

# From Possible to Pause-able: Children's hesitancy may mark implicit skepticism of incorrect intuitive beliefs



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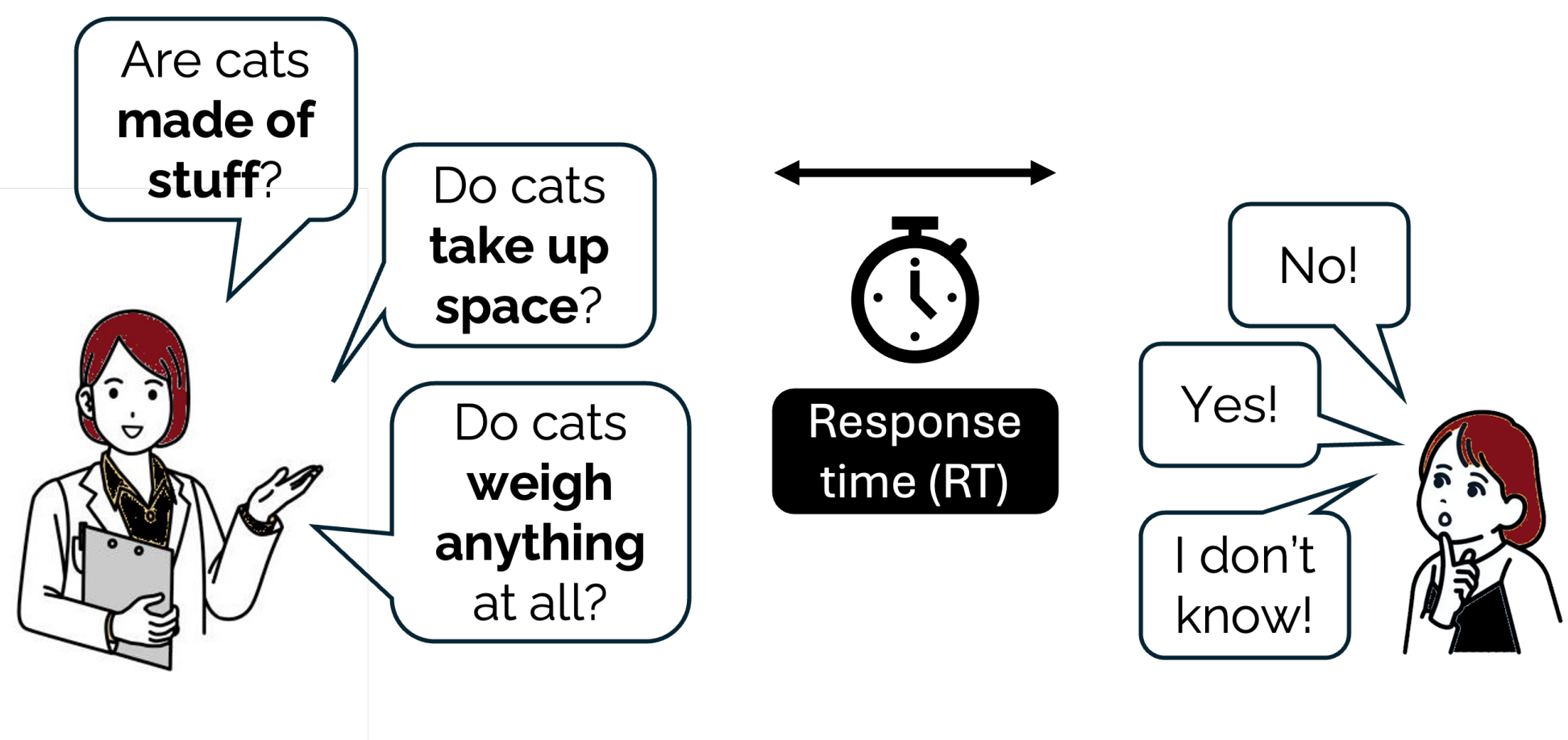
## BACKGROUND

- Young **children's naive, intuitive beliefs** about the material world (e.g., “air is nothing,” “a grain of rice weighs nothing”) are theory-like but **run counter to scientific understanding** <sup>[1, 2]</sup>
- Previous work shows **aspects of naive beliefs are retained in adulthood** – expert adults' correct answers are slower for “incongruent” questions (where correct answers run counter to naive beliefs) than “congruent” questions (where correct answers align with naive beliefs) <sup>[3]</sup>
- Even before acquiring beliefs aligned with scientific understanding**, learners' **naive beliefs may conflict** with other parts of their knowledge (e.g., “air is nothing”; “we need air to breathe”)
- Elementary schoolers wrestling with such conflicting beliefs may respond more slowly to “incongruent” questions even *before* learning the scientifically correct response

Among children with naive beliefs about the material world, are response times (RTs) slower for “theory-incongruent” questions than for “theory-congruent” questions?

## PROCEDURE

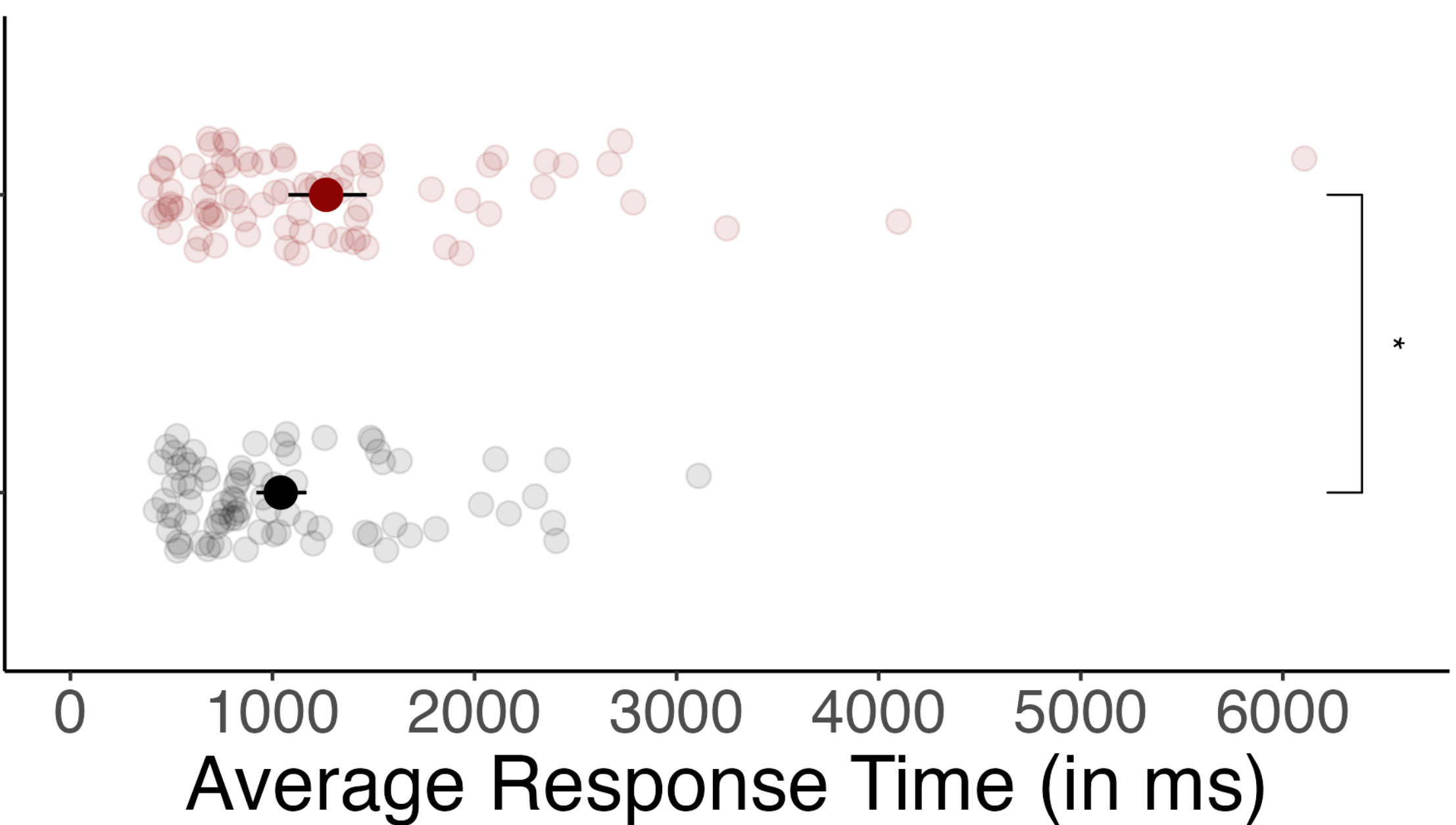
Children answered 30 forced-choice questions about 10 entities and their physical properties.



- Congruent questions** (n = 5) were those **most children** answered **correctly**; **incongruent questions** (n = 5) were those **fewest children** answered **correctly**
- We excluded children's RTs relating to inaccurate and accurate responses, respectively
- Based on video, we **coded children's RTs** (time between end of question and start of response)

## RESULTS

Score ● Congruent Score ● Incongruent Score



OSF AS PREDICTED

N = 81 five- to nine-year-old children

Mean diff. = 225 ms,  $d = .24$ , 95% CIs,  $[-.06, .54]$ ,  $p = .041$ ; paired t-test (two-tailed)

- Second coder blind to hypotheses coded 100% of data; ICC = ,  $p < .001$
- Overall, children were **marginally slower to respond to incongruent questions** than congruent ones
- RTs correlated with EFs and domain knowledge** ( $r = .28$ ,  $p = .021$ ;  $r = .31$ ,  $p = .005$ )
- Variance in RTs did *not* correlate with children's error monitoring or cognitive reflection abilities

## DISCUSSION & FUTURE DIRECTIONS

Children's RTs may be informative of their being at the cusp of overturning naive, intuitive beliefs about the material world.

- Even before acquiring a scientific understanding** of matter and its properties, **preschool children show signs of hesitancy** when producing and communicating responses aligned with incorrect naive beliefs
- Learners vary in their degree of hesitancy**; individual differences relate to levels of EF and overall domain knowledge
- We plan to replicate and extend this finding using a question set a) including items beyond the physical reasoning domain, and b), explicitly controlling for age of acquisition and processing-relevant variables (word frequency and length, no. of syllables)

## REFERENCES

- [1] Carey, S. (2009). The Origin of Concepts. Oxford University Press.
- [2] Shtulman, A. (2017). Scienceblind: Why Our Intuitive Theories About the World Are So Often Wrong. Hachette UK.
- [3] Shtulman, A., & Valcarcel, J. (2012). Scientific knowledge suppresses but does not supplant earlier intuitions. Cognition, 124(2), 209–215. <https://doi.org/10.1016/j.cognition.2012.04.005>