Grouping does not help you to guide conjunction visual search

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The knowledge of target features can be used to guide attention in many conjunction searches in a top-down manner. For example, in search for a red vertical line among blue vertical and red horizontal lines, observers can guide attention toward all red items and all vertical items. Items with both features would gain greater activation. It could be that attention is guided to the group of red items and the group of vertical items with items neatly divided into those with a target feature and those without. Alternatively, attention might be guided to any reddish and relatively vertical items, with no grouping. We tested whether clear, categorical groups were useful in guided search. Observers searched for color-orientation (Experiment 1) or length-orientation (Experiment 2) conjunction targets. Distractors could form two segmentable groups (e.g blue steep and red flat) or distractors could be "non-segmentable" varying from red to blue and steep to flat discouraging grouping and increasing overall heterogeneity. We found that, when the target was present, the searches were quite efficient in Experiment 1 (~9-14 ms/item) and more efficient in Experiment 2 (~0-6 ms/item). Target-present slopes were not affected by "segmentability" manipulations. However, target-absent slopes were less efficient if one of the dimensions was "non-segmentable" (especially in length-orientation conjunctions). In Experiment 3, we demonstrated that search in "non-segmentable" conjunction sets search no less and could be even more efficient than search in "non-segmentable" feature search. Our results suggest that attention is directly guided by the overlap between top-down activation signals corresponding to target features. The guidance mechanism bypasses grouping and segmentation cues that are very important in other tasks like scene parsing and object recognition.

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