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Dear Dr Marieke Schiffer and the Editorial Board at *Communications Psychology*,

Please find our revised submission of “Biased expectations about future choice options predict sequential economic decisions” by van de Wouw, McKay & Furl, originally submitted as COMMSPSYCHOL-22-0014 under the title "How we model prior belief is crucial for predicting decision biases in realistic contexts". Below, we briefly detail how we feel our revisions have enhanced the scientific contribution of this work.

Our initial submission focused on how undersampling biases in realistic sequential decision problems (described in the Abstract) could best be compared to an ideal observer optimality standard, with a focus on how specification of the prior over prospective option values changes the appearance of the bias. The editor and both reviewers felt the manuscript would be enhanced if it offered computational models as theories of undersampling bias, rather than focusing only on comparisons to optimality. We were also asked to run additional studies to further probe our participants’ apparent reluctance to change their sampling rates from condition to condition.

We have accomplished both goals, though they entailed large changes to the manuscript, including to its main narrative. We propose and build new computational models of biased sequential searches, validate them with parameter recover, fit them to human participant data and compare their model fits. All data and code is freely available. We apologise that the creation of this extra research output has taken the time that it has. Nevertheless, we now offer a paper that, as requested, is driven more by computational theory, that now directly explains participants’ undersampling bias and that cements and validates our empirical approach. We believe that the manuscript therefore now makes a stronger scientific contribution that is more appropriate to *Communications Psychology*. Many thanks to you and the reviewers for encouraging this more ambitious version of the work. We look forward to getting feedback on these changes from the reviewers, as we suspect they are what was being envisioned.

In brief (See Abstract for more detail), the main contribution now is that we show that it is the participants themselves who are mis-specifying their prior distribution over options. In doing so, participants derive from their mis-specified prior distribution suboptimally pessimistic expectations of future option values, thereby demotivating them from continuing to search and encouraging them to undersample. Optimality ideal observer models, which are not subject to this bias, are freer to increase their sampling rates when it is adaptive to do so: Such as for incentivisation schemes that favour more option sampling and when sequences of options are longer. The new manuscript demonstrates increased undersampling bias in both these scenarios.

Sincerely,

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Abstract

Considerable research has shown that people make biased decisions in “optimal stopping problems”, where options are encountered sequentially, and there is no opportunity to recall rejected options or to know upcoming options in advance (e.g., when flat hunting or choosing a spouse). Here, we use computational modelling to identify the mechanisms that best explain decision bias in the context of an especially realistic version of this problem: the full-information problem. We show that participants’ bias - the extent to which their sampling rates deviate from an optimality model - depends on the sequence length and the nature of the payoff scheme. Meanwhile, we rule out a variety of other hypothetical sources of bias. Our comparison of several computational models of bias demonstrated that bias most often arises from inaccurate expectations of the quality of future options (i.e., a mis-specified prior distribution). From these results, we propose a new theoretical viewpoint for the human solution to full information problems. Understanding the causes of decision errors could enhance how we conduct real world sequential searches for options, for example how online shopping or dating applications present options to users.