

Guessing and memory processes in output interference in recognition memory

Analyses with a non-stationary diffusion/fast-guess mixture model

Selina Zajdler ^a, Martin Schnuerch ^a, Lukas Schumacher ^b

^aUniversity of Mannheim, ^bUniversity of Basel

1 Background

- Output interference (OI):** recognition accuracy declines over the course of a memory test
- Proposed mechanisms:** motivational and/or memory processes
- Formal approach to OI by means of **diffusion decision model** (e.g., Kilic, 2012; Osth et al., 2018)
 - Decrease in drift rate (evidence for a cognitive process)
 - Ambiguous findings for boundary separation
- Problem(s):** No trial-level modeling, motivation is exclusively mapped onto boundary separation parameter

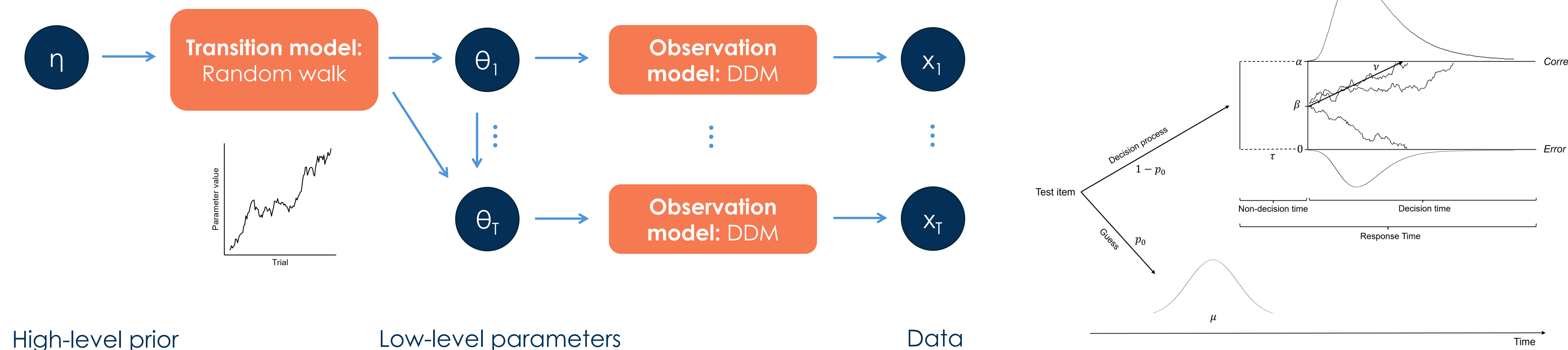
2 Research Goal

Gain more insight into the relative processes contributing to OI by modeling

- Guessing** as an additional motivational measure
- Parameter trajectories at the trial level**

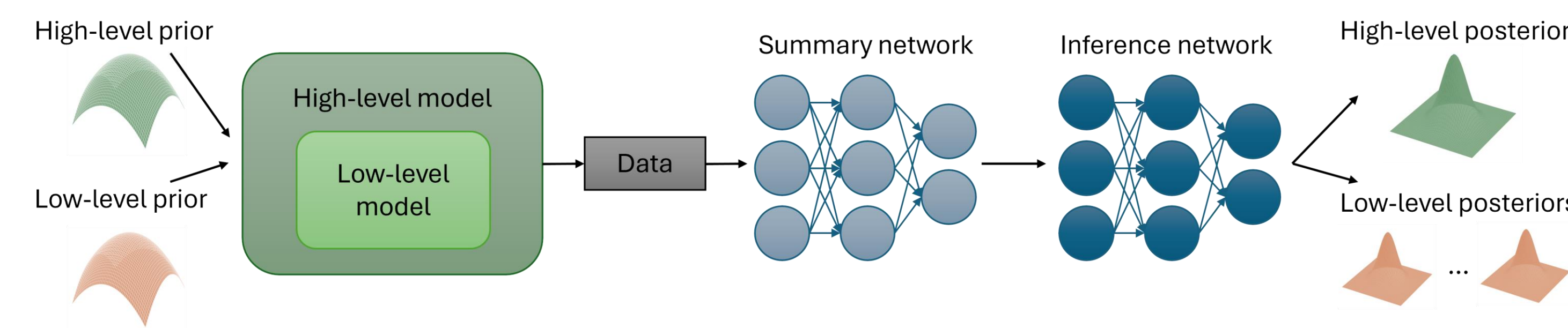
3 Superstatistics Model

(e.g., Schumacher et al., 2023)



4 Amortized Bayesian Inference

(Radev et al., 2022)



5 Data Sets

1 Schnuerch (2014):

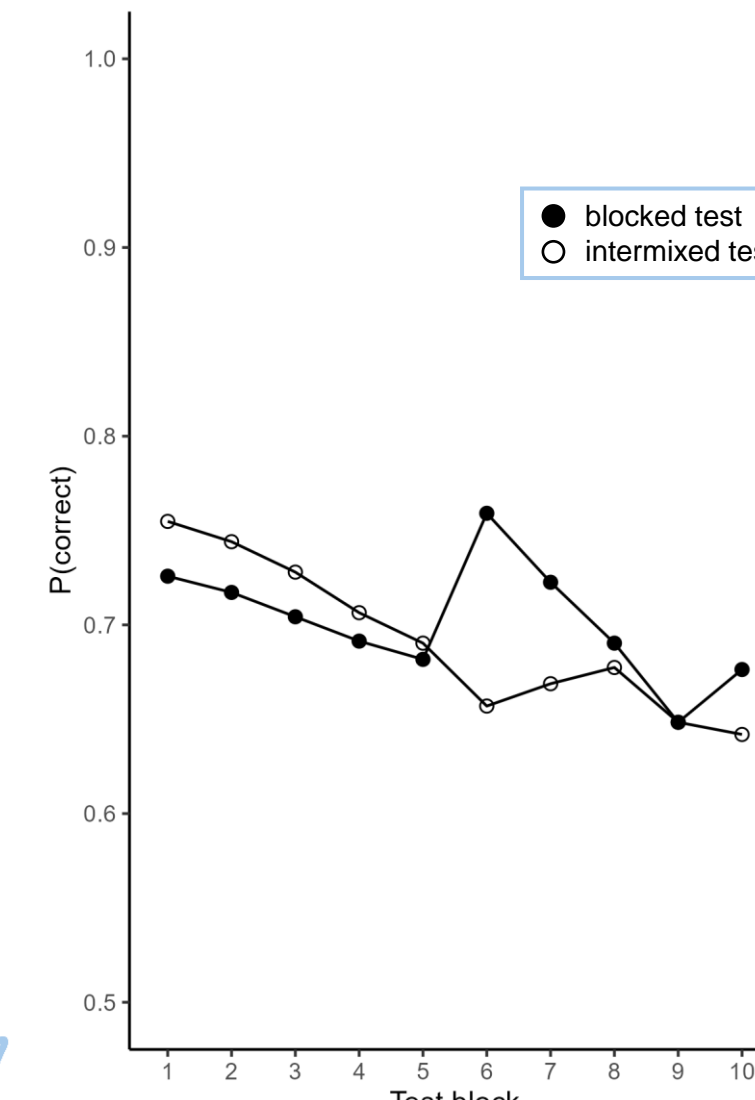
Recognition memory for images with 2AFC response format, $i = 80$

2 Osth et al. (2018):

Recognition memory for words with old/new categorization, $i = 96$

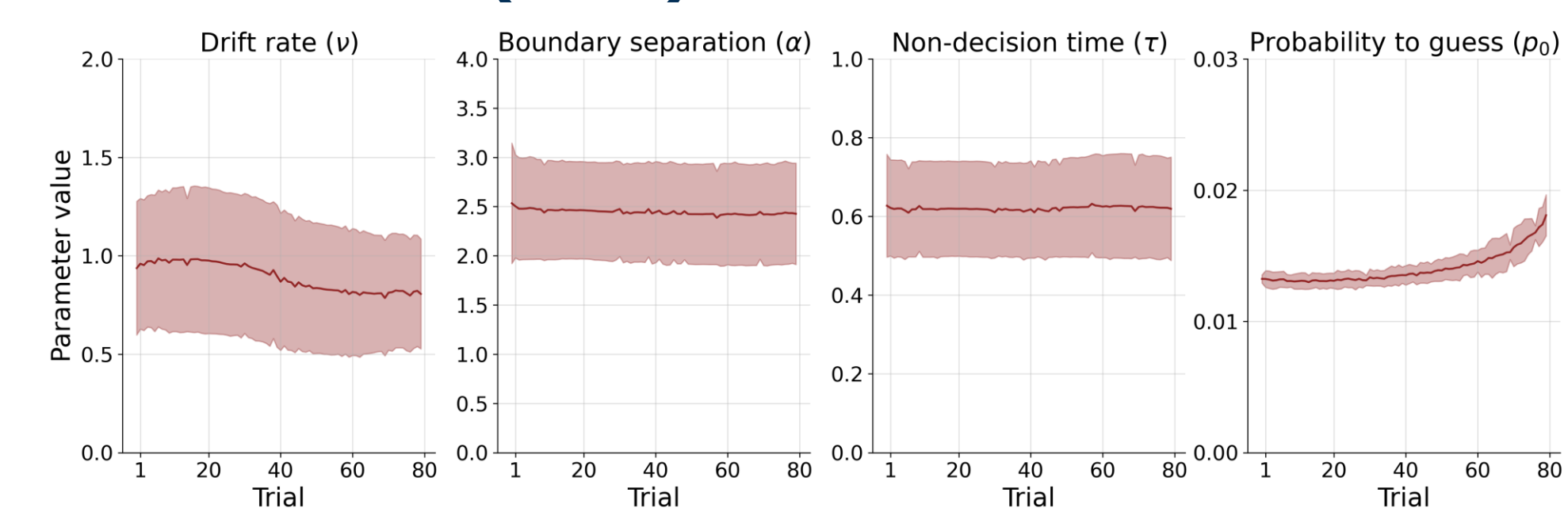
3 Criss et al. (2018):

Reduction of OI by switching material from words to faces with 2AFC response format, $i = 100$

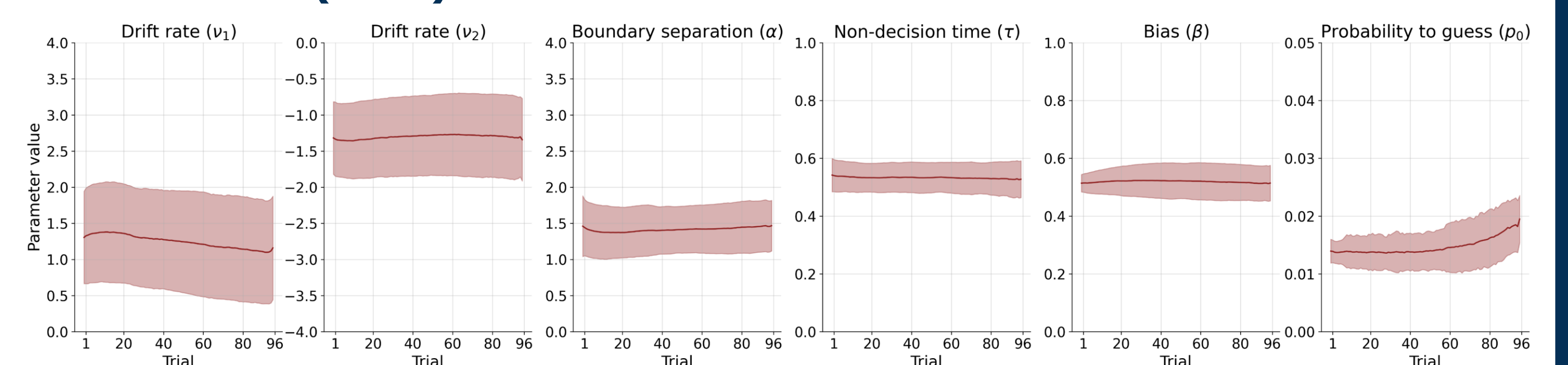


6 Reanalysis Results

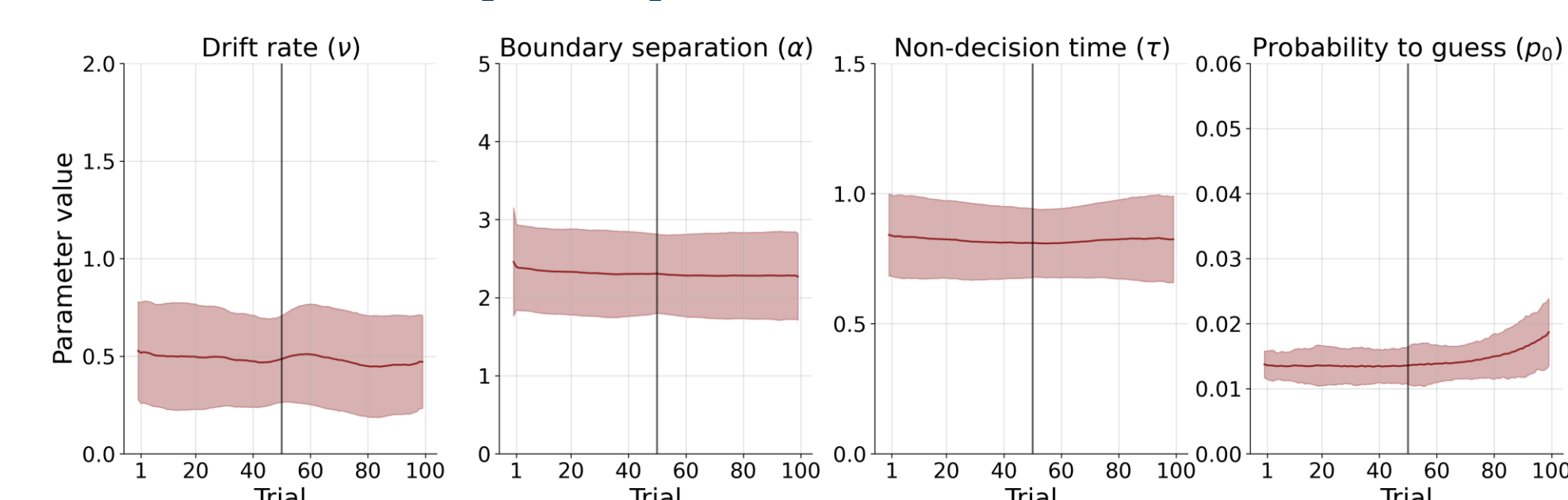
1 Schnuerch (2014):



2 Osth et al. (2018):



3 Criss et al. (2018):



7 Discussion

- We find an **effect of retrieval and motivational processes** and demonstrate the **need to consider dynamics** in decision-making in recognition memory.
- Limitations:**
 - No conclusions towards underlying mechanisms (e.g., item vs. context noise)
 - Can random walk appropriately capture dynamics in guessing?
- Further validation of neural superstatistics approach: experimental manipulations are captured in the relevant parameter (also see Schumacher et al., 2024)

References

- Criss, A. H., Salomao, C., Malmberg, K. J., Ave, W., Kilic, A., & Claridge, M. (2018). Release from output interference in recognition memory: A test of the attention hypothesis. *Quarterly Journal of Experimental Psychology*, 71(5), 1081–1089. <https://doi.org/10.1080/17470218.2017.1310265>
- Kilic, A. (2012, August). *Output interference and strength-based mirror effect in recognition memory*. [Dissertation]. Syracuse University.
- Osth, A. F., Jansson, A., Dennis, S., & Heathcote, A. (2018). Modeling the dynamics of recognition memory testing with an integrated model of retrieval and decision making. *Cognitive Psychology*, 104, 106–142. <https://doi.org/10.1016/j.cogpsych.2018.04.002>
- Radev, S. T., Mertens, U. K., Voss, A., Aralzone, L., & Köthe, U. (2022). BayesFlow: Learning complex stochastic models with invertible neural networks. *IEEE Transactions on Neural Networks and Learning Systems*, 33(4), 1452–1466. <https://doi.org/10.1109/TNNLS.2020.3042395>
- Ratcliff, R., & Kang, I. (2021). Qualitative speed-accuracy tradeoff effects can be explained by a diffusion/fast-guess mixture model. *Scientific Reports*, 11(1), 15169. <https://doi.org/10.1038/s41598-021-94451-7>
- Schnuerch, M. (2014, July 28). *Output interference in recognition memory: A global memory model perspective*. [Bachelor thesis]. University of Mannheim.
- Schumacher, L., Bürkner, P.-C., Voss, A., Köthe, U., & Radev, S. T. (2023). Neural superstatistics for bayesian estimation of dynamic cognitive models. *Scientific Reports*, 13(1), 13778. <https://doi.org/10.1038/s41598-023-40278-3>
- Schumacher, L., Schnuerch, M., Voss, A., & Radev, S. T. (2024, January 26). Validation and comparison of non-stationary cognitive models: A diffusion model application. Retrieved March 14, 2024, from <https://arxiv.org/abs/2401.08626>