

Children's Moral Evaluations of and Behaviors toward People Who are Curious about
Religion and Science

Ariel J. Mosley,¹ Cindel J. M. White,² Larisa Heiphetz Solomon³

¹University of California Davis, ²York University, ³Columbia University

Address correspondence to Larisa Heiphetz Solomon, Department of Psychology, Columbia University, 1190 Amsterdam Ave., New York, NY 10027. Email: lah@columbia.edu.

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Abstract

Although children often exhibit curiosity regarding science, questions remain regarding how children evaluate others' curiosity and whether evaluations differ across domains that prioritize faith (e.g., religion) versus those that value questioning (e.g., science). In Study 1 ($n=115$ 5- to 8-year-olds; 49% female; 66% White), children evaluated actors who were curious, ignorant and non-curious, or knowledgeable about religion or science; curiosity elicited relatively favorable moral evaluations. Study 2 ($n=62$ 7- to 8-year-olds; 48% female; 63% White) found that these evaluations generalized to behaviors, as children acted more pro-socially and less punitively toward curious, versus not curious, individuals. These findings demonstrate children's positive moral evaluations of curiosity and contribute to debates regarding overlap between scientific and religious cognition.

Keywords: curiosity; moral cognition; religion

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Starting early in development, curiosity—an internally motivated desire to gain new information or to fill a gap in one's knowledge—drives many human behaviors (Bonawitz et al., 2011; Gopnik, 2012; Kidd & Hayden, 2015; Liquin et al., 2020; Liquin & Gopnik, 2022; Loewenstein, 1994). Children in particular are active learners who display curiosity by engaging in explanation-seeking behaviors to better understand their worlds (Loewenstein, 1994; Piaget, 1936/1974; Sobel & Letourneau, 2018), and developmental scientists have long sought ways to nurture the virtue of curiosity as a pathway to learning (Jirout & Klahr, 2012; Sobel & Letourneau, 2018). However, it is unclear what responses children might receive from their peers when they display curiosity and whether these responses differ depending on the topic about which children are curious.

Unlike many pro-social behaviors that children and adults widely regard as central to moral goodness, such as sharing and helping (e.g., Dunfield et al., 2011; Piazza et al., 2019; Schein & Gray, 2018; Warneken, 2015), curiosity has a more varied reputation. On the one hand, curiosity may signal that the curious individual is open to new experiences and willing to put in effort to learn, characteristics that many people view positively (e.g., Celniker et al., 2022). Thus, children may perceive curiosity as a moral virtue, especially in domains such as science that value question-asking and exploration as a path to knowledge. On the other hand, curiosity may signal that a person possesses undesirable traits such as ignorance, nosiness, skepticism of received knowledge, or interest in dangerous or taboo topics that are best avoided. These narratives, expressed in proverbs such as "curiosity killed the cat," may lead children to conclude that curiosity is a moral vice. This perception may be especially common in domains such as

religion that emphasize accepting information based on faith and where curiosity may signal a lack of commitment (Cohen et al., 2003; Gill & Lombrozo, 2019).

Therefore, the primary aim of the current research was to probe children's views of curiosity and their responses to curious individuals. Two pre-registered experiments addressed the following questions: (1) How do children evaluate curiosity regarding science (a domain that typically emphasizes the value of exploration and question-asking) versus religion (a domain that sometimes prioritizes faith)? (2) How do moral evaluations of curiosity change or stay the same across development? (3) To what extent do behaviors toward curious individuals map on to moral evaluations?

How Do Children Evaluate Curiosity Regarding Science Versus Religion?

Much prior work on children's own curiosity has focused on the domain of science (e.g., Gopnik, 2012; Legare, 2014). For instance, children in preschool and elementary school exhibit scientific curiosity by engaging in behaviors such as exploration and question-asking (Jirout & Klahr, 2012; Liquin & Lombrozo, 2020; Sobel & Letourneau, 2018), suggesting that curiosity may play an important role in children's interactions with the world around them. However, it is unclear what types of responses children's curiosity might elicit from their peers.

Addressing this question provides insight into basic moral processes by clarifying the extent to which children see others' curiosity as a virtue or a vice. By doing so, the current work extends prior scholarship on which behaviors and characteristics children consider to be morally good and sheds light on the fundamental question of how children think about what qualities constitute a good person. Investigating children's evaluations of others' curiosity also provides insight into the experiences of children who are expressing curiosity, as positive responses from peers may communicate that the behavior is valuable and encourage children to exhibit curiosity

in the future. For instance, Turkish preschoolers who ask a question and hear an informative answer in response (which participants may consider a type of social reward) are more likely to ask additional questions in the future (Unlutabek et al., 2019). Additionally, the presence of peers enhances exploration for children growing up in an indigenous community in Bolivia (Wade & Kidd, 2018). In this research, the mere presence of peers did not have this same effect in the United States. However, encouragement from peers does affect other behaviors in this cultural context, such as imitation and pro-social acts (Hartup & Coates, 1967) as well as interest in forming interracial friendships (Tropp et al., 2014). Thus, it is possible that children may display more curiosity if they perceive it as normative or think that others value these displays.

As a starting point, the present research probed children's evaluations of others' scientific curiosity. However, it is unclear whether responses to curiosity in this domain generalize to other contexts. In particular, responses to scientific curiosity may be especially positive because the scientific method emphasizes the importance of question-asking and exploration. Curiosity in domains that place less value on such behaviors could therefore elicit less positive responses.

Thus, one possibility is that children would respond more positively to scientific, versus religious, curiosity. In some prior work, adult participants have perceived religion and science as distinct and sometimes incompatible ways of knowing (Rios et al., 2015; Sharp et al., 2022). When seeking explanations for unfamiliar phenomena, individuals report that "it's a mystery" is a better explanation for religious versus scientific occurrences (Liquin et al., 2020). Because mystery appears more acceptable in the domain of religion versus science, curiosity may seem less necessary in the former context. Additionally, many religious traditions—especially Christianity, the dominant religious group in the United States and around the world (Pew Research Center, 2017)—emphasize faith (Cohen et al., 2003; Gill & Lombrozo, 2019). Such

traditions may not place as much importance as science on the value of question-asking and discovery, especially in cases where these behaviors may challenge traditional teachings. Therefore, children growing up in Christian contexts may respond more positively to curiosity about science versus religion. These responses may occur even among children from non-Christian family backgrounds, as the broader national culture may powerfully shape cognition across individual religious differences. For instance, in the United States, children from a variety of religious and non-religious backgrounds have endorsed creationist accounts for natural phenomena (Evans, 2001; Kelemen, 2004) and attributed similar mental states to God (Heiphetz et al., 2018; Wolle et al., 2021). Thus, children growing up in the United States may view religious curiosity as less morally good than scientific curiosity regardless of their own religious background.

Alternatively, a difference in children's responses to religious versus scientific curiosity may not emerge. Although people may view science and religion as distinct methods of learning *about the world* (e.g., perceiving science—but not religion—to be grounded in the experimental method), people may learn *about religion and science themselves* in somewhat similar ways (Harris & Corriveau, 2014; Harris & Koenig, 2006). Children typically learn about religion through others' testimony; for instance, they may learn particular ways of thinking about God from their parents or from leaders in their religious communities. Testimony also plays a central role in scientific learning, as children cannot discover many scientific facts for themselves and must instead rely on acquiring relevant information from others. For instance, children learn about germs from hearing the people around them explain that germs exist, not by directly observing germs themselves. Because the methods by which children learn about science and religion are somewhat similar, children's evaluations of others' desire to learn more about these

two domains may not strongly differ. Likewise, people use both natural and supernatural explanations when trying to explain the same phenomena (Legare & Gelman, 2008). This work suggests that people may sometimes reason similarly about religion and science as explanatory systems and therefore view curiosity about either of these socially-valued domains as a moral virtue. The current research tested between these competing predictions, thereby contributing to conversations regarding the extent to which children distinguish between, or reason similarly about, science and religion.

How Do Moral Evaluations of Curiosity Change or Stay the Same Across Development?

Moral evaluations of curiosity about religion and science may further differ depending on the age of the child. We compared 5- to 6-year-olds' and 7- to 8-year-olds' moral evaluations of curiosity because prior work leads to two competing predictions regarding change versus consistency across these age groups.

On the one hand, younger children might be more likely than older children to perceive curiosity as a virtue, particularly in the domain of religion. This possibility stems from work in the cognitive science of religion showing that 5- to 6-year-olds perceive religious beliefs as more fact-like than do 7- to 8-year-olds. For instance, while both 5- to 6-year-olds and 7- to 8-year-olds report that only one person can be right in a disagreement about matters of fact, 5- to 6-year-olds are more likely than older children to report that only one person can be right in a disagreement about religion (Heiphetz et al., 2013). In conjunction with work showing that participants perceive curiosity as appropriate for factual matters (Gill & Lombrozo, 2019; Pew Research Center, 2019), this result suggests that 5- to 6-year-olds may show more positive moral evaluations of curiosity than would 7- to 8-year-olds, particularly when the curiosity is related to religious topics.

On the other hand, moral evaluations of curiosity may remain stable as children age. This possibility stems from work on curiosity showing that children display curiosity and curiosity-related behaviors, such as exploration and question-asking, throughout the elementary school years (Ahl et al., 2022; Busch & Legare, 2019; Hart et al., 2022). In particular, children commonly show curiosity about scientific questions such as how illness spreads and how a machine works (Bonawitz et al., 2011; Gopnik, 2012; Haber et al., 2022). Because children themselves display curiosity throughout this developmental window, they may also evaluate curiosity positively when displayed by others. The current work tested these competing predictions.

To What Extent Do Behaviors Toward Curious Individuals Map on to Moral Evaluations?

To probe children's responses to others' curiosity, the current work measured both cognition (i.e., children's judgments of people who exhibited curiosity) and behavior (i.e., the number of resources children shared with and took away from curious individuals). Much scholarship regarding moral development more broadly has focused on children's cognition, asking children questions such as whether they themselves and other agents think a particular action is okay or not okay (Elenbaas, 2019; Heiphetz et al., 2018; Posada & Wainryb, 2008; Roberts et al., 2021). However, multiple lines of work in social psychology have documented a disassociation between participants' internal states (e.g., evaluations of others) and their actions (Ajzen & Fishbein, 1977; Banaji & Heiphetz, 2010; Festinger & Carlsmith, 1959). In one classic study, hotel owners reported negative attitudes toward Chinese people but did not discriminate against a Chinese individual seeking a room (LaPiere, 1934). More recent findings show a disjunction in the opposite direction; for instance, national polls show evidence of decreasing racial animus in the face of continuing discrimination (Najdowski & Goff, 2022).

To learn whether such a disconnect also occurs among children, Study 1 probed moral evaluations of curious and non-curious individuals, while Study 2 measured pro-social and punitive behaviors toward peers who showed or did not show curiosity. Investigating both cognition and behavior sheds light on the developmental trajectory of adults' propensity to behave in ways that do not necessarily align with their reported attitudes. Additionally, including both types of measures provided more insight into children's moral responses than either measure in isolation. By testing both cognition and behavior, the current work was able to determine how children think about individuals who are curious versus not curious while also discovering how children treat their curious versus non-curious peers.

Overview of Current Work

The present research examined children's moral evaluations of and behavioral responses to peers who were curious or not curious about religion and science. In Study 1, 5- to 8-year-olds indicated their moral judgments of curious, knowledgeable, and not-curious individuals. Study 2 built on the results of Study 1 by investigating the extent to which children's moral evaluations about curiosity generalized to prosocial and punitive behaviors.

Study 1

Study 1 investigated how 5- to 8-year-olds evaluated peers who showed curiosity, or did not show curiosity, about religion versus science. To do so, we told participants about actors who (a) displayed curiosity, (b) lacked knowledge but did not display curiosity, and (c) possessed relevant knowledge in both domains. Participants indicated the moral goodness of each actor and their behavior. We collected data for this study between Fall 2020 and Spring 2022.

Method

We preregistered the planned methods and analyses prior to running this study (https://aspredicted.org/K4Q_FFQ).

Participants. We estimated effect sizes based on prior research on differences in cognition across participant age, participant religious background, and domain (e.g., science versus religion; Heiphetz et al., 2013; Liquin et al., 2020; McPhetres & Zuckerman, 2017). According to a power analysis that estimated medium effects ($d=.50$) and included other standard parameters (power=.80, $\alpha=.05$), we pre-registered a desired sample size of 128 participants. Ultimately, we were able to recruit a total of 127 children living in the northeastern United States from a lab database and conducted analyses only after testing all participants. We excluded three respondents due to distraction, one respondent due to being outside the targeted age range, and eight respondents due to experimenter error (e.g., failing to record participants' responses). Here and in Study 2, analyzing all respondents with available data yielded the same patterns as those reported below. Families received a \$5 gift card for participating.

The 115 remaining participants included 52 5- to 6-year-olds ($m_{age}=5.37$ years, $sd_{age}=.49$ years) and 63 7- to 8-year-olds ($m_{age}=7.48$, $sd_{age}=.50$). Parents identified their child's race as White ($n=79$), Asian ($n=12$), Black ($n=3$), and multiracial ($n=18$); the remaining parents did not answer this question. They identified their child's ethnicity, which was a separate question on our form, as Hispanic or Latina/o ($n=11$) or not Hispanic or Latina/o ($n=102$); the remaining parents did not answer this question. Further, parents identified their child's gender as female ($n=56$), male ($n=56$), and non-binary ($n=1$); one additional parent selected more than one gender, and one did not report their child's gender. Finally, parents identified their child's religious affiliation as Protestant ($n=19$), Catholic ($n=12$), Other Christian ($n=14$), Jewish ($n=17$), Hindu ($n=2$), non-

religious/atheist/agnostic ($n=42$), and "other" ($n=4$); three parents reported more than one religious affiliation, and two parents did not answer this question. On average, parents reported that their children attended religious services "once a year" ($m=3.33$, $sd=1.94$, on a scale ranging from 1="never" to 6="every week or more often") and that it was of moderate importance to them to raise their children in a religious tradition ($m=3.61$, $sd=1.31$, on a scale ranging from 1="not at all important" to 5="very important"). Here and in Study 2, we did not observe reliable differences based on religious demographics; see supplemental materials. Like in prior work (e.g., Evans, 2001; Harris & Koenig, 2006; Heiphetz et al., 2018; Kelemen, 2004), participants from a variety of religious backgrounds as well as non-religious participants were able to answer questions about religious topics. Here and in Study 2, we recruited children based on their age and tested everyone from whom we received assent as well as parental consent, without regard to demographic characteristics such as race, gender, or religious background.

Materials and Procedure

Here and in Study 2, an experimenter tested participants individually via Zoom due to the COVID-19 pandemic. First, the experimenter told each child that they would answer questions about different people and that there were no right or wrong answers. The experimenter then used a Power Point slide to introduce each child to a series of stick figures depicting different actors. All children learned about actors who exhibited religious or scientific curiosity. For instance, children learned about one actor who was internally motivated to discover whether God knows everyone's thoughts and a different actor who was internally motivated to discover the size of germs. To communicate that the actors were genuinely curious, materials provided information both about internal states (e.g., "no one told [actor] that she/he must know the answer to this question, but she/he just really wants to learn") and about behaviors that prior

work has used as indicators of curiosity (e.g., asking questions).

As a comparison, children also learned about actors who (a) lacked knowledge but were not curious or (b) possessed the relevant knowledge. We chose these comparisons to determine whether participants distinguished between non-curiosity based on lack of interest versus non-curiosity based on possessing prior knowledge (i.e., lack of need for curiosity). Of course, individuals can be knowledgeable about a domain and still desire to learn more. However, because the current work represented curiosity and knowledge about specific pieces of information, people could not both possess relevant knowledge and be curious (e.g., desire to acquire knowledge they did not have). For instance, a character could be curious about whether God knows everyone's thoughts, or a character could have learned from someone else whether God knows everyone's thoughts, but she could not be both curious and knowledgeable about this specific piece of information.

Participants completed three counterbalanced trials of each type (science/curiosity, religion/curiosity, science/no curiosity, religion/no curiosity, science/knowledge, religion/knowledge), for a total of eighteen trials describing different actors. For example, in the *curious* condition, the experimenter told participants, "Amy is very interested in learning about God. For instance, she really wants to know whether God knows everyone's thoughts. No one has told Amy that she must know the answer to this question, but she just really wants to learn about this because she is curious. She spends a lot of time talking with people whose job is teaching others about God and asking them questions. She does this because she wants to figure out whether God knows everyone's thoughts." In the *non-curious* condition, the experimenter instead said, "Danielle is not at all interested in learning about God. For instance, she really doesn't care about whether God knows everyone's thoughts. She just really doesn't want to learn

about this because she is not curious. She has had the chance to talk with people whose job is teaching others about God and to ask them questions. But she decided to do something else instead because she thought doing something else would be more fun." In the *knowledgeable* condition, the experimenter said, "Annie has already learned a lot of things about God. For instance, one thing that other people have taught her is whether God knows everyone's thoughts. No one asked Annie whether or not she wanted to know the answer to this question. They just told her about whether God knows what everyone is thinking. Now, Annie feels like she knows whether God can tell what people are thinking about."

In each story, actors were curious (or not curious) about one of three religious questions (whether God knows everyone's thoughts, whether God can do miracles, whether God can hear prayer) or one of three scientific questions (what size different types of germs are, why there are no more dinosaurs alive right now, how magnets work). We drew these items from past work measuring children's responses to religious and scientific information (Heiphetz et al., 2013). Full vignettes used in both studies are available in the supplemental materials. We randomized the order of science vignettes versus religion vignettes as well as the order of trials within each domain. As in many prior studies with children (e.g., Heiphetz & Young, 2019; Lee & Warneken, 2020; McAuliffe & Dunham, 2021; Shaw et al., 2014), female participants heard about female actors, and male participants heard about male actors; participants who did not identify as female or male chose the actors' gender.

After learning about each actor, children indicated their moral evaluations by answering four counterbalanced items: (1) "Is [actor] a good person or a bad person?" (2) "Is [actor] a nice person or a mean person?" (3) "Was [actor]'s behavior good or bad?" (4) "Was [actor]'s behavior right or wrong?" Experimenters followed up each yes-or-no question with a more fine-grained

item asking whether the actor/behavior was a little, kind of, or really good/bad. Responses thus created a 6-point scale with 1 indicating the most negative evaluation (e.g., "really bad") and 6 indicating the most positive evaluation (e.g., "really good"). We then averaged responses to these four items into a composite score with α s ranging from .74 to .89 for each vignette, and then averaged responses to all three actors within each of the six Domain x Actor Curiosity conditions to form a composite moral evaluation score.

Results

As depicted in Fig. 1, participants generally evaluated the curious and knowledgeable actors quite positively for both religious and scientific questions, while the actor who was not curious about these topics received less positive evaluations on average—closer to the scale midpoint between "a little good" and "a little bad." We analyzed moral judgments using a 2 (Participant Age: 5- to 6-year-olds vs. 7- to 8-year-olds) x 2 (Domain: Science vs. Religion) x 3 (Actor Curiosity: Curious vs. Not Curious vs. Knowledgeable) mixed ANOVA with repeated measures for Domain and Actor Curiosity.¹ This test revealed significant main effects of Domain, $F(1, 111)=15.74, p<.001$, partial $\eta^2=.12$, and of Actor Curiosity, $F(1.21, 134.61)=112.83, p<.001$, partial $\eta^2=.51$. These effects were qualified by a Domain x Actor

¹ We also analyzed the data using exploratory mixed-effects regression models that were not pre-registered. These models provided an alternative method of analyzing the complex data structure. We predicted responses to each moral evaluation question from domain, age, curiosity, and all interactions between these conditions, with fixed effects of question type and random intercepts for participant and vignette. This analysis (available in full in the supplemental materials) replicated the key findings from the ANOVA: in both domains, participants reported less positive moral evaluations of actors who were not curious rather than curious ($b=-1.48$ [-1.55, -1.42]) or knowledgeable ($b=-1.42$ [-1.49, -1.36]), although this effect was somewhat larger in the domain of religion than science, $ps<.001$. However, this analysis also revealed a significant Participant Age x Domain x Actor Curiosity interaction, such that interaction between domain and curiosity was larger for 5- to 6-year-olds, $b=0.75$ [0.56, 0.95], $p<.001$, than for 7- to 8-year-olds, $b=0.27$ [0.10, 0.45], $p=.002$. The simple effects revealed that the difference between evaluations of the curious and non-curious actors was largest for 5- to 6-year-olds evaluating religious topics, $b=-1.80$ [-1.93, -1.66], smallest for 5- to 6-year-olds evaluating scientific topics, $b=-1.05$ [-1.19, -0.91], and intermediate for 7- to 8-year-olds evaluating religious topics, $b=-1.68$ [-1.80, -1.56], or scientific topics, $b=-1.41$ [-1.53, -1.29]. A similar pattern occurred for the difference between knowledgeable and non-curious actors, with larger differences between domains for younger children.

Curiosity interaction, $F(1.66, 184.59)=13.80$, $p<.001$, partial $\eta^2=.11$. No other main effects or interactions reached significance, $ps\geq.105$. Non-integer degrees of freedom reflect a Greenhouse-Geisser correction for a violation of the assumption of sphericity.

To further probe the Domain x Actor Curiosity interaction, we conducted two sets of tests (Fig. 1). First, we compared evaluations of actors who were curious, knowledgeable, and not curious about religion. Separately, we compared these three actors in the domain of science. This analysis resulted in six comparisons; therefore, p -values needed to be .008 or lower to pass the Bonferroni-adjusted significance threshold. In both domains, participants reported less positive evaluations of actors who were not curious rather than curious (science: $p<.001$, Cohen's $d=.84$, 95% CI: [.95, 1.45]; religion: $p<.001$, Cohen's $d=1.04$, 95% CI: [1.41, 2.04]) or knowledgeable (science: $p<.001$, Cohen's $d=.78$, 95% CI: [.84, 1.38]; religion: $p<.001$, Cohen's $d=1.06$, 95% CI: [1.40, 2.02]), although this effect was somewhat larger in the domain of religion than for science. No other pairwise comparisons reached significance, $ps\geq.082$, Cohen's $ds\leq.18$.

Second, we compared evaluations of actors who exhibited curiosity, did not exhibit curiosity, or exhibited knowledge regarding science versus religion. This analysis resulted in three comparisons; therefore, p -values needed to be .017 or lower to pass the Bonferroni-adjusted significance threshold. Participants reported less positive moral evaluations of actors who were not curious about religion rather than science, $p<.001$, Cohen's $d=.45$, 95% CI: [.35, .82]. No other pairwise comparisons reached significance, $ps\geq.162$, Cohen's $ds\leq.14$.

Because our actual sample size was somewhat smaller than our pre-registered sample size due to participant exclusions, we also conducted sensitivity analyses for these pairwise comparisons. These analyses indicated that our sample size was sufficient to detect an effect size of .26, whereas the smallest effect we observed was .45.

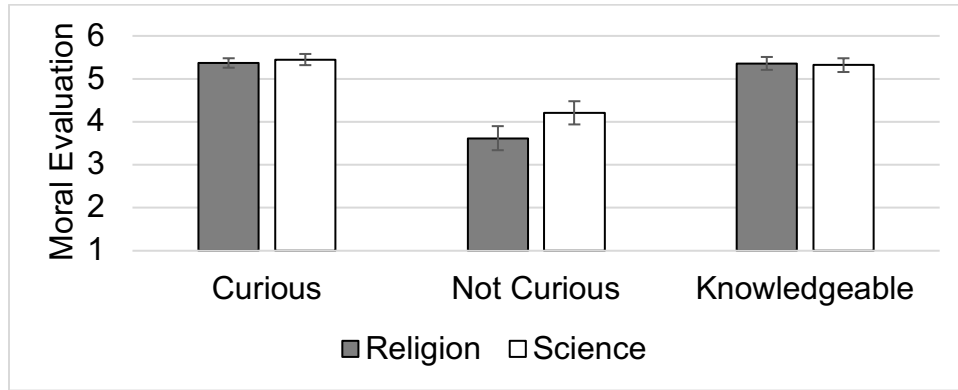


Fig. 1. Moral evaluations of actors who were curious, not curious, and knowledgeable about religion and science, Study 1. Higher scores reflect more positive evaluations, with scores ≥ 4 indicating positive evaluations and ≤ 3 indicating negative evaluations. Error bars represent 95% confidence intervals.

Discussion

Study 1 examined children's moral judgements of people who were curious, not curious, or knowledgeable about science and religion. We observed three results of primary importance. First, children evaluated people who knew the answer to a question or were trying to discover the answer more favorably than people who were not curious and were not trying to remedy their lack of knowledge. This result indicates that in addition to showing curiosity themselves (e.g., Gopnik, 2012; Loewenstein, 1994), children also respond favorably to curiosity among others. Second, we observed consistent patterns across participant age. Although 5- to 6-year-olds view religion as more fact-like than do 7- to 8-year-olds (Heiphetz et al., 2013), and scientific facts may appear to be a more suitable target for curiosity than religious information (Gill & Lombrozo, 2019; Liquin et al., 2020), we observed relatively positive evaluations of curiosity among participants from both age groups. Third, participants reported less positive moral evaluations of people who were not curious as compared with those who were curious or knowledgeable, particularly in the domain of religion. This finding highlights the importance that

participants appear to place on curiosity, even in a domain that sometimes emphasizes the importance of accepting claims based on faith.

While Study 1 assessed children's cognition, it did not address their behavioral responses to curious others. To investigate the link between children's attitudes and behaviors, Study 2 probed children's actions toward curious and non-curious peers.

Study 2

The primary goal of Study 2 was to investigate whether children's behaviors would echo the moral evaluations we observed in Study 1. As discussed above, adults' behaviors often do not align with their internal mental states (Ajzen & Fishbein, 1977; Banaji & Heiphetz, 2010; Festinger & Carlsmith, 1959). We sought to determine if the same would be true for children's responses to curiosity.

We probed two types of behaviors: pro-social responses (sharing stickers) and punishment (taking away stickers). Both types of behaviors can provide reinforcement that communicates how people should behave (Davidow et al., 2016; Feinberg, 1965; Sarin et al., 2021). However, children sometimes respond differently to pro-social versus punitive actions. For instance, although 6- to 9-year-olds are more likely to punish transgressors rather than compensate their victims (McAuliffe & Dunham, 2021), they evaluate helpers more favorably than punishers when responding from a third-party perspective (Lee & Warneken, 2020). Due to these potential differences, the current work tested both pro-social and anti-social actions.

Method

We preregistered the planned methods and analyses prior to running this study (https://aspredicted.org/73M_N9F). Because reliable age differences did not emerge in Study 1, Study 2 tested only 7- to 8-year-olds. We selected the older age group because the effects for this group were slightly larger compared to younger children (e.g., for the pairwise comparison between characters who were curious versus not curious about religion, Cohen's $d=.98$ for 5- to 6-year-olds and 1.10 for 7- to 8-year-olds; for the comparison between characters who were curious versus not curious about science, Cohen's $d=.67$ for 5- to 6-year-olds and .97 for 7- to 8-year-olds).

Participants. We pre-registered a sample size of 62 participants based on the number of 7- to 8-year-olds in Study 1. Ultimately, we recruited a total of 66 children living in the northeastern United States using the same recruitment procedures as Study 1; as in that earlier study, we conducted analyses only after recruiting the full sample. We excluded two respondents due to distraction, two respondents due to being outside the targeted age range, and one respondent due to experimenter error in recording responses. Families received a \$5 gift card for participating.

The 61 remaining participants ($m_{\text{age}}=7.41$ years, $sd_{\text{age}}=.50$ years) included children whose parents identified their race as White ($n=38$), Asian ($n=4$), Black ($n=5$), Native American/Pacific Islander ($n=1$), multiracial ($n=2$), and "other" ($n=2$); the remaining parents did not answer this question. Parents identified their child's ethnicity as Hispanic or Latina/o ($n=6$) or not Hispanic or Latina/o ($n=55$) and their child's gender as female ($n=30$), male ($n=29$), and non-binary ($n=2$). Finally, parents identified their child's religious affiliation as Protestant ($n=9$), Catholic ($n=4$), Other Christian ($n=7$), Jewish ($n=10$), Muslim ($n=2$), non-religious/atheist/agnostic ($n=19$), and "other" ($n=5$); the remaining parents did not answer this question. Using the same scales as in

Study 1, parents reported, on average, that their children attended religious services "once a year" ($m=3.39$, $sd=2.06$) and that it was of moderate importance to them to raise their children in a religious tradition ($m=3.55$, $sd=1.31$, on a scale ranging from 1="not at all important" to 5="very important"). None of the participants in Study 2 had completed Study 1.

Materials and Procedure

The procedures were identical to Study 1, with three exceptions. First, Study 2 included only the curious and not curious actors. We made this decision to allow for the inclusion of both pro-social and punishment tasks while keeping the total study length reasonable for children. When deciding which of Study 1's conditions to exclude, we chose the knowledgeable condition because curiosity about a question may not appear as relevant or salient when an actor already knows the answer to that question. Second, rather than asking about moral evaluations, we introduced two new dependent measures targeting pro-social and punitive behaviors. Participants completed four counterbalanced trials of each type (science/curiosity, religion/curiosity, science/no curiosity, religion/no curiosity); two asked them to share stickers with an actor while the other two asked them to take stickers away from an actor. This design resulted in sixteen total trials. Third, in each story, actors were curious (or not curious) about one of four religious or scientific topics, rather than three topics as in Study 1. We made this decision to allow for an equal number of pro-social and punishment trials across conditions. See the supplemental materials for all items.

In the pro-social task, the experimenter gave participants five stickers per trial and told them that they could share as many as they wanted with the actor. Participants learned that the experimenter would throw away any remaining stickers. In the punishment task, we told participants that each actor had five stickers and that they could take away as many as they

wanted; the actor would keep any remaining stickers. These procedures were based on prior resource-distribution tasks used in developmental research (Shaw et al., 2014; Wolle et al., 2021). Participants completed both dependent measures in a counterbalanced order; they were randomly assigned to complete either the eight pro-social behavior trials first or the eight punishment trials first.

Results

We averaged the number of stickers actors had at the end of each trial; higher numbers indicate that participants shared more stickers with the actor in the pro-social task or that participants left the actor with more stickers (i.e., took away fewer stickers) in the punishment task. As displayed in Fig. 2, curious actors averaged more than three (out of five) stickers at the end of the pro-social and punishment tasks, while the not curious actors typically had fewer than three stickers. We submitted the actor's number of stickers to a 2 (Domain: Science vs. Religion) x 2 (Actor Curiosity: curious vs. not curious) x 2 (Task: Pro-social vs. Punishment) repeated measures ANOVA.² We observed a main effect of Actor Curiosity, $F(1, 60)=34.73, p<.001$, partial $\eta^2=.37$: after participants had finished giving or removing stickers, curious actors ($m=3.59, sd=.88$) had more stickers than actors who were not curious ($m=2.76, sd=1.08$). No other main effects or interactions reached significance, $ps\geq.125$.

² We also performed alternative exploratory analyses using mixed-effects regression models to predict the number of stickers from domain, task, curiosity, and all interactions between these conditions, with random intercepts for participant and vignette. This analysis (which was not pre-registered and which is available in full in the supplemental materials) replicated the main effect of Actor Curiosity, $b=-0.82 [-0.98, -0.66], p<.001$, and also revealed a significant interaction between Domain and Actor Curiosity, $b=-0.37 [-0.69, -0.05], p<.001$, such that the difference between curious and non-curious actors was larger for science, $b=-1.01 [-1.23, -0.78]$, than religion, $b=-0.64 [-0.86, -0.41], ps<.001$. No other main effects or interactions reached significance.

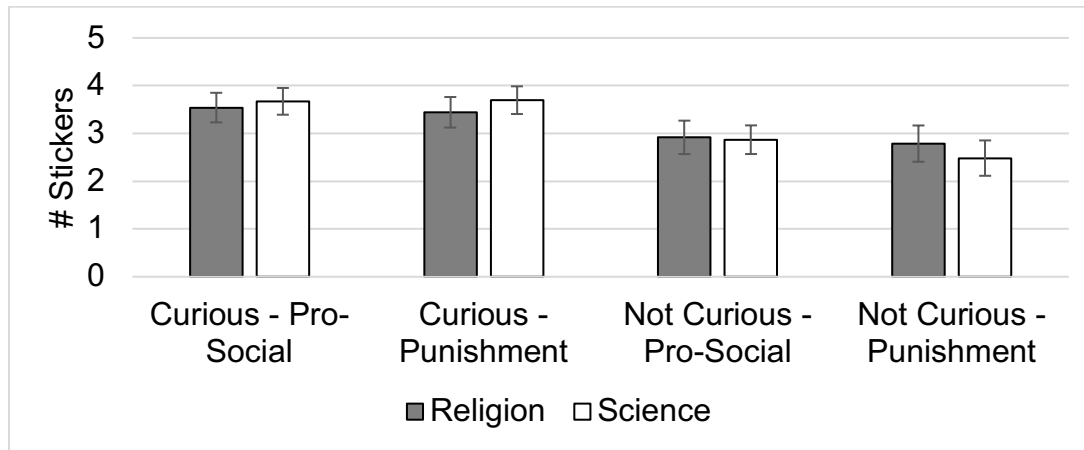


Fig. 2. Number of stickers actors had at the end of each type of trial. Higher numbers in pro-social trials indicate that children shared more stickers with actors; higher numbers in punishment trials indicate that children took fewer stickers away from actors. Error bars represent 95% confidence intervals.

Discussion

Study 2 built on Study 1 by investigating whether children's behaviors would reflect the moral evaluations we observed in Study 1. Just as children evaluated curious actors more positively than actors who were not curious in Study 1, so too did children behave more generously toward curious actors rather than actors who were not curious in Study 2. That is, in Study 2, children shared more resources with curious versus not-curious actors, and they took fewer stickers away from curious rather than not-curious actors. These similarities across task type indicate both a positive effect (children behave more pro-socially toward curious, versus not-curious, individuals) and a negative effect (children behave less punitively toward curious, versus not-curious, individuals). These responses did not differ depending on whether actors showed curiosity regarding religion or science, supporting prior arguments highlighting similarities between religious and scientific cognition outside the domain of curiosity (e.g., Harris & Corriveau, 2014; Harris & Koenig, 2006; Legare & Gelman, 2008).

General Discussion

Two experiments investigated children's attitudes and behaviors in response to curious and not curious actors to answer three questions: (1) To what extent do perceptions of curiosity change or stay the same across development? (2) How do children evaluate curiosity regarding science (a domain that typically emphasizes the value of exploration and question-asking) versus religion (a domain that sometimes prioritizes faith)? (3) To what extent do behaviors toward curious individuals map on to moral evaluations?

In Study 1, 5- to 8-year-olds evaluated actors who displayed curiosity, lacked knowledge but did not display curiosity, or possessed relevant knowledge about religion or science. Regardless of whether they evaluated curiosity about religion or science, children in both age groups viewed actors who were curious as more moral than actors who were not curious. Because 5- to 6-year-olds view religion as more fact-like than do older participants (Heiphetz et al., 2013), and because individuals may see scientific facts as more appropriate targets for curiosity than religious claims (e.g., Gill & Lombrozo, 2019), it was possible that younger children would view religious curiosity in more positive terms than would older children. The fact that we found similar effects across age groups, and did not observe significant differences between older and younger children, suggests that children may form a favorable impression of curiosity relatively early in development—before they come to draw strong distinctions between religious claims and scientific facts. Curiosity may be one trait that 5- to 8-year-olds consider to make up a virtuous person.

Study 1 also revealed that children viewed curious individuals more favorably than individuals who were ignorant but not curious and did not distinguish between curious versus knowledgeable individuals to a statistically significant extent. While prior work has highlighted

children's positive responses to knowledgeable others (Corriveau & Harris, 2009; Koenig & Jaswal, 2011; Tenney et al., 2011), the current research suggests that children may distinguish between different kinds of ignorance (ignorance that an actor is trying to remedy versus ignorance with which the actor appears content). Additionally, children may not view knowledge more positively than ignorance when people are trying to learn the information that they do not know currently. This finding highlights a potential boundary condition of children's generally positive responses to knowledgeable individuals and suggests that when people lack knowledge, they can nevertheless elicit relatively favorable responses from children by demonstrating their efforts to obtain that knowledge.

Further, Study 1's effects emerged in the domains of both religion and science. Christianity—the dominant religious group in the United States (Pew Research Center, 2017), where the current research took place—typically places less emphasis on the importance of questioning and exploration, and more emphasis on faith, than does the scientific method (Cohen et al., 2003; Gill & Lombrozo, 2019). Therefore, children growing up in the United States may have viewed scientific curiosity as more morally good than religious curiosity. However, this effect did not emerge; in both domains, children evaluated curious individuals more favorably than individuals who were ignorant and not curious and individuals who possessed relevant knowledge, and we did not observe significant differences between domains in positive evaluations of curiosity. This finding contributes to conversations about the extent to which religious and scientific cognition share common psychological properties. In some ways, people draw sharp distinctions between religion and science (Rios et al., 2015; Sharp et al., 2022). For instance, 5- to 8-year-olds are more likely to say that only one person can be right in a disagreement regarding science rather than religion (with 7- to 8-year-olds drawing this

distinction between science and religion even more strongly than do 5- to 6-year-olds; Heiphetz et al., 2013), and adults report that "it's a mystery" is a better explanation for religious rather than scientific phenomena (Liquin et al., 2020). In other ways, however, religion and science appear to draw on similar psychological mechanisms. For instance, children appear to learn about both domains in a similar way—from others' testimony (Harris & Corriveau, 2014; Harris & Koenig, 2006). The present findings highlight a related similarity between science and religion, showing that not only do children learn about both similarly but also that they show favorable moral evaluations of people who are trying to learn about both domains.

Study 2 built on Study 1 by showing that children behaved more pro-socially and less punitively toward individuals who were curious rather than not curious. As in Study 1, this effect emerged for both religious and scientific curiosity, further strengthening the evidence for some degree of similarity in how children understand these two domains. While children often behave pro-socially toward others (Chernyak & Kushnir, 2013; Grueneisen & Warneken, 2022; Tomasello & Vaish, 2013), the current work documents that children direct their pro-sociality more toward curious individuals rather than individuals who are not curious. This behavior may have downstream social consequences; for instance, one reason that children commonly exhibit behaviors associated with curiosity (Bonawitz et al., 2011; Gopnik, 2012) may be that they receive positive reinforcement from others for doing so. Indeed, participants may have behaved more generously and less punitively toward individuals who did not exhibit curiosity if the resources they were sharing or taking away could promote curiosity. For instance, children may have distributed more books rather than stickers to children who were not curious, since reading can promote curiosity about a topic (and also satisfy that curiosity to some extent).

The inclusion of both cognitive and behavioral measures in the current work contributes to a longstanding conversation in social psychology about the extent to which internal mental states (in this case, moral evaluations as measured in Study 1) map on to behaviors. While adults commonly behave in ways that do not match their attitudes (Ajzen & Fishbein, 1977; Banaji & Heiphetz, 2010; Festinger & Carlsmith, 1959), the present research showed that children judged curiosity in a morally favorable way (Study 1) and also behaved more pro-socially, and less punitively, toward curious individuals rather than individuals who were not curious (Study 2). Some social psychologists have argued that a disconnect between attitudes and behaviors emerges among adults in part because adults have learned that it is not socially acceptable to report their true attitudes (e.g., White adults may report relatively egalitarian racial attitudes because they have learned that it is not socially acceptable to say racist things out loud, not because they truly hold egalitarian views; Nosek et al., 2007). The evidence for this claim in social psychology comes largely from speeded reaction-time tasks that show less egalitarian social attitudes than what many adults indicate on self-report measures (Dasgupta et al., 2000; Johnson et al., 2017; Lai & Wilson, 2021). The current work adds to this conversation by providing converging evidence using a different method. Namely, by testing children who do not seem to hold back reports of attitudes that may deviate from social norms (as evidenced by their frequent non-socially-desirable responses on attitude measures, such as explicit reports of intergroup bias; Gulgoz et al., 2018; Heiphetz & Young, 2019; Mandalaywala et al., 2019), we provided further evidence for a closer match between internal mental states and behaviors in contexts where people may not be inhibiting reports of their true attitudes and beliefs. In doing so, the current studies strengthen the bridges between developmental and social psychology—an important project because both children and adults interact with other people daily. Thus,

integrating theories from the two subdisciplines provides a clearer picture of human social functioning than would be possible by conducting science as though the phenomena that developmental and social psychologists study are informed by entirely different mechanisms.

Limitations and Future Directions in the Investigation of Scientific and Religious Cognition

The present research provides critical information into how children morally respond to actors who display curiosity in domains of science and religion. In doing so, these findings connect work on curiosity with topics that psychologists typically study separately from curiosity (morality, religion) and increase understanding of children's cognition and behavior. However, like all research, the present research has limitations that prompt questions for future investigation.

The current work contributes to conversations about the extent to which children reason similarly about religion versus science. However, the present studies only investigated a subset of possible religious and scientific questions, and other questions may reveal sharper distinctions between science and religion. For instance, including a condition specifically saying that actors accepted a particular view based on faith (in the religion condition) may have led to greater divergence between religion and science and to less negative evaluations of a lack of religious curiosity, since this lack would be based on a characteristic that is often positively evaluated (faith) rather than a characteristic that may elicit less favorable responses (wanting to do something more fun). Additionally, the religious items tested in the present research all concerned questions of whether or not particular phenomena were real, whereas the scientific topics were more varied. Future work could test a greater variety of religious items, such as curiosity about how (not just whether) God answers prayers.

To increase the generalizability of our results, we tested responses to curiosity regarding

broad, high-consensus, uncontroversial questions about unobservable entities, such as questions about God on which many religions agree (e.g., whether God knows everyone's thoughts, whether God can hear prayer) and questions about scientific topics that do not conflict with mainstream religious teachings (e.g., the size of germs). However, children's positive moral evaluation of curiosity about basic questions may not extend to questions that seem to challenge accepted teachings, and this effect may occur especially strongly in the domain of religion. For instance, children may respond favorably to someone who is curious about God's properties (e.g., whether God is omniscient), but they may respond less positively to someone whose curiosity suggests skepticism (e.g., curiosity about how God could possibly know everything or whether God exists at all). Because science relies on skepticism to a larger extent than does religion, children may show more enthusiasm for curiosity that challenges accepted scientific teachings, in line with previous findings that adults value information search about scientific topics more than information search about religious topics (Gill & Lombrozo, 2019; Liquin et al., 2020).

Furthermore, there may be alternative ways of expressing a lack of curiosity that elicit more positive evaluations than in the present studies. In our studies, one way that actors expressed their lack of curiosity was choosing to do something more fun rather than take an opportunity to learn about the question. This behavior may signal a variety of negative traits, including not appropriately valuing the topic domain or being easily distractible, lazy, or hedonistic. Other justifications for not being curious about the specific question, such as wanting to learn about something else that seemed more important, may elicit more positive evaluations.

Future work can also investigate potential drawbacks of curiosity. The current work found positive moral evaluations of curiosity in specific domains (religion, science). In other contexts, some people may not want to be questioned by others or may see such questioning as

inappropriate or even threatening to their social identity because it implies otherness (Branscombe et al., 1999; Cheryan & Monin, 2005). Indeed, preliminary evidence suggests that adults may show less positive views of curiosity than those observed in the current work when dominant group members place responsibility on minoritized individuals to satisfy their curiosity (Mosley & Solomon, in press) or when individuals display curiosity about topics that are not socially valued, such as how to commit immoral acts (White et al., under review). Future work can build on this research to ask how children might evaluate intergroup curiosity in the context of religion. For instance, a Christian person asking a Jewish person about Jewish religious practices may make the Jewish person feel othered. Negative moral evaluations in regards to such questioning by outgroup members may be particularly likely when the membership category is irrelevant or out of context given the situation at hand (e.g., a Christian teacher using classroom time to ask a Jewish student to explain Jewish practices when the lesson at hand does not concern religion). Thus, future research can probe how moral evaluations of curiosity may differ across contexts and the conditions under which children may perceive curiosity as a vice.

Finally, curiosity may elicit more negative evaluations across development, particularly in the domain of religion. As participants gain more exposure to religious norms—especially norms of religious groups that place particular emphasis on faith rather than questioning—they may learn that religion is not an appropriate topic for curiosity. One initial study with adults found positive evaluations of both scientific and religious curiosity (White, Mosley, & Heiphetz, under review). However, this initial work tested curiosity about similar types of questions as those used in the present research, such as whether God is omniscient. Adults—especially those from religious backgrounds that emphasize faith—may draw stronger distinctions between religious and scientific curiosity in areas where they may perceive religious questioning to be threatening,

such as curiosity about whether God exists at all or whether the teachings of a different religion may be correct. Future work can investigate this possibility.

Conclusion

Curiosity is a pervasive human motivation that drives much of children's behavior (Kidd & Hayden, 2015; Jirout & Klahr, 2012). The current work documents that children respond to others' curiosity favorably—a finding consistent across younger (5- to 6-year-olds) and older (7- to 8-year-olds) children, across the domains of science and religion, and across moral judgments, pro-social behaviors, and punishment. Integrating moral and developmental psychology, this research suggests that children judge others as virtuous when they are internally motivated to gain information.

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