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Dear Editorial Board members,

Evolutionary pressures have made foraging behaviors highly efficient in many species. Eye movements during search present a useful instance of foraging behavior in humans.To what extent can human search be considered efficient? As an example, imagine that you are searching for a red pen, and you know it could be on either of two desks. One desk is completely clean, while the other desk is cluttered with papers, other pens, books, and coffee cups. What is the most effective way to find the red pen? An optimal visual system would not waste any time on the clean desk, but would instead direct eye movements to locations that will maximise information gain (i.e., the cluttered desk).

We test this straightforward prediction using search arrays split vertically into two halves in such a way that the target pops out from the distractors on one side but not the other. If the target is on the pop-out side it would be easily detected using peripheral vision, making any eye movements directed to that region superfluous. We show that observers, as a group, make many fixations on the pop-out side, demonstrating a striking failure to adopt an optimal strategy. We quantify the substantial extent to which each of these unnecessary fixations slow search, and expose two separate components of this inefficiency: a failure to direct fixations to locations that yield new information, and unnecessary fixations that sacrifice speed for a perceived (but not actual) gain in response accuracy. Both of these effects are not well accounted for by an ideal search model, which was first formally proposed a decade ago (Najemnik and Geisler, 2005) and in the absence of direct challenges, has been gaining in acceptance ever since.

Our results reveal surprising and important limitations in human search performance. Previous experiments demonstrating optimality used either complicated algorithms or contrived tasks that impede parallel comparisons to human search performance in every day settings. Our straightforward paradigm and easily quantifiable results present a serious challenge to this increasingly popular viewpoint. We therefore believe our study is important, timely, and particularly well suited to the Proceedings of the Royal Society: B. We therefore kindly request you to consider our enclosed manuscript, entitled "Human visual search behavior on non-uniform arrays is far from ideal" for publication in your journal.

We look forward to your decision and thank you in advance for your consideration,

Anna Nowakowska, Alasdair Clarke & Amelia Hunt

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