

# Does Every Study Show An Effect?

Bayesian Model Comparison In Meta-Analysis

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# The Goal

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# Goal of Meta-Analysis

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- Focus on meta-analytic grand mean
- Is it different than zero?
- What covariates affect it?

# Why the mean?

## Get to the Theoretical Distribution of Effect Sizes

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- This distribution reflects the range of plausible effects in a research area.
- This distribution reflects our choices of paradigms, variables, etc.
- This distribution reflects what is hot in the field.

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- Violent Video Games: Do they lead to more aggression?
- Mozart effect: Do we get more intelligent after listening to music by Mozart?

# What do we really want to know?

Research questions are about the direction rather than the mean.

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

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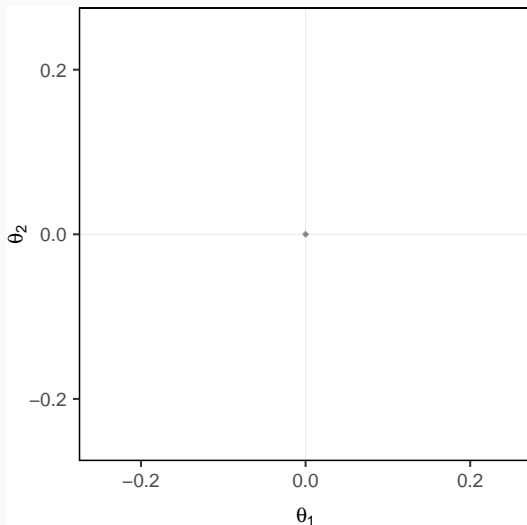
\*That is, a *true* effect in the same direction.



## Models on True Effects

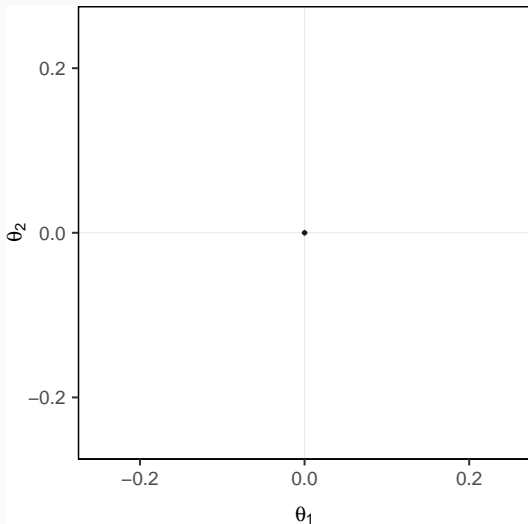
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# Models on the Collection of True Effects

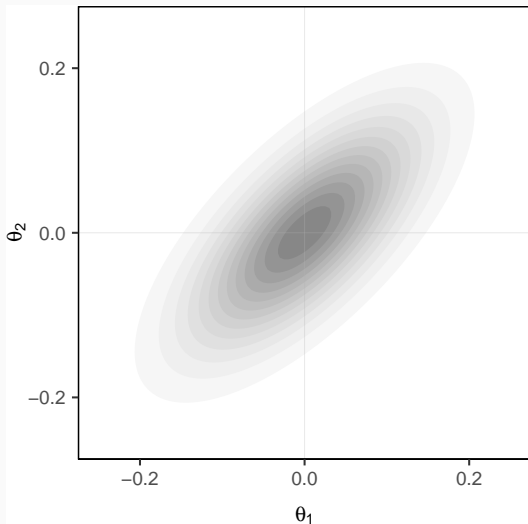


Haaf (2018); Rouder, Haaf, Stober, & Hilgard (submitted)

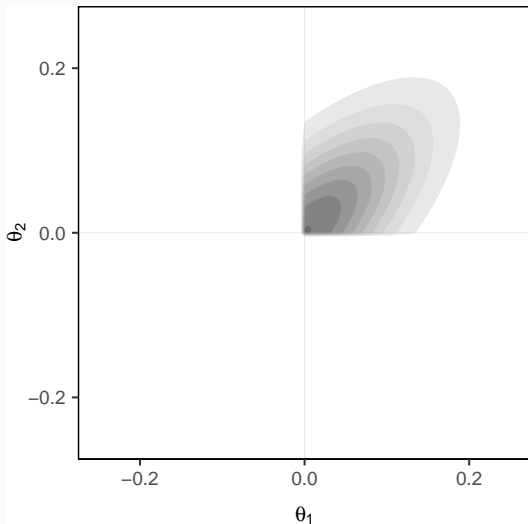
# The Null Model



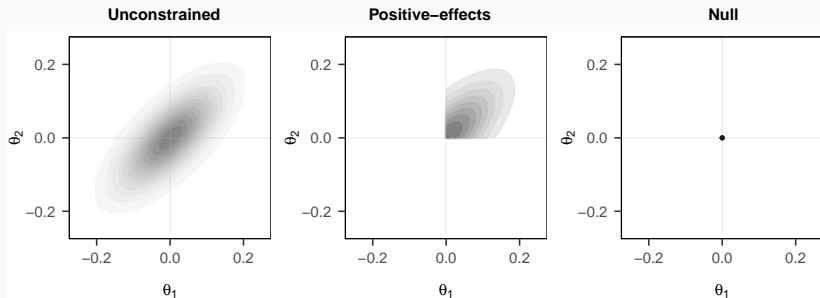
# The Unconstrained Model



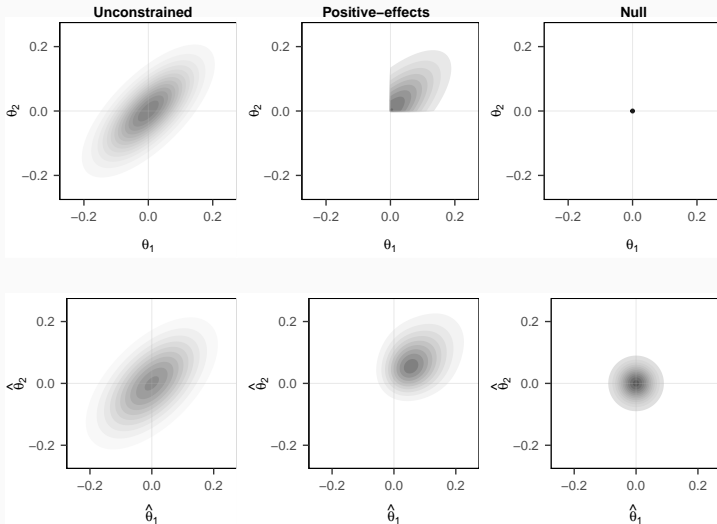
# The Positive-Effects Model



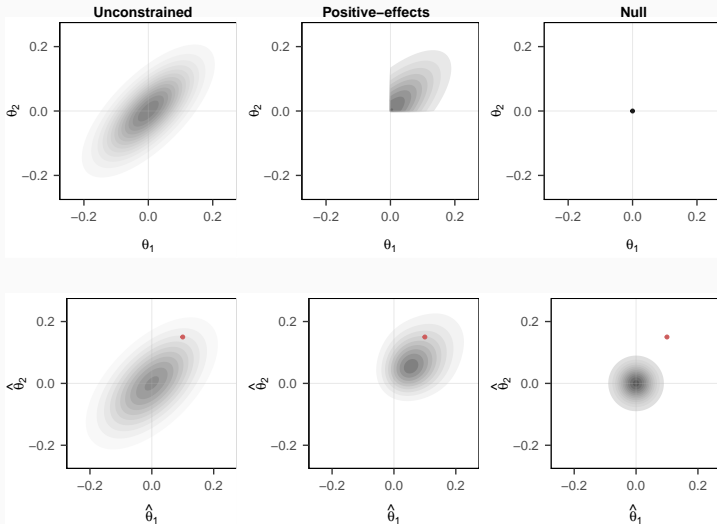
# From Models. . .



# From Models... to Predictions



# From Models... to Predictions... to Evidence



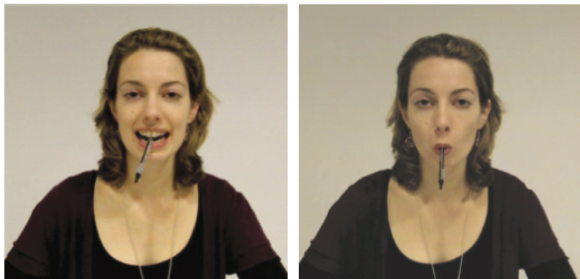


## Application I

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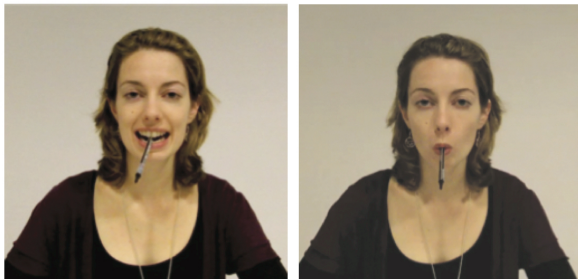
# Facial Feedback Hypothesis

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

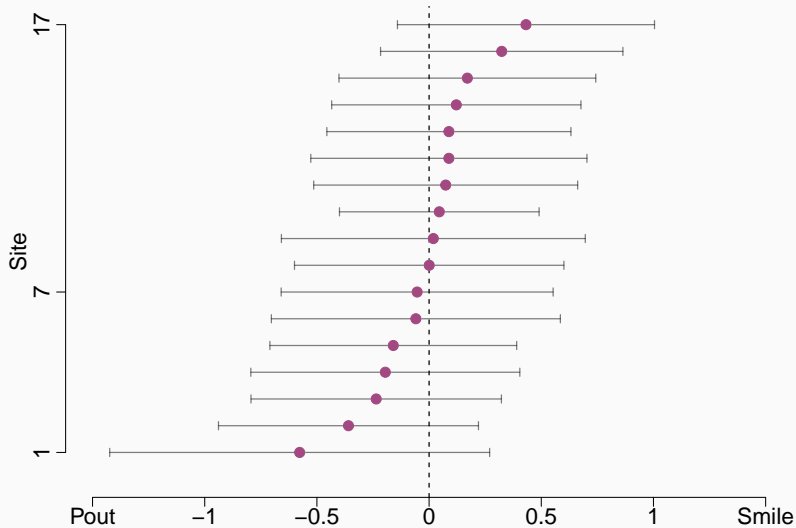


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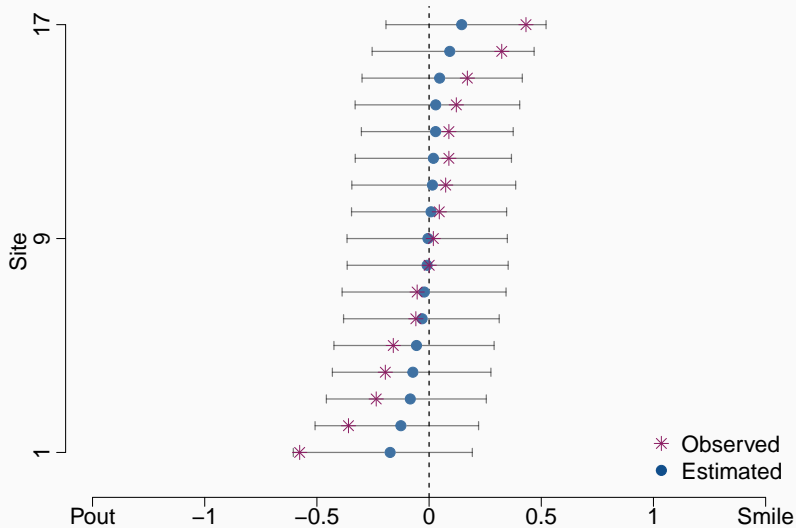
- Strack, Martin, & Stepper (1988): Cartoons are funnier after certain facial muscles are activated
- Wagenmakers et al. (2016) performed a registered replication



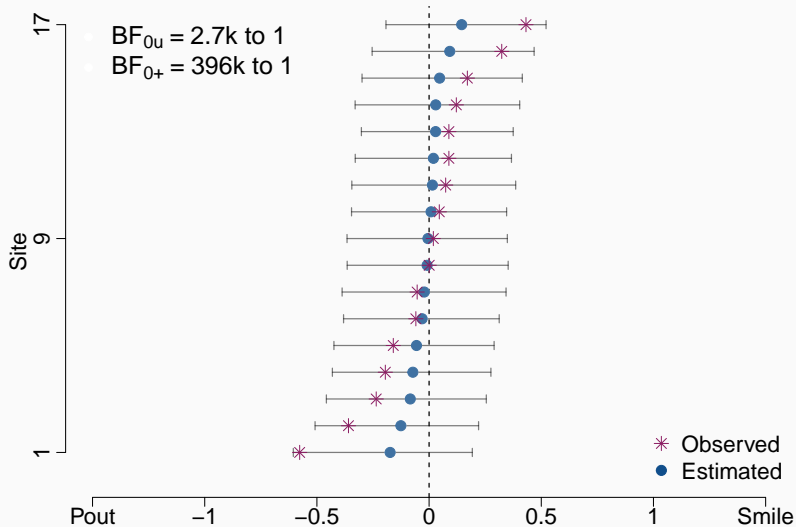
# Observed Effects



# Estimated Effects



# Model Comparison



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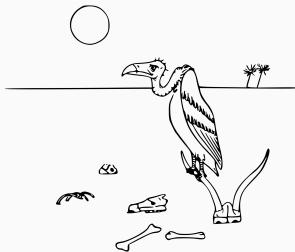
- The Null model is preferred
- There is evidence against the facial feedback effect
- There is evidence that *none of the studies* shows an effect

## Application II

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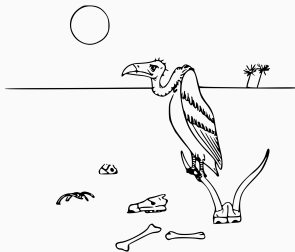
# Survival Processing Advantage in Memory

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



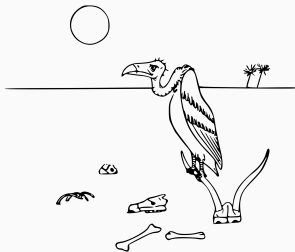
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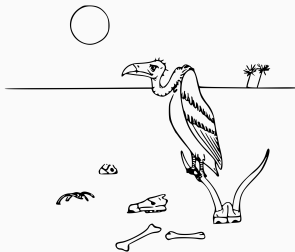
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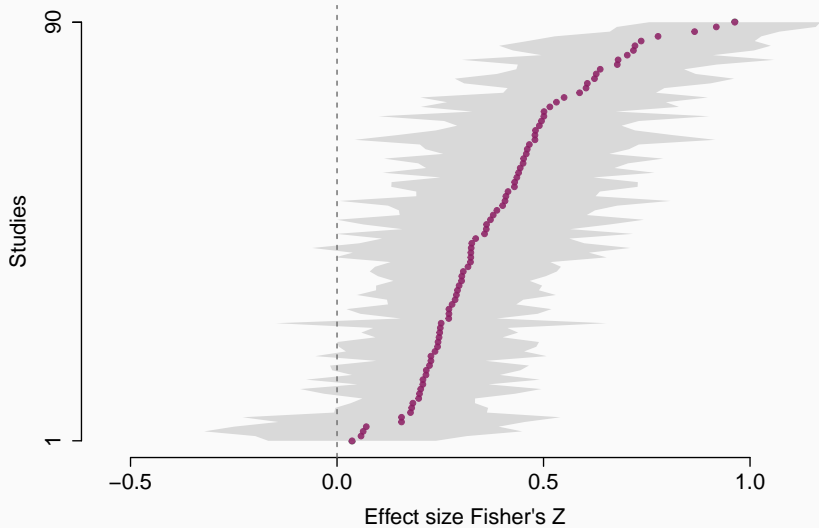


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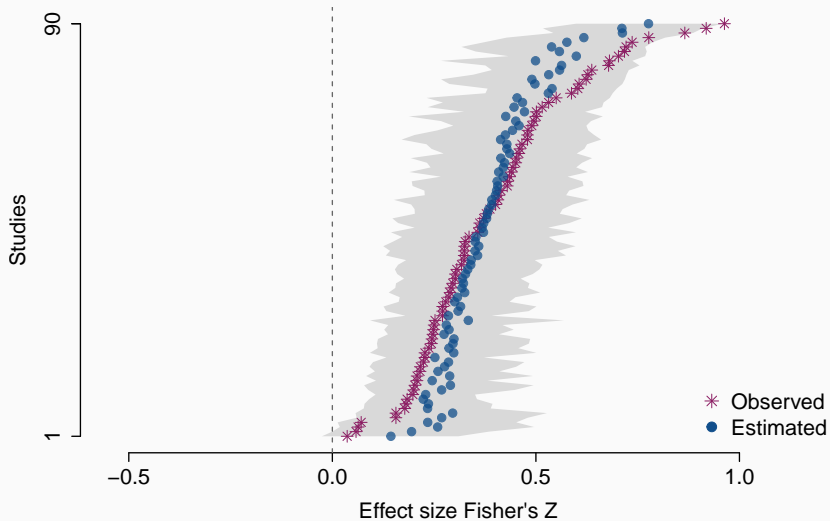
- Scofield, Buchanan, & Kostic (2018): Meta-analysis
- Participants imagine they are stranded in a grasslands. It's dangerous!
- Participants rate a list of words based on relevance in the survival scenario
- Surprise recall memory test for the words



# Observed Effects

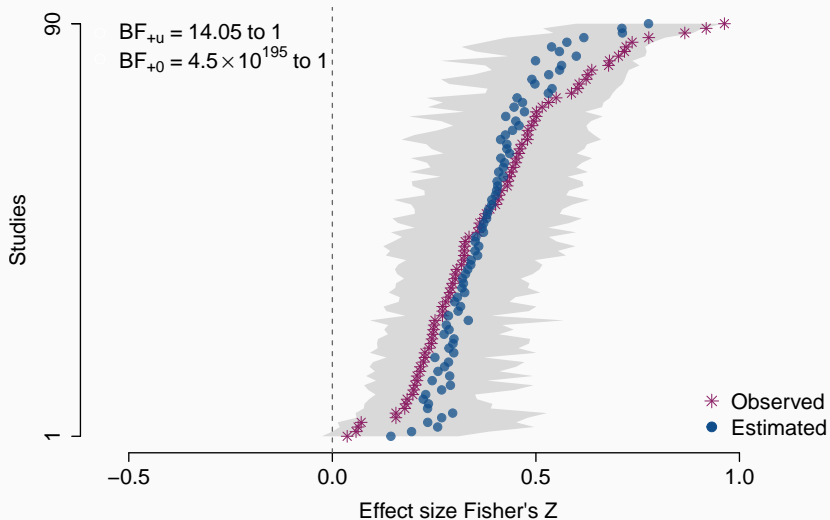


# Estimated Effects





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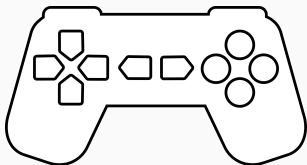
- The Positive-effects model is preferred
- There is evidence for the survival processing advantage
- There is evidence that *all of the studies* show an effect in the expected direction

## Application III

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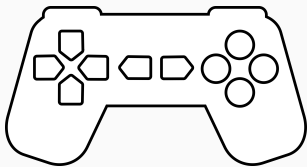
# Violent Video Games and Aggression

- Anderson et al. (2010): 381 effect size estimates from 130,296 participants

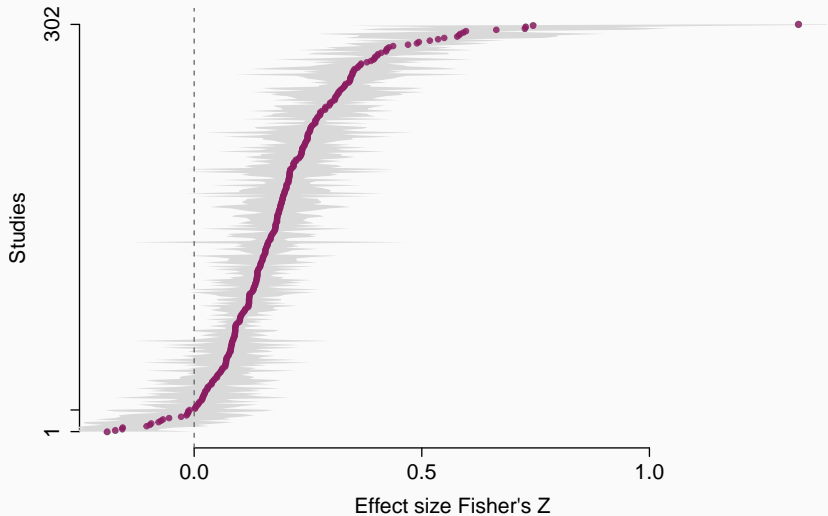


# Violent Video Games and Aggression

- Anderson et al. (2010): 381 effect size estimates from 130,296 participants
- Overwhelming evidence for the effect

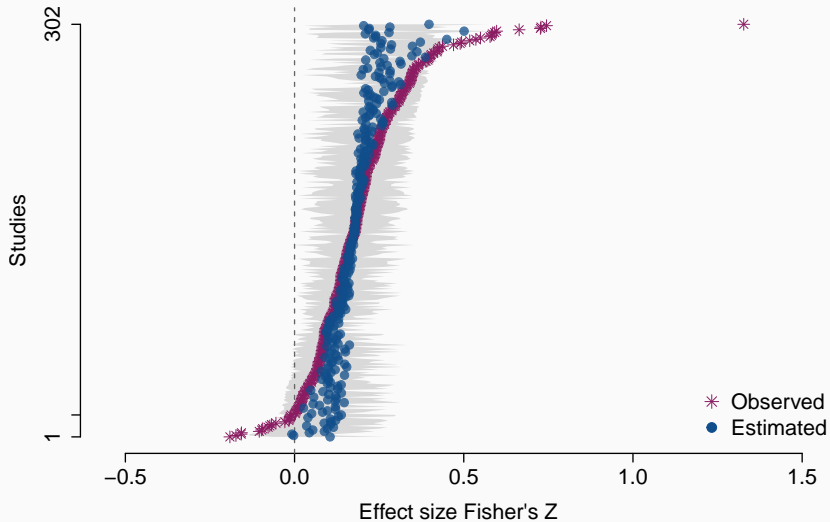


# Observed Effects

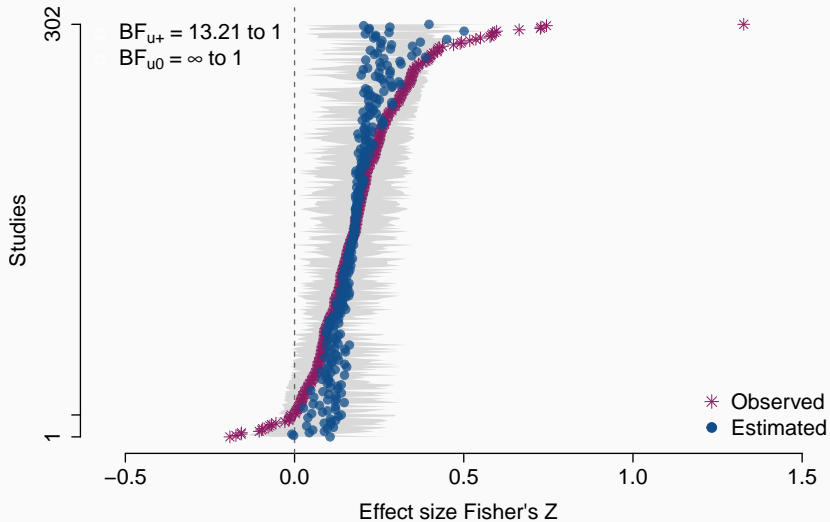




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- While the majority of the studies' effect size estimates are positive, there is too much evidence for negative effects
- We may want to explore next *what* drives the different directions of the effects

## Conclusion

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# Summary

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

# Thank you!

- Anderson, C. A., Shibuya, A., Ihori, N., Swing, E. L., Bushman, B. J., Sakamoto, A., ... Saleem, M. (2010). Violent video game effects on aggression, empathy, and prosocial behavior in eastern and western countries: A meta-analytic review. *Psychological Bulletin*, 136(2), 151–173. Retrieved from <http://psycnet.apa.org/doi/10.1037/a0018251>
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- 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.