

Using drift-diffusion models to understand misinformation sharing behavior

Hause Lin^{1,2}, Adam Bear³, David Rand², Gordon Pennycook¹
¹University of Regina, ²MIT, ³Harvard University

 @hauselin hauselin@gmail.com

Introduction

People who deliberate more or engage more in analytic thinking are less likely to believe in and share misinformation (Pennycook & Rand, 2019; Pennycook et al., 2021).

RQ1: **Why** are analytic thinkers less likely to believe false news?

RQ2: **How** does prompting people to think about accuracy (“**accuracy prompt**” interventions) reduce the sharing of misinformation online?

Can **computational modeling** shed light on the cognitive processes?

- Tendency to **engage in more deliberation**
- Tendency to **focus on accuracy when deliberating**

Methods

News-rating task: 7066 participants from 16 countries indicated **how accurate they thought each headline was** (Arechar et al., 2022). We measured several variables associated with the tendency to engage in analytic thinking: **cognitive reflection test accuracy, need for cognition, education, and attentiveness**.

News-sharing task: 5633 participants (across 6 studies) indicated **whether they would share each headline** on social media and were randomly **assigned to either a control or treatment condition** where they evaluated the accuracy of a single news headline (i.e., “accuracy prompt”) before they completed the task (Pennycook & Rand, 2022).

By jointly modeling binary choices and response times in our tasks, **drift-diffusion models** allow us to distinguish the **amount of deliberation engaged in** (response caution or “boundary”) from **how much deliberation is influenced by the veracity of the news** (“drift rate”).

Abstract

Why are analytic thinkers less likely to believe false news? They not only **deliberate more** but also **deliberate more effectively**. Prompting people to think about accuracy prior to sharing news **does not change how much they deliberated**—they deliberated more effectively by **thinking more about accuracy**.

Results

Participants with higher cognitive reflection test scores, need for cognition, or education had higher drift rates. More attentive participants had higher boundary.

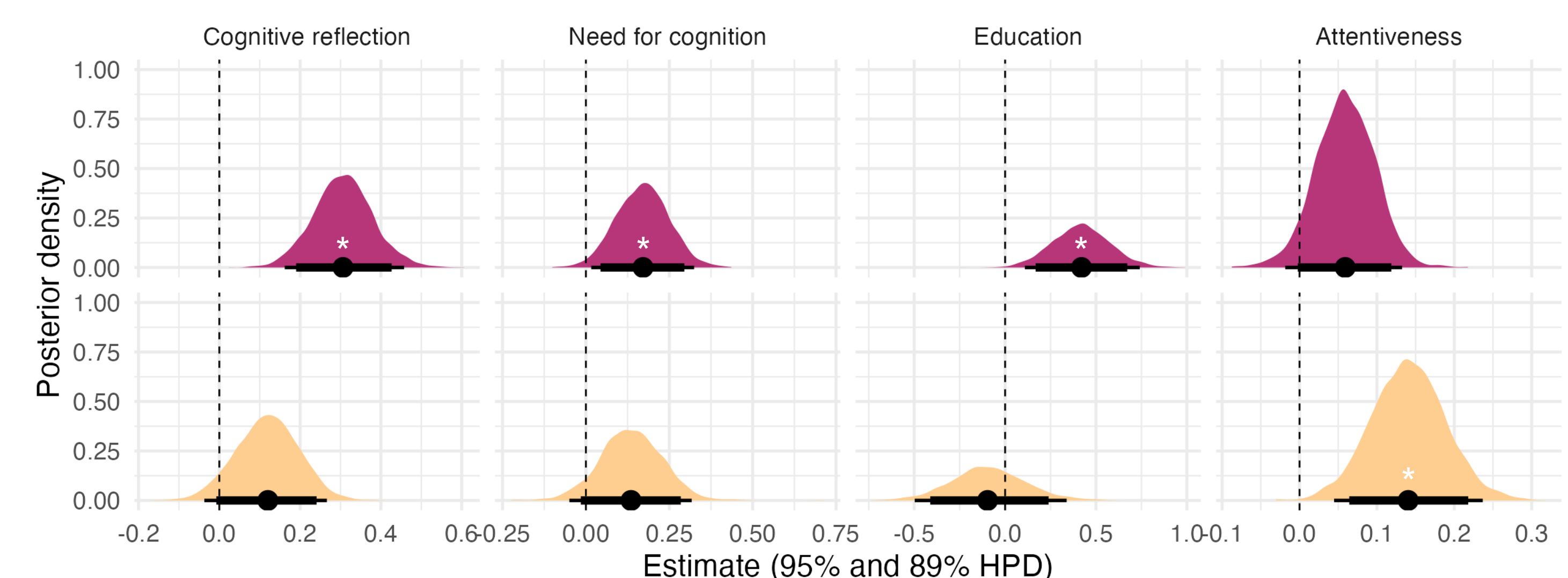


Figure 1. Bayesian posterior estimates for the association between four measures one’s tendency to engage in analytic thinking and diffusion model parameter estimates. Estimates are from preliminary analysis of 5% of the data.

Accuracy prompts don’t cause people to deliberate more when sharing news. They **focus people’s attention on accuracy** (Lin, Pennycook, & Rand, 2023).

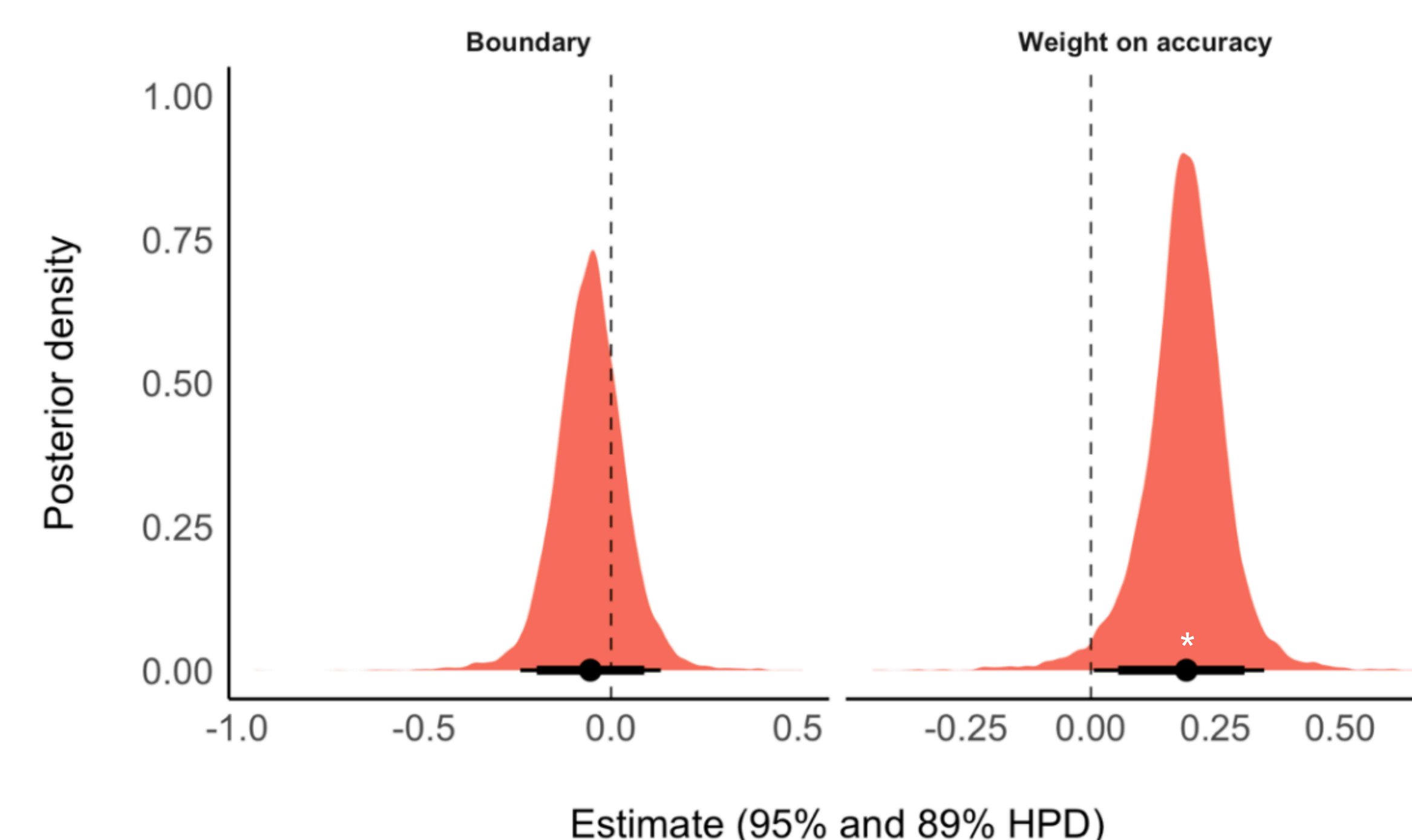
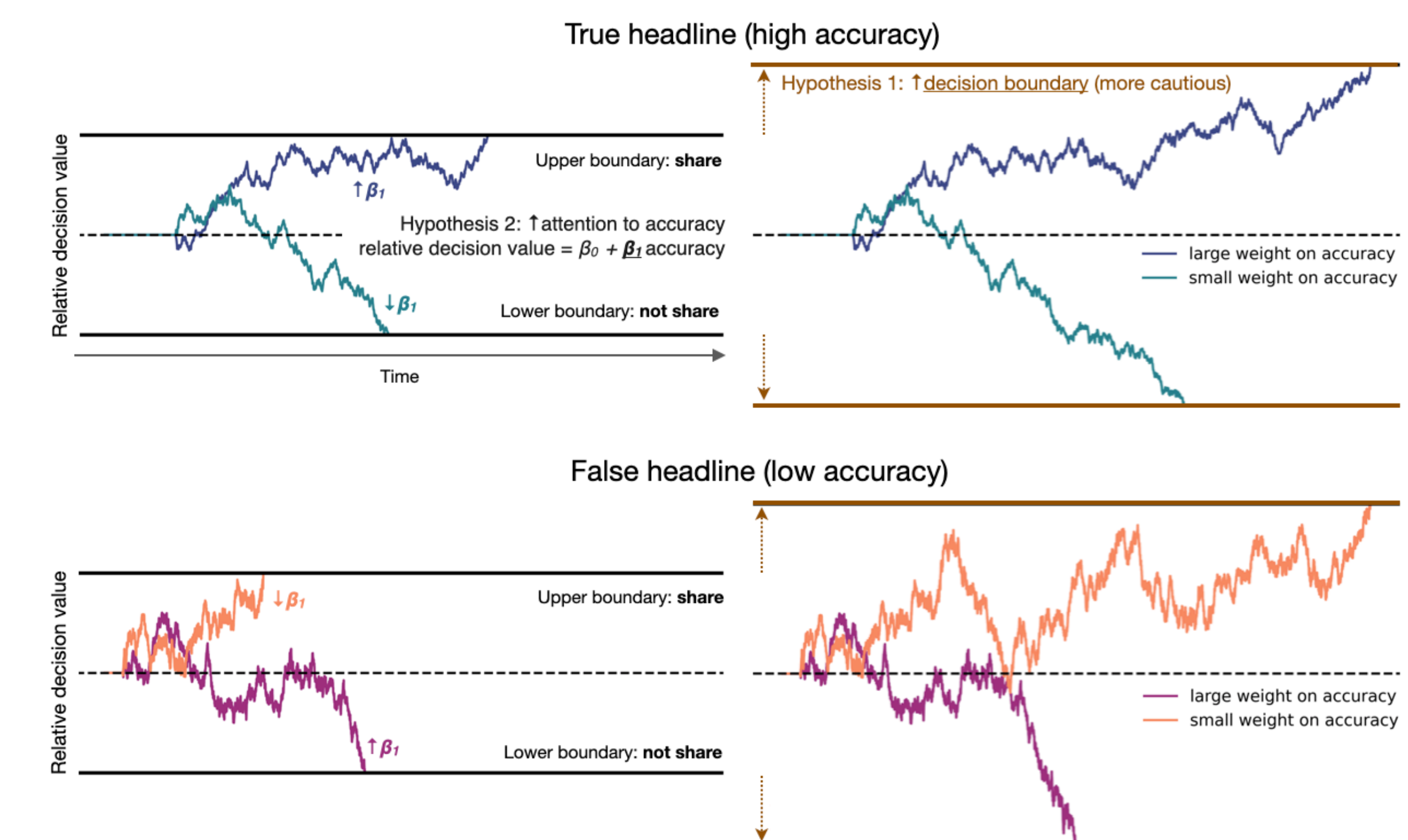


Figure 2. Bayesian posterior estimates for the effect of condition on two diffusion model parameters. Positive estimates indicate larger values in the treatment (vs. control) condition.

Diffusion model predictions



Discussion

Our results highlight the difference between the **tendency to engage in more deliberation**, versus the **tendency to be more accuracy-oriented when deliberating**. Our results common dual-process interpretations of the accuracy-prompt effect.

Social media can distract people from thinking about accuracy versus deliberating. Our results shed light on the cognitive underpinnings of belief in, and intervention against, online misinformation.

References

- Arechar, A. A., Allen, J. N. L., Cole, R., Epstein, Z., Garimella, K., Gully, A., Lu, J. G., Ross, R. M., Stagnaro, M., & Zhang, J. (2022). Understanding and reducing online misinformation across 16 countries on six continents. <https://doi.org/10.31234/osf.io/a9frz>
- Lin, H., Pennycook, G., & Rand, D. G. (2023). Thinking more or thinking differently? Using drift-diffusion modeling to illuminate why accuracy prompts decrease misinformation sharing. *Cognition*, 230, 105312. <https://doi.org/10.1016/j.cognition.2022.105312>
- Pennycook, G., & Rand, D. G. (2019). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, 188(2019), 39-50. <https://doi.org/10.1016/j.cognition.2018.06.011>
- Pennycook, G., & Rand, D. G. (2022). Accuracy prompts are a replicable and generalizable approach for reducing the spread of misinformation. *Nature Communications*, 13(1), 2333. <https://doi.org/10.1038/s41467-022-30073-5>
- Pennycook, G., Epstein, Z., Mosleh, M., Arechar, A. A., Eckles, D., & Rand, D. G. (2021). Shifting attention to accuracy can reduce misinformation online. *Nature*, 592(7855), 590-595. <https://doi.org/10.1038/s41586-021-03344-2>
- Ratcliff, R., Smith, P. L., Brown, S. D., & McKoon, G. (2016). Diffusion decision model: Current issues and history. *Trends in Cognitive Sciences*, 20(4), 260-281. <https://doi.org/10.1016/j.tics.2016.01.007>