Search Task
PSY310: Lab in Psychology

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Github Link:
https://github.com/SaanchiBhatt13/Psy310/tree/Visual_Search_Task

Introduction

The purpose of a visual search task is to train the senses to locate particular target stimuli in a visually complex environment with many distractions. It is a crucial technique for researching attention because it enables researchers to assess how people maintain focus on certain things in the face of distracting stimuli. Visual search tasks allow participants to find specified targets among distractions and offer a controlled environment to study the mechanisms behind attentional allocation. Visual search is divided into two categories: conjunction search, which looks for numerous features to locate the target, and feature search, which looks for targets based on distinctive characteristics like color or form. This study is a visual search task experiment based on feature search.

The attention process and the effectiveness of this visual search process are intimately linked, indicating how attention is focused on the target's items. Reaction times (RTs) are a key indicator of visual search effectiveness as they vary with the number of objects displayed. Effective attentional guidance is demonstrated by an efficient search, which exhibits a modest rise in RTs as distractions grow. On the other hand, inefficient searches show a linear rise in RTs, indicating that every item needs to be processed one after the other. This difference offers important insights into distributing and managing attentional resources in visual activities.

The degree of similarity between targets and distracters is a major factor in search efficiency. Increased similarity can make distinguishing difficult, resulting in more cognitive strain and longer search durations.

This study attempts to improve our understanding of how attention functions in real-world scenarios by investigating the interplay between visual search efficiency and attentional processes. The findings might have bearings for a variety of applications, including security screening and medical imaging.

Method

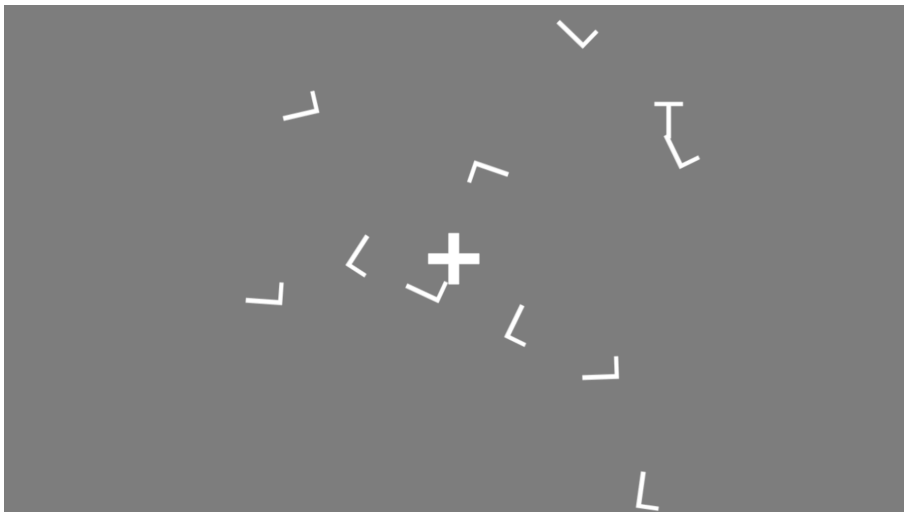
There were 4 participants in the experiment, labeled A, B, C, and D, ranging in the ages 19-21, psychology undergraduate students of Ahmedabad University. Before the experiment began, they were informed about the aim and methodology of the study and their consent was obtained. A 14.5" laptop screen and PsychoPy-2024.1.5 software were used to create the experimental setup.

A full-screen slide displayed various stimuli, including several distractors and one target. The target is “T,” and the distractors are “L.” The number of distractors was 5 or 10, displayed at random. The font properties for both the target and distractors were set as follows:

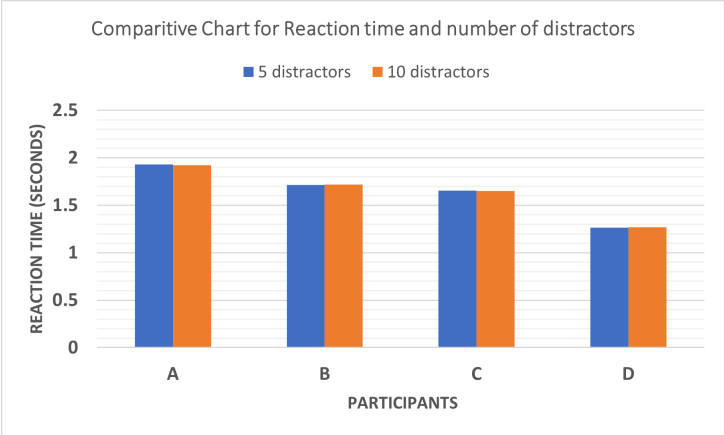
- Font: Open Sans
- Letter height: 0.1
- Language Style: LTR
- Font Colour: white
- Target orientation: 0
- Distractor orientation: random

The properties of the target and distractors were kept uniform to increase the task's difficulty level and reduce the variance between the two types of stimuli, making it a feature search task. No duration was set for the stimuli display, and a new array would be displayed only when a mouse click was recorded. The participants were instructed to identify and click on the target. The response data was recorded and saved in a CSV (comma-delimited) format. Datasets of all 4 participants were integrated into a single Excel file and analyzed for mouse-click reaction time and the number of distractors.

(Fig 1. Image of participant screen for the Visual Search Task Experiment)



Results



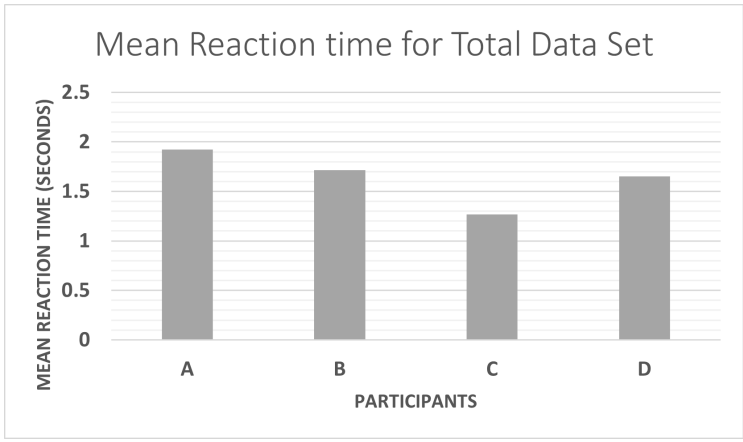
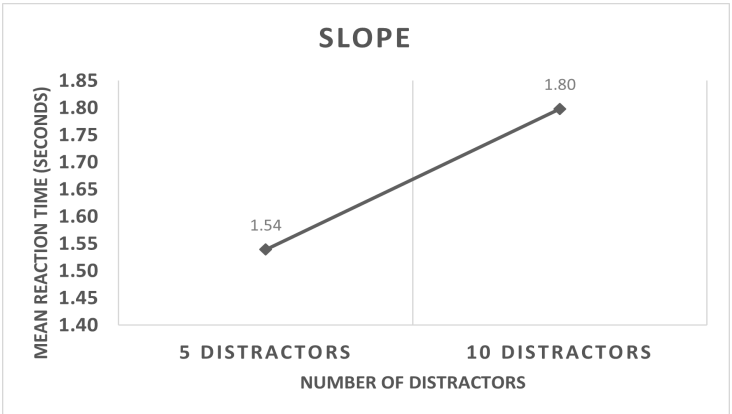


Fig 2: Comparative Chart for Reaction time and number of distractors
Fig 3: Mean Reaction time for Total Data Set

DATA SET:

Participants	5 distractors	10 distractors	Total Data Set
A	1.931331	1.921392	1.922034
B	1.71478	1.718195	1.71478
C	1.653331	1.650732	1.265852
D	1.265852	1.267324	1.650732



Slope:
(MeanRT for 10 distractors - MeanRT for 5 distractors)/(10-5)
= (Y2-Y1)/(X2-X1)

Slope= (1.80-1.54)/(10-5)
= 0.052 secs/distractor
= **52 milliseconds/distractor**

Discussion

Positive Slope: Reaction times appear to grow in tandem with an increase in set size, or the quantity of objects or distractions in the display, if the RT by set size function shows a positive slope. As the set size increases, the positive connection suggests that attentional resources are being serially assigned to each item, leading to longer reaction times.

This variation in the mean reaction times of varying numbers of distractions might be caused by a variety of variables. Maintaining focus and doing well in visual search activities requires steady hand and eye movements (e.g., mouse control). Participants who are paying attention are more adept at maintaining eye contact and hand control, which results in more precise answers.

The spatial arrangement of stimuli can affect the link between response time and attention. Participants may take longer to shift their attention to the target location when it is far from the fixation point, which might result in slower reaction times. Another important factor is the quantity of distractions. Less distractions lead to faster and more accurate replies, which helps participants identify the target from the distractions more quickly and precisely. On the other hand, the serial allocation of attention becomes more difficult in the presence of numerous distractions, resulting in slower and less precise replies.

The artificial laboratory settings of visual search tasks, which may not accurately represent real-world situations, and their dependence on simplistic stimuli that ignore the intricacies of real-world item recognition are among its significant shortcomings. They are still regarded as valuable resources in the field of attention research, nevertheless.

Citations

1. Wolfe, J. M., & Horowitz, T. S. (2017). Five Factors that Guide Attention in Visual Search. *Nature human behaviour*, *1*(3), 0058. https://doi.org/10.1038/s41562-017-0058