



Modeling the role of common ground in pragmatic word learning

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Background

To resolve ambiguity, speakers and listeners make context sensitive inferences based on expectations they have about their communicative partner¹.

General expectations:

- Communicative acts are designed to be relevant and informative (cf. Gricean Cooperative Principle).

Speaker specific expectations

- Communicative acts relate to 'Common Ground'.

Current Study

How do listeners balance and integrate different expectations about speakers?

General expectations: expecting utterances to have small extension in context² (Exp. 1). Speaker specific expectations: some objects are novel to³ or preferred by the speaker⁴ (Exp. 2). We replicated these basic effects in adults and children (ongoing) before crossing them in Exp. 3.

Model

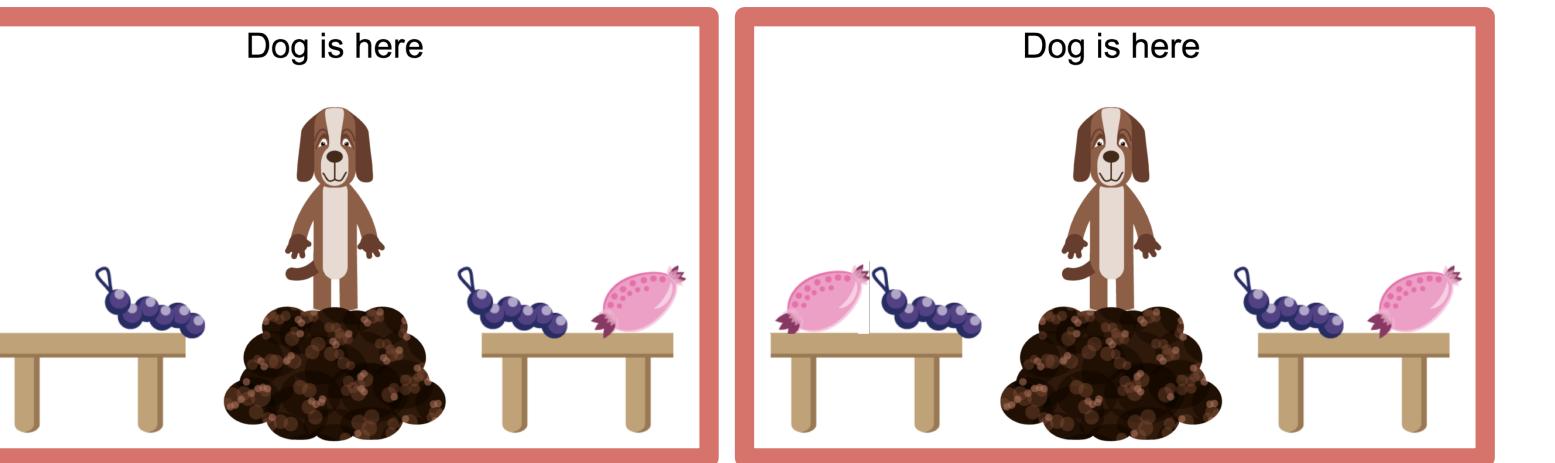
We formalized the interaction between general and speaker specific expectations in a probabilistic model within the Rational Speech Act (RSA) framework⁵:

$$\text{Exp. 3} \quad P_L(r|u) \propto \text{Exp. 1} \quad P(u|r) \times \text{Exp. 2} \quad P_S(r)$$

The probability that an object is the referent is proportional to the likelihood that a speaker would use a particular utterance to refer to it times the prior probability of that object being the referent. As prior probability we used proportion of correct choice from Exp. 2.

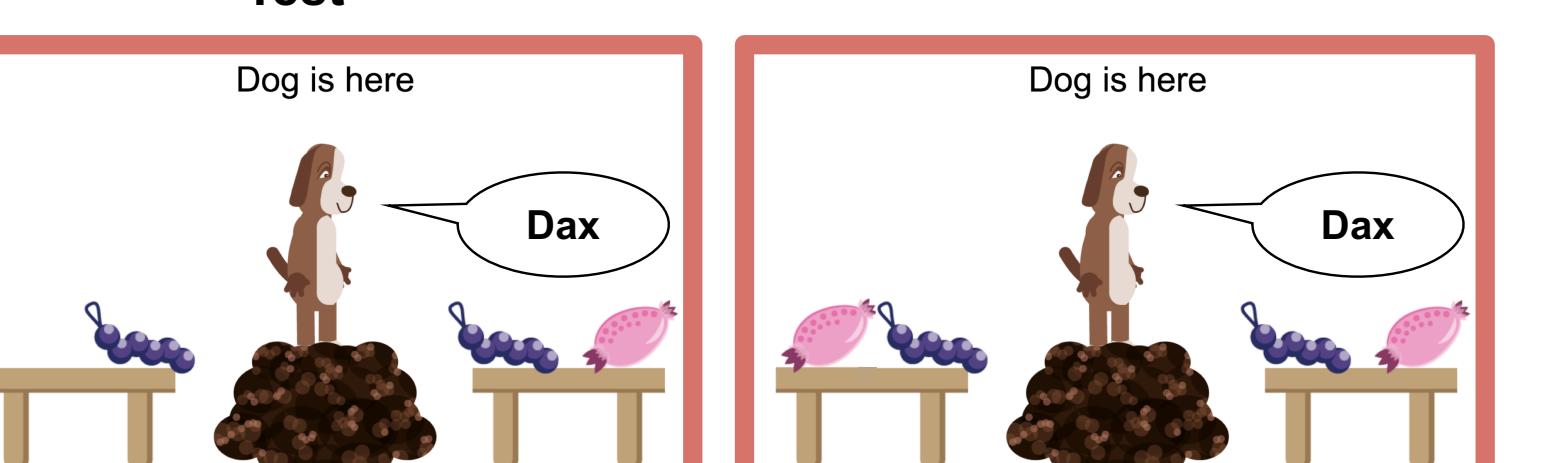
Design

Exp. 1 - Informativeness

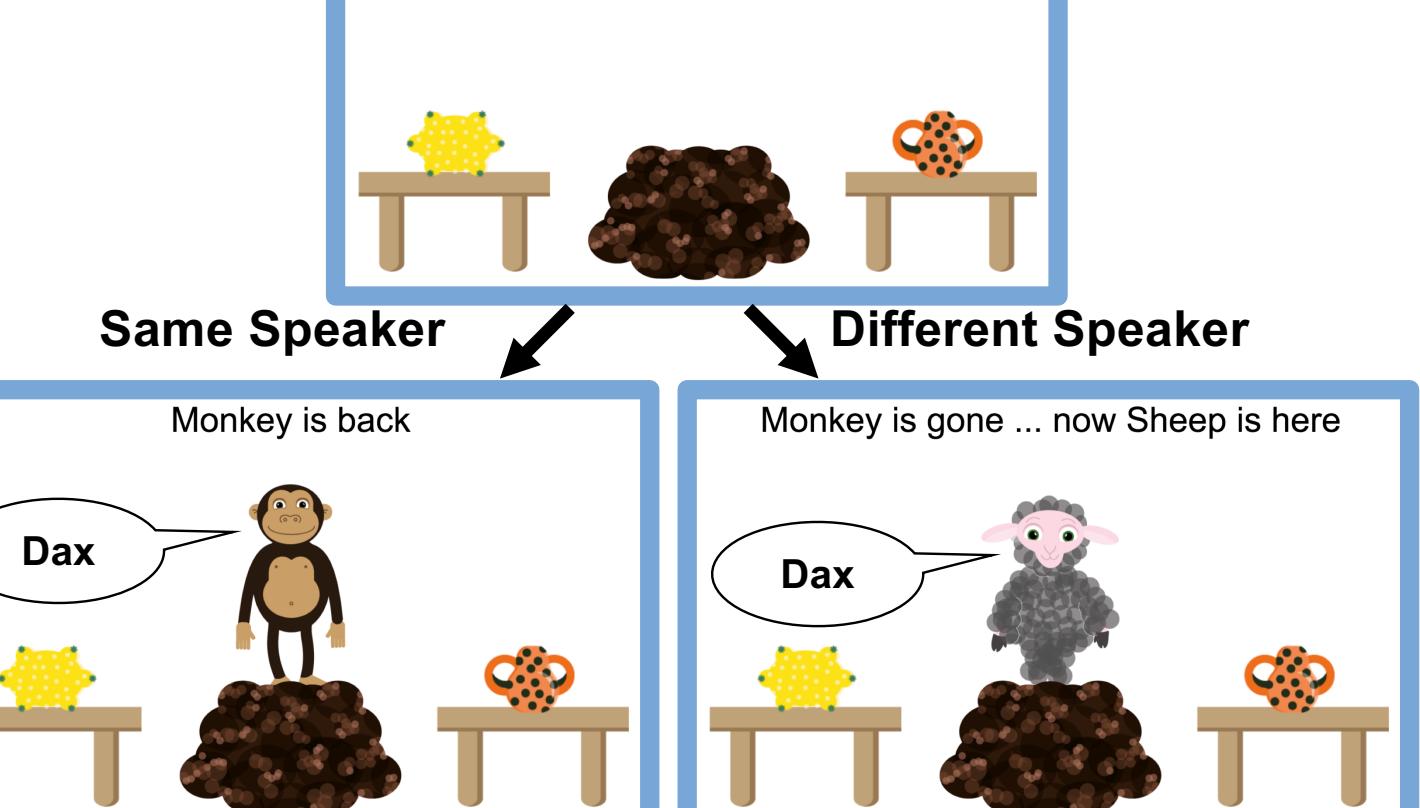
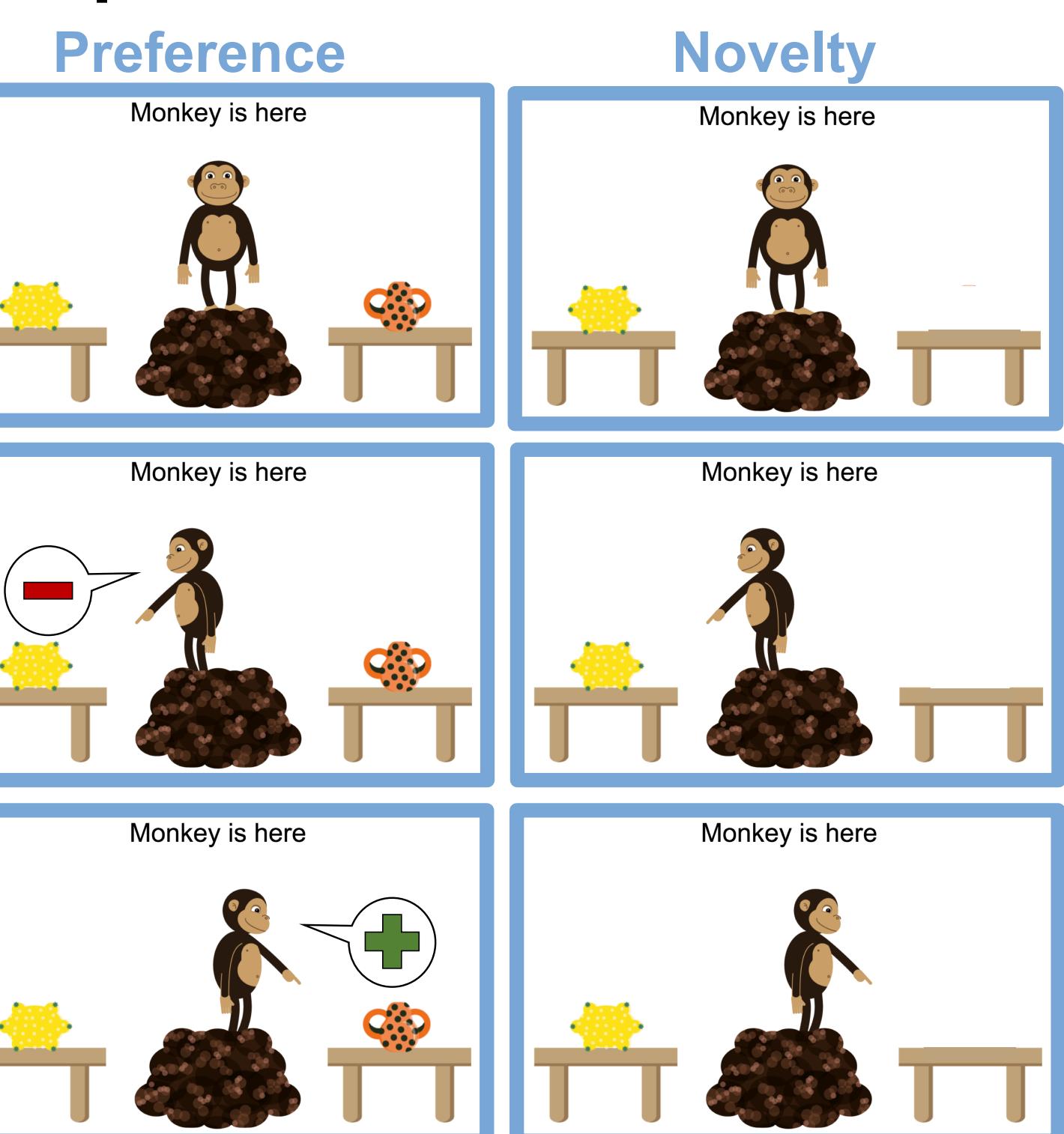


Exp. 3

Congruent:
Expectations point to same object
Incongruent:
Expectations point to different object

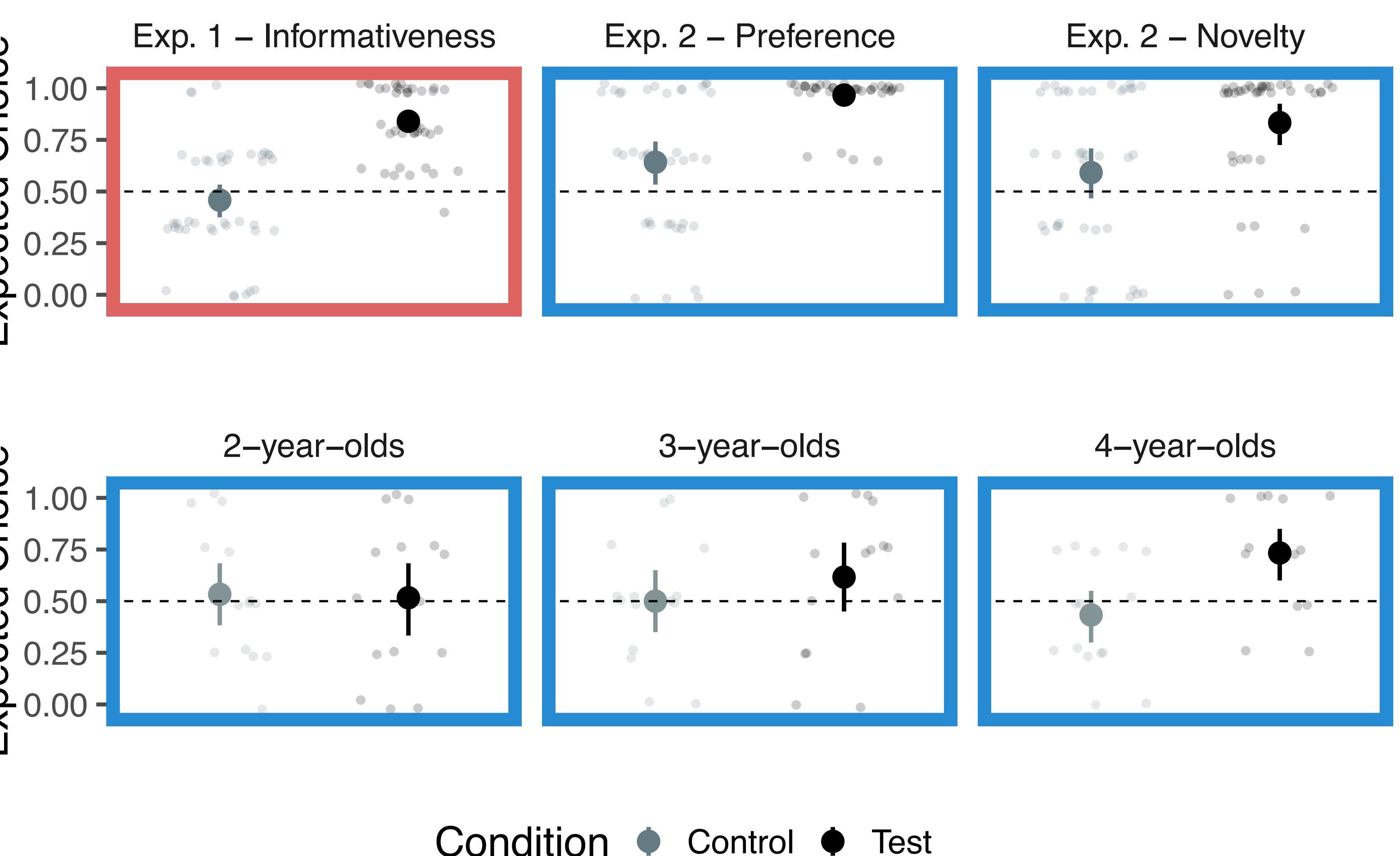


Exp. 2 - Common Ground



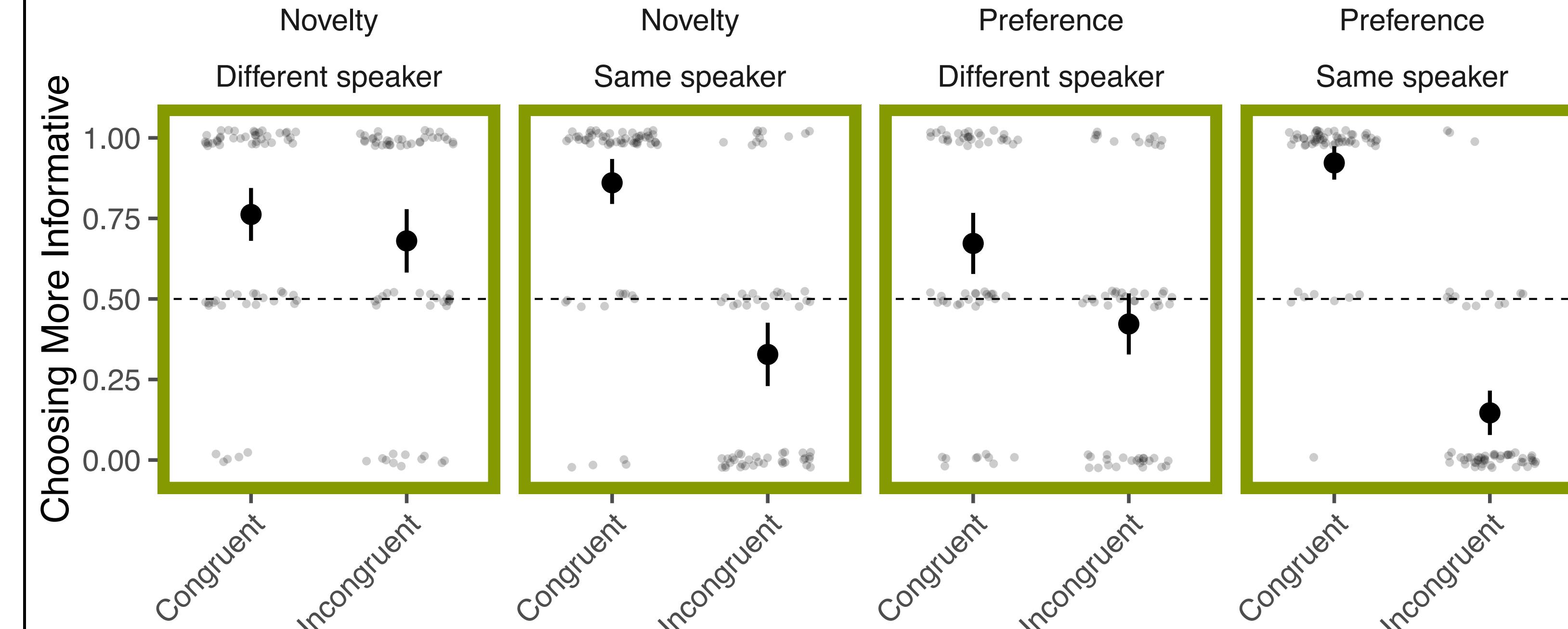
Results Exp. 1 & Exp. 2

Replicates results for general and speaker specific expectations.

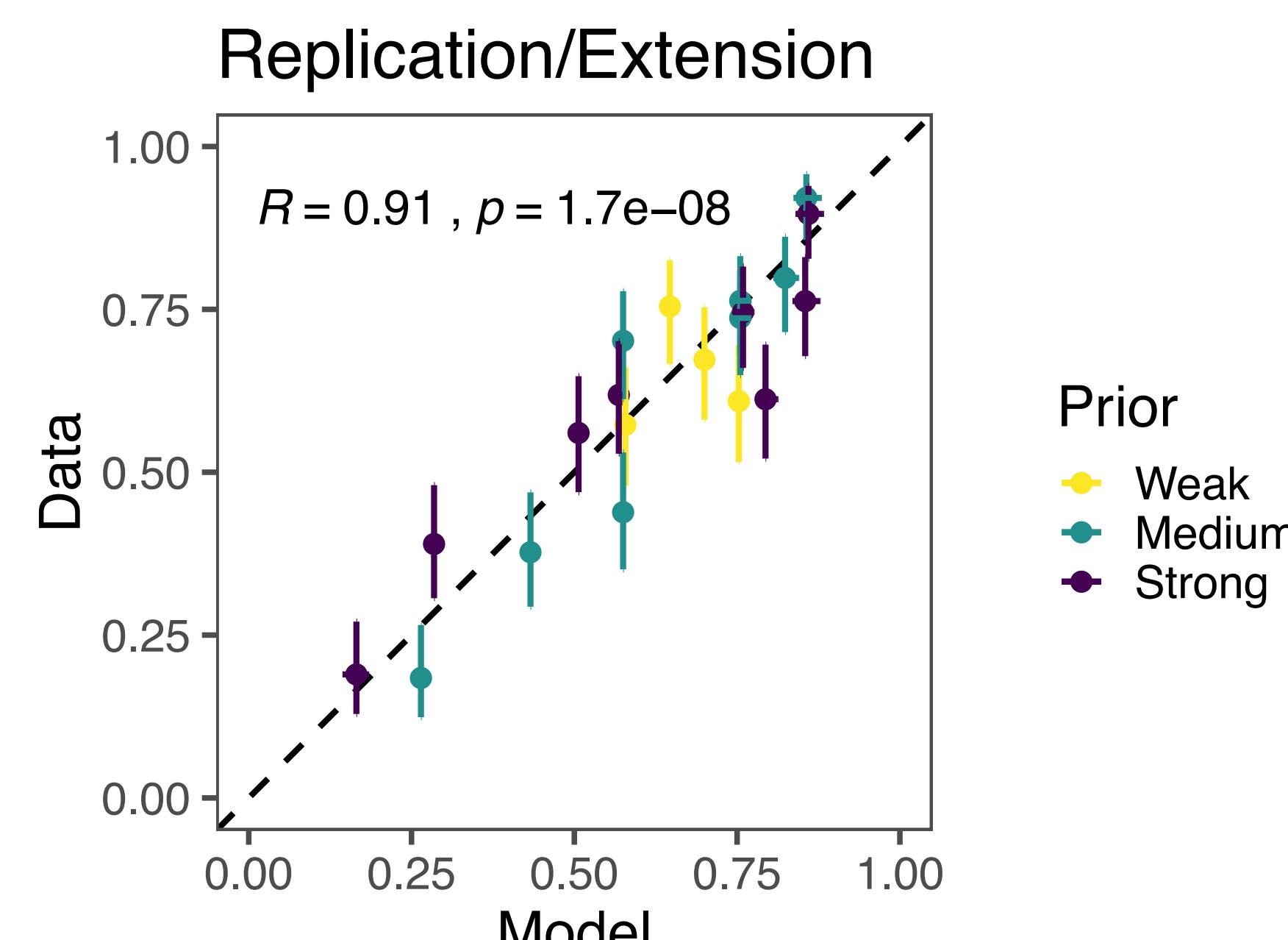
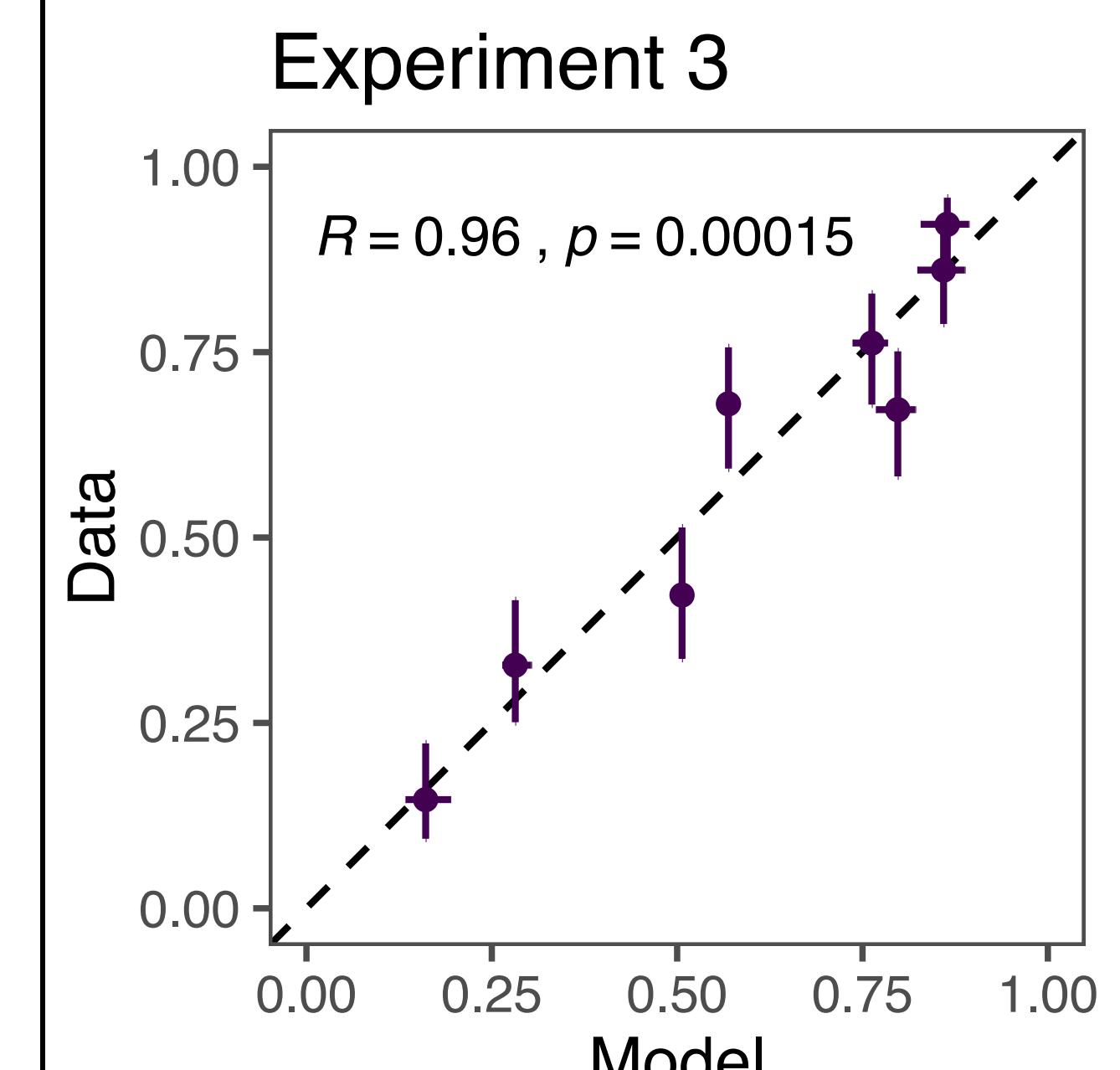


Results Exp. 3

Listeners prioritise speaker specific expectations.



Model Comparison



The pragmatic RSA model captured most of the variance in the data and provided a better fit compared to a 'Prior Only' or a 'Flat Prior' model (both $BF_{10} > 2e25$).

Conclusion

Listeners integrated and balanced different expectations about speakers, prioritizing speaker specific information. Our probabilistic model successfully captured these dynamics.

Next: How do children integrate different expectations?

References: 1 e.g. Clark, H. H. (1996). *Using language*. Cambridge University Press.; Bohn, M., & Köymen, B. (2018). Common Ground and Development. *Child Development Perspectives*, 12(2), 104-108. 2 Frank, M. C., & Goodman, N. D. (2014). Inferring word meanings by assuming that speakers are informative. *Cognitive Psychology*, 75, 80-96. 3 Akhtar, N., Carpenter, M., & Tomasello, M. (1996). The role of discourse novelty in early word learning. *Child Development*, 67, 635- 645. 4 Saylor, M. M., Sabbagh, M. A., Fortuna, A., & Troseth, G. (2009). Preschoolers use speakers' preferences to learn words. *Cognitive Development*, 24, 125-132. 5 Goodman, N. D., & Frank, M. C. (2016). Pragmatic language interpretation as probabilistic inference. *Trends in Cognitive Sciences*, 20, 818-829.