Beyond Overall Effects: A Bayesian Approach to Finding Constraints In Meta-Analysis

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The Problem

Goal of Meta-Analysis

- Combine a bunch of similar studies to reach an omnibus conclusion

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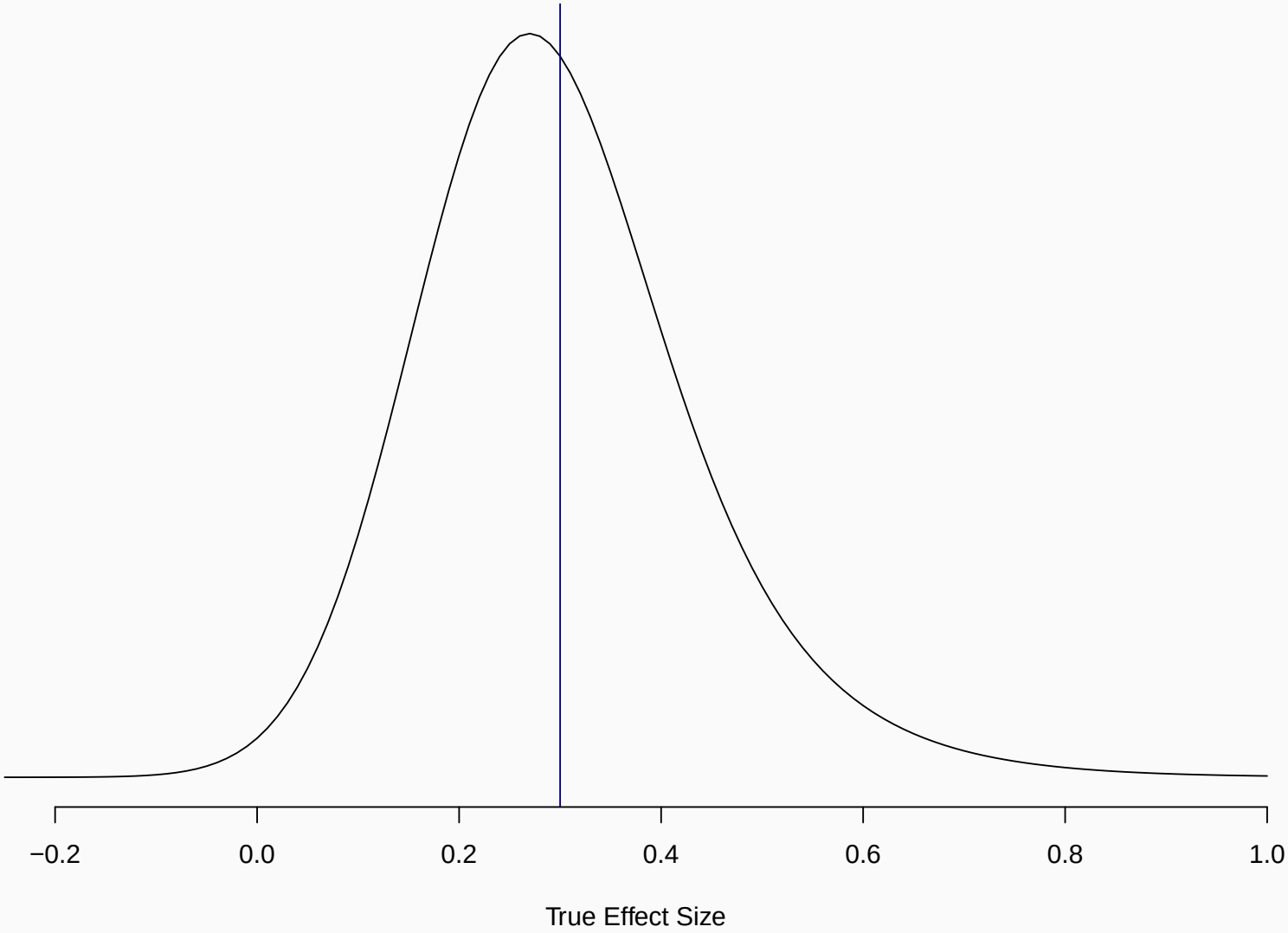
- Is it different than zero?
- What covariates affect it?

Why the Mean?



Theoretical Distribution of Effect Sizes?

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Preferred Direction

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- Stroop: Incongruent slower than Congruent
- Violent Video Games: More aggression
- Memory: Better for more salient information

New Meta-Analytic Question

Does Every Study In A Collection Plausibly Show an Effect in the Same Direction?

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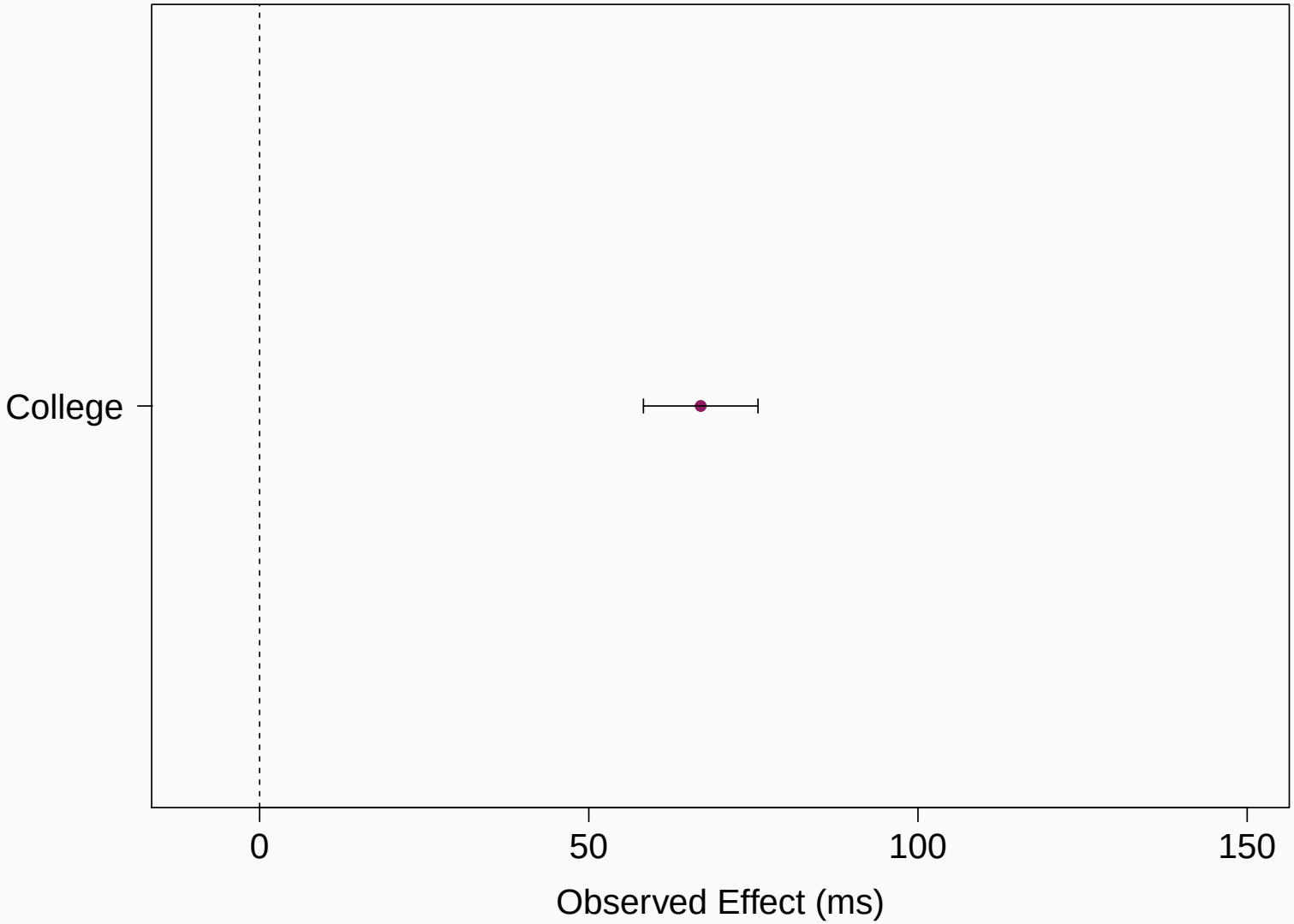
The Case of Stroop Effects



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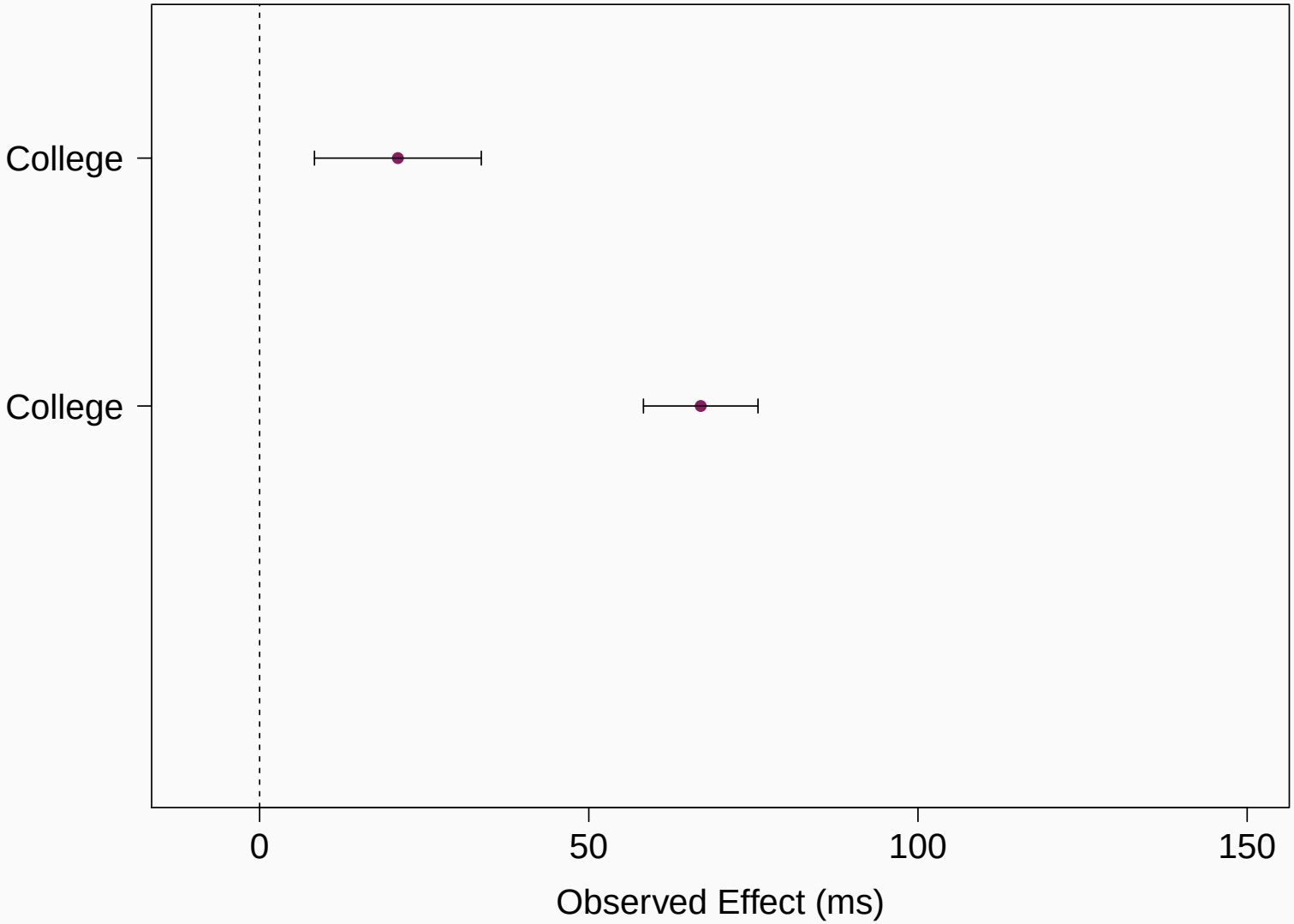

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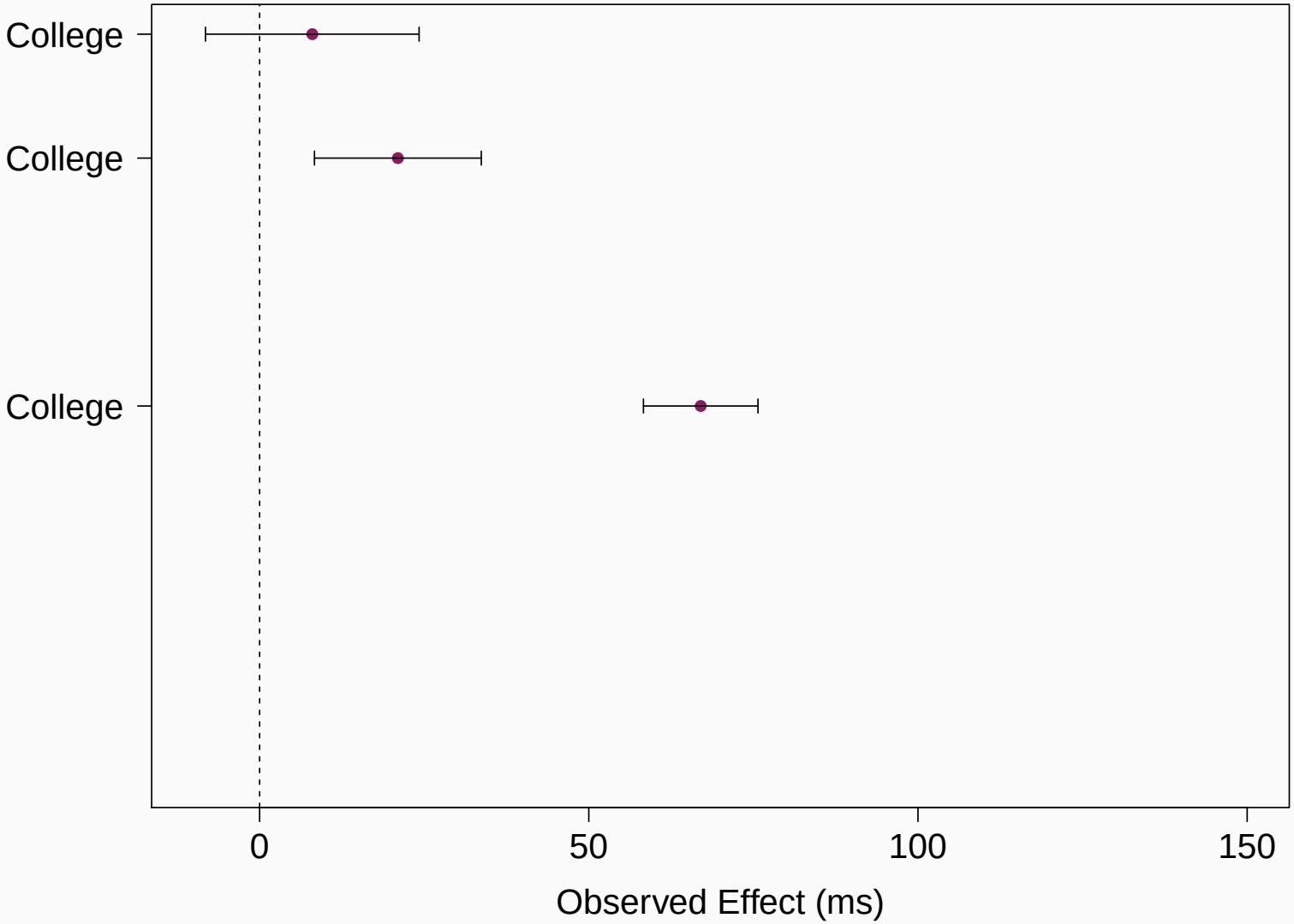

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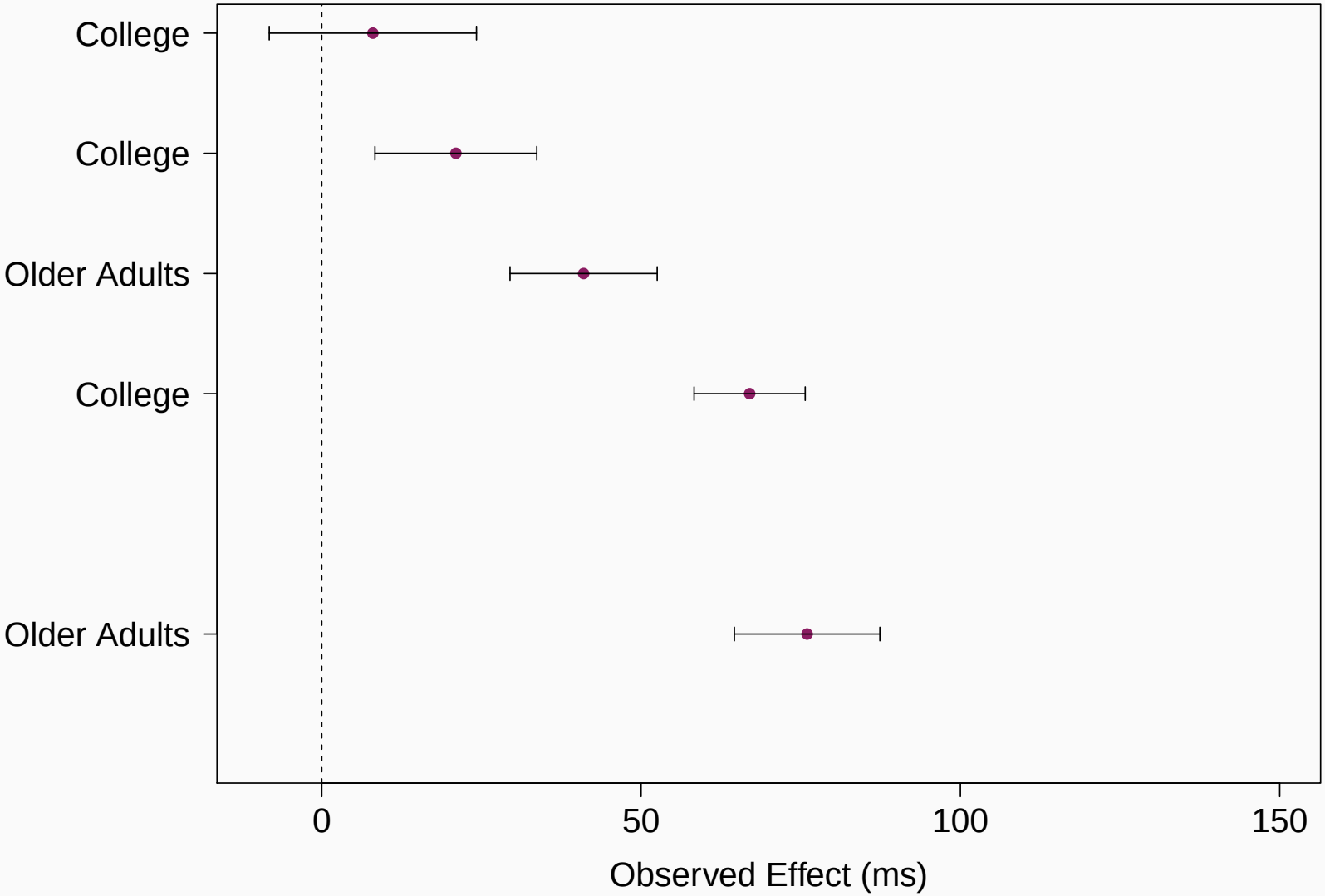

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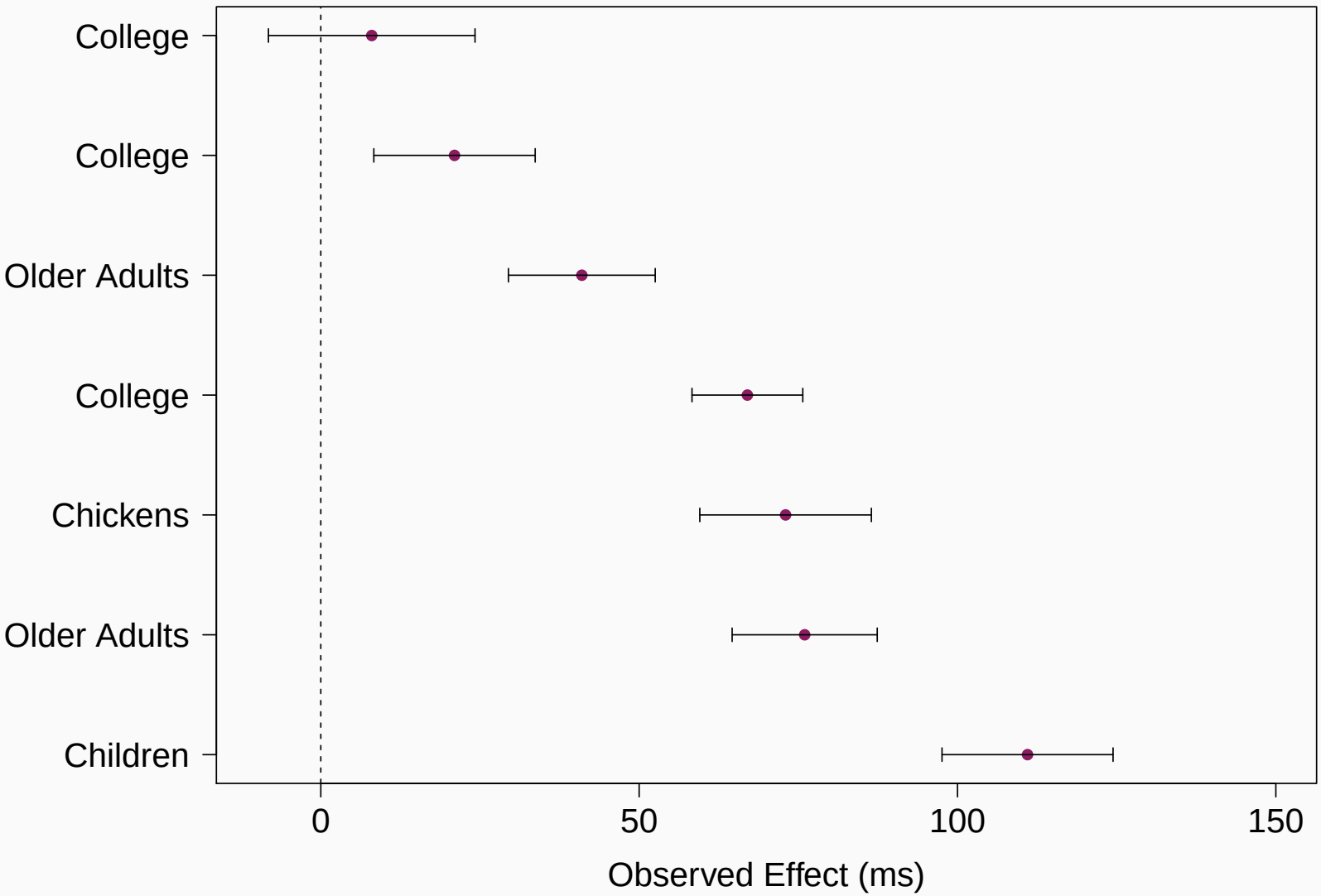
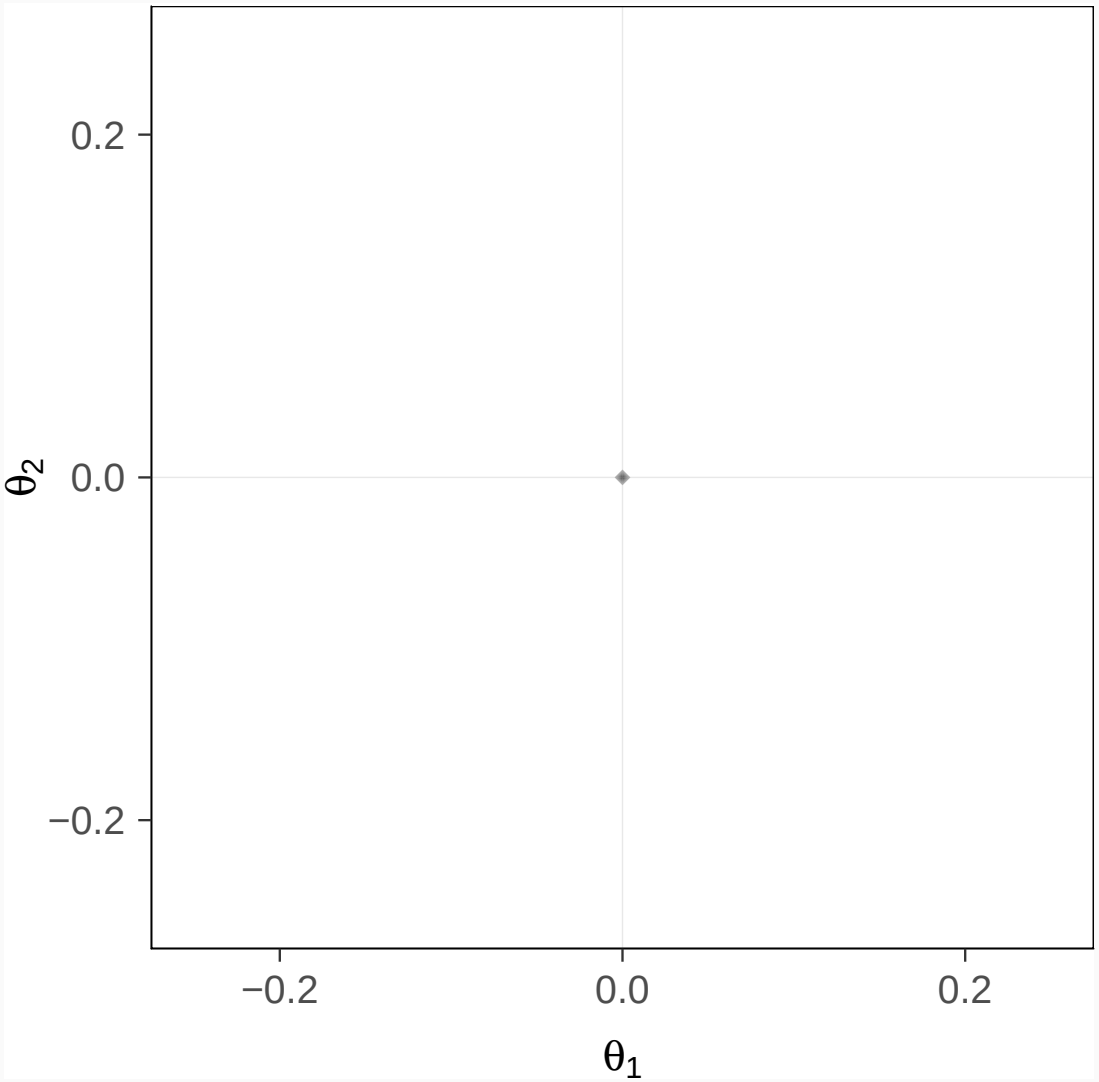


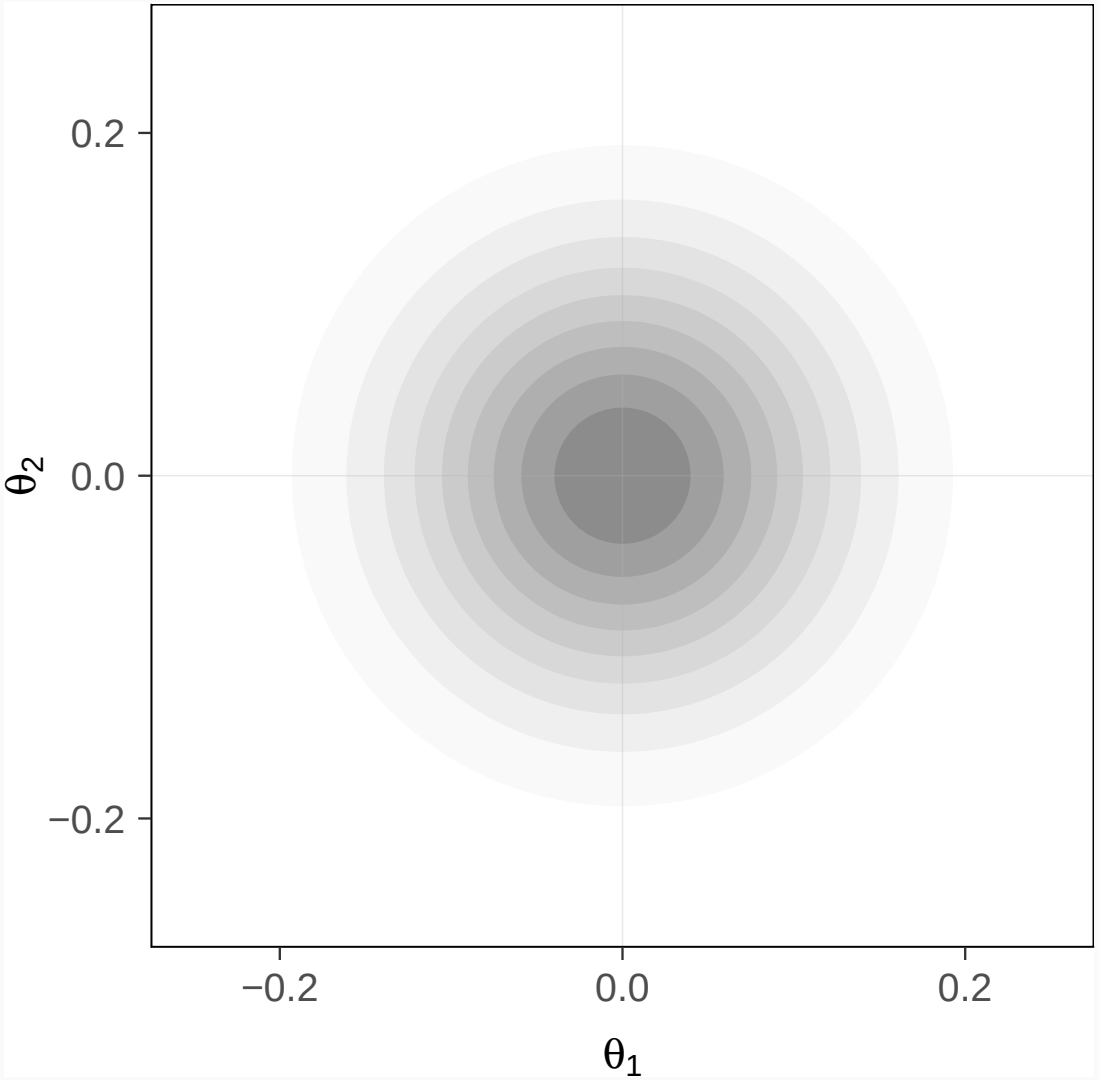
Models on Random Effects

Models on the Collection of Random Effects



Haaf (2018); Rouder, Haaf, Stober, & Hilgard (submitted)

The Unconstrained Model



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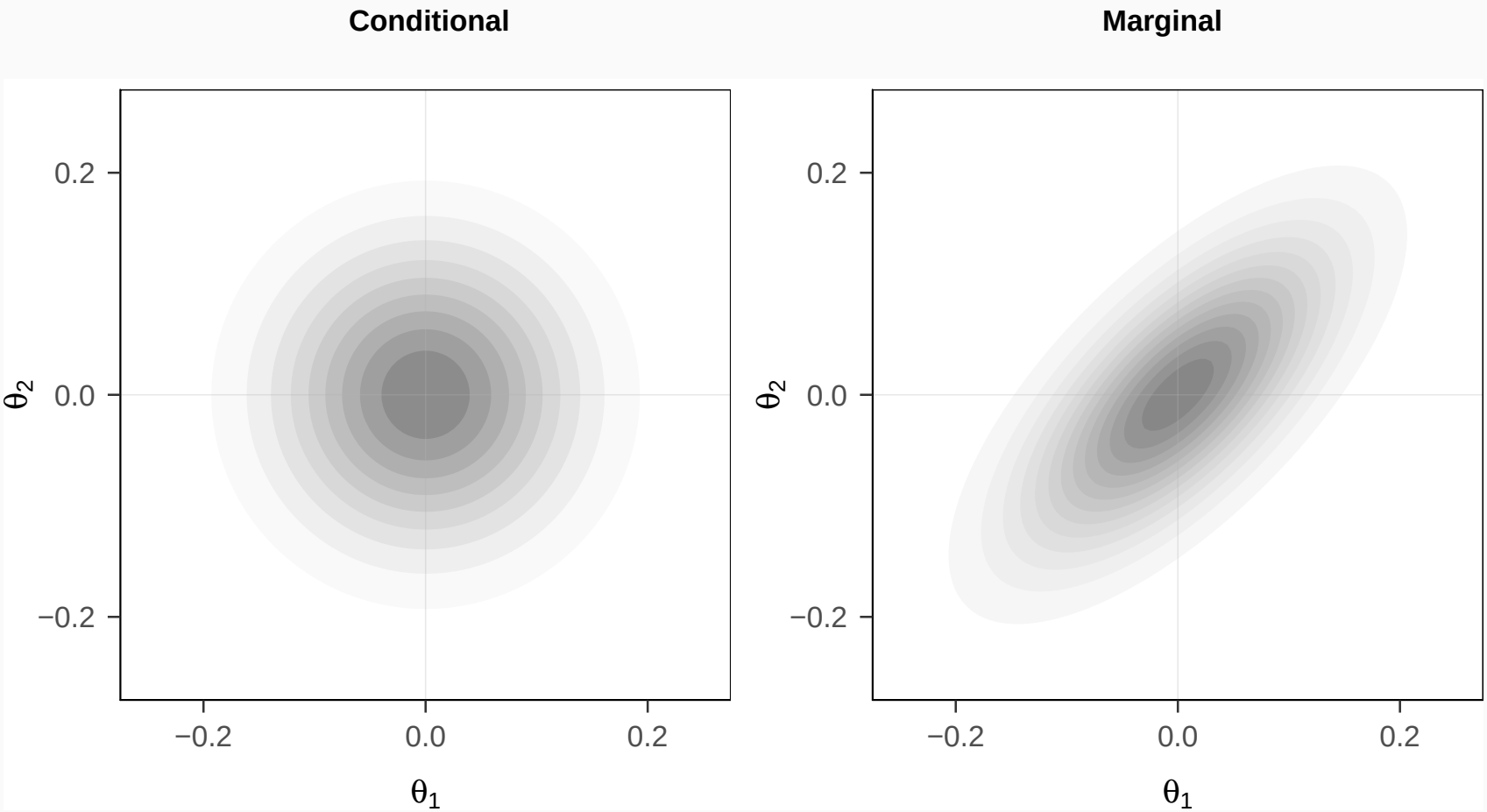
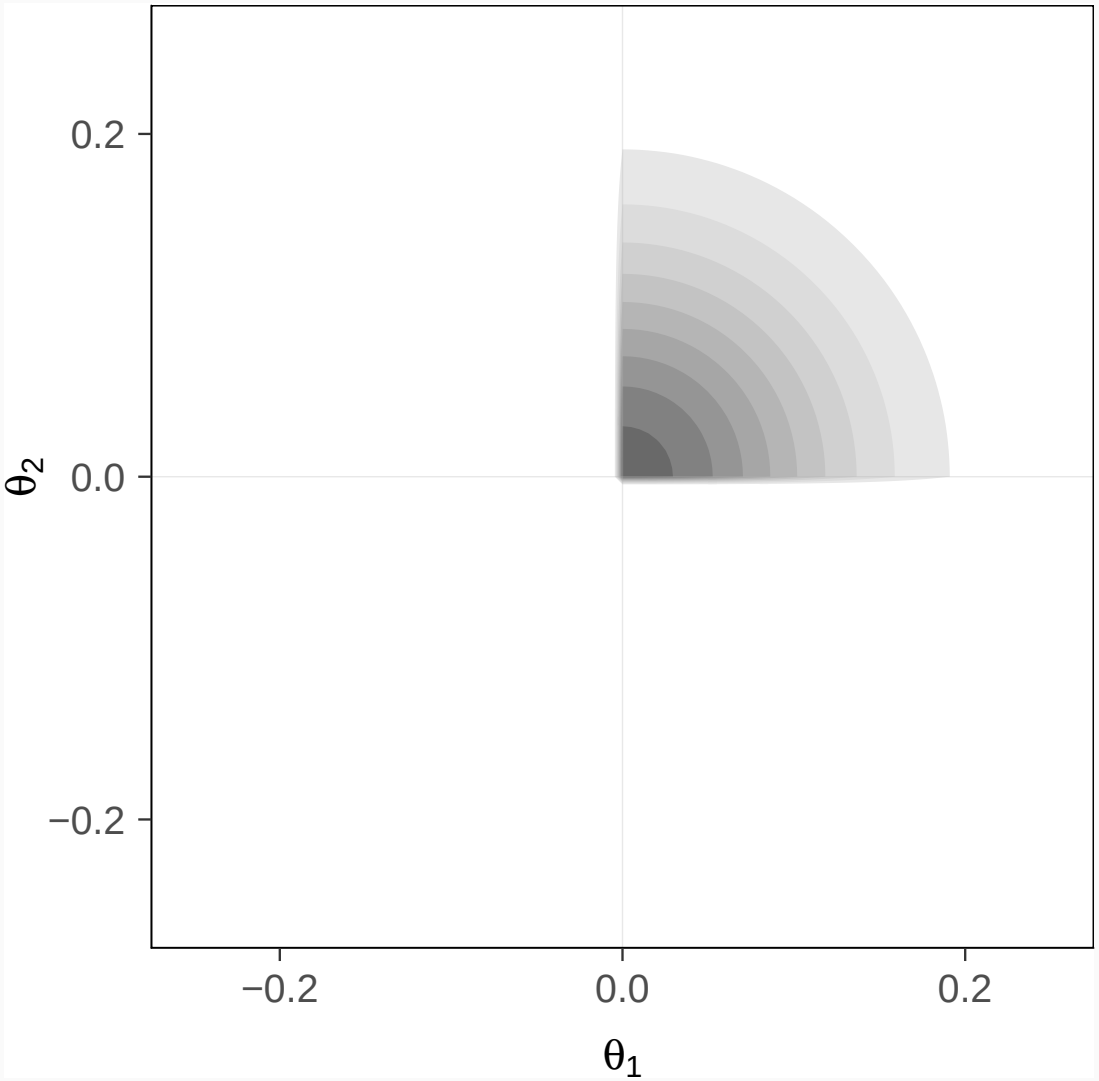


The Positive-Effects Model



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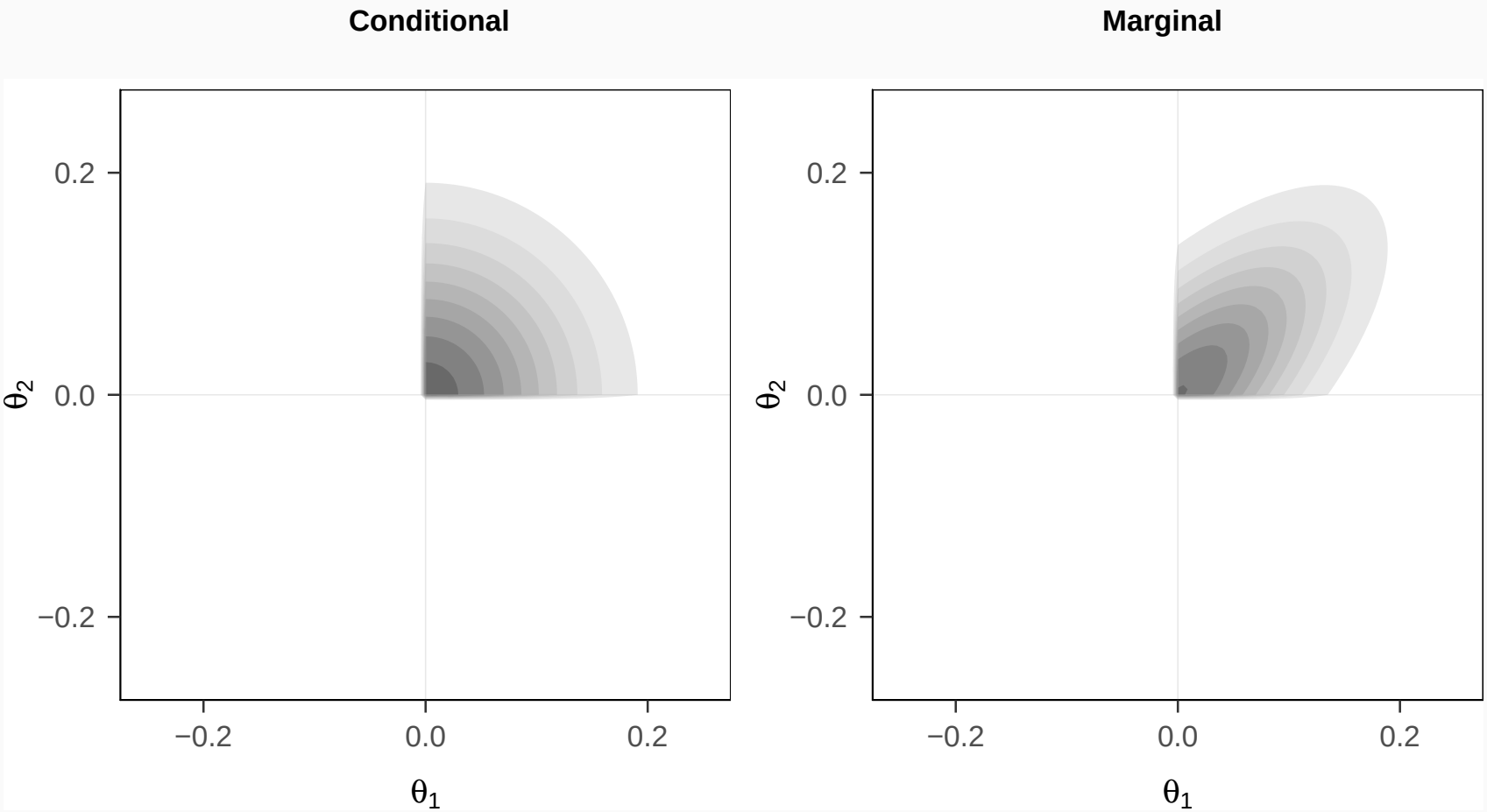
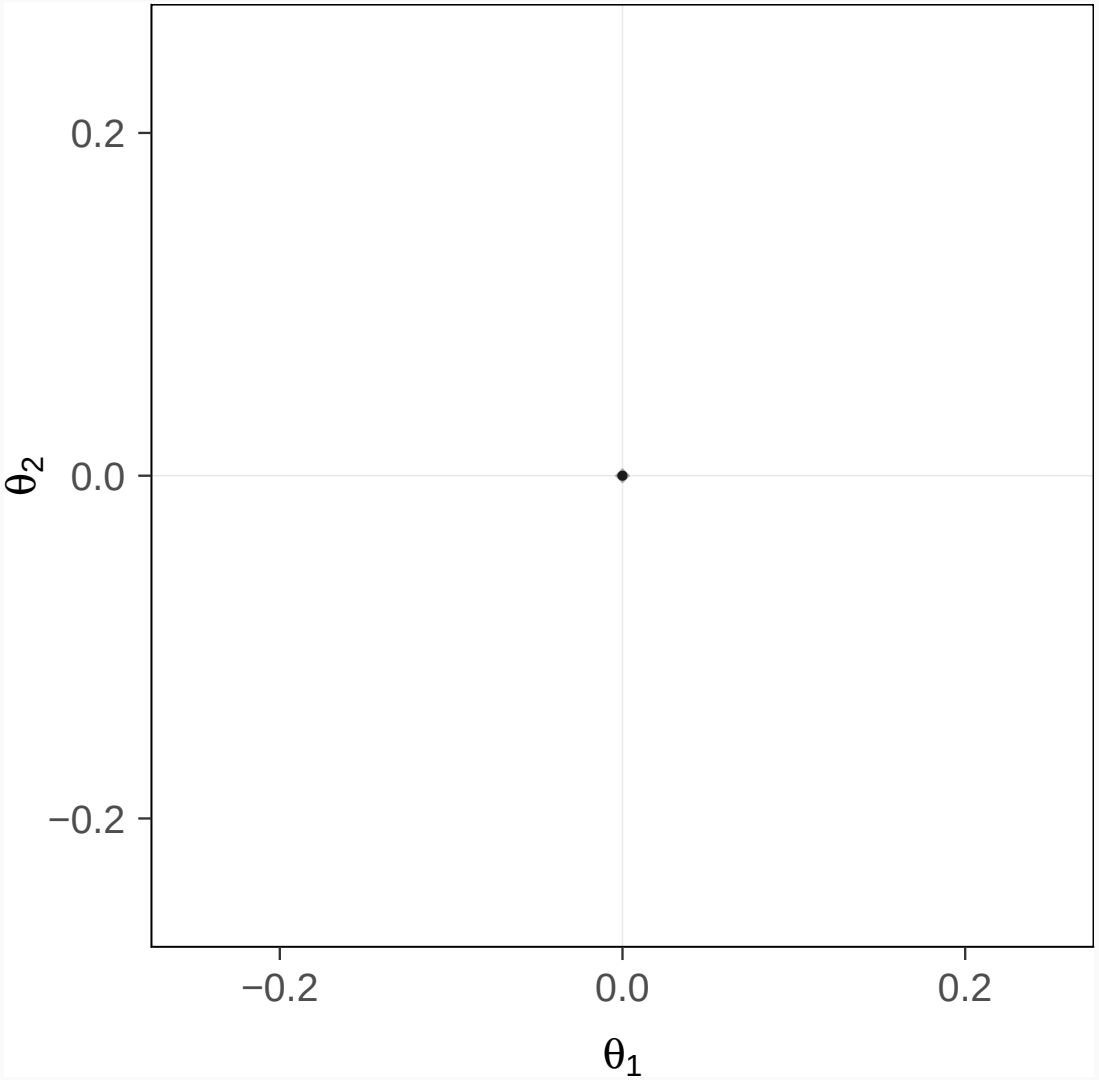


The Null Model



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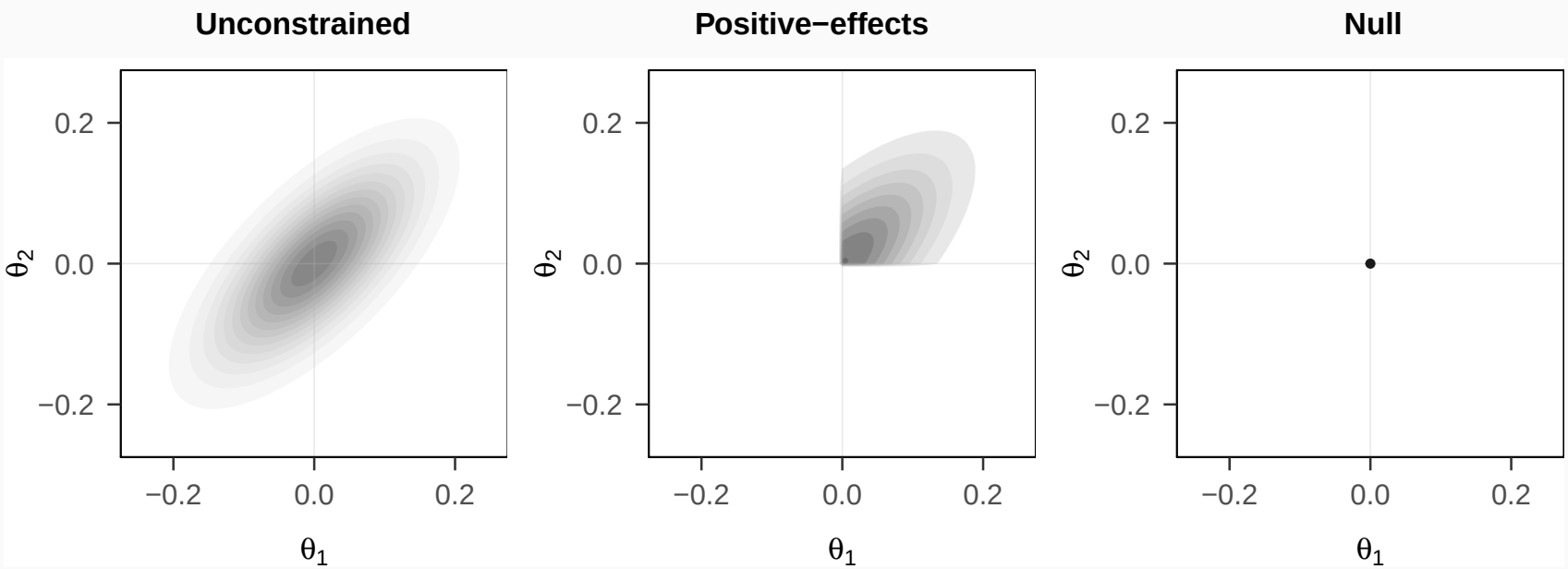

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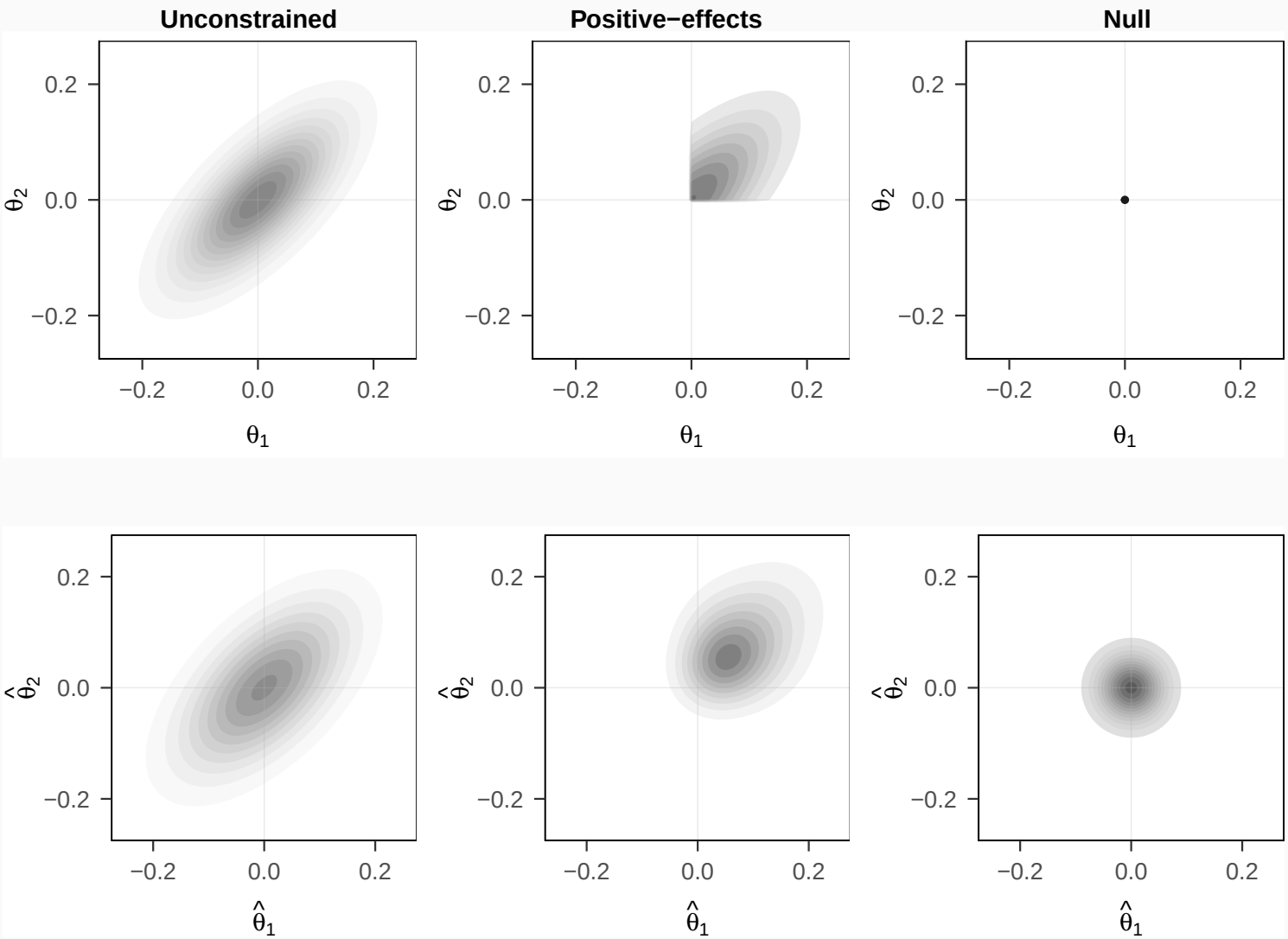

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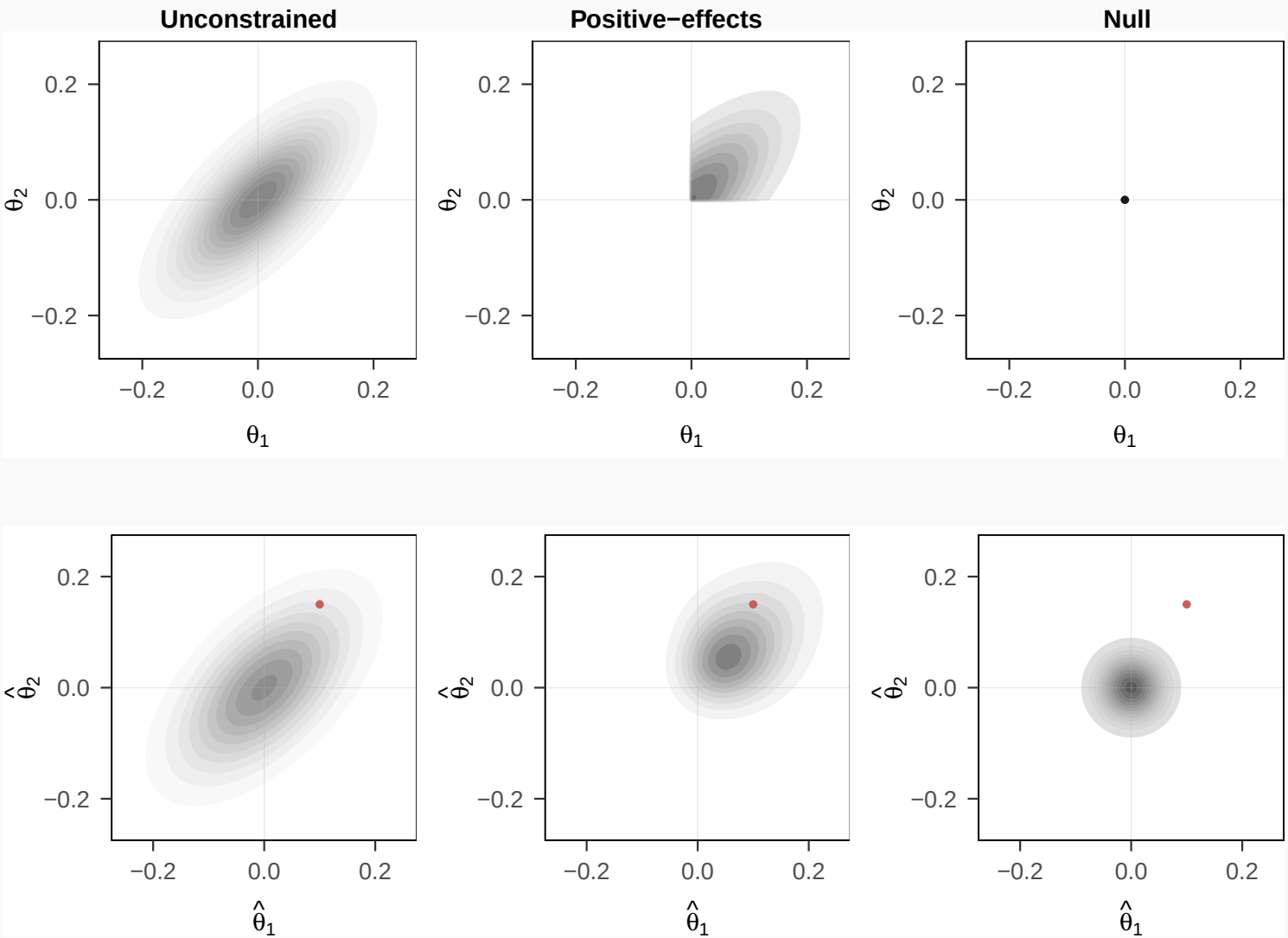
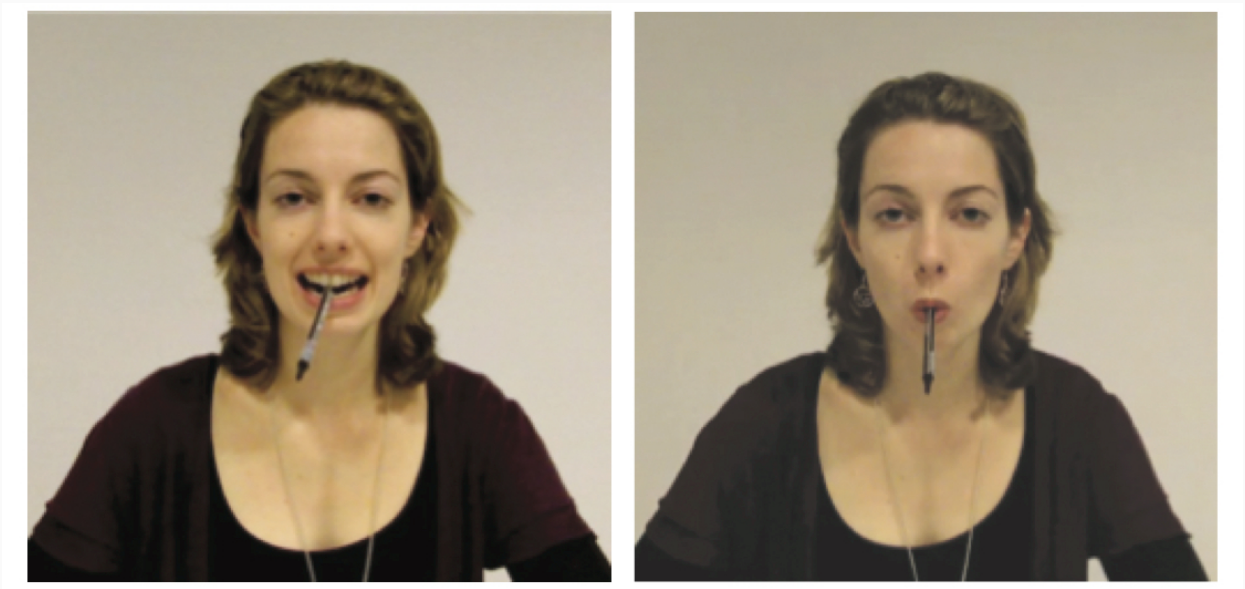


Application I

Facial Feedback Hypothesis

- Strack, Martin, & Stepper (1988): Cartoons are funnier after certain facial muscles are activated



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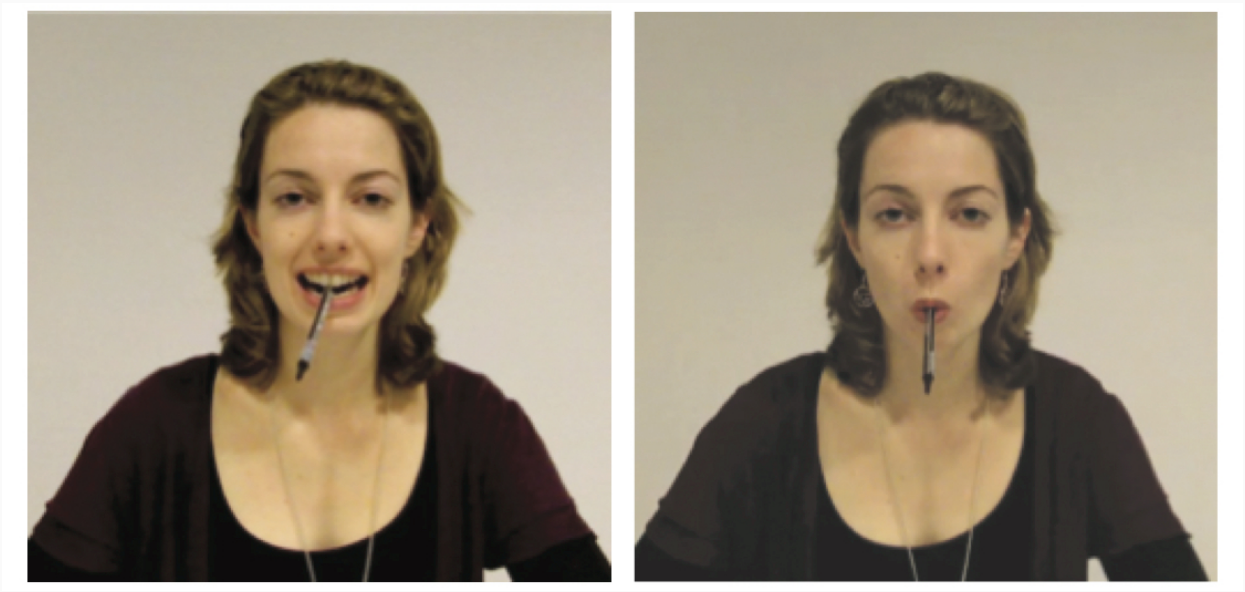
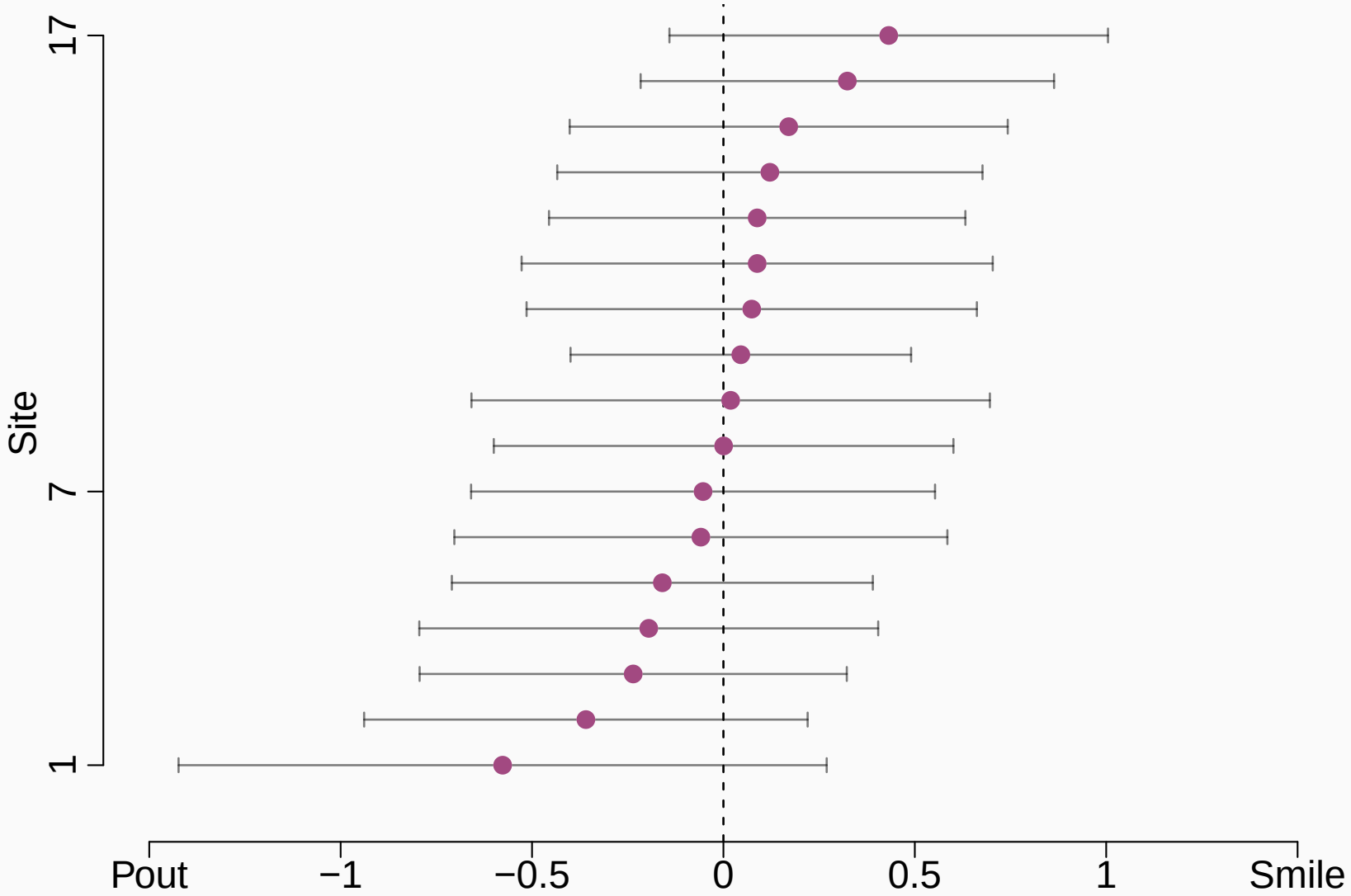
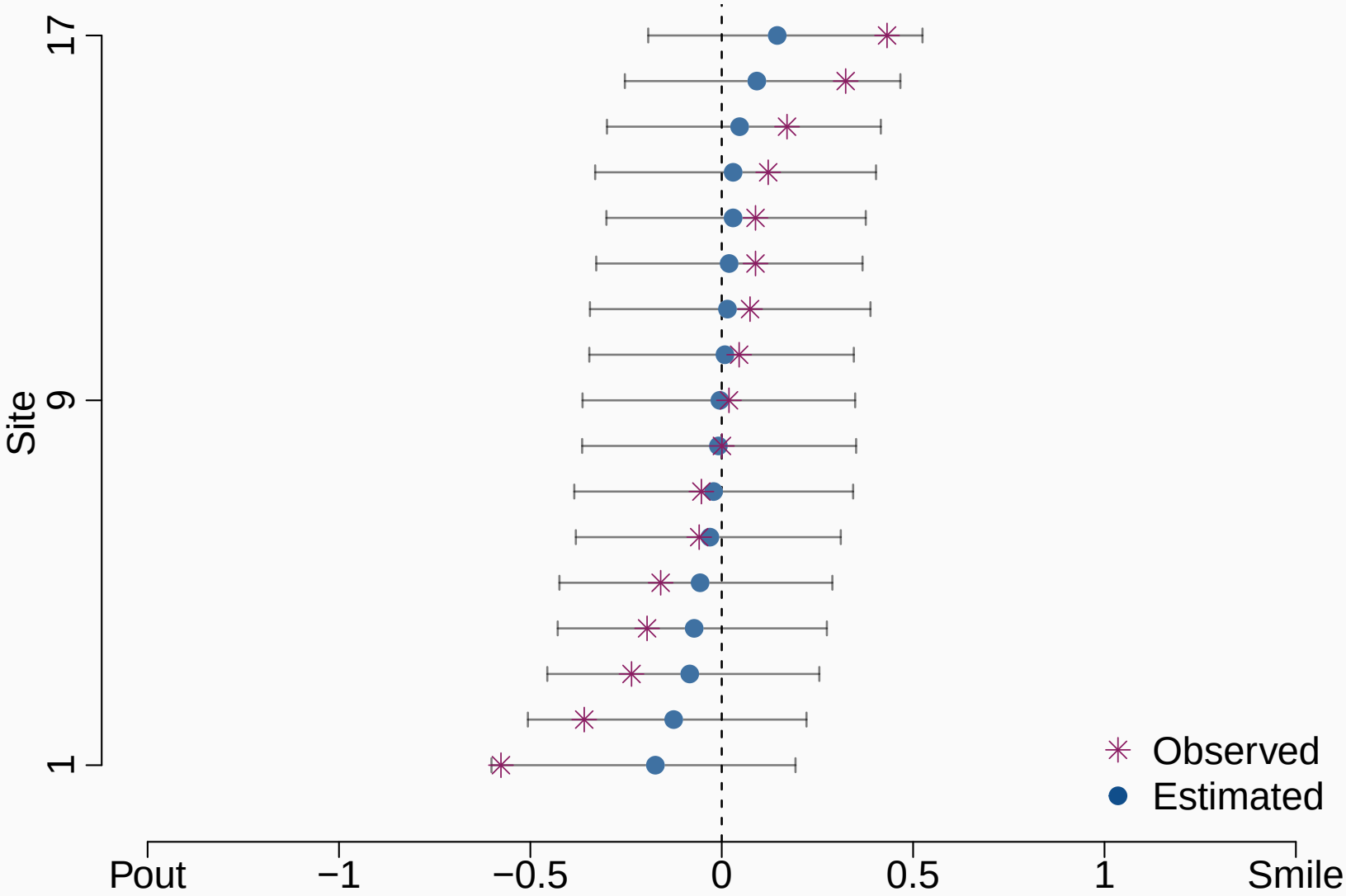
- Wagenmakers et al. (2016) performed a registered replication



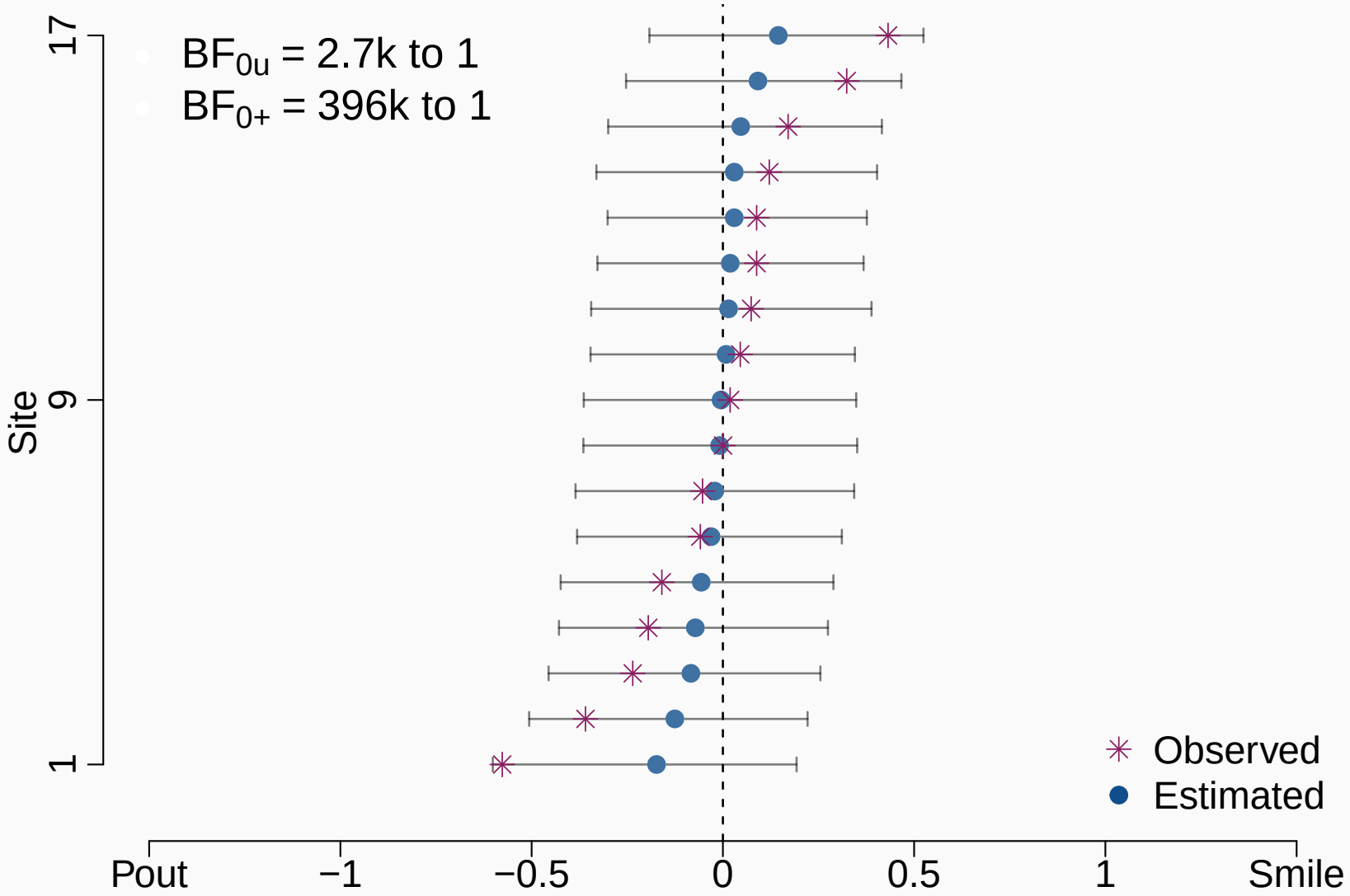
Observed Effects



Estimated Effects



Model Comparison



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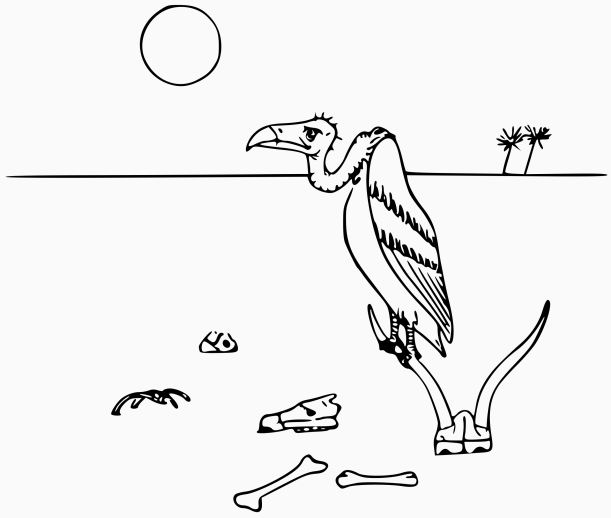
Application II

Survival Processing Advantage in Memory

- Participants imagine they are stranded in a grasslands



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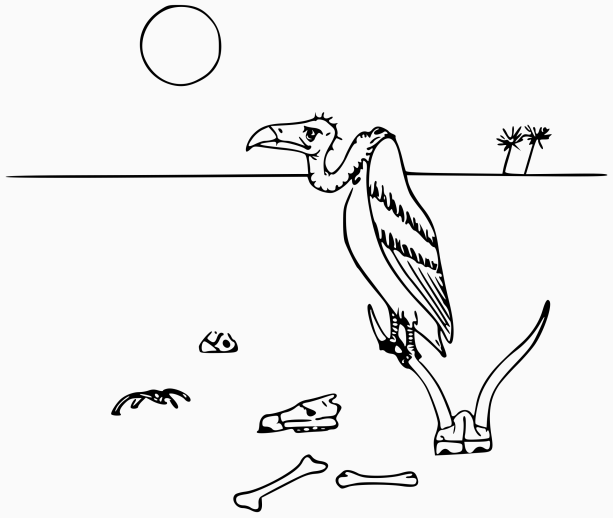

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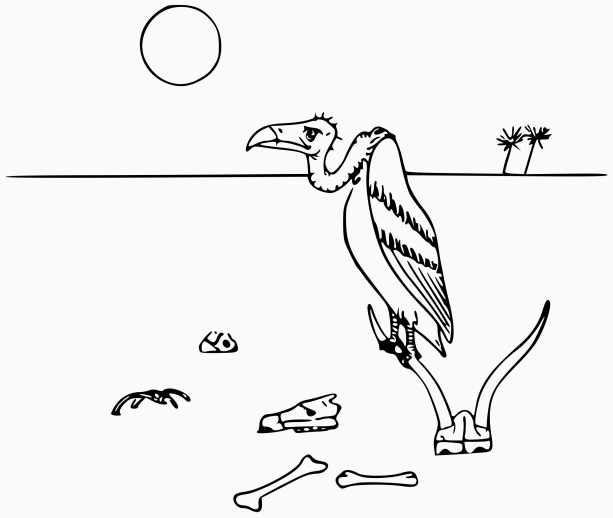

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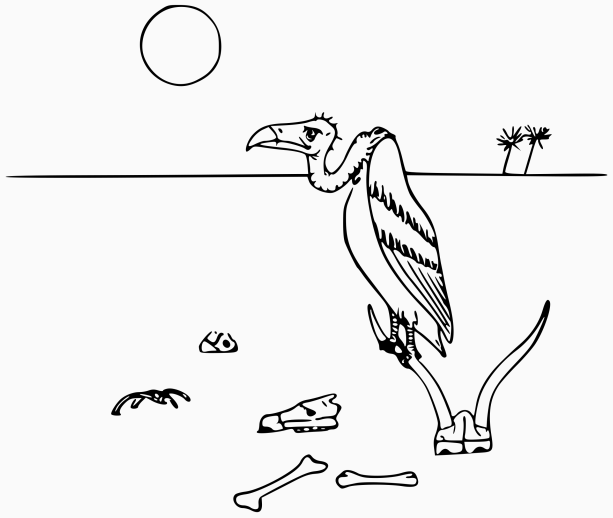

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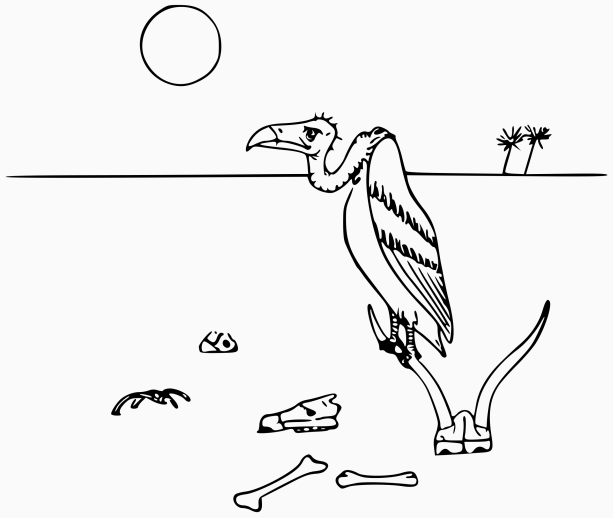
- Scofield, Buchanan, & Kostic (2018): Meta-analysis



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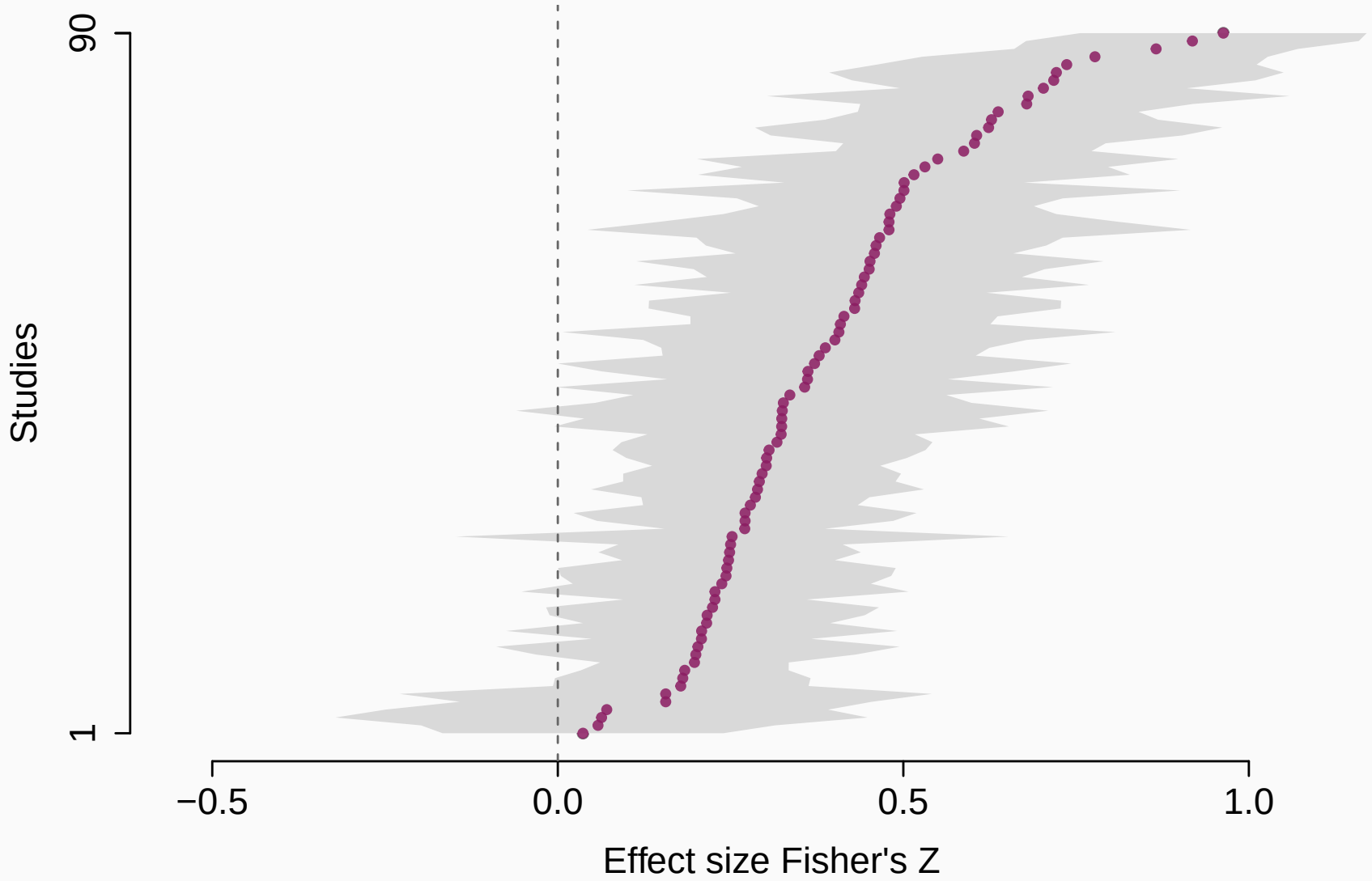

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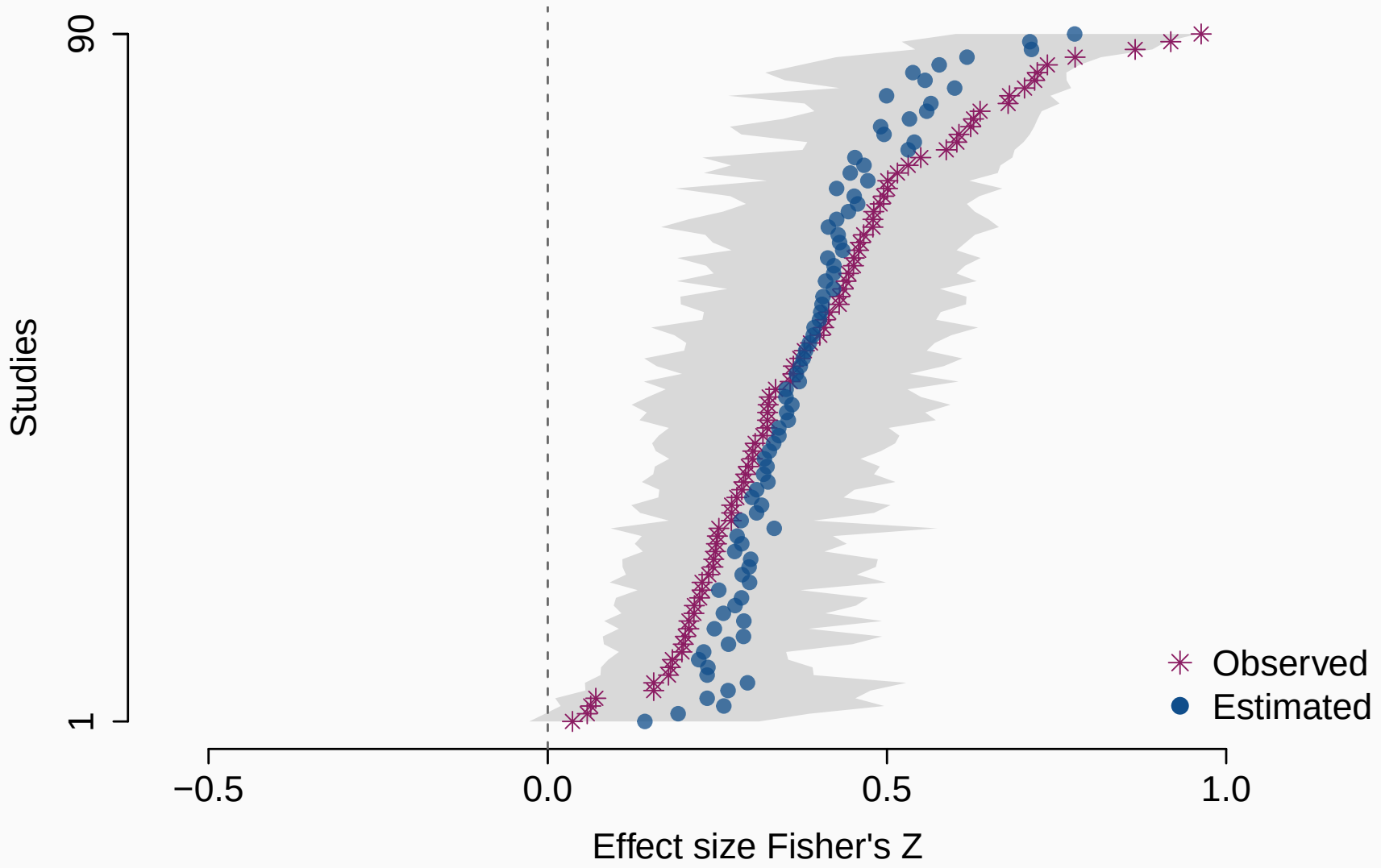

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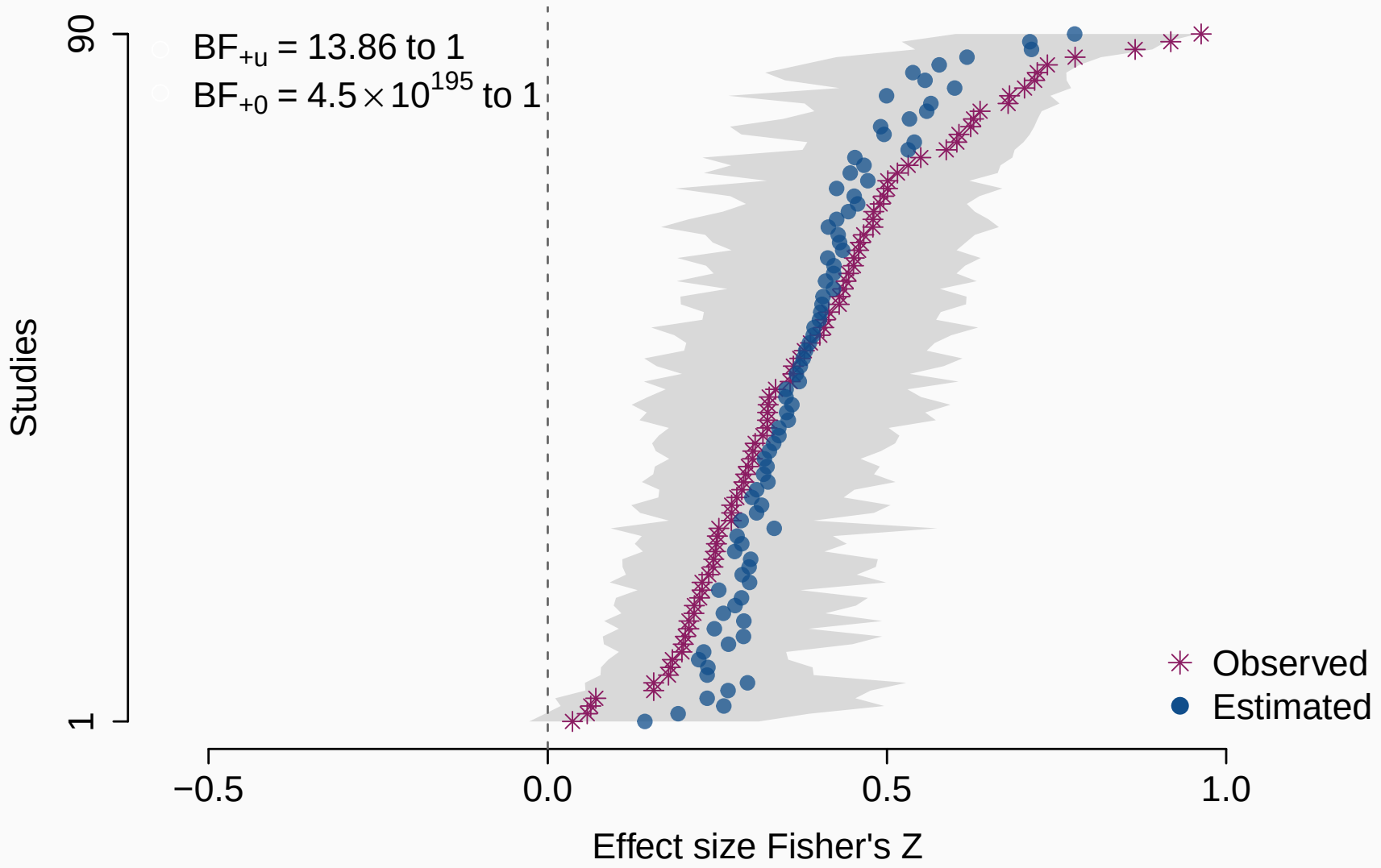

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- Average effects are limited and may not be that useful
- We may ask: Does every study show an effect in the usual direction?
- Positive-effects model highlights extremely robust findings
- May be related to replicability
- But there is no magic here

Thank you!

Haaf, J. M. (2018). *A hierarchical Bayesian analysis of multiple order constraints in behavioral science* (PhD thesis). University of Missouri.

Rouder, J. N., Haaf, J. M., Stober, C., & Hilgard, J. (submitted). *Beyond overall effects: A Bayesian approach to finding constraints across a collection of studies in meta-analysis*. Retrieved from `https://psyarxiv.com/zubr3/`

Scofield, J. E., Buchanan, E. M., & Kostic, B. (2018). A meta-analysis of the survival-processing advantage in memory. *Psychonomic Bulletin & Review*, *25*(3), 997–1012.

Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*(5), 768–777.

Wagenmakers, E.-J., Beek, T., Dijkhoff, L., Gronau, Q. F., Acosta, A., Adams Jr, R., ... others. (2016). Registered replication report: Strack, Martin, & Stepper (1988). *Perspectives on Psychological Science*, *11*(6), 917–928.