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Background

Representing possibilities and alternatives is a critical skill that humans develop and hone throughout their lives. Yet, despite the ubiquity of notions of possibility, it is a rather puzzling concept: *What does it mean for something to be possible?* Possibility could be represented using an epistemic construal, dependent on one's own state of knowledge and beliefs, or a non-epistemic, objective construal, based on logic, physics, metaphysics and other laws and rules governing our universe—genuine possibility. Using a modified ramps task (Beck et al., 20016), this study disentangles children's responses based on epistemic possibility from those based on objective possibility, focusing on the cognitive representations children build in response to modals.

Methods

N = 254 children aged 2 years, 3 months – 6 years, 0 months

The study progressed in 5 phases:

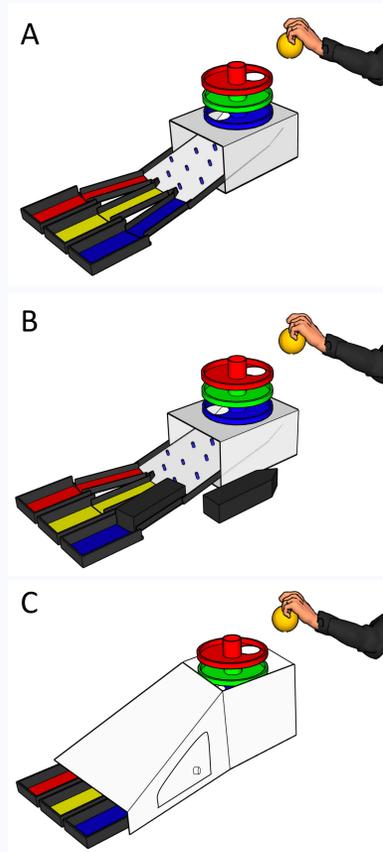
Machine with no blockers (Fig A)

Machine with visible blocker (Fig B)

Machine with cover on (Fig C)

Machine with cover on and a hidden blocker (Fig C)

Machine with hidden blocker revealed (cover removed)



One ball was dropped down the machine for each phase 1-4.

For each phase 1-5, the child was asked three questions:

Which color did this ball go down?

Could this ball have gone down [alternative color ramp]?

Could this ball have gone down [other alternative color ramp]?

Results

Three response patterns emerged among children's responses, with a developmental progression:

Liberal Modalizers (mean age = 3 years, 6 months)

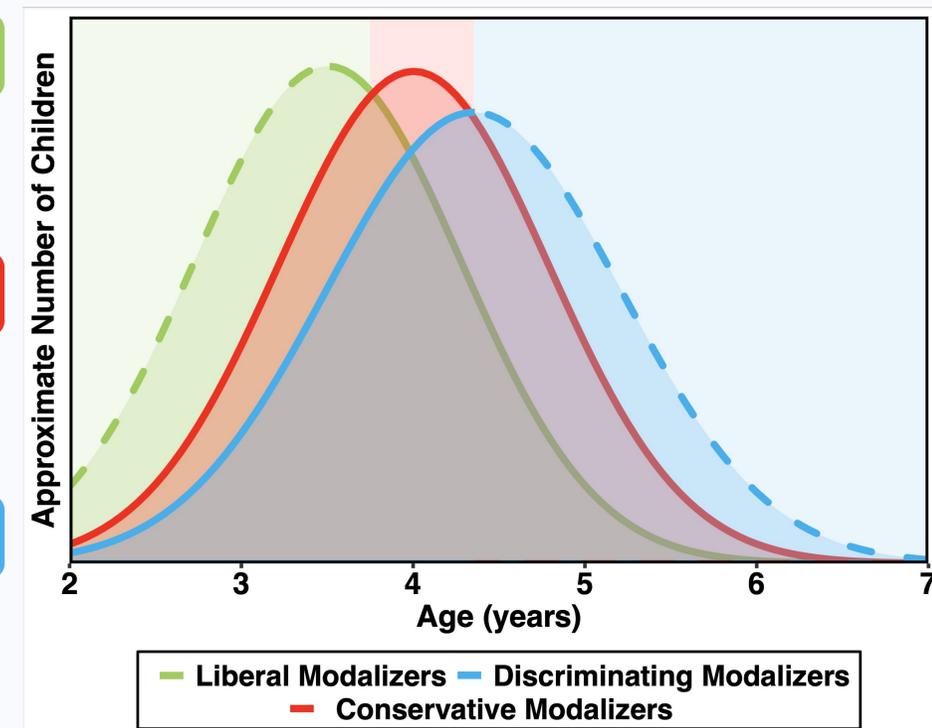
- Report that all outcomes are possible
- Answer 'yes' to questions about the possibility of counterfactual outcomes - including questions about blocked ramps

Conservative Modalizers (mean age = 4 years, 0 months)

- Report that only the actual outcome is possible
- Answer 'no' to questions about the possibility of counterfactual outcomes - including questions about unblocked ramps

Discriminating Modalizers (mean age = 4 years, 4 months)

- Adult-like pattern of response
- Make judgements of epistemic and objective possibility appropriately
- Success with false belief, past knowledge, and non-counterfactual possibility



Conclusions

Counterfactual thinking, epistemic possibility, non-epistemic possibility, and theory of mind may emerge at similar times in development at around 4 and a half years of age. The developmental progression of children's understanding of possible and impossible events and dramatic shift in responses to counterfactual questions, which go beyond a simple 'yes' or 'no' bias, reflect a change in what is deemed to count as a relevant alternative possibility, until the threshold for the domain of possibilities is properly set.

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