Children Use Causality to Guide Question Asking

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Question:

Can 5- and 7-year-olds draw on their knowledge of real-world ***causal relationships*** to identify relevant questions?

Background:

In question asking, learners need to identify which of numerous possible queries are most helpful to their information search.

- By age 5, children can identify more effective questions given an explicit information structure (Ruggeri et al., 2017).
- However, children also struggle to identify the most useful, pertinent information to ask about (Ruggeri et al., 2021; Davidson, 1991; Jirout & Klahr, 2020).
- By age 4, children readily employ knowledge of causal relationships to guide their reasoning (Magid et al., 2015; Tsividis et al., 2015).

Here, we ask whether children draw on their knowledge of real-world causal relationships to guide question asking.

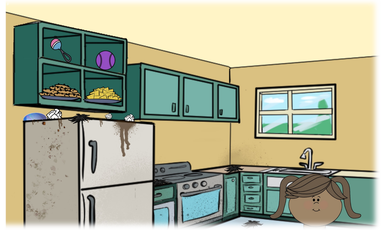
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Method:

Ppts heard **one of two stories** about an event with an unknown cause.

The story included details suggesting traits of the true cause.

Story 1: *Kitchen*

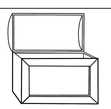


Story 2: *Garden*



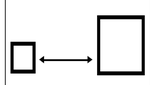
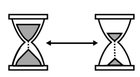
In **three trials**, children made a forced-choice between two questions to ask about possible causes. Both questions targeted similar information, but one was causally related to a story detail.

Story 1: *Kitchen*

"For each pet, we can ask…"	*Relevant:*	*Irrelevant:*	*Clue from Story:*
Ability trial: *"…can it **climb**, or can it **make noise**?"*			*"There was a mess on top of the fridge."*
Appearance trial: *"…what color **eyes** does it have or what color **fur** does it have?"*			*"There was black fur all around."*
Preference trial*: *"…what does it like to **play with** or what does it like to **eat**?"*			*"There was the rattle, the ball, and the chips, but the cookies were missing."*

**Note: A quarter of participants were presented with a missing toy, rather than a missing treat.*

Story 2: *Garden*

"For each pet, we can ask…"	*Relevant:*	*Irrelevant:*	*Clue from Story:*
Ability trial: *"…how **big** is it, or how **fast** is it?"*			*"The pet got into the garden by fitting through a crack in the fence."*
Appearance trial: *"…what color **eyes** does it have or what color **fur** does it have?*			*"There was black fur all around."*
Preference trial*: *"…what does it like to **chew on** or what does it like to **sleep on**?"*			*"There was the basket of hay, the basket of sticks… but the tomatoes in the last basket were full of holes."*

**Note: A quarter of participants were presented with a nest, rather than a chewed item.*

Results:

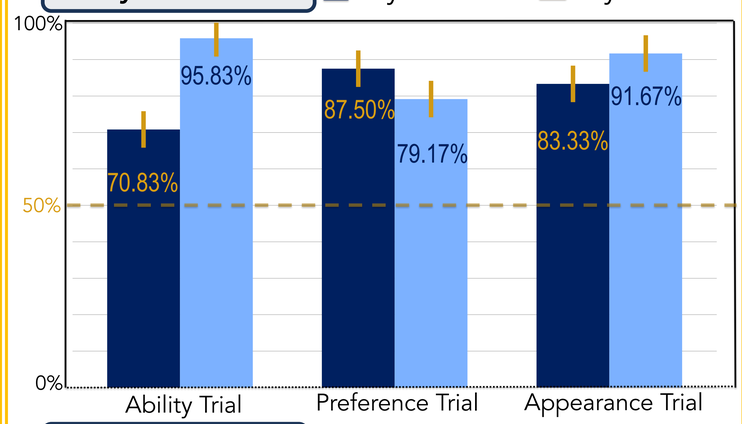
(*N* = 96, 48 per age group)

Overall, children overwhelmingly chose questions that targeted relevant causal relationships, with differences by age.

- The overall proportion of relevant questions chosen (72.92%) was significantly greater than chance ($p < 0.001$; 95% CI = [68.03, 78.43], *two-tailed binomial*).
- Performance differed significantly between age groups (Wald, $z = -2.33$, $p = 0.02$) and Stories ($p < 0.001$).

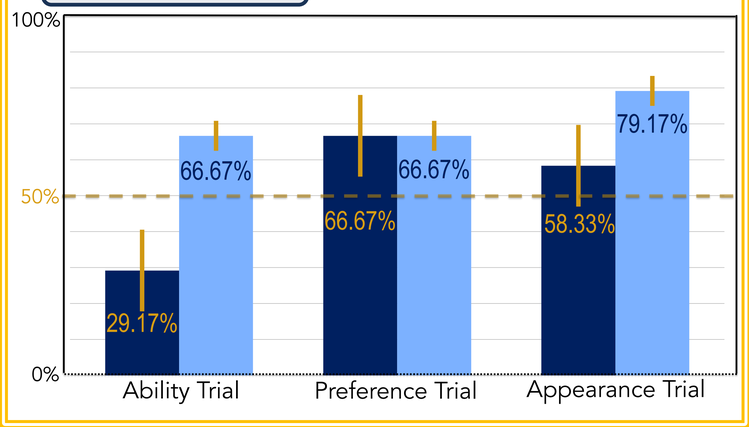
Percentage of Causally Relevant Questions (by age, story, and trial type)

Story 1: *Kitchen*



Story 2: *Garden*

Note: Error bars represent standard error.



Conclusion:

Children readily leverage their real-world ***causal knowledge*** to evaluate and select relevant questions. A follow-up study is underway to test whether these causal inferences provides a similar guide to ***question generation***.

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