

Failure to Recognize a Manipulated Target during Search

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BACKGROUND

Occlusion and the need for physical exploratory actions are common aspects of search outside of the lab. Little prior work has explored search under these conditions.

EXPERIMENTS

In two experiments we used a novel “Unpacking” paradigm. Participants were presented with a heap of items on virtual “cards” and instructed to use the mouse to sort through the heap and locate the target item, and then drag this item onto the green box containing the target template.

In **Experiment 1** we evaluate the basic characteristics of the task, manipulating Set Size (12, 24) and item type (Similar, Dissimilar).

Similar

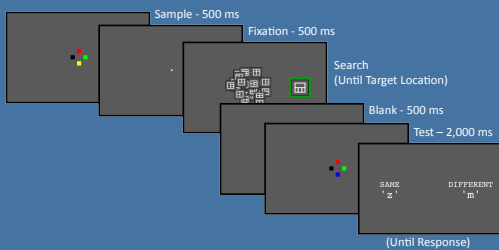


Dissimilar

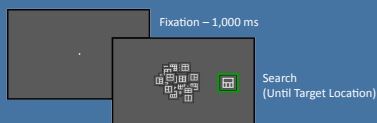


In **Experiment 2** we evaluate performance under memory load, manipulating Set Size (12, 24) and memory load (Load, No Load) for search among Similar items.

Load Display Sequence



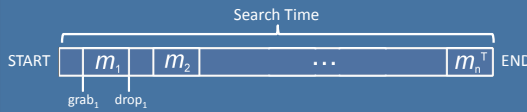
No Load Display Sequence



ANALYSIS

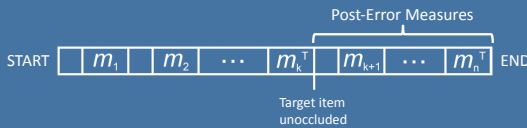
$$m_i = i^{\text{th}} \text{ move in trial} \quad m_i^T = \text{Target move}$$

Search Time: From display onset to trial-terminating Target drop. Corrected for positive skew with log-transform.



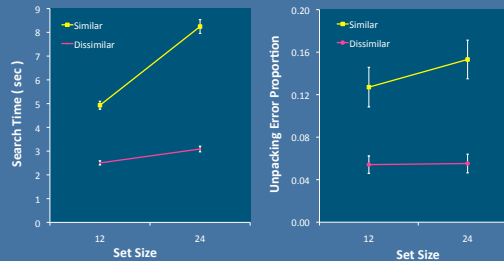
Unpacking Error: Target item is moved more than once during the trial.

Post-Error Measures: Time and number of moves following first target move. Comparison trials – non-error trials where target is unoccluded at display onset (since target is guaranteed to be unoccluded following the erroneous target move in error trials).



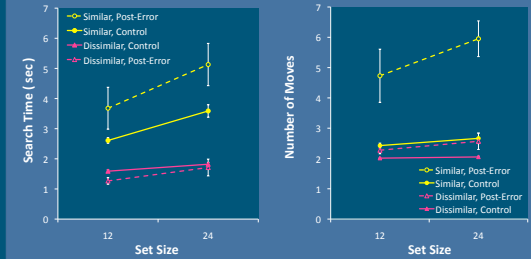
Experiment 1 RESULTS

Overall Search Times & Unpacking Error Rate



- 1) Search faster and more efficient for Dissimilar items vs Similar items.
- 2) More unpacking errors for Similar item vs Dissimilar items.
- 3) No effect of Set Size on unpacking error rate, despite robust effect on overall search times.

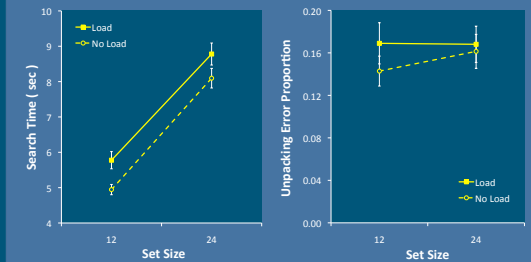
Post-Error Measures



- 1) For Similar items, search following unpacking error is slower, and requires more moves than search on comparable non-error trials.
- 2) For Dissimilar items, these effects are attenuated or absent altogether.

Experiment 2 RESULTS

Overall Search Times & Unpacking Error Rate



- 1) Search times slower but no less efficient under memory load.
- 2) No difference in unpacking error rates for search under load and search alone.

GENERAL DISCUSSION

The unpacking error is necessarily unique to settings where physical interaction with search items is possible.

The likelihood of the error depends on target-distractor similarity, but not on either set size or dual task manipulations.

Indicates a striking dissociation between perceptual and motor processes during embodied search, apparently independent of central-resource limitations.