



Effects of Confidence Feedback on Sequential Dependencies and Metacognitive Efficiency in Recognition Memory

Patrick Sweeney, Sara Leslie, & Michael Miller
University of California, Santa Barbara



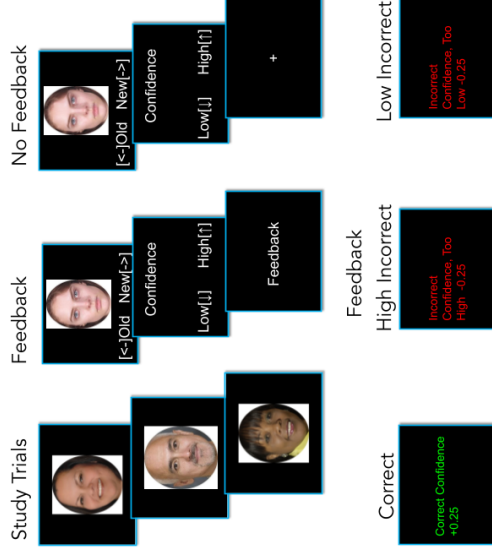
Introduction

- Subjective confidence estimates for decisions made with reference to memory or perceptual evidence allow for the assessment of past decisions and the preparation for future decisions.
- Feedback on confidence accuracy during perceptual decision making tasks has been shown to improve metacognitive biases and efficiency.^{1,2} Previous work has shown sequential dependencies in confidence estimates.³
- However, we are aware of no studies to date that investigate the effects of confidence feedback on sequential dependencies for confidence estimates in domain of recognition memory
- In this ongoing study, we aim to demonstrate that confidence feedback on a recognition memory task improves confidence calibration and reduces sequential dependencies in confidence as would be expected given the aforementioned research.

Methods

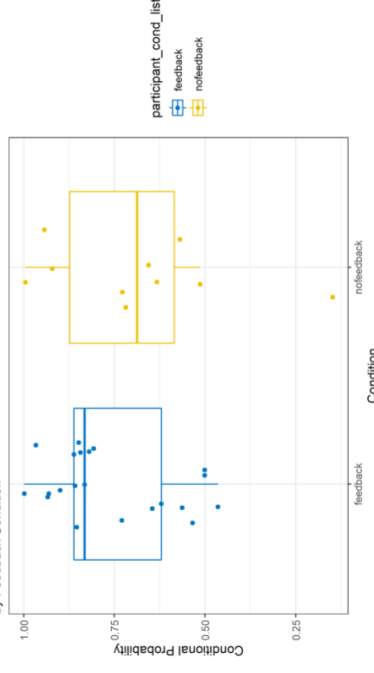
- Experiment:**
- 31 participants (6 M, 23 F, 2 O; $M_{age} = 19.2$, $SD = 0.91$)
 - 1200 test trials over the course of 10 blocks per participant
 - In study trials 60 face images are presented for 400 ms followed by 50 ms interstimulus interval.
 - In test trials, 120 face images are presented until the participant responded. In half of the trials the face images were presented on a study trial. Participants indicate whether the picture was old or new using the arrow keys (right for new, left for old).
 - After the participant indicated whether or not they seen the image, their confidence is assessed using a two-point scale. Participants used the up arrow to answer with high confidence and down for low confidence.
 - In the feedback group, participants receive feedback indicating that their confidence was correct, too high, or too low. Feedback lasts for 850 ms.
 - Participants are rewarded with in-game money based on their confidence performance
- Analysis:**
- Using rstudio we ran a t-test comparing metacognitive efficiency of the baseline blocks compared to last two blocks between conditions.
 - Metacognitive efficiency was calculated using the metaSDT package for R. Metacognitive efficiency is defined as the discriminability of the confidence decision (meta-d') over the recognition memory stimuli discriminability (d').
 - A t-test was also performed to compare sequential dependencies (the conditional probability that a confidence response predicts the next confidence response) for confidence estimates between groups.

Methods



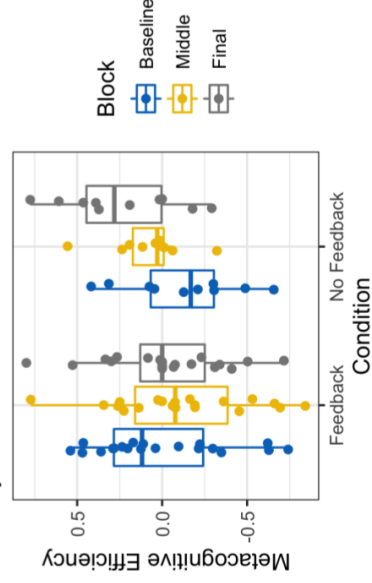
Results

Sequential Dependency for High Confidence by Feedback Condition



Results

Metacognitive Efficiency Across Blocks by Feedback Condition



Discussion

- In these preliminary result, the confidence feedback group showed significantly decreased metacognitive efficiency in comparison to the no feedback group.
- Moreover, the feedback group showed increased confidence carryover for high confidence.
- Contrary to our initial hypothesis, feedback appears to worsen metacognitive performance.
- These results are preliminary and a larger sample is currently being collected. Ergo, more participant data is needed to draw conclusions about the relationship between confidence feedback in recognition memory and metacognitive performance.
- Future analysis will be done on the complete dataset to investigate the effect of the kind of feedback that is received (correct or incorrect feedback trials) and confidence carryover.

References

1. Carpenter J, Sherman MT, Kevir RA, Seth AK, Lau H, Fleming SM. Domain-general enhancements of metacognitive ability through adaptive training. *J Exp Psychol Gen.* 2019;148(1):51-64. doi:10.1037/xap0000505
2. Haddara, N., & Rahnev, D. (2022). The Impact of Feedback on Perceptual Decision-Making and Metacognition: Reduction in Bias but No Change in Sensitivity. *Psychological Science*, 33(2), 259-275. <https://doi.org/10.1177/09567976211032887>
3. Kanmer, J., Solinger, L. A., Gyalinas, D., & Dobbins, I. G. (2019). Confidence carryover during interleaved memory and perception judgments. *Memory & cognition*, 47(2), 195-211. <https://doi.org/10.3758/s13421-018-0859-8>.

Contact: patrick@sweeney@ucsb.edu, saramlesie@ucsb.edu