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MECHANISM OF VERBAL INFORMATION INFLUENCE ON VISUAL SEARCH

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Abstract
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Annotation

for the dissertation by Maxim Morozov, Ph.D. candidate in Psychology: "Mechanisms of Verbal Information Influence on Visual Search"

Two major trends can be observed in contemporary cognitive psychology of attention. The first is a general movement within cognitive science toward increasing the ecological validity of experimental research. In the domain of visual search, this trend manifests in the growing interest in how the categorical label of a target object affects the visual search process. In real-world conditions, a search target is typically defined by its categorical label, whereas in laboratory studies it is often specified by an exact image of the target. Experiments that more closely approximate everyday search contexts involve greater variability and thus require more complex theoretical frameworks to interpret the results. Consequently, earlier models of visual search have not fully accounted for how categorical target label influence the mechanisms of visual search.

The second major trend is the development of the Guided Search theory (Wolfe, 2021) toward an integrated model that can explain visual search mechanisms across a wide range of conditions within a unified framework. Following these trends, the present research investigates how the categorical label of a target influences the process of visual search.

According to current theoretical perspectives, visual search comprises two key processes: guidance and target verification. The guidance process involves selecting candidate objects based on their perceptual similarity to the target. The target verification process entails comparing selected candidate objects to the target representation (the target template) in order to determine which of them matches the target. To date, no theoretical model has described how a categorical target's label affects the target verification process during visual search. Previous studies have primarily focused on how categorical target label influence guidance. The present research addresses this gap by examining the mechanisms through which a categorical target label affects the target verification process.

Based on theoretical analysis and a series of experiments, the following findings were obtained:

1. Two groups of mechanisms were identified that explain how the categorical target label influences information processing during visual search. The first group of mechanisms is associated with the guidance process. It was found that the influence of the categorical target label is indirect. When the search target is defined by its categorical label, its effect on guidance is mediated by the visual features of the most typical exemplar of the target category. In tasks that require the integration of visual and verbal information, the categorical label influence is mediated by the pre-processing of stimuli and their activation in long-term memory.
2. No effect of the categorical target label was found on the maintenance of the guiding template in working memory during the execution of the visual search task. This absence of influence is likely due to the working memory's ability to prioritize the guiding template over other concurrent representations during search.

3. The second group of mechanisms was associated with the target verification process. A review of the literature revealed that these mechanisms remain underexplored. The present study addressed the problem of how categorical target label may influence target verification during visual search.
4. A theoretical model was proposed to describe how categorical target label affects target verification. According to this model, the categorical label facilitates target verification by reducing interference between the target template and other representations stored in activated long-term memory. This reduction in interference occurs due to the additional activation of the target template elicited by the categorical label.
5. However, this model did not receive empirical support. Instead, the activation of a categorical target label led to an increase in target verification time. This effect was observed both for category labels newly learned during the experiment and for labels that were already familiar to participants. Furthermore, maintaining words semantically related to the target template in memory did not affect the verification process.
6. Based on these findings, several modifications were made to the theoretical model. Two conditions were identified under which interference between the target template and other representations stored in activated long-term memory occurs during visual search:
   (a) the interfering representations must have a perceptual format of encoding; and
   (b) these representations must be associatively or semantically related to the target template. Interference arises only when both of these conditions are met simultaneously.
7. The final model provides an explanation for the influence of verbal information on target verification. The activation of a categorical target label leads to the activation of a perceptual representation of the most typical exemplar of the target category. Because this representation is linked to the target template, it remains co-activated in ALTM, producing interference between the two representations. This interference results in a slower target verification process.