EMPIRICAL ARTICLE

Children and adults' intuitions of what people can believe

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Abstract

Two preregistered studies tested how 5- to 6-year-olds, 7- to 8-year-olds, and adults judged the possibility of holding alternative beliefs ($N = 240$, 110 females, U.S. sample, mixed ethnicities, data collected from September 2020 through October 2021). In Study 1, children and adults thought people could not hold different beliefs when their initial beliefs were supported by evidence (but judged they could without this evidential constraint). In Study 2, children and adults thought people could not hold different beliefs when their initial beliefs were moral beliefs (but judged they could without this moral constraint). Young children viewed moral beliefs as more constrained than adults. These results suggest that young children already have sophisticated intuitions of the possibility of holding various beliefs and how certain beliefs are constrained.

Can people believe whatever they want, or are certain things not possible to believe? For instance, while we may readily endorse that climate change deniers can, and should, believe that climate change is real, we may deny that they can believe it's a good thing that climate change is happening. What determines which beliefs are viewed to be possible to hold and which beliefs are not?

Relevant to this question is the distinction between fact-based beliefs and value-based beliefs (Chandler et al., 2000; Flavell et al., 1990, 1992; Stevenson, 1963). Fact-based beliefs are truth-directed and aim to represent the actual state of the world (Fodor, 2000; Heiphetz et al., 2013; Schwitzgebel, 2011). One intuitive hypothesis is that whether a fact-based belief is viewed as possible to hold hinges on the objective nature of the existing evidence. For example, presumably, most readers believe the United States is no longer a colony of Great Britain. Importantly, it seems we cannot believe the United States is still a colony of Great Britain, even if we were offered $500,000,000 (Alston, 1988). The evidence we possess is simply too great, leaving us with no discretion over what to believe in this case. However, in other cases, we seem to endorse that it is possible to hold different fact-based beliefs. For example, sometimes people hold beliefs that, from our perspective, are contradicted by evidence (e.g., the belief that climate change is a hoax). In such cases, we might think that it is possible for them to hold another belief (e.g., to believe that climate change is real).

Likewise, when there is no evidence, or the evidence that exists is weak or ambiguous, we seem to grant that people can hold various beliefs.

In contrast to fact-based beliefs, value-based beliefs indicate one's judgments of what is right or better in a given context (Chandler et al., 2000; Flavell et al., 1990, 1992; Stevenson, 1963). Although value-based beliefs are often thought of as subjective, certain value-based beliefs are judged to be more objective than others (Goodwin & Darley, 2008). For example, moral beliefs (e.g., the belief that stealing from people is wrong) are viewed as being more objectively true than opinions or preferences (e.g., the belief that the beach is the best place to have fun). Therefore, similar to evidence for fact-based beliefs, morality may limit what value-based beliefs are viewed as possible to hold. For instance, people are often unwilling or unable to even imagine that certain immoral things can be true in fictitious situations (e.g., that it is a good thing to harm innocent people)—a phenomenon referred to as *imaginative resistance* (Gendler, 2006; Liao et al., 2014). Thus, people may be reluctant to grant that others can simply switch to endorsing these immoral beliefs in everyday life. Asymmetrically, when someone is viewed to hold an immoral belief, we may judge that they can freely hold other beliefs. Most people likely think that those who hold immoral beliefs *should* hold moral beliefs, which implies they *can* hold these beliefs. It seems anyone can believe it is wrong to harm innocent people.

Similarly, we may endorse that people can believe what they want with regard to beliefs that are non-moral or opinions. For example, that people can believe what they want about the best places to travel. Thus, while people may perceive moral beliefs as constrained, immoral beliefs and opinions may be judged as malleable.

Prior research on intuitions of possibility

There has been much research on both children and adults' intuitions of what actions are possible to commit (Chernyak et al., 2013; Josephs et al., 2016; Kalish, 1998; Kushnir et al., 2015; Nichols, 2004; Phillips & Bloom, 2017; Shtulman & Carey, 2007; Shtulman, 2009; Shtulman & Phillips, 2018). However, only a small number of previous studies are relevant to people's intuitions of what beliefs are possible to hold. Cusimano and Goodwin (2019) asked adults to judge how much control an individual had over various mental states, including beliefs (e.g., believing that God exists), desires (e.g., desiring chocolate chip cookies), emotions (e.g., feeling anxious about an interview), and intentions (e.g., intending to go to bed early). Beliefs were viewed to be more controllable than desires and emotions, but less controllable than intentions. In a follow-up study, adults again endorsed that people's beliefs were controllable, especially when participants judged the control other people have over their beliefs compared to the control participants thought they had over their own beliefs (Cusimano & Goodwin, 2019). These results suggest adults generally think people can choose the beliefs they possess.

However, as described above, these judgments might systematically vary with the type of belief and constraints in question. Indeed, prior studies suggest that evidence and morality may influence adults' judgments of if people can choose their beliefs (Cusimano & Goodwin, 2019; Turri et al., 2018). People think others have slightly less control over their belief that it is going to rain if they see a forecast prediction with a high likelihood of rain compared to a low likelihood of rain (Turri et al., 2018). Yet, how possible would it be for someone to believe it is raining if they looked outside and saw that it was sunny, compared to if they saw it was rainy? No study has compared how judgments of what people can believe may vary depending on whether the belief is directly supported by evidence or not, or whether the belief is moral or not. Studying a variety of different types of beliefs will provide a better understanding of people's perceptions of what beliefs we can hold and how these perceptions vary with respect to the constraints they face.

Additionally, no study has examined how young children think about the possibility of holding various beliefs and how these intuitions change across development. We do not know the origins of adult intuitions and the default assumptions young children make about what people can believe. We do know that across development children's conception of belief radically evolves. Especially around 3- to 5-years of age, children become increasingly aware of other people's beliefs: They recognize that people's beliefs are mental representations that can be different from reality and that people can hold different beliefs than themselves (Bartsch & Wellman, 1989; Flavell et al., 1990; Gopnik & Astington, 1988; Gopnik & Wellman, 1992; Rakoczy, 2022; Wimmer & Perner, 1983). This suggests children progressively view beliefs as internal states, which are unique to the perspective of an agent and do not necessarily correlate with reality. What is not understood is if this implies children think that people can hold any belief they want, or if there are certain beliefs that are beyond our capacity to hold. For example, can someone hold a belief that differs from reality if they have direct access to the relevant evidence? How much maneuverability do children think people have in what they believe?

Past research on children's judgments of possibility has exclusively focused on actions. Starting at age 4, children have sophisticated intuitions about the actions that people can commit. Children in early and middle childhood generally think that people are free to commit different actions than they did, but also recognize constraints placed upon them (Chernyak et al., 2013; Chernyak & Kushnir, 2014; Kushnir et al., 2009, 2015; Wente et al., 2016). For instance, Kushnir et al. (2015) asked 4- to 6-year-old children whether an agent had to step off a stool onto the ground or whether they could have done something else instead, such as to stay on the stool (possible action) or to float into the air (impossible action). Children endorsed the agent's ability to commit a physically possible action alternative but denied the agent's ability to commit a physically impossible action alternative. In other words, children recognize that we cannot violate the physical constraint of gravity, but we can do other types of actions. Similarly, 4- to 6-year-olds thought they could draw something they had seen before (e.g., a visible shape an experimenter drew), but thought they could not draw something they had not seen before (e.g., a concealed shape an experimenter drew). Children think that the actions people can commit are dependent on whether they have knowledge of those options (see also Chandler et al., 2000). Therefore, children endorse that people can commit alternative actions but are sensitive to the physical and epistemic constraints they may face.

Importantly, and relevant to the current investigation, children's judgments about possible actions are also influenced by whether those actions are moral. For example, not only do children think it is impossible to do something that is statistically improbable (e.g., drinking onion juice; Shtulman & Carey, 2007, Shtulman, 2009), they also think it is impossible to do an act that is immoral (Kalish, 1998; Phillips & Bloom, 2017; Shtulman & Phillips, 2018). In Shtulman and Phillips (2018), 3- to 10-year-old children were asked to rate the possibility of immoral and physically

impossible acts by answering whether it could be done in real life. Younger children between the ages of 3–6 judged that doing something immoral (e.g., lying to one's parent) was nearly as impossible as doing something physically impossible (e.g., changing the day of the week with a snap of a finger). In both cases, children rule out that these are options people can take. Yet, with age, children increasingly hold that they can violate moral rules (see also Chernyak et al., 2013; Hardy & Carlo, 2011; Piaget, 2013; Wainryb et al., 2004). Across development, children seem to view behaving according to moral norms as more optional and up to the person to decide. Actions that were once ruled impossible to perform become more conceivable. Thus, it seems young children have strong intuitions about the actions that people can commit. Over time, children increasingly view people as responsible agents who can decide to do one thing or another (but are limited by various constraints, such as gravity).

The present research

We test children and adults' intuitions of what beliefs are possible to hold. Do children think people can hold any belief they think of? Or are there cases in which children deny an agent's ability to believe something? Moreover, how do these judgments change with age? Over time, as children gain more experiences with various constraints, do they think it is more or less possible to hold certain beliefs? We were specifically interested in how children and adults' intuitions of possibility vary depending on both evidential and moral constraints, and how this might change across development.

In the current preregistered studies, we investigated participants' judgments of the possibility of beliefs, focusing on fact-based beliefs in Study 1 and on value-based beliefs in Study 2. Participants (5- to 6-year-olds, 7- to 8-year-olds, and adults) viewed stories about characters who held a certain belief and were asked whether the characters could hold an alternative belief. In Study 1, we examined how judgments of the possibility of beliefs may depend on evidence by manipulating whether the character's belief was supported by evidence or not. In Study 2, we examined how judgments of the possibility of beliefs may depend on morality by manipulating whether the character's belief was moral or not. For points of reference, participants also viewed stories about characters and an action they committed and were asked whether the characters could select an alternative action (which was either physically possible or impossible).

STUDY 1

In Study 1, we investigated the possibility of holding alternative fact-based beliefs. We presented children and adults with picture-book-like stories describing characters and their beliefs. Three conditions varied the type of evidence behind the character's belief (*No Evidence Condition*, *Counterevidence Condition*, *Strong Evidence Condition*). We predicted that when an agent holds a belief supported by strong evidence, holding a different belief will be judged to be not possible. However, when an agent holds a belief supported by no evidence or contradicted by evidence, holding a different belief will be judged to be possible.

Method

The design, procedure, predictions, and analyses for Study 1 were preregistered at AsPredicted.org (see our OSF page for details, https://osf.io/a4fwj/).

Participants

Participants were forty 5- to 6-year-old children ($M = 5.99$ years, SD = 0.55, 24 girls), forty 7- to 8-year-old children ($M = 7.94$, SD = 0.55, 21 girls), and 40 adults (M = 36.76, SD = 10.98; 7 women). Participants identified as White (46.7%), Asian (18.3%), African or African American (5.8%), Hispanic or Latino (3.3%), multiple races (20.8%), and other/unknown (5%). Children were recruited through an online database that they were added to following their parents' written consent (families were mostly from the San Francisco Bay Area). An experimenter tested children over the online communication platform Zoom. All sessions were recorded. Data for children were collected between September 2020 and January 2021. Adults were recruited using the crowdsourcing marketplace, Amazon Mechanical Turk. Adults saw prerecorded videos of the stimuli narrated by the experimenter on a Qualtrics survey. Data for adults were collected in March of 2021.

We aimed to include 40 individuals per age group in our final sample, for a total of 120 participants. The sample size was determined with a power simulation, expecting a significant effect of condition. Across different simulated random slopes and random effects, this led to an average power of $1 - \beta > .90$ (see the OSF page for details). To reach our predetermined sample size, we tested 84 children. In total, we excluded data from four children. Data from two 5-year-old children were excluded due to children being distracted and not able to follow along with the stimuli. Data from the last two children were excluded as we had already reached the preregistered sample size. There were 10 trials per child, in total 800 trials. For the statistical analysis of the dependent variable, seven trials from four children were excluded because they did not provide an answer. So, our final child sample contained data from 793 trials of children. No adults were excluded, so our final adult sample contained data from 400 trials.

Ethical statement

The procedures for Studies 1 and 2 were approved by an IRB ethics committee. Informed written consent was obtained from all parents of children and additional verbal consent was obtained from each child who participated in these studies.

Design and materials

We deployed a within-subjects design, with participants from each age group participating in three belief conditions (*No Evidence Condition*, *Counterevidence Condition*, *Strong Evidence Condition*), and two reference conditions (*Possible Action Condition*, *Impossible Action Condition*). In all conditions, participants were shown picture-book-like stories and illustrations. Each subject saw 10 stories, two per condition.

In the three belief conditions, each story described a character who held a certain belief. The conditions varied the type of evidence available for the character's belief, whether there was no evidence, counter-evidence, or strong evidence. We created six sets of belief storylines (the weather; cookie jar; present box; dad; TV show; and bunny storylines; see Supporting Information for full stories). Each storyline had three different versions, one for each of our three main conditions (for a total of 18 individual stories). All storylines were very similar in structure and narrative. Stories that participants saw were ordered so the same storyline did not appear twice for a subject. In the two reference conditions, the stories described a character who had committed a certain action. The conditions varied the possibility of the character committing a different action (the alternative action was either physically possible or impossible). We created two action stories for each condition, of which participants viewed all four (see Supporting Information for full stories). In all conditions, participants were asked if a character could have done or believed otherwise.

Procedure

Stories were presented in a PowerPoint presentation for children, and identical stories were presented in a video-based Qualtrics survey for adults. Subjects first participated in the two reference action conditions (*Possible Action Condition*, *Impossible Action Condition*). Stories and the DV were adapted from previous research on children's judgments of the actions that agents can commit (Chernyak et al., 2013; Kushnir et al., 2009, 2015). Participants viewed stories about a character who committed an action. Participants were then asked to judge whether the character could have done otherwise and committed an alternative action instead, which was either physically possible or impossible.

An example of a Possible Action story involves a character who thought about either grabbing a glass of apple juice (possible) or lemonade (possible). The character grabbed the apple juice. An example of an Impossible Action story involves a character who thought about either climbing up a ladder (possible) or flying into the sky (impossible). The character climbed up the ladder. After each story, the DV in these conditions asked participants if the character could do otherwise ("instead of grabbing the apple juice, could [they] have grabbed the lemonade?"). If children did not answer or said "I don't know" the question was repeated once, if they still did not provide an answer the story was repeated once. Then, participants were asked why they think so in an open-response format.

Next, subjects participated in the three belief conditions (*No Evidence Condition*, *Counterevidence Condition*, *Strong Evidence Condition*). Participants viewed stories about a character who held a belief and then were asked to judge whether the character could have believed otherwise and held an alternative belief instead. The character's belief was either based on no evidence, contradicted by evidence, or supported by strong evidence, respectively. To illustrate the three belief conditions, the "weather" storyline set is described below (see Figure 1). This storyline involved a character named James who thought about what the weather was like outside, whether it was sunny or rainy. In the *No Evidence Condition*, James believed it was sunny while he was in his bedroom all morning, which had no windows. For the *Counterevidence Condition*, James believed it was rainy while he was in a sunny room. For the *Strong Evidence Condition*, James believed it was sunny while he was in a sunny room. Note that a participant only viewed one of these versions and viewed versions of other storylines in the remaining trials. After each story, participants were asked if the character had to hold their belief, or if they could believe otherwise and hold an alternative instead ("*Instead of believing it's sunny outside, could James believe it's rainy?*"). If children did not answer or said, "I don't know," the same procedure was used with the action conditions described above. After they responded, participants were asked why they thought so.

Coding

Coding of the child data was completed by the first author from recordings of the Zoom sessions with children. Adults recorded their responses into a Qualtrics survey, so the adult data was coded automatically. Participants' responses to our main DV ("*Instead, could James believe it is rainy?*") were coded as either "yes, the character could do/believe otherwise, or "no," the character could not do/believe otherwise. A research assistant who was

No Evidence Condition		*Counter-evidence Condition*		*Strong Evidence Condition*	
Introduction: James is at home one morning. *Representing Possibilities:* He wonders if it is sunny or rainy.		*Introduction*: James is at home one morning. *Representing Possibilities:* He wonders if it is sunny or rainy.		*Introduction*: James is at home one morning. *Representing Possibilities:* He wonders if it is sunny or rainy.	
Evidence: James has been in his bedroom, which does not have windows. There are no clues for what the weather is like.		*Evidence*: James goes into the living room. He looks out the window and sees the sun shining. The sun is very bright.		*Evidence*: James goes into the living room. He looks out the window and sees the sun shining. The sun is very bright.	
Belief: James believes it is sunny today. Instead of believing [that], could James believe it is rainy?		*Belief*: James believes it is rainy today. Instead of believing [that], could James believe it is sunny?		*Belief*: James believes it is sunny today. Instead of believing [that], could James believe it is rainy?	

FIGURE 1 Example of the fact-based belief conditions. Above is one of six storyline sets with shortened instructions. Each storyline set included a No Evidence, Counterevidence, and Strong Evidence Condition version. Each version described a character and an event the character was considering. After describing what evidence (if at all) the character has, the character declared their belief. Participants were then asked if they could hold an alternative belief. Participants viewed only one version per storyline and saw a version of other storylines in other trials.

unaware of the study design and hypothesis independently coded 25% of all trials. Agreement between raters was 96% (Cohen's $\kappa = .92$).

Participants' explanations in response to our "*Why?*" question ("*Why do you think James couldn't believe that?*") were coded on three levels. First, we coded whether participants' explanations mentioned the target agent in the story or not ("James can see the sun right there"). This was to ensure children were responding in terms of the character and their belief (James' belief about the weather) and not the content of the belief (the weather). In other words, that participants were answering the question of whether James could believe it is rainy outside, not whether it is rainy outside. Agreement between raters was 98% (Cohen's $\kappa = .97$).

Second, following prior research on children's possibility judgments in the context of actions (Kushnir et al., 2015), we also divided participants' explanations into 5 categories (see Table 1: Internal Motivation (i.e., the character's likes, preferences, or desires for holding a belief; "he likes trains more"); External Conditions (i.e., conditions of the story that allow or explain holding a

belief; "that's one of the spots he can hide in"); Autonomy (i.e., the character's willpower to hold a belief; "people can believe anything they want"); Evidence (i.e., referencing the evidence in the story; "he sees the sun right there"); and Other (i.e., saying "I don't know" and all other responses; "she could"). Agreement between raters was 89% (Cohen's $\kappa = .81$). Third, we coded participants' explanations with regard to whether they contradicted the stated conditions of the story (e.g., explaining how a character could believe the TV wasn't on even though it was on right in front of her because "maybe she was playing outside."). Agreement between raters was 96% (Cohen's $\kappa = .91$).

Statistical analysis

To analyze the results, following our preregistered plan, we used a logistic Generalized Linear Mixed Model fitted via maximum likelihood (Baayen et al., 2008; Bates et al., 2014), as *possibility* was a binary response variable (coded as 0 = belief/action is not possible, 1 = belief/action

TABLE 1 Explanation categories and examples of participants' "why" responses.

Explanation category	Examples (from children)	Percent-use across trials
Internal motivation	"I think he likes trains more;" "he wanted it for Christmas;" "she probably wants there to be a cartoon on"	5- to 6-year-olds: 4.2 7- to 8-year-olds: 3.3 Adults: 1.0
External conditions	"it could also fit in the box;" "those are the two places it could hide;" "the bushes have more space"	5- to 6-year-olds: 20.8 7- to 8-year-olds: 21.7 Adults: 11.3
Autonomy	"you can believe whatever you want;" "she can choose what she thinks;" "he can believe whatever he thinks about"	5- to 6-year-olds: 2.9 7- to 8-year-olds: 8.8 Adults: 10.0
Evidence	"he sees the sun right there;" "he hasn't opened the box yet;" "he opened the jar already"	5- to 6-year-olds: 41.7 7- to 8-year-olds: 52.9 Adults: 59.2
Other	"I'm not sure;" "because I think that;" "my dad is in his bedroom"	5- to 6-year-olds: 30.4 7- to 8-year-olds: 13.3 Adults: 18.8

is possible). All statistical models were fitted with bound optimization by quadratic approximation (Powell, 2009). We first analyzed only the belief conditions without the reference action conditions. We included the predictors *condition* (No Evidence, Counterevidence, Strong Evidence) and *age group* (5- to 6-year-olds, 7- to 8-year-olds, adults) and their interaction as fixed effects. We also included the random effect of *individual identity* with the random slope of *trial number* and *condition* to account for repeated measures and potential learning effects. To avoid increased type 1 error risk due to multiple testing, we first tested the overall effect of the predictors.

The deviance of the full model was compared to that of a null model containing only the random intercept and random slope. Next, to determine the effects of each predictor we compared the full model to reduced models lacking the predictor of interest. Then, we performed post hoc pairwise comparisons (Tukey method) for significant predictors. Finally, we compared the belief and action conditions. We fitted additional models containing one belief and action condition at a time. For a more detailed description of the statistical analyses, please refer to the Supporting Information (which also includes frequency statistics in Tables S1 and S2).

Results

Participants' judgments about the possibility of an agent holding a different belief depended on the available evidence (see Figure 2). The full model was a significantly better fit than the null model, $\chi^2(8, N=120)=117.49$, $p<.001$. We also found a significant main effect of condition, $\chi^2(2, N=120)=111.13$, $p<.001$, such that judgments of possibility varied depending on whether the belief was backed by no evidence, contradicted by evidence, or supported by strong evidence. There was no effect of age group, $\chi^2(2, N=120)=4.19$, $p=.12$, nor was there

an interaction effect of age group and condition, $\chi^2(4, N=120)=.91$, $p=.92$.

Because we found an effect of condition, we used post hoc pairwise comparisons to tease apart differences between the belief conditions. Holding alternative beliefs when a person's initial belief was supported by strong evidence was judged as less possible than holding alternative beliefs when a person's initial belief was supported by no evidence ($p<.001$). Likewise, holding alternative beliefs when a person's initial belief was supported by strong evidence was judged as less possible than holding alternative beliefs when a person's initial belief was contradicted by evidence ($p<.001$). In other words, while participants largely thought holding different beliefs in the *No Evidence Condition* and *Counterevidence Condition* was possible, participants thought holding different beliefs in the *Strong Evidence Condition* was not (See Figure 2). Additionally, although we had no prior predictions for this comparison, we also found that holding different beliefs when one's initial belief was not supported by evidence was judged as less possible than holding different beliefs when one's initial belief was contradicted by evidence ($p=.02$).

As for the belief and reference action comparisons, holding a different belief when one's belief was supported by no evidence was judged as similarly possible as committing possible actions ($p=.39$), but more possible than committing impossible actions ($p<.001$). Likewise, holding a different belief when one's initial belief was contradicted by evidence was judged as similarly possible relative to possible actions ($p=.85$), but more possible than committing impossible actions ($p<.001$). Holding a different belief when one's initial belief was supported by strong evidence was judged as less possible than committing possible actions ($p<.001$), but as more possible than committing impossible actions ($p<.001$).

We found that a majority of participants explained that a person could or could not hold a fact-based
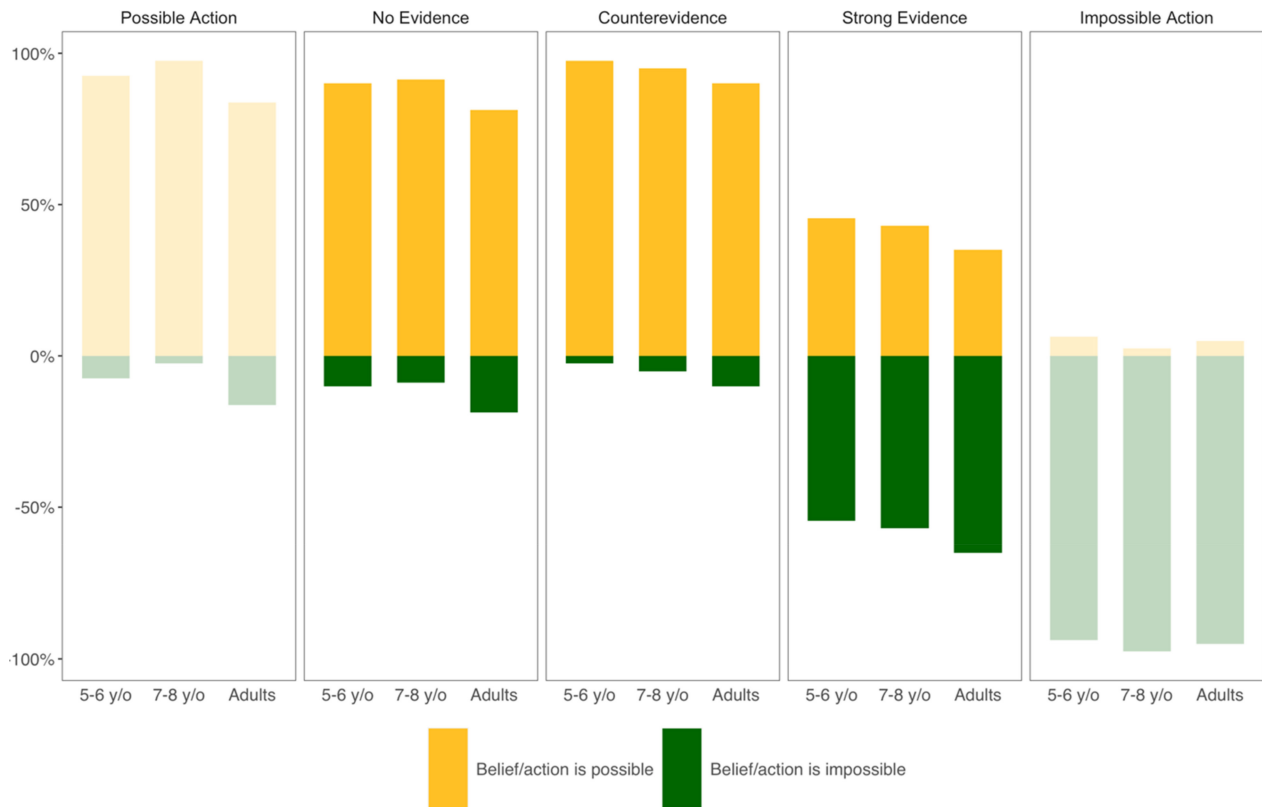
FIGURE 2 Possibility of fact-based beliefs and actions. Proportion of trials indicating participants' judgments of the possibility of holding an alternative belief (or committing an alternative action), by condition and age group. Yellow bars indicate that participants thought holding the alternative belief/action was possible and the agent could do otherwise, and green bars indicate that participants thought holding the alternative belief/action was not possible and the agent could not do otherwise. Brighter panels in the middle depict the belief conditions; transparent panels on the left and right depict the action conditions.

belief by referencing Evidence (41.7% of trials for 5- to 6-year-olds; 52.9% for 7- to 8-year-olds; and 59.2% for adults; see Table 1 for a full breakdown). We were also interested in if these explanation categories varied by age. An exploratory (not part of the preregistration) chi-square test revealed a significant difference across age groups ($p < .001$). Visual inspection of the results indicates that this effect is driven by an increased use of referencing Evidence and Autonomy. These results seem to suggest that with age, people may increasingly use evidence and notions of autonomy in their explanations of whether someone can hold a belief.

Discussion

Across all age groups, the possibility of holding a belief depended on the available evidence. Children and adults judged that people could hold different beliefs when there was no available evidence or when there was evidence contradicting their initial beliefs. These judgments of possibility were similar to that of committing different possible actions. However, children and adults thought people could not hold different beliefs when there was

strong evidence for their initial beliefs. Holding different beliefs than these evidence-backed beliefs was judged as less possible than committing possible actions, but more possible than committing impossible actions. These results suggest that already at 5 years of age, children possess sophisticated intuitions about the possibility of beliefs and how possibility interacts with evidence. Next, we examined if children and adult's judgments of possibility also vary with respect to morality.

STUDY 2

In Study 2, we investigated the possibility of holding alternative value-based beliefs. As in Study 1, we presented children and adults with picture-book-like stories describing characters and their beliefs. This time, the three belief conditions varied whether the belief was moral or not (*Opinion Condition*, *Immoral Condition*, *Moral Condition*). We predicted that when an agent holds a moral belief, holding a different belief will be judged to be not possible. However, when an agent holds an opinion or immoral belief, holding a different belief will be judged to be possible.

Method

The design, procedure, predictions, and analyses for Study 2 were preregistered at AsPredicted.org (see our OSF page for details, https://osf.io/a4fwj/).

Participants

Participants were forty 5- to 6-year-old children ($M = 5.88$ years, SD $= 0.62$, 16 girls), 40 7- to 8-year-old children ($M = 7.90$, SD $= 0.65$, 25 girls), and forty adults ($M = 40.28$, SD $= 12.58$, 17 women). Participants identified as White (56.7%), Asian (15.8%), Hispanic or Latino (4.2%), African or African American (2.5%), American Indian/Alaskan Native (1.7%), multiple races (16.7%), and other/unknown (2.5%). Children were recruited from the same online database as in Study 1. Subjects that participated in Study 1 did not participate in Study 2. An experimenter tested children over Zoom. Data for children were collected between July and October of 2021. Adults were recruited using Amazon Mechanical Turk. Adults saw prerecorded videos of the stimuli narrated by the experimenter on a Qualtrics survey. Data for adults were collected in November 2021.

Like in the previous study, we aimed to include 40 individuals per age group in our final sample, for a total of 120 participants. The sample size was determined with a power simulation, expecting a significant effect of condition (this led to an average power of $1 - \beta > .90$). To reach our predetermined sample size, we tested 83 children. In total, we excluded data from three children. Data from one 5-year-old was excluded due to the child being distracted and not able to follow along with the stimuli. Data from the last two children were excluded as we had reached the preregistered sample size. There were 10 trials per child, 800 total trials. For the statistical analysis of the dependent variable, eight trials from four children were excluded because they did not provide an answer. The final child sample contained data from 792 trials. No adults were excluded, so the adult sample contained data from 400 trials.

Design and materials

As for Study 1, we used a within-subjects design, with participants from each age group participating in three belief conditions (*Opinion Condition*, *Immoral Condition*, *Moral Condition*), and two reference conditions (*Possible Action Condition*, *Impossible Action Condition*). In all conditions, participants were shown similar picture-book-like stories as in Study 1. Each subject saw 10 stories, two per condition.

In the three belief conditions, the stories described a character who held a certain belief. The conditions varied whether the character's belief was an opinion, an immoral belief, or a moral belief. We created six new sets of belief storylines (the bike, sidewalk, daycare, playground, ladder, and beach storylines; see Supporting Information for full stories). Each storyline had three different versions, one for each of our three belief conditions (for a total of 18 new stories). Storylines per condition were very similar in structure and narrative. Stories that participants saw were ordered so the same storyline did not appear twice for a subject. We used the same action stories for the two reference conditions used in Study 1, of which participants viewed all four.

Procedure

The procedure for Study 2 was identical to the procedure in Study 1 described above. After participants were presented with the Possible and Impossible Action conditions, they viewed the three belief conditions (*Opinion Condition*, *Immoral Condition*, *Moral Condition*). To illustrate the different belief conditions, the "bike" storyline set is described below (see Figure 3). This storyline involved a character named Ashley who saw a boy with his bike. In the Opinion version, Ashley believed it was good that the boy's bike was the color orange. In the Immoral version, Ashley believed it was good that a boy fell off his bike and hurt himself. In the Moral version, Ashley believed it was bad that a boy fell off his bike and hurt himself. As in Study 1, participants were then asked if the character had to hold their belief, or if they could believe otherwise and hold an alternative instead ("*Instead of believing that, could Ashley believe it's good that the boy is hurt?*"). After they responded, participants were asked why they thought the character could or could not believe that.

Coding

Coding was identical to Study 1. Children's responses to our main DV ("*Instead of believing that, could Ashley believe it's good that they got hurt?*") were coded as either (yes), the character could do/believe otherwise, or (no), the character could not do/believe otherwise. A research assistant who was unaware of the study design and hypothesis independently coded 25% of all trials. Agreement between raters was 98% (Cohen's $\kappa = .97$).

Similar to Study 1, participants' explanations in response to our "*Why?*" question ("*Why do you think Ashley couldn't believe that?*") were coded on three levels. First, we coded whether participants mentioned the agent in the story or not ("She doesn't want to make him sad"). Agreement between raters was 95% (Cohen's $\kappa = .90$). Second, we also divided participants' explanations into the same 5 categories as in Study 1 (see Table 2), except the Evidence category was replaced with the Moral category: Internal Motivation
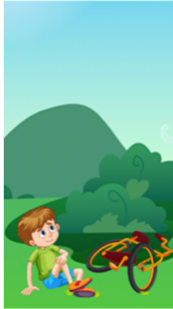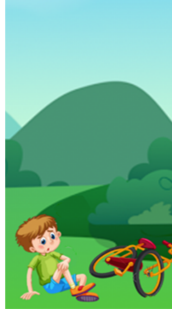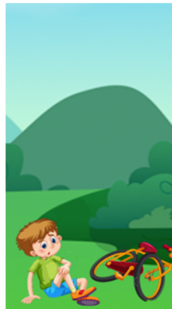
Opinion Condition		*Immoral Condition*		*Moral Condition*	
Introduction: Ashley is walking outside. Ashley sees a boy sitting with his bike. She sees that the bike is orange.		*Introduction:* Ashley is walking outside. Ashley sees a boy fall off his bike. She sees that the boy's leg is injured and that he is hurt.		*Introduction:* Ashley is walking outside. Ashley sees a boy fall off his bike. She sees that the boy's leg is injured and that he is hurt.	
Representing Possibilities: Ashley thinks about the bike.		*Representing Possibilities:* Ashley thinks about the boy.		*Representing Possibilities:* Ashley thinks about the boy.	
Belief: Ashley believes it's good that the bike is orange. Instead of believing that, could Ashley believe it's good if the bike was blue?		*Belief:* Ashley believes it's good that the boy is hurt. Instead of believing that, could Ashley believe it's bad that the boy is hurt?		*Belief:* Ashley believes it's bad that the boy is hurt. Instead of believing that, could Ashley believe it's good that the boy is hurt?	

FIGURE 3 Example of the value-based belief conditions. Above is one of six storyline sets with shortened instructions. Each storyline set included an Opinion, Immoral, and Moral Condition version. Each version described a character and an event they were considering. After the character declared their belief, participants were asked if they could hold an alternative belief instead. Participants viewed only one version per storyline and saw a version of other storylines in other trials.

TABLE 2 Explanation categories and examples of participants' "why" responses.

Explanation category	Examples (from children)	Percent-use across trials
Internal motivation	"she likes that color;" "she might want to play with that one too;" "she wants that shovel"	5- to 6-year-olds: 10.4 7- to 8-year-olds: 9.2 Adults: 4.6
External conditions	"those are both good places to sit;" "both are just shovels;" "the shovel works just as good as the other one"	5- to 6-year-olds: 15.4 7- to 8-year-olds: 17.1 Adults: 10.4
Autonomy	"it's her own mind, she can believe whatever she wants;" "you can believe anything you want to believe;" "it would be hard to believe it's good but it's her choice"	5- to 6-year-olds: 5.0 7- to 8-year-olds: 13.8 Adults: 21.7
Morality	"it's bad and he is hurting;" "bad things you can't believe that's why;" "it's impossible for someone to get hurt and it be a good thing"	5- to 6-year-olds: 47.1 7- to 8-year-olds: 48.8 Adults: 46.7
Other	"I don't know;" "she could believe that;" "I have two cats"	5- to 6-year-olds: 22.1 7- to 8-year-olds: 11.3 Adults: 16.7

("maybe she likes that color"); External Conditions ("both swings are fun to play on"); Autonomy ("it's her own mind and she can think whatever she wants"); Morality ("bad things you can't believe that's why"); and Other ("he doesn't think that"). Agreement between raters was 90% (Cohen's $\kappa = .85$). Third, we coded participants' explanations with regard to whether the child changed the stated conditions of the story (e.g., "he could be hurt or not"). Agreement between raters was 100% (Cohen's $\kappa = 1.00$).

Statistical analysis

As in Study 1, and following our preregistered plan, we used a logistic Generalized Linear Mixed Model to analyze the results with *possibility* as a binary response variable (coded as 0 = could not believe otherwise, 1 = could believe otherwise). We first analyzed only the belief conditions with the predictors *condition* (Opinion, Immoral, Moral), *age group* (5- to 6-year-olds, 7- to 8-year-olds, adults), and their interaction. First, we also included

the random effect of *individual identity* with the random slope of *trial* and *condition*. The estimates of the model could not be calculated for the original data because of complete separation issues (Field, 2005) due to all 7- to 8-year-olds answering the same (1 = could believe otherwise) in the Immoral condition. Therefore, one at a time each trial indicating 1 in this condition was replaced by a 0, and every time a separate model was fitted. For the overall result, the results of all those models were then averaged. This led to models with minimal confidence intervals and overestimated effects. Thus, we reduced model complexity by dropping the random slopes from the model and repeating the procedure. The same procedure was used for the reduced models that lacked the predictor of interest and for the null model containing only the random intercept and random slope. Finally, we also used the procedure described above to create models containing both belief and action conditions for condition comparisons.

Results

Participants' judgments about the possibility of an agent holding a different belief depended on whether the belief was moral or not (see Figure 4). The full model was a significantly better fit than the null model, $\chi^2(8, N=120)=263.82$, $p<.001$. We also found a significant interaction effect between condition and age group ($\chi^2(4, N=120)=28.60$, $p<.001$), and a main effect of condition ($\chi^2(2, N=120)=233.79$, $p<.001$), such that judgments of possibility varied depending on whether the belief was an opinion, immoral belief, or moral belief. We found no overall main effect of age group, $\chi^2(2, N=120)=1.84$, $p=.40$.

Next, we used post hoc pairwise comparisons to tease apart differences between the belief conditions. We found that holding a different belief when a person held a moral belief was judged as less possible than holding a different opinion ($p<.001$). Likewise, holding a different belief when a person held a moral belief was judged as less possible than holding a different belief when a person held an immoral belief ($p<.001$). Holding different beliefs when one held an opinion was judged as similarly possible as when one held an immoral belief ($p=.47$).

Due to the interaction effect between condition and age, we conducted analyses to test differences across condition and age, as well as their interaction. In most conditions, all age groups made similar judgments of possibility. The exception was in the *Moral Condition*.
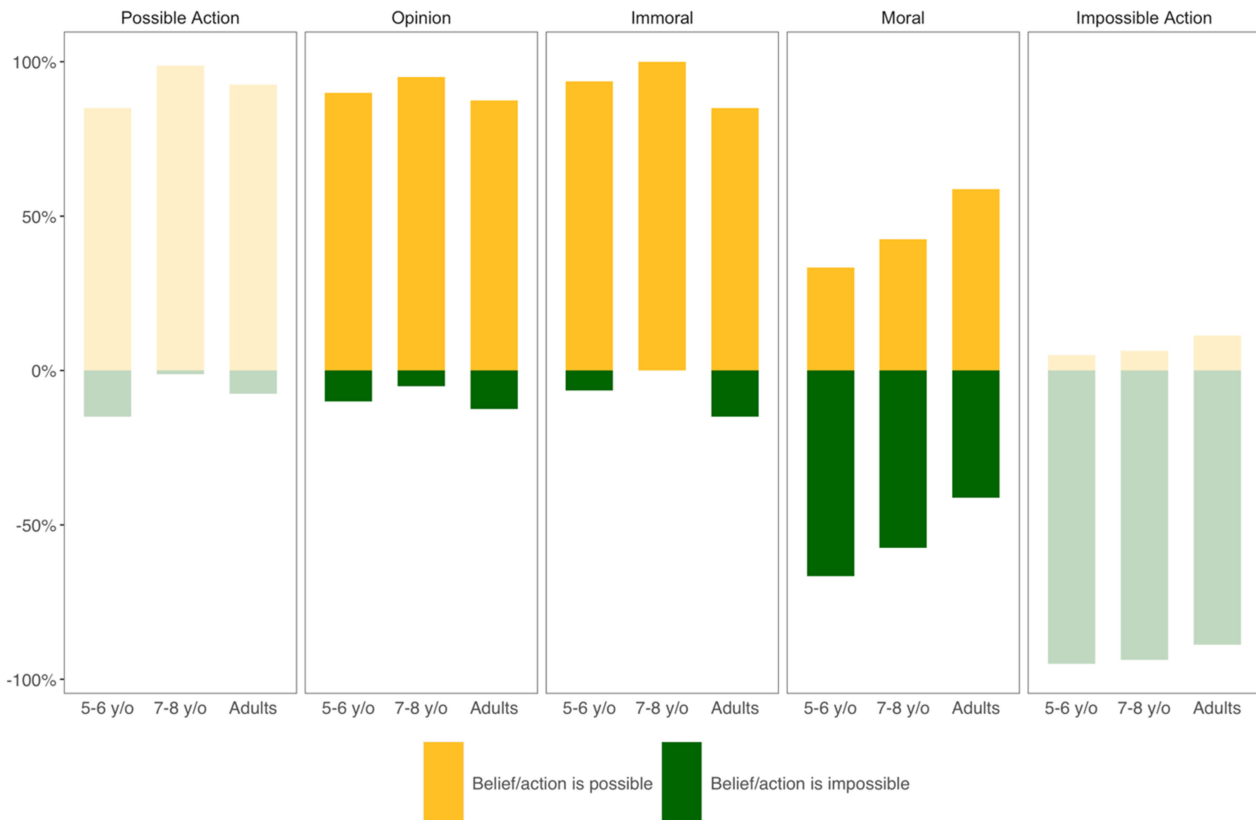
FIGURE 4 Possibility of value-based beliefs and actions. Proportion of trials indicating participants' judgments of the possibility of holding an alternative belief (or committing an alternative action), by condition and age group. Yellow bars indicate that participants thought the alternative belief/action was possible and the agent could do otherwise, green bars indicate that participants thought the alternative belief/action was not possible and the agent could not do otherwise. Brighter panels in the middle reflect the belief conditions; transparent panels on the left and right reflect the action conditions.

Here, 5- to 6-year-olds ($p<.01$), and to a lesser extent 7- to 8-year-olds ($p<.08$), thought that holding different beliefs when an agent held a moral belief was significantly less possible than for adults.

Afterward, we used post hoc pairwise tests to compare the belief conditions to the reference action conditions. Holding different opinions was judged as similarly possible as committing possible actions ($p=.20$), but more possible than committing impossible actions ($p<.001$). Likewise, holding a different belief when one held an immoral belief was judged as similarly possible as committing possible actions ($p=.97$), but more possible than committing impossible actions ($p<.001$). However, holding a different belief when one held a moral belief was judged as less possible than committing possible actions ($p<.001$), but more possible than committing impossible actions ($p<.001$).

We found that a majority of participants explained that a person could or could not hold a value-based belief by referencing Morality (47.1% of trials for 5- to 6-year-olds; 48.8% for 7- to 8-year-olds; and 46.7% for adults; see Table 2 for a full breakdown). We were also interested in if these explanation categories varied by age. An exploratory (not part of the preregistration) chi-square test revealed a significant difference across age groups ($p<.001$). Visual inspection of the results indicates that this effect is driven by an increased use of referencing Autonomy. These results suggest that with age, people may increasingly use notions of autonomy in their explanations of whether someone can hold a belief.

Discussion

Across all age groups, the possibility of holding a different belief was tied to the morality of that belief. Children and adults judged that people could hold different beliefs when they held opinions or immoral beliefs. These judgments of possibility were identical to that of committing possible actions. However, children and adults thought that people were not as able to hold different beliefs when they initially held moral beliefs. The ability to believe otherwise was judged as less possible than committing possible actions, but more possible than committing impossible actions. Interestingly, children thought that it was less possible to hold a different belief when an agent initially held a moral belief than adults did.

GENERAL DISCUSSION

Do we think people can believe whatever they want? Or are there certain things we cannot believe? In the current research, we examined children and adults' judgments of the possibility of holding beliefs and how these judgments may systematically vary depending on the type of belief. Our findings indicate that intuitions of possibility hinged on whether there was evidence for a belief and whether a belief was moral. Additionally, we found that young children possessed nuanced intuitions of people's ability to hold particular beliefs. In fact, they possessed similar intuitions as adults in most cases. The one domain where children and adults' judgments diverged was morality: children viewed moral beliefs as more constrained than adults. Below, we provide a more detailed discussion of our findings and suggestions for future research.

The results of Study 1 show that available evidence influences judgments of the possibility of holding different beliefs. Children and adults thought that it was possible to hold a different belief when an agent held a belief that was not grounded in evidence. For example, they judged that a person could hold a different belief about the weather if they had been inside all day with no windows. These beliefs were judged to be as possible as committing alternative possible actions (such as grabbing one of two drinks from a table). When beliefs *were* supported by strong evidence; however, children and adults judged holding different beliefs to be relatively impossible. People were thought to be significantly less able to hold alternative beliefs. For example, children and adults judged that a person may not be able to hold an alternative belief about the weather if they looked outside at the sun. Judgments were in between that of committing possible actions and impossible actions (such as flying). Notably, children and adults made similar judgments of possibility for evidence-based beliefs. One explanation is that the evidence used in this study was very strong (i.e., direct visual evidence). One direction for future research is to investigate if developmental differences start to emerge when the evidence is more ambiguous. Children and adults may differ in how they reason about one's ability to avoid the constraint of more murky types of evidence.

Study 2 found that morality likewise impacts judgments of the possibility of holding beliefs. Children and adults thought that when an agent held an opinion and immoral belief, holding a different belief was possible, similar to judgments of committing possible actions. People were thought to be able to hold other beliefs in these cases. For example, children and adults judged that a person could hold an alternative belief if they currently held an immoral belief (e.g., when they thought it was good that a person fell off their bike). Yet, when their initial beliefs were moral, people were thought to be less able to hold an alternative belief. For example, children and adults judged that a person may not be as able to hold a different belief if they thought it was bad that a person fell off their bike. Similar to evidence-backed beliefs, the possibility of holding different beliefs when one initially held a moral belief was judged as in between that of committing possible and impossible actions.

Taken together, these results demonstrate that both the evidence supporting a belief and the morality of a

belief greatly influence the extent to which people are thought to be able to hold certain beliefs. Children and adults viewed evidence-backed beliefs and moral beliefs as largely constrained, while they had strong intuitions of people's ability to hold different beliefs without these constraints. Our findings indicate we do not make uniform judgments of possibility for all beliefs but carefully and selectively weigh the constraints people face in forming beliefs.

Our findings also indicate that already at 5 years of age, young children have advanced intuitions of the possibility of holding various beliefs. They made a clear distinction between beliefs people are able to hold and those people are not. The assumption from early in development seems to be that beliefs are, in general, malleable. However, evidential and moral constraints limit our ability to hold different beliefs in specific contexts. A great deal of past research suggests from around 4 years of age, children understand beliefs are internal representations of what is real or right, rather than direct expressions of what is real or right (Bartsch & Wellman, 1989; Chandler et al., 2000; Flavell et al., 1990; Gopnik & Astington, 1988; Gopnik & Wellman, 1992; Tomasello, 2018; Wimmer & Perner, 1983). For instance, children at this age recognize that someone's belief about the location of a marble can be different from where it is in reality if the agent does not have access to the current evidence (i.e., beliefs are only one's representations of reality and, therefore, can be wrong and subject to error). Our current results indicate children think someone's belief *cannot* be different from reality if the agent *does* have access to the evidence. If a belief contains objective content (evidential or moral content), children think we cannot endorse alternative representations of the situation. Even though beliefs are conceptualized as representational states that can differ from reality, if the belief is objective, they are viewed to be locked into place. Further, it is likely that the more objective a belief is viewed to be, the more the ability to hold different beliefs is judged to be constrained. Yet, without these objective constraints, children think there is more room to form different ones.

For most fact- and value-based beliefs, children and adults made identical judgments of possibility. The one exception was in judgments of moral beliefs. In this condition, children and adults were asked if agents had to hold a moral belief or if they could hold an immoral alternative belief instead. Young children thought people have less of an ability to hold immoral beliefs compared to adults. Children judged that our ability to hold immoral beliefs is closer to our ability to fly than to grab one of two balls from the ground. These results complement past work on judgments of agency over moral actions and the consideration of alternative possibilities (Engelmann et al., 2021; Leahy & Carey, 2020). This research has indicated young children also think it is impossible to commit immoral acts and would require magic to do so (Kalish, 1998; Phillips & Bloom, 2017;

Shtulman & Phillips, 2018). Yet, with age, children increasingly endorse people's ability to violate moral norms and behave immorally (Chernyak et al., 2013; Phillips & Knobe, 2018; Wainryb et al., 2004).

This raises the intriguing question of why morality is viewed to limit what we can believe especially early in development and why these judgments diminish with age. One interpretation is that children may regard morality as more objective and fixed relative to adults. Indeed, young children may view abiding by moral rules and forming moral beliefs as something people have to do, similar to how physical objects have to abide by gravity (Piaget, 2013). They seem to reason we cannot adopt immoral beliefs, similar to how we cannot fly into the air. Yet with age, we gain experiences in which we see people behave and think in immoral ways. Options that were once ruled out and viewed as impossible become more commonplace. Adults, relative to children, then may view being moral as more of an optional choice people make. Shtulman and Phillips (2018) suggest that while young children can understand abnormal events (e.g., an immoral event) as such, they are not seasoned at appropriately designating whether that event is a violation of what could happen, should happen, or usually happens. With age, we become better at making these distinctions. Indeed, relative to children, adults have a more sophisticated type of reasoning that represents both moral and immoral events as possible. Yet, under time pressure, adults default to children's patterns of results and consider immoral actions impossible (Phillips & Cushman, 2017).

Another explanation for why children increasingly endorse our ability to hold immoral beliefs is that with age, children develop stronger notions of autonomy. Across development, we may judge that people have more of a choice in the things they do and think (see Chernyak et al., 2013). Thus, with age, people may increasingly hold that others are more able to choose what beliefs they want despite facing strong moral constraints. Support for this interpretation comes from our analyses of children and adults' explanations: in Studies 1 and 2, the use of "Autonomy" explanations increased across development (e.g., from 5.0% of trials for 5- to 6-year-olds to 21.7% of trials for adults in Study 2). However, little empirical work has actually examined the developmental shift of how morality is viewed to constrain people's freedom. Future research should investigate the processes that account for this developmental change, including the role experience with immoral actors and developing notions of autonomy play in altering perceptions of possibility. For instance, future work should manipulate exposure to actors with immoral beliefs and measure how this affects children's judgments about what people can believe.

There are possible alternative interpretations of the present findings. Across the current studies, an alternative explanation for children's responses is that when they were asked, for example, "*Instead, can James*

believe that it is raining outside?," children did not answer the question but rather judged the content of their beliefs ("*is it raining?*"). This would mean that children are responding in terms of if it is raining or not, instead of if the character could believe it is raining or not. Evidence that this is not the case comes from children's responses to the "*Why?*" question. In Studies 1 and 2, over 90% of children made direct reference to the agent or their mental state in at least one belief trial ("because he sees the sun" or "she can believe anything she wants").

While participants mostly endorsed that people could not hold different beliefs when they held a belief supported by strong evidence, some participants endorsed people's ability to believe otherwise in the face of these constraints. For example, some participants thought that an agent could believe it is raining outside despite the agent looking out the window at the sun. This is a puzzling finding. One explanation is that participants are imagining ways in which the evidence no longer applies or are effectively denying the character's access to the evidence. In other words, participants may be finding clever ways of changing the stories such that the character "avoids" the evidence. This is supported by participants' responses to the "*Why?*" question. Following our coding scheme mentioned above, we found that children changed the stated conditions of the story in 43% of the *Strong Evidence Condition* trials (compared to 2.7% for all other belief trials). For instance, some individuals posited that the character in the TV story could believe the TV was off despite the TV being on right in front of the character in the living room because "maybe she was outside playing." However, this would simply mean that the character *does not* possess evidence and, therefore, resembles our *No Evidence Condition* in which we expect high levels of possibility judgments. Nevertheless, future research should investigate more specifically why people hold that individuals can hold such "impossible" beliefs.

Additionally, it is possible that some participants interpreted our DV as one about correctness. Yet, we did not find evidence of this in children's why explanations. For example, only one child in one trial in the *Moral Condition* in Study 2 mentioned the character "shouldn't think that" when they answered "no." Further, if children were interpreting the question as one about correctness, it would be odd that so many children answered "yes" in the *Moral Condition*, given that "yes" would mean that the character should believe it is good that a person is hurt. Additionally, no child in the *Strong Evidence Condition* in Study 1 mentioned the word "should" when they answered "no." When children answer "yes," this does not conflict with our interpretations as saying a belief is correct to hold implies a belief is possible to hold (given that should implies can). Given these findings, we believe that it is unlikely children interpreted the question in terms of correctness rather than possibility.

Future directions

Our findings lead to several open questions. Future research should examine the connection between perceptions of being able to hold alternative beliefs and judgments of blame. From past research, we know there is a close connection between judgments of how freely an action was chosen and judgments of punishment (Confer & Chopik, 2019; Shariff et al., 2014). Further, adults blame people for having thoughts they view as wrong, particularly when the person is viewed as having control over these mental states (Cohen & Rozin, 2001; Cusimano & Goodwin, 2022; Weiss et al., 2021). Our current results indicate that young children and adults think people are able to hold alternative beliefs unless they hold beliefs that are heavily supported by evidence or hold moral beliefs. In other words, young children and adults think that people can hold different beliefs when their initial beliefs are unsupported by evidence, are mere opinions, or are immoral beliefs. In these cases, children may be more likely to hold people accountable for these beliefs, especially if they disagree with them. That is, children may not only selectively blame people for choosing wrong actions (Josephs et al., 2016), they may also selectively blame people for choosing wrong beliefs.

Relatedly, we may hold specific individuals more deserving of blame for holding their beliefs than others. Recent work suggests that we view others' beliefs as more freely chosen than our own (Cusimano & Goodwin, 2020). In a similar way, we may also view outgroup individuals as more blameworthy for choosing their group's beliefs than ingroup members for choosing "our" beliefs. One way in which we may do this is by discrediting the constraints on outgroup members' beliefs. For instance, by downplaying, rejecting, or attempting to undermine the evidence for opposing beliefs (Sinatra & Hofer, 2021). As illustrated in Study 1, if there is no credible evidence supporting a belief, then people endorse the ability to hold alternative beliefs and can thus be viewed as responsible for what they believe. Future research should examine how children selectively hold group members accountable for their group beliefs as they start to become more concerned with belonging to social groups (Dunham et al., 2011).

Lastly, there is likely cultural variability in the extent to which people view certain beliefs as possible to hold, and how evidence and morality constrain beliefs. Some authors have theorized that the focus on freedom and choice may be more emphasized in Western thought relative to other cultures (for example, compared to in China and India; Chakrabarti, 2018). Indeed, developmental research indicates 4- to 11-year-old children from the United States have stronger intuitions that people can choose their own moral actions across development relative to children from Nepal (Chernyak et al., 2013). It is possible that a cultural emphasis on

freedom may override perceptions of the strength of particular constraints on our beliefs relative to other cultures. Additionally, cultures vary with respect to how much concepts like beliefs are used in everyday life (McNamara et al., 2019). Therefore, cross-cultural research on what beliefs are possible to hold is an important area of future work.

CONCLUSION

The present studies investigated children and adult's judgments about what beliefs are possible to hold. What we think people are capable of believing varies depending on the available evidence for a belief and the morality of a belief. Possessing beliefs that are grounded in evidence or morality limits the degree to which a person is thought to be able to change their mind. Moreover, children as young as 5 possess advanced intuitions of the possibility of holding beliefs and how these beliefs are constrained. Interestingly, they possess similar intuitions as adults in most cases but view our ability to hold immoral beliefs as more limited.

CONFLICT OF INTEREST STATEMENT
The authors have no competing interests to declare.

DATA AVAILABILITY STATEMENT
The materials, data, and preregistered analyses are publicly available on our OSF project page (https://osf.io/a4fwj/).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.