Visual Search Task
Lab Report

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Github link:

Introduction

A visual search task is a perceptual task that involves actively scanning the scene to search for a specific target. This target could be a specific object or even a feature. Although eye movements are not required for visual search tasks, saccades—rapid eye movements—are frequently used. The foveal vision is directed to various regions for in-depth examination by these saccades, which can aid in target recognition.

Cognitive, perceptual, and sensory processes are all involved in visual search. Consequently, the search paradigm has been applied to study a wide variety of phenomena. Changing the search task can change how much attention is required.

The exercises in visual search tasks demonstrate attentional shifts, showing patterns such as serial versus parallel processing and how the focus shifts during a scene. Furthermore, visual search shows variability in the ease and effort of attentional focus by differentiating tasks based on single features (e.g., colours and those requiring conjunctions of features (e.g., shape). These tasks are used by researchers to investigate the relationship between bottom-up control, which is influenced by environmental stimuli that are salient, and top-down control, which is directed by objectives and expectations. The efficiency of the attentional system is further determined by the speed and precision of target identification in visual searches, which also serve as indicators of attentional concentration and capacity.

Visual search efficiency, which measures the brain's ability to concentrate on a target while blocking out distractions, is closely related to attention. Selective attention is important for efficient searches because it shows the limits of attentional capacity; the more distractions present, the worse the search results. Conjunction searches take longer and need more work than simple feature searches. Efficiency is also influenced by how well top-down attention—driven by expectations—and bottom-up attention—driven by sensory salience—are balanced. Furthermore, increased cognitive load can reduce productivity by straining attentional resources, which is why visual search is an important tool in attention research.

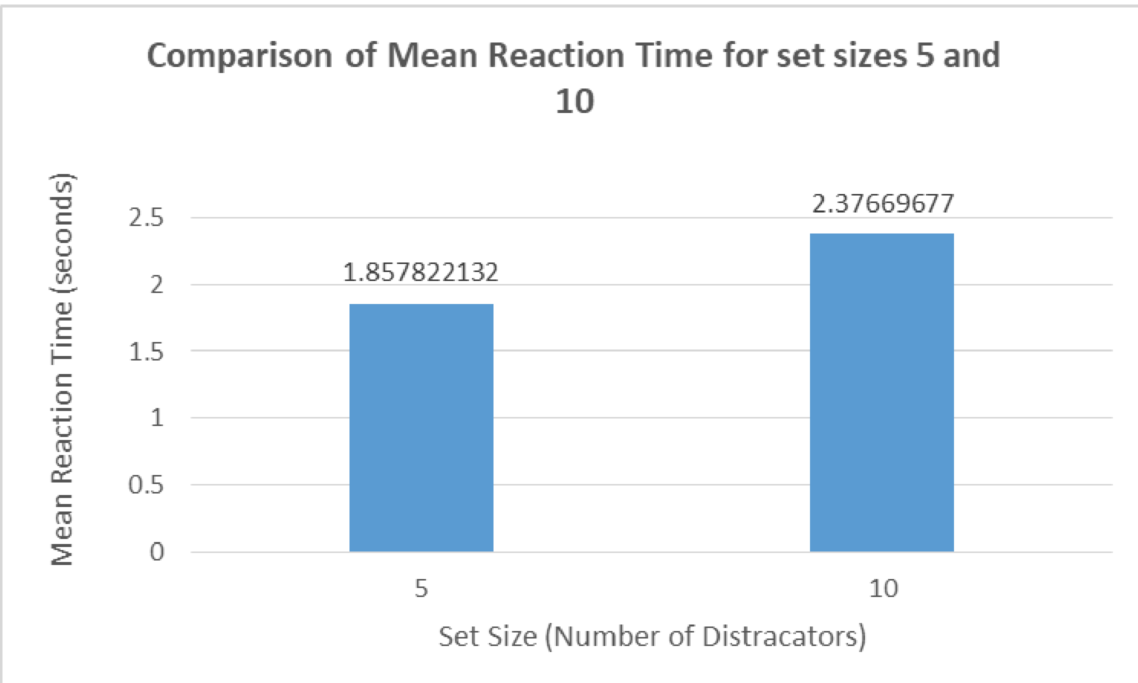
Method

Data was collected from the students in the Lab in Psychology course. They did the experiment themselves and shared data to compute the reaction time. The experimental setup was made with PsychoPy v2024.1.5 (Peirce et al., 2019). The 14-inch monitor that was used has a resolution of 1920 x 1080 pixels and a refresh rate of 60 Hz.

In this experiment, four participants each completed 200 trials of a visual search task designed to test their reaction speeds and the impact of distractors on attention and search efficiency. The task for the participants was locating and clicking on the letter 'T' on a screen, with the letter 'L' serving as a distractor. The target 'T' was positioned next to five or ten 'L' distractions at random in each experiment. Participants were timed on how soon they could click on the target and identify it using a mouse. The objective was to investigate the effects of changing the amount of distractions on search efficiency and attentional focus.

Result

The mean reaction time of accurate trials is 0.1037 which is approximately 104 milliseconds. The value shown indicates the average amount of time it took for participants to find and click on the target 'T' on all trials, independent of the quantity of distractions (either five or ten). With a mean reaction time of 104 ms, it appears that participants could do the job efficiently and respond effectively.



This bar graph shows how the mean reaction times for set sizes five and ten compare. The mean reaction time in seconds is displayed on the y-axis, and the number of distractions (set size) is represented on the x-axis. The graph shows that, in comparison to five distractions, the reaction time increases with ten.

The visual search task's slope of ***2.07549855*** indicates that participants' reaction times increase by about 2.075 seconds for each extra distractor. Put another way, individuals take longer and longer to find the goal 'T' when the number of distractions (such as the letter 'L') increases.

This slope indicates that there is a rather steep increase in reaction time with each additional distractor, suggesting that as the number of distractions increases, participants may find it more difficult to stay focused and locate the object quickly. This is a crucial sign of how the task's cognitive burden affects attention as it grows.

Discussion

In visual search tasks, the slope of RT by set size function provides an insightful indicator of how attention functions. It shows how well attention processes relevant versus irrelevant stimuli and the amount of cognitive burden that is imposed when there are different numbers of distractions. A steeper slope highlights the association between attention and cognitive performance in tasks requiring visual search, indicating that participants take longer to answer as attentional demands grow.

The slope of RT by set size contributes to our knowledge of the complex dynamics of attention, cognition, and behavior in complex visual environments in addition to quantifying the effect of distractions on performance. This information can be crucial for creating plans to improve attentional control, boost productivity on jobs requiring fast and precise decision-making, and deal with attention-related issues in a variety of settings.

References

Davis, E. T., & Palmer, J. (2004). Visual search and attention: an overview. *Spatial vision*, *17*(4-5), 249–255. Retrieved from https://doi.org/10.1163/1568568041920168