

# *An abstract equivalent of visual search: Gain maximization fails in the absence of visual judgments.*

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## Abstract

Consider two sequential tasks, one visual, one abstract. In the visual search task, observers examine object after object to find a target. The target is present on only a proportion of the trials, observers search as long as they like and declare finally whether the target is present or absent. They are rewarded for correct responses. In the abstract task, observers click on a series of boxes on a computer display, one of which may contain a prize. There is a cost to opening each box and they continue opening boxes until they find the reward or decide not to look further. These tasks are similar in structure. However, in the visual task, observers were nearly optimal gain maximizers with average winnings above 95% of optimal, while in the abstract task, they were far below optimal, with average winnings about 65% of optimal. In the box task, the longer it had been since the last time observers found a prize, the fewer boxes they would open. This behavior suggests that they may have treated the independent trials as non-independent in the box task, but not in the visual search task. Moreover, while visual search observers compensated effectively for changes in target prevalence and remained nearly optimal, in the abstract task, prevalence changes lead to even greater deviations from optimality. Our results clearly show fundamental differences between how visual and abstract information is exploited. One possibility is that visual decisions were optimal because observers made multiple rapid decisions about items in the display, while the longer box decision times allowed opportunities for biases to creep in. Alternatively, we may be evolutionary equipped for visual search but not for abstract reasoning. Estimating probabilities in the search task may be easier than processing the explicitly stated probabilities in the box task.