



# Children's hesitancy as a marker of implicit skepticism of incorrect intuitive beliefs

Adani Abutto<sup>a, b</sup> Igor Bascandziev<sup>a</sup> Caren Walker<sup>c</sup> Elizabeth Bonawitz<sup>a</sup>  
<sup>a</sup>Harvard University <sup>b</sup>Stanford University <sup>c</sup>University of California San Diego



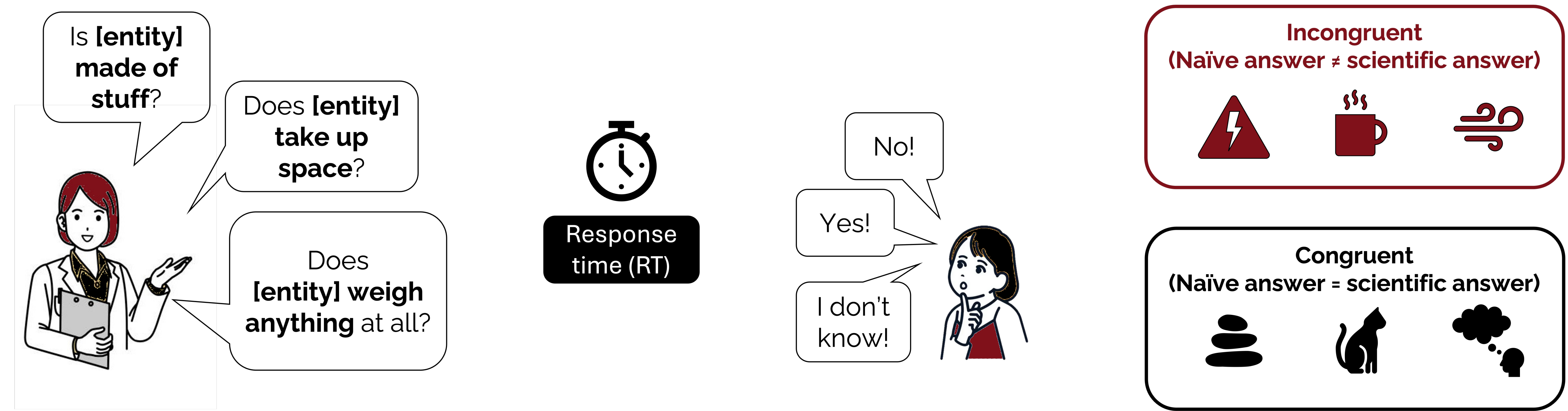
## BACKGROUND

- Young children's naive, **intuitive beliefs** about the material world (e.g., "*Air is nothing*") are theory-like but **often run counter to scientific understanding** (e.g., "*Air is matter*")<sup>[1, 2]</sup>
- Between ages 6-12, in an episode of conceptual change, children start revising their "theory of matter"<sup>[1]</sup>
- Even before** acquiring beliefs aligned with **scientific understanding**, learners may have **knowledge that is inconsistent with naive beliefs** but consistent with scientific understanding (e.g., "*We need air to breathe*")
- Belief inconsistency may lead to slower answers to "incongruent" questions (naive answer ≠ scientific answer; typically undergoing change) than "congruent" questions (naive answer = scientific answer)

Do children at the brink of revising their naive beliefs about the material world show slower response times for "incongruent" questions than "congruent" questions?

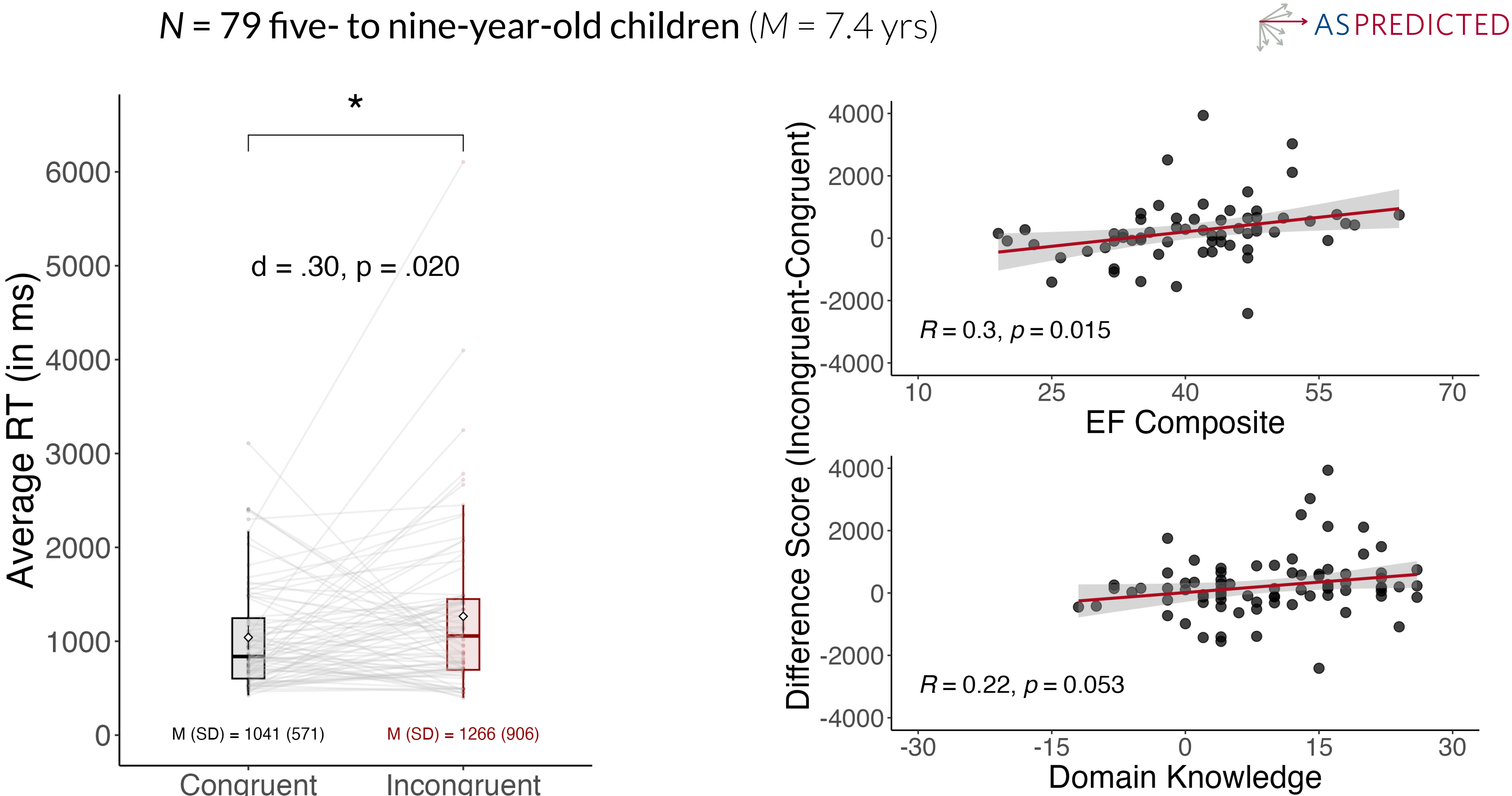
## PROCEDURE

Children answered 36 forced-choice questions about entities and their physical properties



- We selected a subset of 10 questions for analysis: Congruent questions (n = 5) were those most children answered correctly; incongruent questions (n = 5) were those fewest children answered correctly
- Based on **video**, we **coded children's RTs** (time between end of question and start of response)
- We then analyzed children's **RTs for incorrect responses to incongruent questions** and **correct responses to congruent questions**, also computing an individual "difference score" ( $M_{\text{incongruent}} - M_{\text{congruent}}$ )
- Children's executive functioning was captured via Backward Digit Span (working memory), verbal fluency (inhibition), Day-Night (set-shifting); we also assessed cognitive reflection (CRT-D) and error monitoring

## RESULTS



Children were **slower** answering **incongruent** questions; individual hesitancy varied markedly

Hesitancy **correlated with EF** and **domain knowledge** but not CRT-D or error monitoring

## DISCUSSION & FUTURE DIRECTIONS

Our data suggests children's RTs reflect being at the cusp of overturning their naive beliefs about the material world.

- Even before acquiring a scientific understanding** of matter and its properties, **elementary schoolers show signs of hesitancy** when producing responses invoking *incorrect* naive beliefs
- Learners vary in their degree of hesitancy**; individual differences relate to levels of EF and overall domain
- We plan to replicate and extend this finding using a question set a) including items beyond the physical reasoning domain, and b), 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.

Data & details:

