VSS2013

Searching for many targets: What can eye-movements tell us about hybrid visual and memory search?

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In "Hybrid" Search, observers memorize a number of possible targets and then search for any of these in visual arrays of items. How is this Hybrid Search accomplished?

1. Observers might search through the memory set each time a visual item is evaluated.
2. Observers might search the entire visual display for one target at a time, requiring multiple sequential searches.

In the current set of experiments, we tracked eye-movements during Hybrid Search for photorealistic objects. Observers searched for one of 1, 4, 16, or 100 targets amongst 8 or 16 possible items. Wolfe (2012) has previously shown that reaction times in Hybrid Search increase with the log of the memory set size. Thus, the increase from 1 to 4 possible targets is roughly equivalent to the increase from 4 to 16 targets. In our data, distractor dwell time also increased in a loglinear fashion with memory set size, providing strong evidence that hybrid search is accomplished through a memory search for each visual item that is fixated. There was no evidence for multiple searches through the display as would be expected if each target was searched for separately.

In addition, memory set size had a profound effect on the number of items that were fixated: when searching for one item, only 7% of distractors was fixated, while 54% of distractors was fixated with a memory set size of 100. It is possible that fewer items were fixated at smaller memory set size because a more precise template could be used to reject many visual items. Alternatively, Os may have processed many items in a single fixation when the memory set was small; either by multiple, serial deployments of covert attention or by expanding function visual field, allowing for processing of multiple visual objects in parallel (Young & Hulleman, 2012).