

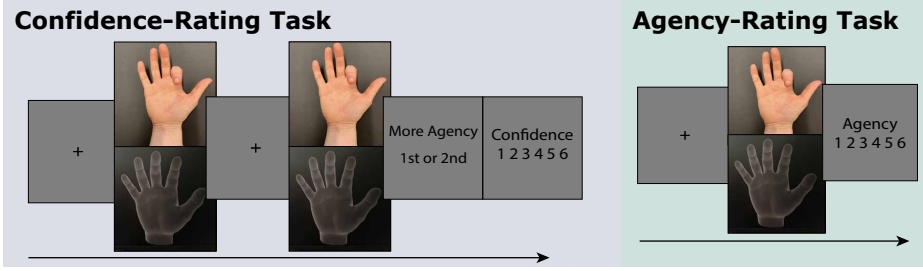
Are agency judgments metacognitive?

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Background

Judgments of agency (JoAs) have often been assumed to be metacognitive ¹, since, at the broad conceptual level, they seem to involve monitoring of one's own cognition. However, it is unclear if this link holds at the level of computational mechanisms. To determine whether JoAs are metacognitive in the computational sense, we investigate whether JoAs monitor the precision of an internal representation following the same computational principles as metacognitive confidence judgments ².

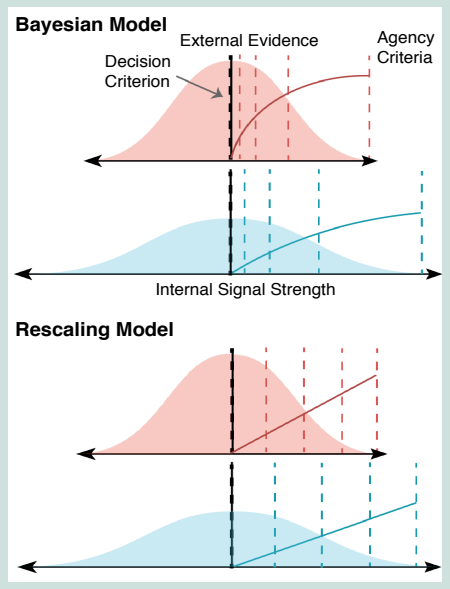
Methods



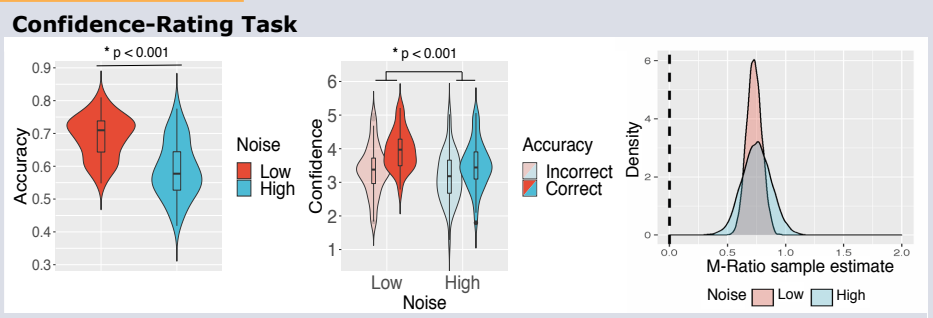
Participants (n=47) made finger movements and watched a virtual hand that tracked their movements, either in synchrony or with added delay (70, 100, or 200 ms, or staircased in confidence task) ³. This was done in a 2IFC confidence task (200 trials), and an agency rating task (480 trials). In both, we manipulated sensory noise by changing the contrast of the virtual hand displayed on the screen.

Predictions

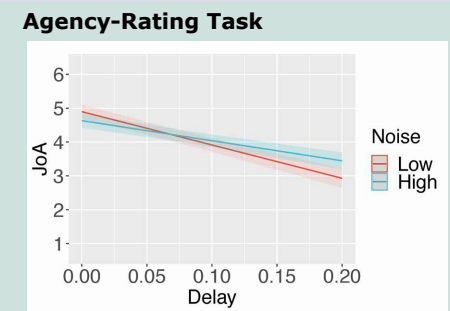
- We formed a 2-criterion test for JoAs being metacognitive:
- JoAs should be affected by the precision of the comparator signal
 → Mean JoA should depend on delay and noise.
 - JoAs should monitor the noise, scaling with P(Correct) about agency detection, like confidence ²
 → To test this, we compared two models, both satisfying Criterion 1:
 The Bayesian-agency model involved metacognitive monitoring like confidence.
 The Rescaling model did not.



Results

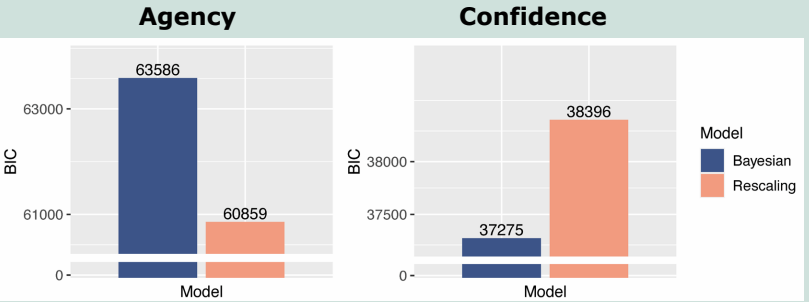


Accuracy and confidence following correct decisions were lower in high noise, confirming our noise manipulation worked. Participants could metacognitively monitor their agency decisions above chance in both conditions ⁴.



Mean JoA did depend on both noise and delay, with less change in JoA across delays under high noise. Hence, JoAs met our first criterion and were influenced by noise.

Model Fits



The Rescaling model - involving no metacognitive noise estimates - better explained JoAs, while confidence was better explained by the Bayesian model. Therefore, the influence of noise on JoAs is better considered as a contextual cue leading to ratings being compared independently per condition.

Conclusion

- JoAs better reflect first-order measures of the internal signal, without involving metacognitive computations.
- JoAs are influenced by noise when it can serve as a visible cue to rescale ratings.
- Participants can make strictly metacognitive confidence judgments about agency.

References
 [1] Metcalfe & Greene, 2007, *J. Exp. Psychol. Gen.*, 136, 184
 [2] Sanders et al., 2016, *Neuron*, 90, 499
 [3] Krugwasser et al., 2019, *J. Vis.*, 19, 14
 [4] Fleming, 2017, *Neurosci. Conscious.*