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Do We Know What We Are Doing?

A Multi-Method Mapping of Intuitive and Analytic Thought in Rule-Based and Memory-Based Processes

Background & Summary

- The fast-and-slow dual-process perspective suggests that intuitive processes are autonomous and fast, and analytic processes slow and deliberate.^{1,2}
- The Brunswikian perspective states that intuitive processes are approximate, always affected by noise, whereas analytic processes are deterministic, yielding spikey error distributions^{3, 4}.
- We compare the predictions of the two perspectives across a data base containing four multiple-cue learning experiments ($n=284$).
- Written verbal reports from participants were coded as signaling reliance on intuitive or analytic processes.
- Results suggest that the fast-and-slow hypothesis of analytic processes being slow is not supported whereas the Brunswikian hypothesis is supported.

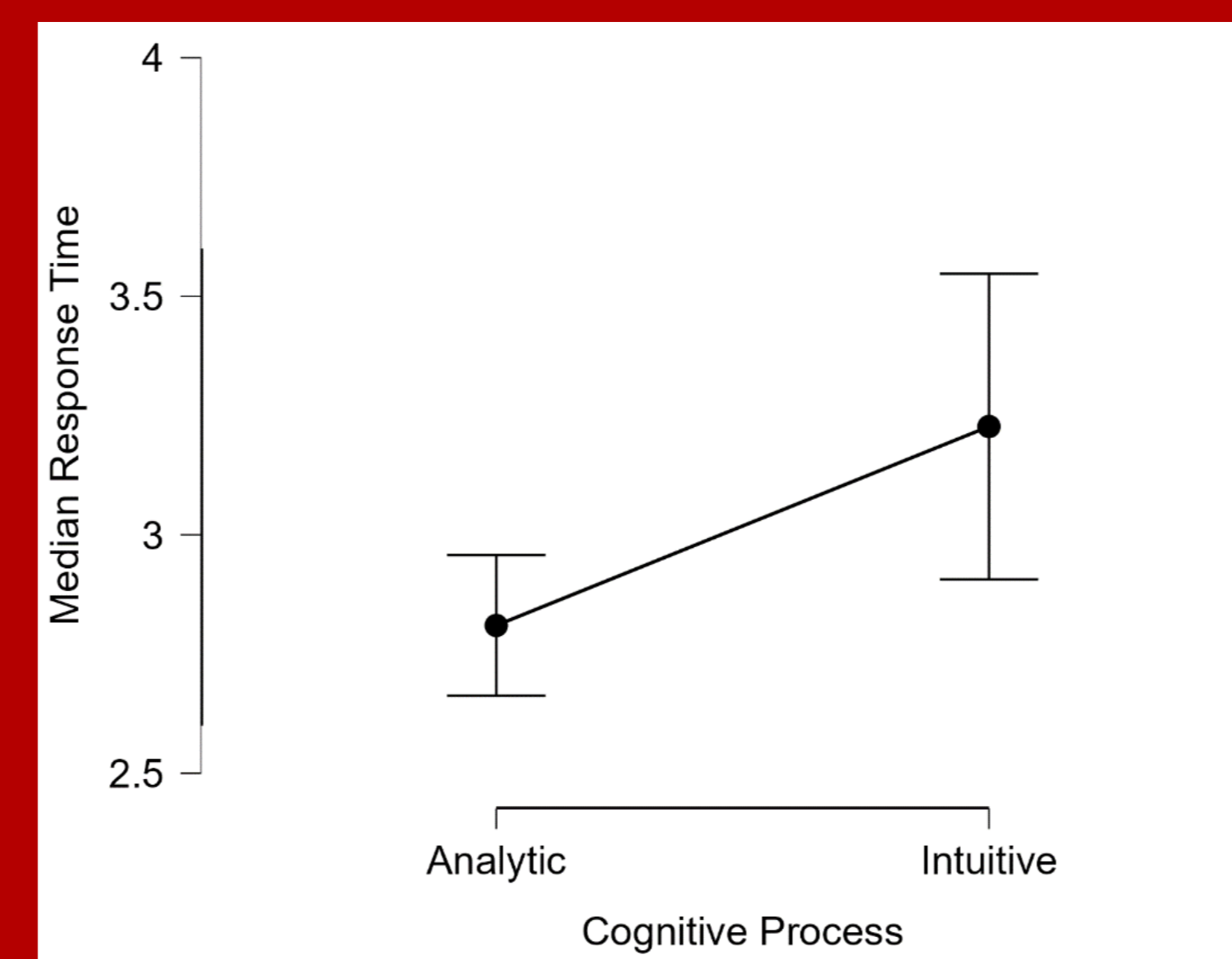
Results

- Participants relying on a more analytic process are not responding slower than participants relying on a more intuitive process ($BF_{01} = 18.519, n = 284$)

- Participants relying on a more analytic process have spikier error distributions with less responses affected by error (lower λ), than participants relying on a more intuitive process ($BF_{10} = 113420, n = 284$)

Figure 3.

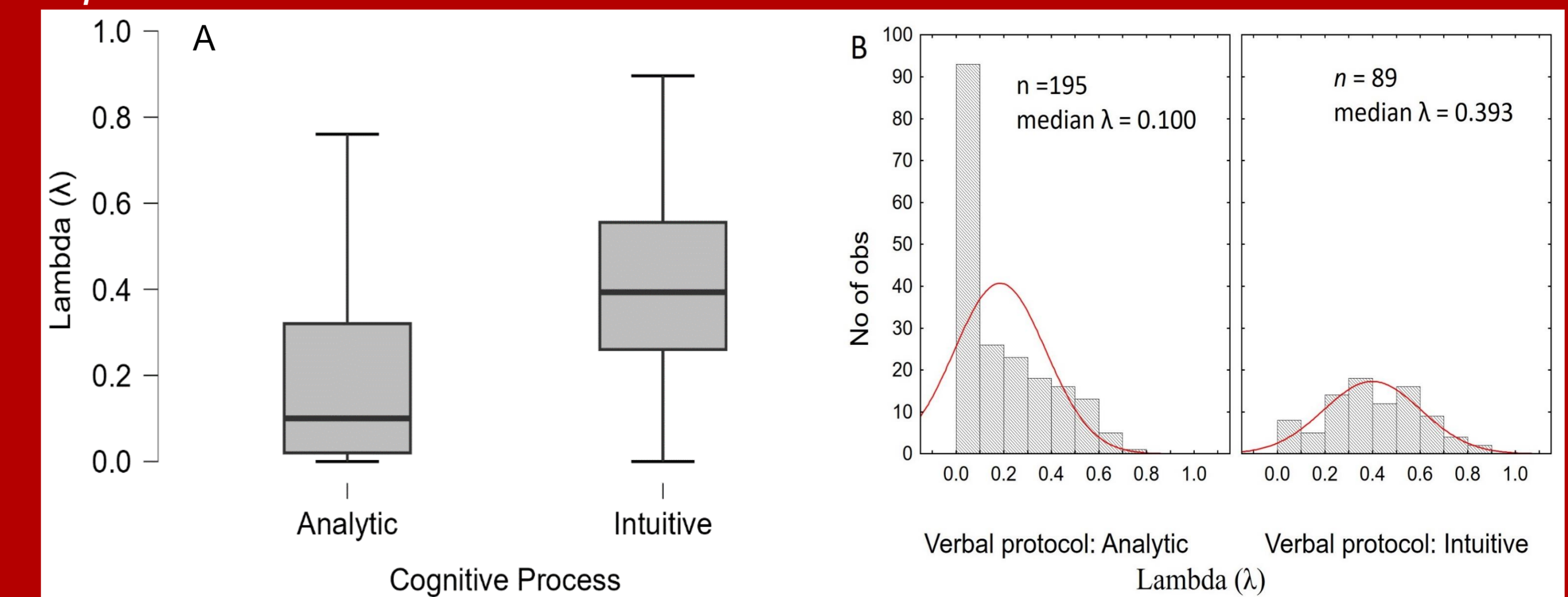
Mean median response time for participants categorized as relying predominately on an analytic or intuitive process based on their verbal protocols



Note. Data consists of individual median response times for the test phase of the experiments. Error bars are 95% credible intervals.

Figure 3

Box-plot of lambda (λ) (Panel A) and the distribution of lambda (λ) (Panel B), for participants categorized as analytic or intuitive based on their verbal protocols.



Note. Panel A: The box shows Q1 to Q3 with a vertical line for the median (Q2). Whiskers show minimum and maximum values. Panel A and B: Data consists of best-fitting individual participant values for lambda (λ).

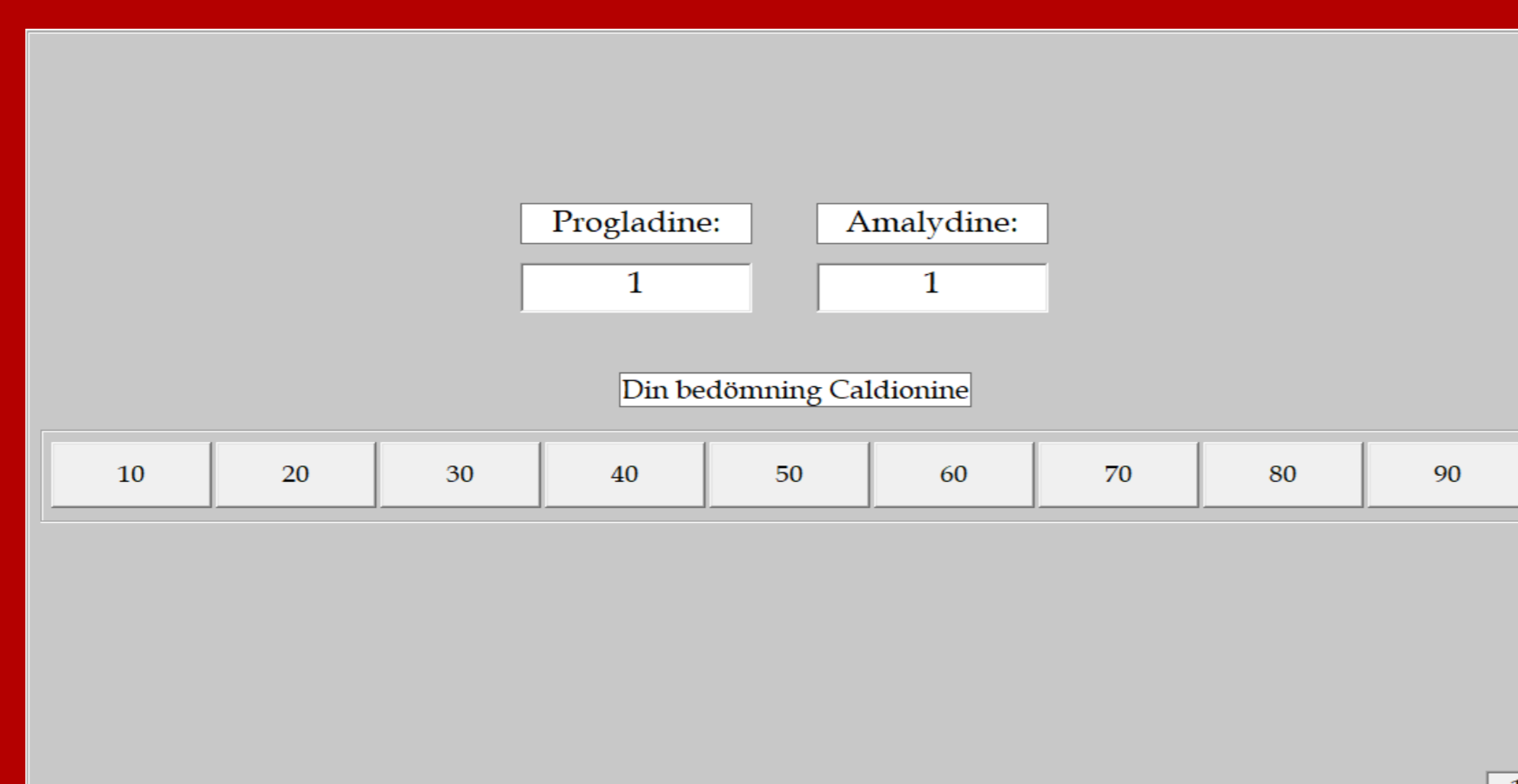
All results hold over the large bulk of factors varied within experiments (format of cues and criterion and normative integration rule), across experiments (e.g. type of cover story and type of feedback) and across participants best fit by rule-based cue-abstraction models and exemplar-based memory models.

Methods

- Four multiple-cue learning experiments with a 2x2 between-subjects design, varying format of cues and criterion (verbal vs numeric) and normative integration rule (additive vs non additive)
- Participants train to predict the level of a fictions hormone (criterion) based on two other hormones (cues)

Figure 1

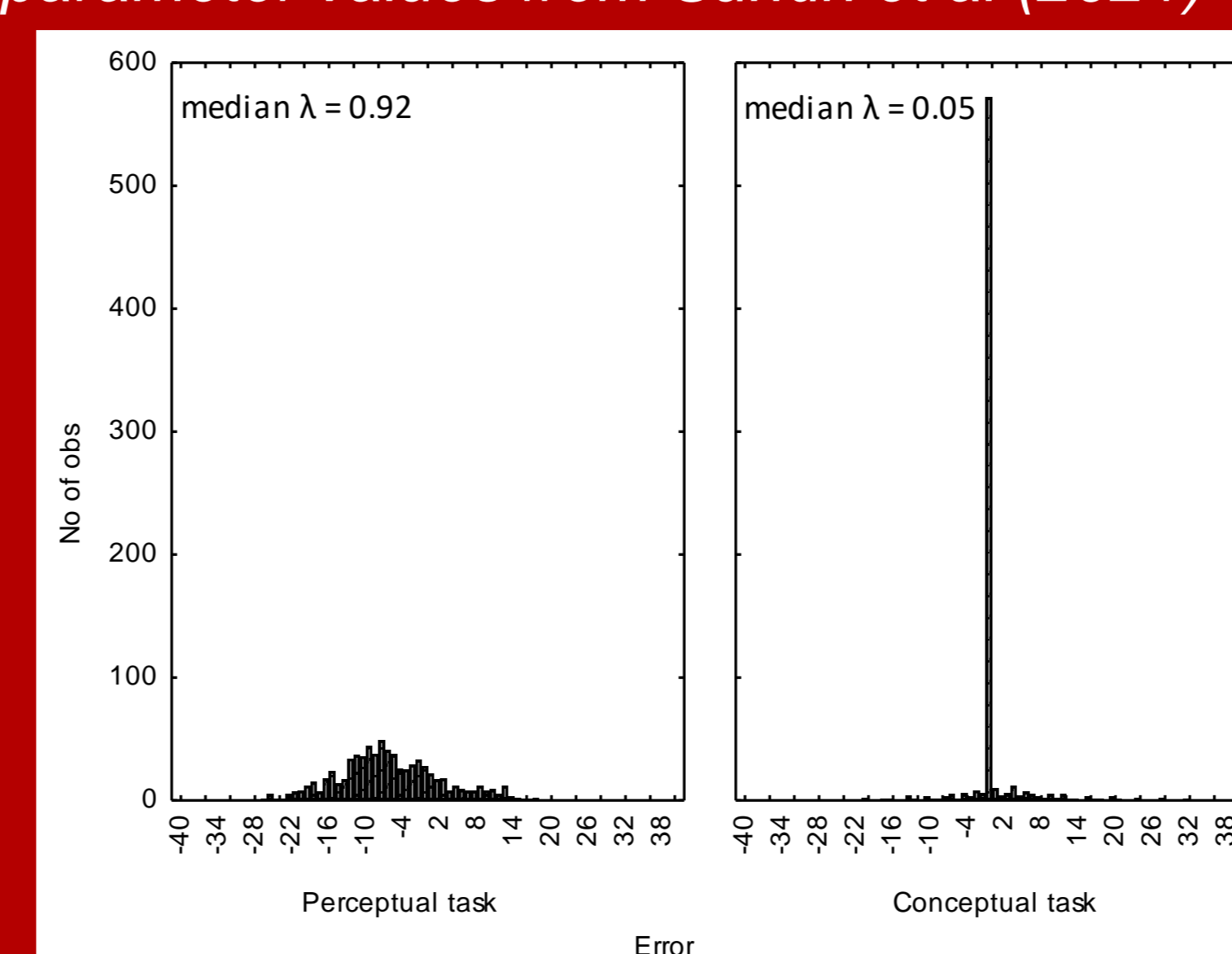
Example of task appearance for the numerical format condition



- We utilized the PNP model⁴ that estimates the proportion of responses affected by noise via the lambda (λ) parameter, where $\lambda = 1$ signals all responses affected by noise and $\lambda = 0$ no responses affected by noise.
- Two rule-based cue-abstraction models and an exemplar-based memory model⁵ fitted within the PNP framework.

Figure 2

Example of aggregate error distributions with associated median lambda parameter values from Sundh et al (2021)



Conclusions

- The Brunswikian hypothesis of more deterministic responding for analytic participants is supported, whereas the fast-and-slow hypothesis of slower response times is not supported.
- Endogenous noise in the judgment process is diagnostic of cognitive processes and, particularly, the intuitive or analytical nature of the process.

References

- Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-Process Theories of Higher Cognition: Advancing the Debate. *Perspectives on Psychological Science*, 8(3), 223–241.
- Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.
- Brunswik, E. (1956). *Perception and the representative design of psychological experiments* (2nd ed.). University of California Press.
- Sundh, J., Collsiö, A., Millroth, P., & Juslin, P. (2021). Precise/not precise (PNP): A Brunswikian model that uses judgment error distributions to identify cognitive processes. *Psychonomic Bulletin & Review*, 28, 351-373.
- Juslin, P., Olsson, H., & Olsson, A-C. (2003). Exemplar effects in multiple-cue judgment. *Journal of Experimental Psychology: General*, 132(1), 133-156

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