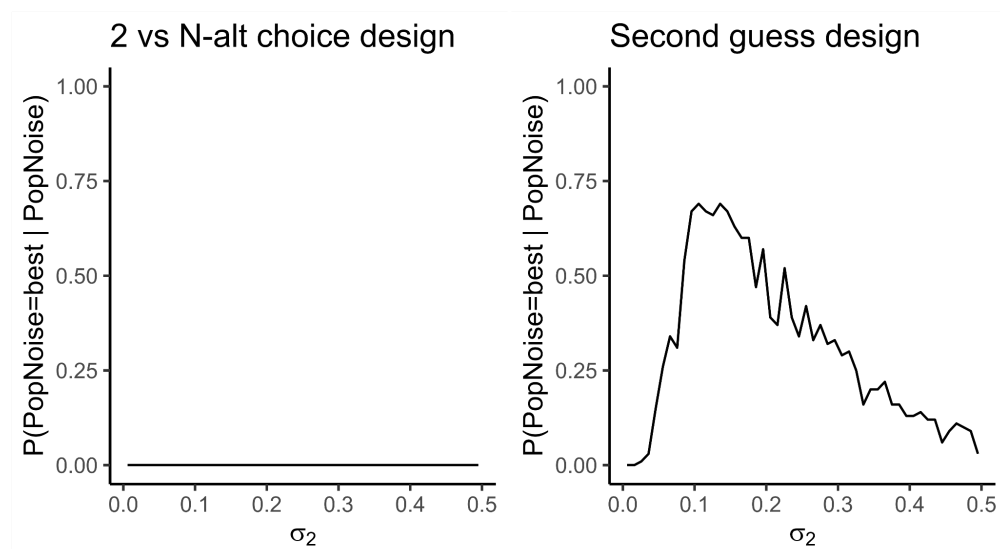


Supplementary material for the study: “Decisions are based on less information than metacognitive judgments in multi-alternative contexts”

Model recovery analysis.

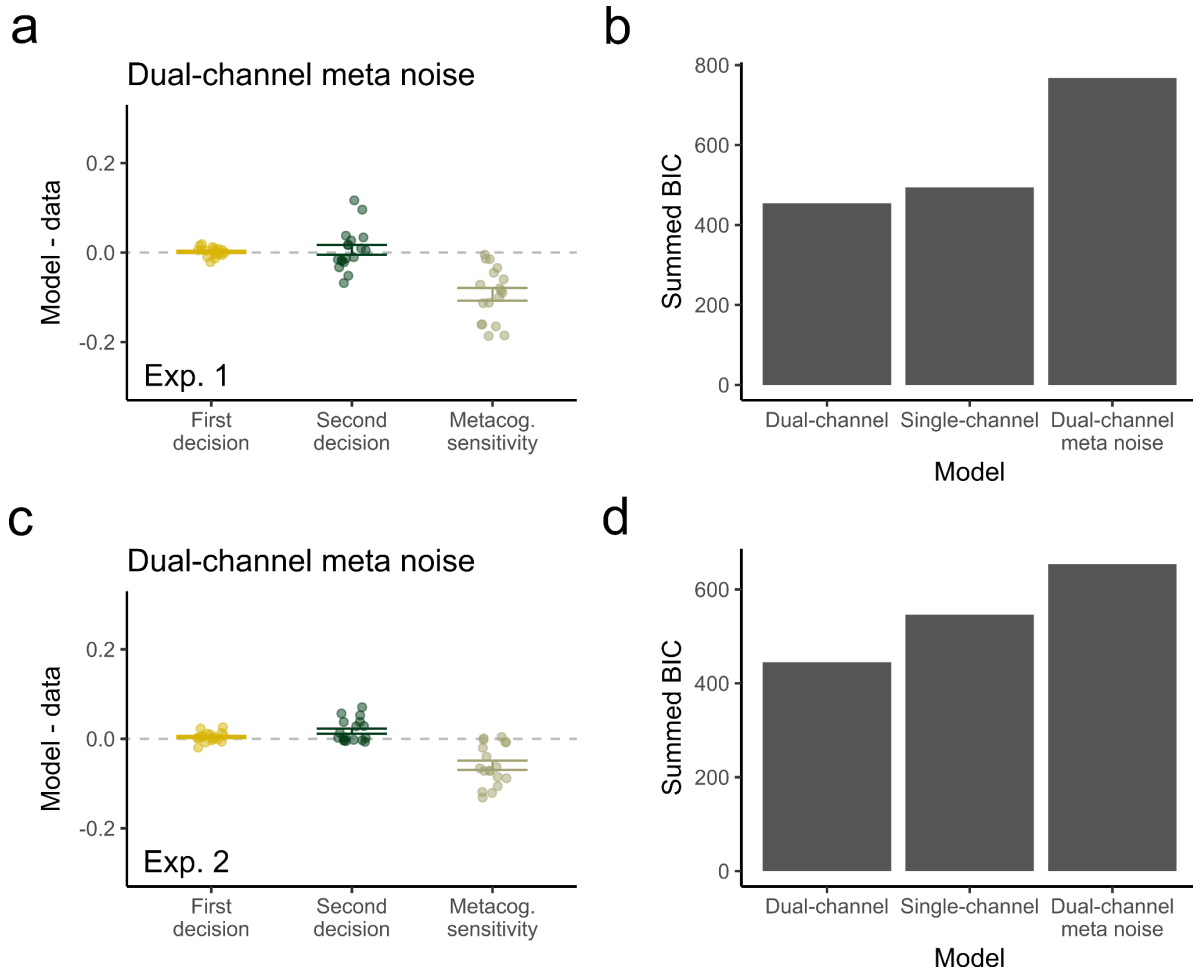
To evaluate whether the design from experiments 1, 2 and 4 from Yeon & Rahnev (2020) study (“2 vs N-alt choice design”) and the second guess design allow us to recover the Population+noise model we simulated 600 trials from 5000 subjects with this model under each design. We fixed the initial σ to 0.07 for the 2 vs N-alt choice design and to 0.09 for the second guess design (those values were the mean σ found across subjects after fitting the Population+noise models to Experiments 1 and 3 from Yeon & Rahnev’s study). Then, we simulated each subject with increasing values of σ_2 , ranging from 0.001 to 0.5. After the simulation was complete we fitted the three competing models to each simulated subject. We found that only the second guess design allows recovery of the Population+noise model, as can be seen in the Supplementary Figure 1 below.



Supplementary Figure 1 – Model recovery analysis. On the y axis is depicted the probability of finding the Population+noise model as the best fitting model on the simulated data. To approximate this probability we constructed bins of 100 values of σ_2 and computed the relative frequency of finding the Population+noise model on each bin. The 2 vs N-alt choice design (left panel) did not allow the recovery of the Population+noise model, as this probability was equal to zero for all values of σ_2 . On the other hand, the second guess design (right panel) can recover the true model, especially at middle noise levels. This makes sense as the Population+noise model practically reduces to the Population model at low-noise levels and to the Summary model at high-noise levels.

Population+noise dual channel model with metacognitive noise.

Given that recent metacognition models include “metacognitive noise” (Bang et al., 2019; Boundy-Singer et al., 2023; Mamassian & De Gardelle, 2022; Shekar & Rahnev, 2021), we tested a version of the Population+noise model including noise specifically for metacognitive computations. In other words, this version of the model follows a dual-channel architecture where the metacognitive channel—the one that carries information for confidence judgments—is corrupted by a different noise parameter (σ_3) than the one corrupting the information in the decision channel (σ_2). Results of model fits are shown below in Supplementary Figure 2, along with a BIC comparison with the other Population+noise models tested in the two experiments.



Supplementary Figure 2 – Population+noise model with metacognitive noise fitting results. a) Experiment 1 model fitting results. b) Model fitting comparison with other versions of the Population+noise model in Experiment 1. Note that this “metacognitive noise” version wins against the Summary model ($BIC_{\text{summary}} = 1274.89$) but not against the Population model ($BIC_{\text{population}} = 455.63$) in this dataset. c) Experiment 2 model fitting results. d) Model fitting comparison with other versions of the Population+noise model in Experiment 2. Note that this “metacognitive noise” version wins against both the Summary model ($BIC_{\text{summary}} = 911.03$) and the Population model ($BIC_{\text{population}} = 1141.99$) in this dataset.

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