

Interpretive theory of mind predicts greater willingness to seek out disagreement for learning

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Abstract

Though disagreement provides valuable chances to learn, people typically avoid it. This study tested whether understanding that people can hold different views because they have interpreted the same evidence differently predicts children's and adults' interest in talking to someone with a different belief (children: 6 to 11 years; $N = 97$; 50 females, 47 males; diverse ethnicities; adults: $N = 100$; 49 females, 49 males, 1 gender-queer, 1 non-binary; diverse ethnicities). Data were collected between November 2024 and March 2025. Participants were first asked about their beliefs on different topics, then asked whether they wanted to talk to someone who agreed or disagreed with them to learn more. Interpretive theory of mind (iTOM) was then measured using 2 paradigms assessing the ability to recognize that 2 people could interpret the same ambiguous stimuli differently. Higher iTOM predicted greater willingness to seek out disagreement to increase learning. For children, this held across belief domains, whereas for adults it was only true for moral questions and ambiguous situations, not settled facts or personal preferences. The effect was stronger in children than adults when beliefs concerned preferences. These findings suggest that iTOM may be required for understanding the epistemic value of disagreement.

Keywords disagreement, interpretive theory of mind, perspective taking, learning

Lay summary

Disagreement is inevitable, and though often seen as negative, it can be valuable for learning. Even so, people tend to avoid those who hold different views, perhaps assuming they're wrong. But disagreement doesn't always mean that someone is mistaken—often two people have interpreted the same information differently. We tested whether grasping this distinction makes children (6 to 11 years) and adults more willing to talk to someone who disagrees with them, across topics from personal preferences to moral questions. Those who better understood that people can interpret evidence differently were more willing to do so. Helping children and adults recognize that disagreement often reflects different interpretations—not just right versus wrong—may foster openness to learning from opposing views.

Disagreement and conflicting views are inevitable features of social interactions. Though often perceived negatively, disagreement can present valuable learning opportunities—offering epistemic, interpersonal, and cognitive benefits (Kuhn, 2019; Langenhoff et al., 2025). Yet both children and adults tend to avoid disagreement (Blakey & Ronfard, 2026; Ransom et al., 2025), preferring instead to seek out like-minded others. What might explain this reluctance? We propose that valuing disagreement requires understanding that people can hold different views because they have interpreted the same evidence differently [interpretive theory of mind (iTOM)], rather than because one person is simply

wrong. The current study tests this hypothesis by examining whether children's (aged 6 to 11) and adults' iTOM scores predict their willingness to talk to someone with a different belief.

Prior research suggests that children develop increasingly sophisticated understanding of disagreement during middle childhood. By age 5, children distinguish between more objective beliefs—where only one person can be right (settled facts, moral questions)—and more subjective beliefs—where multiple interpretations are valid (personal preferences, ambiguous situations; Danniels & Perlman, 2021; Heiphetz et al., 2013; Ransom et al., 2025; Wainryb et al., 2004). This reasoning continues developing

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through age 10, as children increasingly acknowledge the possibility that opposing claims can coexist until additional evidence is gathered (Yang et al., 2023), suspend judgment when receiving equally supported conflicting evidence (Langenhoff et al., 2024), and improve their ability to identify when phenomena could lead to opposing claims (Amemiya et al., 2021).

Until recently, less research has examined whether children recognize disagreement as actively facilitating learning. By age 4, children begin to understand that talking to someone with a different belief can be helpful for others' learning, particularly when data are mixed or facts are unsettled (Ransom et al., 2025). When reasoning about themselves, however, both children and adults are generally unwilling to engage with someone who disagreed with them to learn more about a topic (Blakey & Ronfard, 2026). Understanding the epistemic value of disagreement develops substantially between ages 4 and 8, and continues developing into adulthood, with older participants increasingly recognizing that disagreement can facilitate learning even in moral domains. Yet only from around age 7 do children begin to explicitly articulate disagreement's epistemic value when justifying their choices—specifically noting that opposing views reveal blind spots. Perhaps due to this emerging and not fully developed understanding, teaching younger children (6 to 9 years) about the epistemic benefits of disagreement did not increase their willingness to engage with disagreement, while it did increase engagement in older children (10 to 11 years) and adults (Blakey & Ronfard, 2026). This suggests that explicit instruction alone may be insufficient.

To see the value in disagreement, children may require an iToM. While theory of mind refers to the ability to attribute mental states to oneself and others (Wimmer & Perner, 1983), iToM specifically concerns the recognition that different people can hold equally valid but different interpretations of the same ambiguous evidence. Disagreement therefore becomes epistemically informative rather than a social threat or sign of error, arising from differing interpretations rather than from one person being wrong (Amemiya et al., 2021; Carpendale & Chandler, 1996). Consistent with this, iToM has been proposed to predict scientific reasoning (Astington et al., 2002) and more recently shown to do so at age 10 (Osterhaus & Koerber, 2023), suggesting it plays a broader role in how children engage with evidence and uncertainty. Recognizing that others may interpret evidence differently may also heighten uncertainty about one's own beliefs and appreciation for alternative viewpoints.

We directly test this hypothesis by examining whether the ability to recognize that others may interpret the same evidence differently (iToM) predicts greater willingness to seek out disagreement for learning in children aged 6 to 11 and adults. Participants were first asked about their beliefs on different topics, then asked whether they preferred to talk to someone who agreed or disagreed with them in order to learn more about that topic (Blakey & Ronfard, 2026). Participants also completed two iToM tasks: the integrating perspectives paradigm (Amemiya et al., 2021, Study 1) and the ambiguous referential communication paradigm (Carpendale & Chandler, 1996). We hypothesized that higher iToM scores would predict stronger engagement with disagreeing others. We also test whether this relationship is stronger for subjective beliefs (personal preferences, ambiguous situations) than objective beliefs (settled facts, moral questions), given that interpretation plays a greater role in the former.

Method

Participants

The final sample consisted of 97 children aged 6 to 11 years ($M_{age}=9.07$ years, $SD=1.76$ years, range=6.11–11.99 years; 50 females, 47 males) and 100 adults ($M_{age}=38.57$ years, $SD=11.95$ years, range=18–70 years; 49 females, 49 males, 1 gender-queer, 1 non-binary). Six additional children were excluded due to task interference ($n=3$), technical issues ($n=2$), or missing data ($n=1$). Two additional adults were excluded for failing attention checks. These data were collected as part of a larger project (Blakey & Ronfard, 2026); the current analyses were not included in the scope of that project.

All children were recruited from a university participant database in the Greater Toronto Area and participated on Zoom with an experimenter. Adults from Canada and the United States were recruited via Prolific and participated independently. Data were collected between November 2024 and March 2025.

Both samples were ethnically diverse. Among children's caregivers, 94% provided ethnicity information: 38% White, 29% Asian, 9% Black, 1% Latin American, 23% mixed, and 1% other. Among adults, 98% reported their ethnicity: 56% White, 16% Asian, 15% Black, 7% mixed, and 6% other.

Socioeconomic information was collected for the child sample. Caregiver education was reported by 97%: 14% of children's caregivers had no university education, 24% had one caregiver with university education, and 63% had two caregivers with university education. Annual pretax household income was reported by 66% of families: 8% earned less than \$50,000 CAD, 15% earned \$50,000–\$100,000 CAD, 17% earned \$100,000–\$140,000 CAD, and 60% earned over \$140,000 CAD. The sample skewed toward higher-income households compared to the median after-tax income for Canadian families of \$74,200 (Statistics Canada, 2025).

Stimuli and procedure

All participants completed three tasks: (1) the first-person learning from disagreement paradigm (Blakey & Ronfard, 2026), (2) the integrating perspectives paradigm (Amemiya et al., 2021), and (3) the ambiguous referential communication paradigm (Carpendale & Chandler, 1996).

Learning from disagreement paradigm

The procedure followed Blakey and Ronfard (2026, Study 1). In each trial, participants indicated which of two statements they believed and then watched a vignette of two children: one who agreed and one who disagreed with their belief. Participants were asked who they would talk to if they wanted to learn more—the agreeing child or the disagreeing child. Belief domain was manipulated across 16 trials (four per domain): (1) *factual knowledge* (e.g., germs are very small vs. very big), (2) *moral questions* (e.g., it is not okay vs. it is okay to hit people), (3) *personal preferences* (e.g., oranges vs. apples are the tastiest fruit), and (4) *ambiguous situations* (e.g., the purple rock vs. the orange rock is heaviest). On the last trial of each domain participants were asked to explain their choice.

Integrating perspectives paradigm

The integrating perspectives paradigm (Amemiya et al., 2021, Study 1) was adapted for online testing using the original

materials. In this task participants encountered four different disagreements about hidden objects. Across the four trials, one disagreement concerned a preference (whether a painting was beautiful or ugly), while the other three involved differing beliefs about the object's properties (color, number, and category).

Participants were told that two adults had seen the same object behind a curtain. They then heard the adults disagree about what was hidden. For example, they heard, "She [first adult] said that there is a beautiful painting. She [second adult] said that there is an ugly painting. So, they disagreed with each other." Participants were then asked two questions: "Why do you think they disagreed with each other?" and "What do you think was behind the curtain?" Finally, they were shown three images and asked to choose which item was hidden: one matching only the first adult's perspective (e.g., a painting of a rose), one matching only the second adult's perspective (e.g., a painting of dirty socks), or one that could integrate both perspectives (e.g., abstract art).

Ambiguous referential communication paradigm

Participants completed two trials of the ambiguous referential communication paradigm (Carpendale & Chandler, 1996). In one trial, participants watched a video showing three cards: two with red circles (one small, one large) and one with a large blue circle. They were introduced to two characters, Mary and Maxi, and told "The dollar is under the card with a red circle." Mary and Maxi each endorsed a different but equally plausible belief about where the dollar was hidden, under the big red circle vs. the small red circle. Participants were asked whether it was okay for Mary and Maxi to say different things, and whether, if someone was told the dollar was under the card with a red circle, they would *know* or *not know* which card that person would think the dollar was under. In both cases they were prompted to explain their answer. The second trial followed the same procedure using different cards: two with large triangles (one orange, one green) and one with a small green triangle, with the prompt "The dollar is under the card with a big triangle." Trial order was randomized.

Statistical analyses

The hypotheses, study design, and analyses were preregistered (<https://aspredicted.org/h45k-wwwd.pdf>); therefore, the analyses were considered confirmatory unless explicitly identified as exploratory. Analyses were performed using R (R Core Team, 2026), with generalized linear mixed effects models (GLMMs) fit using *lme4* (Bates et al., 2015). To account for repeated observations, we initially specified maximal random effects structure including random slopes (Barr et al., 2013); however, these models were unidentifiable; therefore, we included only random intercepts. Model fit was assessed using likelihood ratio tests to compare the full model with a null model lacking the predictor variables, and post hoc analyses were conducted using *emmeans* (Lenth et al., 2024). Variance inflation factors (VIFs) were calculated to assess multicollinearity among predictors (excluding random effects and interactions) using the *car* package (Fox et al., 2026). All VIFs were ≤ 1.42 , indicating no collinearity concerns. Correlations were assessed using Pearson's correlation coefficient. p -values $< .05$ were accepted as statistically significant.

Results

Learning from disagreement paradigm

To compare children and adults' willingness to seek disagreement across belief domains, we fit a binomial GLMM with fixed effects of age group (children, adults), belief domain (factual, moral, preference, ambiguous), and their interaction, with a random intercept of participant ID. The model revealed a significant interaction between domain and age group, $\chi^2(3) = 10.16, p = .017$ (Figure 1A).

Post hoc comparisons showed that adults were significantly more likely than children to seek disagreement in the moral domain ($b = 1.44, SE = 0.40, z = 3.57, p < .001$) and ambiguous domain ($b = 0.77, SE = 0.39, z = 1.98, p = .048$). Across age groups, participants were less likely to seek disagreement in the factual domain than in all other domains ($p \leq .046$).

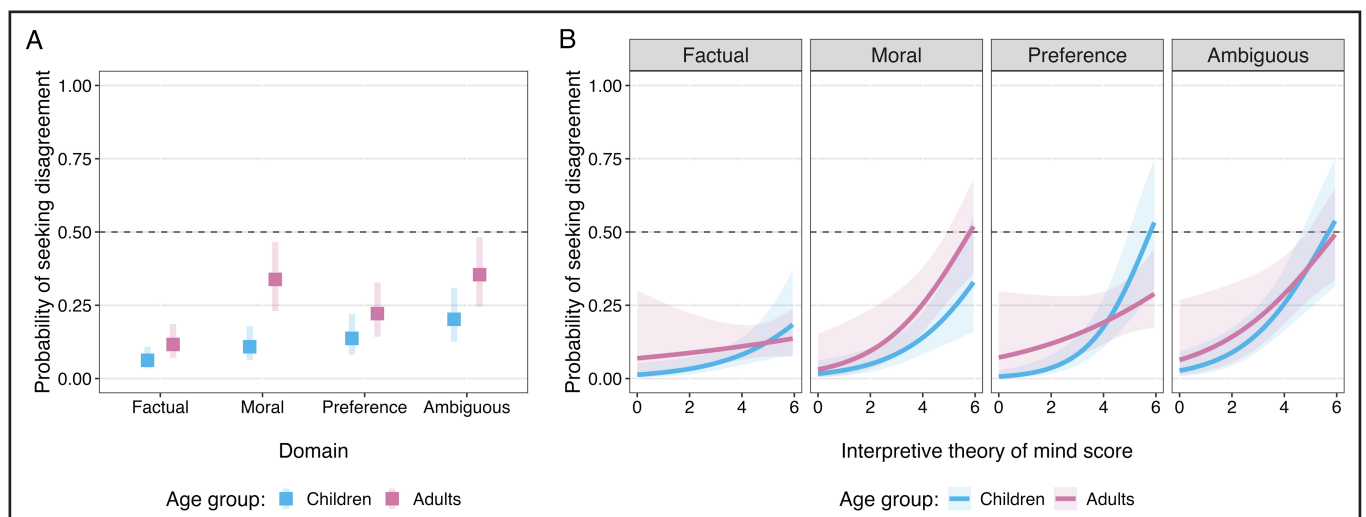


Figure 1 Children's and adults' probability of seeking disagreement across domains. (A) In each domain by age group. (B) By interpretive theory of mind (iTOM) score and age group, separated by domain. Dashed line indicates chance level (50%). Error bars and ribbons represent 95% confidence intervals.

Compared to the preference domain, adults sought disagreement more often in both the moral ($b=0.58$, $SE=0.19$, $z=3.06$, $p=.012$) and ambiguous domains ($b=0.66$, $SE=0.19$, $z=3.51$, $p=.003$). Children, however, sought disagreement more often in the ambiguous than the moral domain ($b=0.73$, $SE=0.22$, $z=3.36$, $p=.004$), adults showed no such difference ($p=.981$).

A second model treating children's age as a continuous predictor showed no significant interaction between age and domain. However, there were significant main effects of age and domain, with older children being more likely to seek disagreement ($b=14.02$, $SE=2.67$, $z=5.26$, $p<.001$; see [Supplementary Materials](#)).

Integrating perspectives paradigm

Children's performance in the integrating perspectives paradigm broadly resembled the pattern reported by [Amemiya et al. \(2021\)](#). Independent samples t -tests showed that, across all four items, children who selected the referent that integrated perspectives were significantly older than those who did not ($p\leq .01$; see [Table S1](#)). To examine this pattern, we fit a binomial GLMM for selection of the integrated referent with a fixed effect of age (scaled and centered) and random intercepts of trial and participant. The model revealed a significant effect of age, indicating that older children were more likely to integrate perspectives ($b=0.92$, $SE=0.17$, $z=5.29$, $p<.001$; [Figure 2A](#)). A separate model for adults, without age, showed that they consistently integrated perspectives, with a predicted probability of 0.86. Based on the fitted model for children, the age at which performance exceeded chance (i.e., the confidence interval did not include 33%) was 8.58 years, younger than reported in the original study (9.8 years).

Ambiguous referential communication paradigm

To pass each trial, participants had to meet two criteria: (1) acknowledge that "it's okay" for the two characters to think

different things, and (2) predict that they "would not know" what another person would choose when given the same instructions. Participants received a score ranging from 0 to 2 across the two trials. Children's scores were positively correlated with age, $r(95)=0.30$, $p=.002$, and by 10 to 11 years, their performance ($M=1.76$) closely matched that of adults ($M=1.78$). Mean scores for each age group are presented in [Figure 2B](#). Performance on each criterion, as well as combined performance, is detailed in [Table S2](#). Although most participants provided the basic responses, producing appropriate justifications was more challenging, especially for younger children.

Relation between iToM paradigms

To assess the relation between the iToM paradigms, we correlated participants' scores in the integrating perspectives paradigm (0–4) and their scores in the ambiguous referential communication paradigm (0–2). The two measures were significantly correlated, $r(195)=0.36$, $p<.001$. This pattern held for both children, $r(95)=0.36$, $p<.001$, and adults, $r(98)=0.27$, $p=.008$. Given this correlation and their conceptual overlap between the paradigms, we summed these scores into a single iToM score (0–6).

iToM and learning from disagreement

We examined whether the relationship between the iToM composite score and willingness to seek out disagreement differed for children and adults. To do this, we fit a binomial GLMM for participants' choice in the learning from disagreement paradigm (disagreeing child = 1, agreeing child = 0). Fixed effects included iToM score (0–6, scaled and centered), belief domain (factual, moral, preference, ambiguous), age group (children, adults), and all interactions. A random intercept for participant ID accounted for repeated observations.

The full model fit significantly better than the null model, $\chi^2(15)=148.54$, $p<.001$. The three-way interaction between iToM, domain, and age group was significant, $\chi^2(3)=10.01$, $p=.018$.

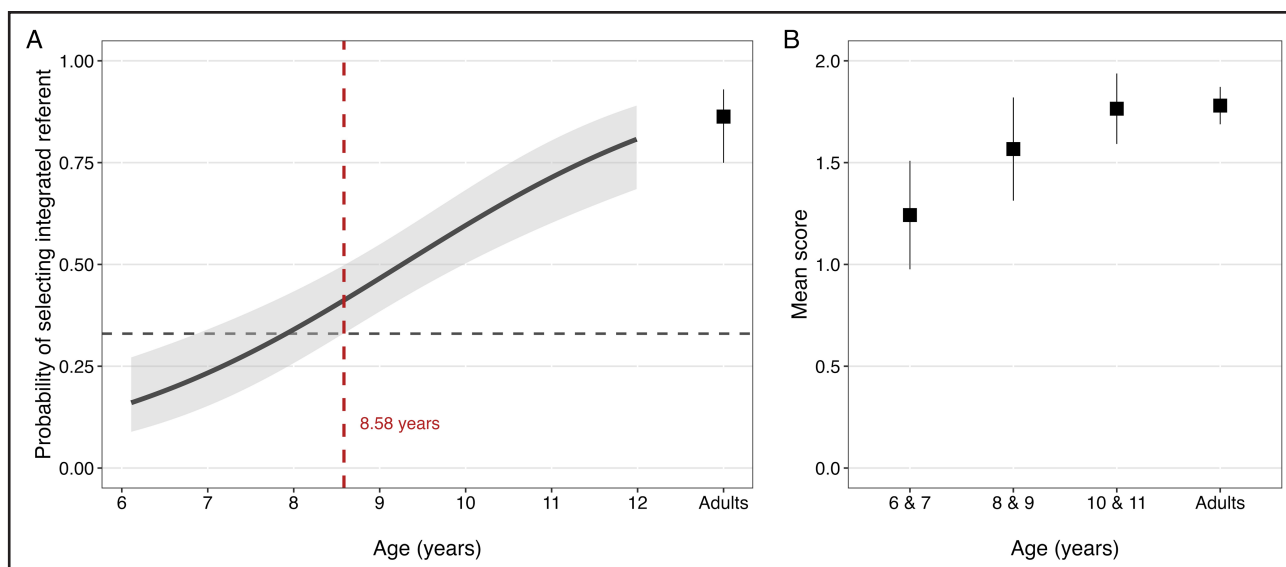


Figure 2 Children's and adults' performance in the interpretive theory of mind paradigms. (A) Probability of selecting the integrated referent by age. Gray dashed line indicates chance level (33%); red dashed line indicates the age at which performance exceeded chance (8.58 years). (B) Mean scores on the ambiguous referential communication paradigm by age. Ribbon and error bars represent 95% confidence intervals.

Post hoc trend analyses showed that, for children, iToM predicted seeking disagreement across all domains ($p \leq .007$). For adults, however, iToM predicted seeking disagreement only in the moral and ambiguous domains ($p \leq .011$).

Post hoc comparisons revealed that the effect of iToM was significantly stronger in children than adults in the preference domain ($b = 1.02$, $SE = 0.44$, $z = 2.33$, $p = .020$), with no age group differences in the other domains ($p \geq .167$; Figure 1B). Adults showed a stronger iToM effect on seeking disagreement in the moral domain than factual domain ($p = .006$). Children did not show domain differences ($p \geq .187$), aside for a marginally significant tendency to seek disagreement more often in the preference domain than factual domain ($p = .053$). These results suggest that the interaction was driven by a stronger association between children's iToM and seeking disagreement in the preference domain.

iToM and justifications

Children's justifications for their choices in the final trial of each domain in the learning from disagreement paradigm were transcribed and coded (see Blakey & Ronfard, 2026, for coding details). Interrater reliability was very good (Fleiss $\kappa = 0.82$; Koo & Li, 2016). The explanations were coded into three broad categories: (1) *correct explanations*, in which participants referred to what they believed to be true about the world (e.g., "it makes more sense to talk to the boy in the green shirt because what he's saying, in my opinion is correct"), (2) *conflicting views explanations*, emphasizing the value of considering a different perspective (e.g., "I think that I would talk to the girl in the yellow shirt, because I want to know why she thinks that way so I could learn another way to think about it"), and (3) *similarity explanations*, referring to shared features between themselves and the person they chose (e.g., "because we have lots in common so I think it would be easier to agree").

In an exploratory analysis, we examined the relationship between children's iToM scores (0–6) and the number of times they referred to conflicting views when explaining their choices to seek or avoid disagreement (0–4). Across all children, there was a significant positive correlation between the two measures, $r(86) = 0.51$, $p < .001$, which persisted after controlling for children's age, $r(85) = 0.34$, $p = .001$. When examined by age group, the relationship strengthened with development. Although both younger (6 to 8 years) and older (9 to 11 years) children showed positive correlations, it was not significant for younger children, $r(40) = 0.27$, $p = .087$, but was significant for older children, $r(44) = 0.53$, $p < .001$. These results suggest that children's ability to recognize disagreement as caused by differing interpretations is related to their capacity to articulate the epistemic benefits of disagreement, and this association strengthens with age.

Discussion

We investigated whether iToM predicts children's and adults' willingness to seek out conflicting views for the purpose of learning. Consistent with our predictions, those who had higher iToM scores were more willing to seek out disagreement. This was most prominent in children, as iToM significantly predicted their choices across domains. For adults the pattern was less robust, and only significant in the moral and ambiguous domains. The lack of correlation in the factual and preference domains could have been the result of adults having greater knowledge about

when engaging with disagreement can be useful. However, it is also possible that a ceiling effect in adults' iToM scores reduced the ability to detect a relationship in these domains, given that adults' iToM scores were generally high on both measures.

The association between iToM and seeking disagreement in the preference domain for children, which was stronger than in adults, may reflect that children are still learning that preferences are inherently a matter of interpretation. Understanding that others interpret the same evidence differently may help children understand that subjective beliefs, such as preferences or ambiguous situations, are the kind of beliefs about which conflicting perspectives could be beneficial for learning. Indeed, integrating perspectives on the painting trial—a preference judgment—predicted seeking disagreement in the preference domain (exploratory analysis, see Supplementary Materials). Recognizing that others' minds interpret rather than passively receive evidence may increase both uncertainty about one's own beliefs and an appreciation for what alternative viewpoints might offer, particularly when evidence is ambiguous or incomplete. Therefore, iToM may be a prerequisite not just for understanding disagreement, but for valuing it.

Although disagreement is beneficial for learning, both children (aged 6 to 11) and adults tend to avoid it, and teaching younger children (aged 6 to 9) about its value does not change this (Blakey & Ronfard, 2026). Our findings suggest that this may be because children who have not yet developed the ability to recognize that disagreement can arise from different interpretations of the same evidence may be told that disagreement is useful without being able to grasp why, leaving their behavior unchanged.

The link between iToM and willingness to seek out conflicting views was also reflected in children's ability to explicitly articulate the epistemic value of disagreement. Children with higher iToM scores were more likely to explain that conflicting viewpoints would help them assess the accuracy of their own views when asked to justify their choice of whom to talk to ($r = 0.51$), an association that remained significant after controlling for age ($r = 0.34$). This association was strong in older children (aged 9 to 11; $r = 0.53$), the age group that performed above chance on the integrating perspectives paradigm and produced more explanations referring to conflicting views, but was not significant in younger children (aged 6 to 8; $r = 0.27$). That this association persisted after controlling for age, but was strongest in older children, suggests that once children have developed the capacity to integrate different interpretations of the same evidence—beyond simply acknowledging that disagreement exists—they are also better able to articulate why engaging with a different view or interpretation could be informative and thus helpful for learning.

In addition to investigating the effect of iToM on seeking disagreement, we replicated and extended findings from prior work in integrating conflicting perspectives. The pattern of children's and adults' performance on the integrating perspectives paradigm aligned closely with the developmental trajectory reported in the original study (Amemiya et al., 2021). However, our results suggest an earlier age at which children chose the integrated option at above chance, emerging around age 8.6 years compared to 9.8 years in the original study. This is consistent with findings from a similarly structured paradigm in which children integrated the reports of two disagreeing informants, choosing a midpoint compromise when making their own judgement, by around age 8 when the informants expressed equal confidence (Baer et al., 2025). Together, these findings suggest that the

capacity to integrate different perspectives is established by ages 8 to 9. Performance on the ambiguous referential communication paradigm also increased with age, with children aged 10 to 11 performing in line with adults, broadly consistent with previous work (Carpendale & Chandler, 1996; Osterhaus et al., 2016).

Future work should examine whether interventions that explicitly develop children's understanding that the same evidence can lead to different views increases younger children's willingness to seek out disagreement. Such an intervention would provide causal evidence for the link between iToM and recognizing the epistemic value of disagreement.

Overall, these findings support the proposal that an iToM may be required to understand the value of disagreement for learning. Children and adults who better recognized that conflicting views can be the result of differences in interpretation were more willing to engage with someone who had a different view than their own. Given that disagreement is an ever-present aspect of social interactions, understanding what drives the development of this capacity is a first step toward designing interventions that promote seeking out disagreement throughout childhood and into adulthood.

Supplementary material

Supplementary material is available at *Child Development* online.

Data availability

The data and code necessary to reproduce the analyses presented here are publicly accessible. Data, code, and materials are available at <https://doi.org/10.17605/OSF.IO/A4Y2N>. Analyses were also preregistered. The preregistration is available at <https://aspredicted.org/h45k-wwwd.pdf>.

Author contributions

Kirsten H. Blakey (Conceptualization, Methodology, Writing—review & editing [equal], Data curation, Formal analysis, Project administration, Visualization, Writing—original draft [lead]), and Samuel Ronfard (Conceptualization, Methodology, Writing—review & editing [equal], Funding acquisition [lead])

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Conflicts of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

Ethics

This research received approval from the University of Toronto's Research Ethics Board (#37434). Adult participants and children's parents provided informed written consent, while children provided verbal assent.

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