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Dear Editorial Board at *Psychological Review*,

Please find our submission of “Participants use a mixture of strategies to solve sequential decision problems” by van de Wouw, McKay & Furl. Below, we briefly detail why we have selected *Psychological Review* as a suitable venue for reporting this research and attach an abstract below.

We systematically evaluate alternative computational theories to explain how humans approach decision problems that are ubiquitous in the real world. In these “optimal stopping problems”, sequentially presented options are available for choice only at the time they are presented. Though optimal mathematical solutions exist, most work with human behaviour is limited to a simple “toy” version (the “secretary problem”). Here, we advance our knowledge about humans solve “full information problems”. This computationally more challenging optimal stopping problem better resembles many real-world searches through sequences for ideal options, such as online dating, job searches, shopping, etc. We show that the previously-proposed “ideal observer” solution falls short of explaining human choices. We therefore built five improved computational theories of choice, each of which includes psychologically interpretable parameterisations to explain choice. We fitted and compared these models to ten datasets, including previously un-investigated search domains. Participants relied mainly on two possible strategies. Some participants were overly optimistic about future option values. Other participants perceived the act of sampling new options as itself rewarding. Both strategies motivated participants to sample more options than the ideal observer.

This submission includes Supplementary test and figures. The results presented in these materials are included in supplement rather than main text, as they are not used to directly test our primary hypotheses. Nevertheless, they include results that are considered good scientific practice for complete computational modelling reporting such as parameter recovery analyses and plots of fitted parameter estimates, though we do not draw additional conclusions from the magnitudes of these estimates themselves. The supplementary materials also include analysis of the ranks of the chosen options about which, in our experience submitting papers with similar paradigms, reviewers often ask. Nevertheless, our hypotheses most directly concern the number of options samples as the main dependent variable, as reported in the main text.

The submitted manuscript reports secondary analysis of datasets previously analysed in the below references, as well as analysis of new datasets.

Furl, N., Averbeck, B. B., & McKay, R. T. (2019). Looking for Mr(s) Right: Decision bias can prevent us from finding the most attractive face. Cognitive Psychology 111, 1–14. https://doi.org/10.1016/j.cogpsych.2019.02.002

van de Wouw, S., McKay, R., Averbeck, B. J., & Furl, N. (2022). Explaining human sampling rates across different decision domains. *Judgment and Decision Making 17,* 487-512. https://doi.org/10.1017/S1930297500003557

Recommended reviewers:

Michael Lee, UC Irvine, mdlee@uci.edu

Non-preferred reviewers:

Peter Todd, Indiana University

Abstract:

Full-information best choice problems typify many real-world decisions. Participants face a sequence of decision options and must accept or reject each option at the time it is encountered. The challenge is to use prior knowledge of the distribution of option values to predict whether continued sampling might result in a higher-valued option than the one currently on offer. On these tasks, biases are apparent when human decisions are compared against mathematical optimality solutions. Specifically, tasks involving choices about options presented as images appear to evoke an oversampling bias, in which participants perform suboptimally by rejecting optimal choices and continuing to sample new ones. Using computational modelling of ten datasets spanning five choice domains, we demonstrate two dominant sampling strategies. These strategies, which explained the overly long searches, involved a combination of overly optimistic predictions about future option values and an intrinsic perception that sampling itself has reward value. These strategies, and their associated systematic biases, could manifest in real-world decisions such as shopping, choosing dating partners or trustworthy job candidates.

Sincerely,

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