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## How Children and Adults Represent God's Mind

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### Abstract

For centuries, humans have contemplated the minds of gods. Research on religious cognition is spread across sub-disciplines, making it difficult to gain a complete understanding of how people reason about gods' minds. We integrate approaches from cognitive, developmental, and social psychology and neuroscience to illuminate the origins of religious cognition. First, we show that although adults explicitly discriminate supernatural minds from human minds, their implicit responses reveal far less discrimination. Next, we demonstrate that children's religious cognition often matches adults' implicit responses, revealing anthropomorphic notions of God's mind. Together, data from children and adults suggest the intuitive nature of perceiving God's mind as human-like. We then propose three complementary explanations for why anthropomorphism persists in adulthood, suggesting that anthropomorphism may be (a) an instance of the anchoring and adjustment heuristic; (b) a reflection of early testimony; and/or (c) an evolutionary byproduct.

*Keywords:* Anthropomorphism; Religious cognition; Social cognition; Social cognitive development; Theory of mind

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### 1. Introduction

On January 16, 2011, Gary Schmitt stabbed a former high school classmate and his classmate's daughter a total of 20 times. After his arrest, he claimed that he had been following instructions from God. Despite the fact that both survivors could identify their attacker, Schmitt was found not guilty due to insanity. The court's reasoning is of particular interest because the insanity defense could not have depended solely on Schmitt's claim that God spoke to him. The belief that God communicates directly with people is a key component of many religious traditions—including evangelical Protestantism

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(Balmer, 1989; Luhrmann, 2012), Quakerism (New England Yearly Meeting of Friends, 1985), and Mormonism (Mould, 2011)—yet society has not committed all adherents of these religions to psychiatric facilities. The idea that God, like a human being, can think about what should happen and tell people how to behave does not seem crazy to many. Indeed, most people in the world are theists (Lynn, Harvey, & Nyborg, 2009). For example, more than 9 in 10 Americans report believing in God (Pew Forum, 2008).

Instead, the court may have been influenced by Schmitt's claim about what exactly God said. Although many Americans are willing to accept that God can tell people to donate to charity or volunteer at a soup kitchen, they may be far less likely to accept the claim that God commanded violence toward members of their in-group, such as fellow Americans. Unlike humans, God is often perceived as unwilling to harm us and other members of our in-group (cf. Ginges, Atran, Sachdeva, & Medin, 2011; Ginges, Hansen, & Norenzayan, 2009). Here, we attempt to shed light on these issues by reviewing and examining how children and adults understand the mind of God.

This review focuses on people's perceptions of God's mind—particularly God as conceptualized within Judeo-Christian traditions—for two reasons. First, these religious groups have the largest number of adherents worldwide (Pew Forum, 2008). Second, the preponderance of experimental evidence on religious cognition focuses on Western samples and Judeo-Christian representations of God. We note, though, that many traditions focus on supernatural beings other than the Judeo-Christian God—in the form of multiple gods, spirits, ghosts, ancestors, witches, devils, and demons (e.g., Atkinson & Whitehouse, 2011; Atran, 2002; Bering, 2002; Boyer, 2001, 2003; Cohen & Barrett, 2008; Luhrmann, 1989; McCauley & Lawson, 2002; Slone, 2004)—and we highlight such findings where relevant.

Work on religious cognition has been conducted from a number of disciplinary perspectives, including cognitive psychology, developmental psychology, social psychology, and neuroscience. In an effort to chart a more coherent story of how and why people perceive God's mind as they do, we identify important connections across research programs in these areas. Work using developmental methods typically asks how children represent God's mind and the extent to which they distinguish God's mind from human minds (e.g., Barrett, Newman, & Richert, 2003; Barrett, Richert, & Driesenga, 2001; Knight, 2008; Knight, Sousa, Barrett, & Atran, 2004; Lane, Wellman, & Evans, 2010, 2012, 2014; Makris & Pnevmatikos, 2007; Wigger, Paxson, & Ryan, 2013). Meanwhile, work with adults typically investigates the antecedents and consequences of reasoning about God's mind (e.g., Epley, Akalis, Waytz, & Cacioppo, 2008; Gervais & Norenzayan, 2012; Gray & Wegner, 2010; Kay, Moscovitch, & Laurin, 2010; Laurin, Kay, & Moscovitch, 2008; Norenzayan, 2013; Shariff & Norenzayan, 2011; Waytz, Gray, Epley, & Wegner, 2010; Waytz, Epley, & Cacioppo, 2010; for examples of work that has investigated adults' perceptions of God's mind, rather than the antecedents and consequences of such perceptions, see Gorsuch, 1968; Spilka, Armatas, & Nussbaum, 1964). Our integrative framework unites these separate research programs and highlights change and consistency across development. This approach allows us to identify ways in which

cognitive development and social learning might support adult-like representations as well as religious concepts that emerge early in life.

Our central argument is that distinguishing God's mind from human minds requires socio-cognitive development and deliberate reasoning. To support this argument, we begin by discussing adults' *explicit* representations of God's mind—that is, representations of which adults are consciously aware and which they can articulate. These representations often result from some deliberation, including thoughtfully considering what God is like. At this level, people recognize God's mind to be quite different from human minds. We then turn to literature on adults' *implicit* representations. We view representations as implicit if they are not deliberate or consciously available (cf. Dasgupta, 2009; Greenwald & Banaji, 1995; Rudman, 2004). One need not take time to think to express implicit representations; in fact, adults are often unaware of these representations and fail to articulate their implicit attitudes and beliefs (e.g., Bargh & Chartrand, 1999; Nisbett & Wilson, 1977). Whereas explicit representations can arise from thoughtful deliberation, implicit representations occur spontaneously, without such deliberation. We highlight findings showing that, despite their explicit reports to the contrary, adults do not always sharply distinguish between God's mind and human minds at an implicit level. Next, we discuss children's representations of God's mind. We integrate literatures from cognitive, developmental, and social psychology, as well as neuroscience, to show that children's explicit representations often resemble adults' implicit representations. We conclude that perceptions of God's mind as human-like emerge early in development and remain implicit even for adults.

## 2. Adults' explicit representations of God's mind

Theologians and religious studies scholars have long argued that God's mind is quite different from that of a person (see Armstrong, 1993, for a review). Similarly, when asked for their views of God, many adults provide “theologically correct” answers (Barrett, 1999, p. 326), describing God as superhuman. For example, adults from Australia, China, Italy, and the United States report that God and other supernatural beings have greater perceptual access and greater mental capacities (e.g., a stronger ability to think, reason, intend, and plan) than do humans (Demoulin, Saroglou, & Van Pachterbeke, 2008; Gray, Gray, & Wegner, 2007; Gray & Wegner, 2010; Haslam, Kashima, Loughnan, Shi, & Suitner, 2008). In general, adults across diverse cultures report that God is all-knowing and has privileged access to humans' mental states (for a review, see Bering & Johnson, 2005). This perception is not limited to explicit responding in experimental settings. In several ethnographic studies (e.g., Balmer, 1989; Luhrmann, 2012), American evangelical Protestants reported that God has complete access to their mental states. God's perceived omniscience—that is, God's knowledge of all things that can be known—contrasts sharply with the more limited knowledge that adults typically attribute to humans (e.g., Dungan & Saxe, 2012; Keysar, Lin, & Barr, 2003; Saxe & Young, 2013).

However, cognitive science has shown that, under some conditions, adults hold more anthropomorphic views of God. Borrowing from prior work (Epley, Waytz, & Cacioppo, 2007; Waytz, Morewedge, et al., 2010), we define anthropomorphism as the attribution of a human-like mind to non-human agents, objects, or phenomena. Importantly, this operationalization focuses on the attribution of a human-like mind (rather than the attribution of human-like behavior or appearance), given that both lay theories and philosophical definitions of personhood center on mind as the defining feature of humanness. In particular, this definition of anthropomorphism involves attributing emotions and analytic abilities that people perceive to be uniquely human, such as hope, guilt, prospection, and self-reflection (e.g., Demoulin et al., 2004; Haslam, Bain, Douge, Lee, & Bastian, 2005; Haslam et al., 2008). This definition also includes attributing limitations of the human mind, such as ignorance, to non-humans. Thus, anthropomorphic representations of God feature human characteristics such as honesty, human emotions such as happiness, or human limitations such as ignorance. In contrast, non-anthropomorphic representations of God are those in which God's mind is represented as distinct from human minds. Within the domain of knowledge, for example, representing God non-anthropomorphically would involve attributing knowledge to God that would not be attributed to humans.

In a study highlighting the boundary conditions of adults' distinction between God's mind and human minds, Shtulman (2008) asked undergraduates at an American university as well as adults from the community whether a set of adjectives typically used to describe humans (e.g., honest/dishonest, happy/sad) could be used to describe three types of beings: (a) religious beings (angels, messiahs, Satan, and God); (b) fictional beings (fairies, ghosts, vampires, and zombies); and (c) human beings. Adults attributed fewer human-like adjectives to religious beings than to fictional beings (and fewer human-like adjectives to fictional beings than to actual humans), showing that, at an explicit level, adults rejected the idea that God has certain human-like properties. Yet participants still attributed, on average, more than three (out of nine) human-like traits to God. Although the traits were not necessarily uniquely human, Shtulman (2008) argued that these findings reflected some degree of anthropomorphism as the traits are typically used to describe humans. If anthropomorphism were entirely absent, participants would attribute zero human-like traits to God. Furthermore, the majority of human-like traits attributed to God were psychological (e.g., honest/dishonest) rather than biological (e.g., alive/dead) or physical (e.g., hot/cold). This pattern of results shows that adults perceive that God, like humans, has a mind that engages in human-like psychological processes.

Although adults report that God shares some human-like psychological traits, they also report that God's mind is different from human minds in certain respects. In a recent study, a primarily Christian sample of adults completing an online survey responded, on average, that God could have agency (the ability to plan and intend) but not experience (the ability to feel certain emotions; Gray et al., 2007). In this framework, God could form goals, but God could not be happy when those goals were fulfilled, a result that may be partially explained by the specific emotions examined. For example, adults were asked about the extent to which God could feel emotions associated with bodily states

(e.g., hunger, thirst) and reflection on one's own wrongdoing (e.g., embarrassment). Participants may have responded that God lacks the capacity for experiencing these specific emotions because Jewish and Christian Scriptures refer to God as flawless (e.g., "As for God, His way is perfect" [Psalm 18:30]) and without physical needs (e.g., "God is a Spirit" [John 4:24]). Additionally, the Judeo-Christian view of God posits that God is bodiless, which may increase the agency and reduce the experience attributed to God (Gray, Knobe, Sheskin, Bloom, & Barrett, 2011). Indeed, other work has shown that adults often attribute other emotional experiences, such as love, anger, and wrath, to God (e.g., Gorsuch, 1968; Noffke & McFadden, 2001; Spilka et al., 1964; Zahl & Gibson, 2012).

In summary, although adults report that God shares some human-like psychological traits (e.g., the ability to feel love), they also report that God's mind is different from human minds in other respects. For example, adults commonly express the idea that God has more knowledge than do humans and that, unlike humans, God is unable to experience emotions associated with reflection on one's own wrong actions, such as embarrassment. However, adults' explicit reports may not always match their implicit representations, and it is to this evidence we turn next.

### **3. Adults' implicit representations of God's mind**

People perceive God, like humans, to have a mind (Waytz, Epley, et al., 2010; Waytz, Gray, et al., 2010), and adults' theory of God's ostensibly extraordinary mind is not entirely distinct from their theory of ordinary human minds. Previous work (e.g., Baumard & Boyer, 2013; Pyysiäinen, 2004) has pointed out that adults' explicit representations of God's mind often differ from their implicit representations and that this dissociation accounts for several signatures of religious cognition (e.g., certain religious beliefs may be resistant to argument because they are based on intuition rather than reflection). We focus specifically on representations of God's mind and add a developmental perspective to argue that adults' implicit representations of God's mind as human-like emerge early in development. The idea that implicit religious representations may differ from explicit reports connects religious cognition to numerous other domains where people's self-reported beliefs and attitudes do not match their implicit representations (for examples concerning intergroup attitudes, see Chaiken & Trope, 1999; Devine, 1989; Nosek, 2007; for examples concerning perceptions of the physical world, see Baillargeon, Spelke, & Wasserman, 1985; Kellman & Spelke, 1983; for examples concerning theory of mind, see Onishi & Baillargeon, 2005; Senju, Southgate, Snape, Leonard, & Csibra, 2011). Furthermore, the hypothesis that early childhood intuitions persist implicitly in adulthood has also been supported by work on scientific knowledge, which has shown that many of adults' implicit representations of the physical world are similar to children's explicit representations (e.g., Goldberg & Thompson-Schill, 2009; Kelemen, Rottman, & Seston, 2013; Potvin, Turmel, & Masson, 2014; Shtulman & Valcarcel, 2012; Zaitchik & Solomon, 2008).

One measure of implicit religious cognition involves testing participants' memory, as in a study that asked university students from a variety of religious backgrounds to repeat stories containing theistic content (Barrett & Keil, 1996). By measuring participants' errors in recall, rather than participants' explicitly reported concepts of God's mind, this study leveraged an implicit measure of religious cognition. Because it is likely that participants were trying to remember the story accurately, memory errors reflect implicit, unconscious processing rather than the deliberative reasoning that is a hallmark of explicit representations. Participants heard stories such as the one below:

It was a clear, sunny day. Two birds were singing back and forth to each other. They were perched in a large oak tree next to an airport. God was listening to the birds. One would sing and then the other would sing. One bird had blue, white, and silver feathers. The other bird had dull gray feathers. While God was listening to the birds, a large jet landed. It was extremely loud: the birds couldn't even hear each other. The air was full of fumes. God listened to the jet until it turned off its engines. God finished listening to the birds.

The story is consistent with a theologically correct view of God's perceptual abilities. For example, the story mentions that the two birds could not hear each other over the noise of the jet but does not say that the jet interfered with God's ability to hear. Nevertheless, when paraphrasing the story, many participants exhibited anthropomorphism by attributing human limitations to God. For instance, one participant stated, "The noise was so loud God couldn't hear the birds." Such paraphrasing occurred although most participants explicitly endorsed a theologically correct view of God's mind, claiming, for example, that God could know everyone's thoughts, perform multiple mental activities simultaneously, and hear things from far away. These findings suggest that participants' explicit descriptions of God's mind differ from their implicit representations. Participants may *say* that God is everywhere, knows everything, and defies physical constraints, but on some level they also represent God's mind as far more human-like.

One criticism of Barrett and Keil's (1996) research is that the stories themselves may have primed an anthropomorphic representation of God's mind. For instance, in the example above, God is portrayed as having conscious awareness and the ability to listen. Because these traits were included in the original stories, the experimental stimuli may have primed participants to adopt an anthropomorphic representation of God's mind, even if this representation did not match participants' everyday understanding.

More recent work has used methods that overcome the limitations of Barrett and Keil's (1996) work to provide additional evidence for the hypothesis that adults implicitly anthropomorphize God's mind. One promising technique to investigate anthropomorphism without priming human-like representations of God's mind involves using neuroimaging to compare patterns of neural activation in response to thoughts of God versus thoughts of other beings. Neuroimaging can be considered an implicit measure insofar as people are largely unaware of, and cannot typically control, variations in levels of their own brain activity.

In one study (Schjoedt, Stodkilde-Jorgensen, Geertz, & Roepstorff, 2009), researchers scanned Danish Christian adults during four tasks of interest—reciting the Lord’s prayer, praying to God using their own words rather than well-known prayers, reciting a familiar nursery rhyme, and telling Santa Claus their wishes—and examined activation in brain regions associated with reasoning about human minds and mental states (e.g., medial prefrontal cortex, temporo-parietal junction, precuneus). If God is represented as an imaginary being or as an impersonal force, praying to God should not *uniquely* activate these brain regions. For example, if these regions are simply activated any time people direct speech toward an agent, neural activation should be similar across the prayer and Santa Claus conditions. However, this research found more activation in the personal prayer condition (when participants prayed in their own words) than in the other three conditions. This result highlights the similarities, on a neural level, between communicating with people and communicating with God. Therefore, this finding provides further evidence in favor of a dissociation between adults’ implicit representation of God’s mind as similar to humans and adults’ explicit representations of God’s mind as quite distinct from humans. If adults’ implicit and explicit representations matched, communicating with God would not be expected to activate regions associated with reasoning about human minds.

Rather than perceiving God as just another human being, adults may perceive God’s mind as especially similar to their own, revealing a representation of God that is not only anthropomorphic but egocentric as well. One line of work (Epley, Converse, Delbosc, Monteleone, & Cacioppo, 2009) investigated ideological beliefs, or socially shared beliefs about how the world is and how it should be (e.g., Jost, Federico, & Napier, 2009). Ideologies include beliefs about topics such as abortion and same-sex marriage. The participants in Epley et al.’s (2009) research, who were predominantly religious believers, exhibited more similar patterns of activation across numerous brain regions (medial prefrontal cortex, bilateral temporo-parietal junction, right medial temporal gyrus, left insula regions) when thinking about their own beliefs and God’s beliefs than when thinking about another person’s beliefs. Like the work by Schjoedt et al. (2009), this research used fMRI to show that at on an implicit (uncontrolled, non-deliberative) level, participants represented God’s mind as human-like. The work by Epley et al. (2009) additionally showed that participants viewed God’s mind as especially similar to their minds rather than to the mind of another person.

Epley et al. (2009) also found behavioral evidence of anthropomorphism; participants’ own ideological beliefs correlated more strongly with the ideological beliefs they attributed to God than with the ideological beliefs they attributed to other people. Another group of researchers (Ross, Lelkes, & Russell, 2012) obtained a similar result: Christian adults perceived Jesus (who is portrayed as God or God’s son in Christian traditions) to hold the same ideological beliefs they did, but more strongly. That is, liberal Christians reported that a contemporary Jesus would hold an even more liberal ideology, while conservative Christians reported that a contemporary Jesus would hold an even more conservative ideology. These responses can be considered implicit because participants were not asked to directly compare human minds with God’s mind. Had adults been asked directly

whether they are more similar to God or to another human being, they may have reported greater similarity with other humans. By contrast, the measures employed by Epley et al. (2009) and Ross et al. (2012) tap implicit cognition by disguising the comparisons of interest (e.g., by asking participants to respond to a number of items about their own beliefs and then a number of items about Jesus's or God's beliefs rather than interspersing the two types of questions).

In summary, adults implicitly anthropomorphize God's mind despite displaying an explicit tendency to distinguish God's mind from human minds. For example, on an explicit level, adults may attribute complete knowledge and superhuman perceptual abilities to God. However, on an implicit level, adults show similar patterns of brain activity when thinking about God and another person—especially themselves. The differences between adults' explicit and implicit religious cognition suggest that perceiving God's mind as human-like may be implicit and that distinguishing God's mind from human minds may require deliberate reasoning. In the following section, we draw on the developmental literature to investigate the origins of adults' religious cognition and to highlight converging evidence that anthropomorphism may be intuitive.

#### **4. Children's representations of God's mind**

What role do social learning and cognitive development play in the emergence of adult-like concepts of supernatural minds? The answer to this question comes from cognitive and developmental psychology, where researchers have turned their attention to the developmental origins of the patterns observed in social psychology among adult participants. In conjunction, data from cognitive, developmental, and social psychology provide converging insights on people's representations of God's mind. Below, we review evidence that anthropomorphizing God's mind comes intuitively to young children and that a full explicit understanding of omniscience emerges progressively over the course of development. Thus, the developmental and adult literatures provide converging evidence for the hypothesis that people need to learn to distinguish God's mind from human minds.

In Piaget's (1929) view, children younger than approximately 7 years old treat God's mind and human minds similarly, either by imbuing God and adults with omniscience or by attributing mental fallibility to both. In this framework, the same underlying conceptual structure is responsible for children's representations of both God's mind and human minds, and the cognitive development necessary to distinguish human minds from God's mind is not specific to the domain of religious cognition.

Following Piaget, Barrett and Richert (2003; Richert & Barrett, 2005) have proposed a "preparedness" account. Under this account, children's representations of God's extraordinary mind are supported by the same cognitive structures that allow children to reason about intentional agents in general. Unlike Piaget's view, however, the preparedness account argues that children are prepared to represent minds as extraordinary (e.g., as having greater knowledge than human minds) and that children's default assumption is

that all intentional agents have supernatural abilities. In this framework, the role of social learning is not to teach children that God is omniscient but rather to teach them that humans' mental capacities are limited. Below, we review evidence that has been taken to support the preparedness account and then discuss more recent findings that challenge this account. Ultimately, we argue that, under some circumstances, very young children represent God's mind—like human minds—as fallible and that cultural input (e.g., religious education) is needed to teach children that God is omniscient.

Piaget's account and Barrett and colleagues' account both predict that by the time children have reached the early elementary school years, they will be able to distinguish God's mind from human minds. Indeed, empirical evidence does show that, by this age, children attribute fewer false beliefs to God than to humans on explicit tasks. For example, in one study (Barrett et al., 2001), children were presented with a false contents theory of mind (ToM) task. An experimenter showed children a cracker box and asked what they thought was inside the box. After providing their response, children were shown that the box actually contained rocks. Given this information, 5-year-olds (as well as younger children, in this study) responded that a human was more likely than God to think that the box contained crackers. Participants in this study also attributed more knowledge to God than to ordinary animals and to trees. Similarly, by the age of 4 years, American Christian children attributed equal (low) amounts of knowledge concerning an occluded display to their mother and to an ordinary dog, but higher amounts of knowledge to God (Barrett et al., 2003).

Numerous other studies conducted with American, Greek, Spanish, and Mayan children have found that, by the age of 5 years, children attribute greater and more accurate knowledge to God than to humans (e.g., Barrett et al., 2001; Gimenez-Dasi, Guerrero, & Harris, 2005; Knight, 2008; Knight et al., 2004; Lane, Wellman, & Evans, 2010, 2012; Makris & Pnevmatikos, 2007; Richert & Barrett, 2005; Wigger et al., 2013). This greater attribution of knowledge generalizes to other beings. For example, American Christian preschoolers attributed greater knowledge to God as well as to a person described as having X-ray vision (Heroman), to a person described as knowing "everything," and to animals described as having special perceptual access, compared to their mother and an ordinary girl (Lane et al., 2010, 2012; Richert & Barrett, 2005).

To determine whether 5-year-olds' performance reflects a very early "preparedness" to understand supernatural minds, data from younger children are needed. The preparedness hypothesis found initial support in findings that children as young as 3 years old fail to attribute false beliefs to God (Barrett et al., 2001; Knight et al., 2004), a result consistent with much research demonstrating that 3-year-olds fail to attribute false beliefs to humans (Wellman, Cross, & Watson, 2001). Proponents of the preparedness perspective argue that such findings indicate that an understanding of God's infallibility is present in 3-year-olds (and perhaps even younger children) and that to later understand God's extraordinary powers requires only that children and adults hold on to their early concepts. However, more recent work has typically not found developmental continuity. For example, in studies with children from the United States and Germany, 4-year-olds often

attributed false beliefs and ignorance both to humans *and* to God (Kiessling & Perner, 2014; Lane et al., 2010, 2012; see also Gimenez-Dasi et al., 2005 for data with Spanish children). Only later in development did children distinguish between humans' fallibility and God's less fallible knowledge.

Studies with Greek and German children also indicate that Barrett and colleagues' earlier findings may be specific to contexts in which children themselves know the correct answer. When children possessed the knowledge needed to correctly answer the experimenter's question (as in Barrett et al.'s tasks), they were much more likely to attribute that knowledge to God and to humans; when children were ignorant of key information, 3- and 4-year-olds often denied knowledge of such information to God as well as to humans (Kiessling & Perner, 2014; Makris & Pnevmatikos, 2007). Further evidence against the idea that 3-year-olds' concepts are theologically correct and represent cognitive preparedness is found in children's explicit reasoning. When asked to explain why God would possess knowledge on ToM tasks, 3-year-olds often mentioned their own knowledge, whereas 5-year-olds more often mentioned God's mental capacities—that God is very smart or all-knowing (Lane et al., 2010, 2012). These findings appear to reflect egocentrism—whereby young children tend to attribute the contents of their own minds to others—as well as anthropomorphism.

Thus, even 3- and 4-year-olds do not appear to attribute extraordinary knowledge to God. Moreover, preschoolers' understanding of omniscience (not just knowing the contents of boxes, but knowing everything that can be known) is *especially* limited. In one line of work illustrating this phenomenon (Lane, Wellman, et al., 2014), preschoolers heard about Ms. Smart, a character who knew “everything about everything.” Despite learning during the experimental session that Ms. Smart was omniscient, preschoolers often denied her many types of knowledge, including historical knowledge (e.g., what the first dog looked like), knowledge of others' personal events (e.g., the child's birth date), and knowledge of others' actions (e.g., whether a friend did something naughty at school). Though older children (7-year-olds) attributed considerably broader knowledge to Ms. Smart—claiming that she knew information across all of these domains—it was not until adulthood that participants attributed an extraordinary depth of knowledge to Ms. Smart by responding that she knew even more than experts about their domains of expertise. The difference between children's and adults' responses was greater on questions concerning Ms. Smart's depth of knowledge as compared with specific pieces of knowledge. This result suggests that understanding the depth of omniscient knowledge is more cognitively challenging than understanding that supernatural beings (from God to Ms. Smart) may have certain knowledge that ordinary humans lack.

In summary, young children's explicit representations of God's mind resemble adults' implicit representations. In both cases, God's mind is often imbued with human properties, such as ignorance. Though the argument that children anthropomorphize God's mind has been made previously, recent evidence has highlighted the process by which such anthropomorphism occurs: Young children explicitly attribute to God (and humans) knowledge that they themselves possess but often attribute ignorance to God (and humans) when asked questions to which they do not know the correct answer. Integrating

insights from work with children and adults allows for a more precise understanding of the developmental trajectory of anthropomorphism and leads to the novel conclusion that young children's explicit understanding of God's mind is consistent with adults' implicit representations.

## **5. What do developmental data reveal about adults?**

Developmental data can inform scientific understanding of the process by which adult-like beliefs emerge. Integrating approaches from cognitive, developmental, and social psychology and from neuroscience provides a clearer understanding of the emergence, development, and maintenance of anthropomorphism. In conjunction, findings from these separate research programs provide converging evidence for the conclusion that distinguishing God's mind from human minds requires both development and deliberate reasoning.

The findings reviewed thus far suggest that children initially generalize qualities from human minds to God's mind and only later gain an appreciation of potential differences between the two. One example of a plausible developmental trajectory is as follows. Early in development, children understand that, in some circumstances, others' minds may contain imperfect representations of the world. For example, preschoolers reject inaccurate information and correct inaccurate informants (e.g., Chan & Tardif, 2013; Clement, Koenig, & Harris, 2004; Koenig & Echols, 2003; Lane, Harris, Gelman, & Wellman, 2014; Pea, 1982), demonstrating that preschoolers do not perceive adults as all-knowing. Preschoolers also understand that their own minds are limited (they do not know everything) and fallible (some of their factual beliefs are mistaken, e.g., Gopnik, 2012; Gopnik & Astington, 1988; Gopnik & Slaughter, 1991; Jaswal, 2010; Schulz, 2012; Schulz, Goodman, Tenenbaum, & Jenkins, 2008). Because every human mind that children have ever encountered (including their own) is fallible, children may initially assume that all minds (including God's mind) are similarly limited.

As they increasingly understand that different minds may possess different knowledge and beliefs, children may also come to see God's mind as different from all human minds. If this hypothesis is correct, a developing ToM should support children's (and adults') ability to represent God's mind. One piece of evidence supporting this claim is that the distinction between God's mind and human minds seems to emerge contemporaneously with children's ability to explicitly report that other people lack knowledge that they themselves possess (see Wellman et al., 2001, for a review). This ability may emerge later than preschoolers' tendency to correct inaccurate informants in part because, in the latter case, preschoolers are presented with indisputable evidence that an adult has a false belief. In traditional tasks measuring false-belief understanding, participants must infer the presence of a false belief, which may be more challenging than simply responding to an incorrect statement. Additional evidence suggesting that the emergence of ToM is associated with reasoning about God's mind comes from work in social psychology showing that adults with autism (who, like preschoolers, have difficulty with certain ToM

tasks) tend to believe *less* in a personal God than adults who do not have autism (Norenzayan, Gervais, & Trzesniewski, 2012). Thus, adults with ToM deficits may experience difficulty representing God's mind, making the idea of God less compelling and less believable.

Such findings provide evidence against the preparedness hypothesis—the ToM deficits typical of 3-year-olds and adults on the autism spectrum do not reflect an understanding of God-like omniscience. Rather, typical ToM development likely supports an *increased* differentiation between God's mind and human minds and a greater understanding of God's omniscience. ToM development might also foster stronger belief in God. Additionally, these findings suggest that representations of God's mind may rely on the same cognitive structures that people use to reason about human minds (Barrett, 2004; Gervais, 2013; Guthrie, 1993; Lawson & McCauley, 1990). ToM abilities allow children and adults to understand both human minds and God's minds, yet these same abilities also allow individuals to distinguish human minds from God's mind.

Prior research has found suggestive relations between children's understanding of omniscience and other cognitive competencies that develop during early and middle childhood—namely, an ability to imagine the improbable (Shtulman & Carey, 2007) and an understanding of infinity (Falk, 1994). For example, children who were better at imagining novel, improbable phenomena also attributed broader knowledge to an omniscient being (Lane, Harris, et al., 2014). Additionally, because omniscience can be understood as knowing *everything* that can be known, an ability to cognitively represent limitlessness more generally may contribute to understanding omniscience. Consistent with this hypothesis, children's ability to understand infinity in the domain of number is related to their attributions of a deeper body of knowledge to an omniscient being (Lane, Harris, et al., 2014). These findings identify some conceptual difficulties (e.g., difficulties with imagining the improbable and with understanding infinity) that may limit children's explicit understanding of complete omniscience but that are often overcome over the course of development.

In summary, anthropomorphism—seeing God's mind as human-like and therefore limited—does not require adult-like cognitive abilities or extensive experience (e.g., exposure to religious teachings) to emerge. Instead, it is a richer understanding of God's omniscience that requires social experience and cognitive development. Nevertheless, this later developing understanding of God's mind does not entirely replace the earlier emerging anthropomorphic representations of God's mind. Rather, in adulthood, such representations of God's mind as human-like persist and are elicited especially by implicit rather than explicit measures.

## 6. Why adults anthropomorphize God

Why do adults anthropomorphize God? In this section, we elucidate several accounts for anthropomorphism. These accounts include the following: (a) anthropomorphism is a specific form of a more general *heuristic*; (b) anthropomorphism reflects *early learning*

from others; and (c) anthropomorphism is a *byproduct* of other evolutionary processes. We perceive these accounts as complementary—in principle, all could contribute to anthropomorphism in adulthood. Nevertheless, these accounts have received varying levels of empirical support, and we highlight relevant experimental findings and directions for future research. Furthermore, these accounts can function at both proximate and ultimate levels. For example, in a given moment, adults may anthropomorphize God because anthropomorphism is a cognitively straightforward heuristic; at the same time, anthropomorphism may serve long-standing adaptive purposes (e.g., agent detection; see the byproduct account below). Each account stems primarily from one research area—the heuristic account from cognitive psychology, the early-learning account from developmental psychology, and the byproduct account from evolutionary psychology. We bring together insights from each area to provide a more complete picture of why adults anthropomorphize.

One promising explanation for anthropomorphism among adults is that anthropomorphism is a heuristic that minimizes cognitive load. Human life is full of encounters with novel beings (people that one is meeting for the first time, animals that one has not previously encountered, fictional characters in stories), and deciphering each being's full set of characteristics would require a great deal of cognitive effort and resources. Using the minds with which humans are most familiar (i.e., human minds) as a starting point is an effective shortcut, and the "human minds as a starting point" theme runs through many God concepts. God is perceived to have more or less of certain abilities, but God is not perceived to have an entirely unique sort of mind with capacities that are unheard of in human minds. For example, it appears non-sensical to debate whether God's mind can fly, because that is not the kind of thing that a (human) mind does. The similarity between concepts of God's extraordinary mind and concepts of ordinary human minds suggests that, to understand God's mind, people may represent human minds and then adjust up (e.g., God knows more than humans) or down (e.g., God is less capable of feeling hungry than humans). The literature on anchoring and adjustment in reasoning shows that people often make estimates of unknown quantities by "anchoring" on salient information and then adjust insufficiently, leading to final estimates that remain close to the original anchor (e.g., Ariely, Loewenstein, & Prelec, 2006; Epley & Gilovich, 2004, 2005; Tamir & Mitchell, 2013; Tversky & Kahneman, 1974). If people anchor on human minds in general or on their own minds in particular (e.g., Epley et al., 2009; Ross et al., 2012) and then adjust to represent God's mind, their final representation of God's mind may still largely resemble that of human minds.

If this heuristic account is correct, children and adults may anthropomorphize any object or agent if their attempts to understand that object or agent begin by (consciously or unconsciously) representing a human mind. Few experiments have investigated the conditions under which people anchor on human minds, though one promising line of work suggests that people may be especially likely to anchor on human minds when trying to understand aspects of their environment over which they have not yet gained mastery (Waytz, Morewedge, et al., 2010). Future work could investigate other situations that promote or inhibit anchoring on human minds. Additionally, future research could

examine the influence of manipulating the initial anchor. Under the heuristic account, people ought to anthropomorphize more when they are led to anchor on human minds and less when they are led to anchor elsewhere.

The heuristic account offers a compelling explanation for why anthropomorphism persists into adulthood. Other accounts are needed to explain why adults anchor on human minds in particular.

An early-learning account of anthropomorphism suggests that perceiving God's mind as similar to human minds, as opposed to other phenomena, may come intuitively in part because individuals learn about the two kinds of minds in similar ways—via social interaction. According to this account, people have learned to anthropomorphize God's mind during childhood and, as adults, maintain the same strategy to some extent. Children's everyday social interactions with other people contribute to their developing understanding of other people's minds (see Carpendale & Lewis, 2004, for a review). Because all of the minds that children interact with are fallible, it makes sense that children should first come to understand that minds are limited, not omniscient. It is *this* understanding that will help children navigate their social world.

Whereas children can learn about other people through these sorts of social interactions, they lack the ability to directly interact with God this way. Thus, Harris and colleagues (Harris & Corriveau, in press; Harris & Koenig, 2006; Lane & Harris, 2014) have argued that children learn about God's mind through others' testimony about God, featuring the messages that are prominent in their cultures and that are provided to them directly by parents, friends, and religious leaders. Children are able to use others' testimony to infer the reality status of a number of entities, including God (Canfield & Ganea, 2014; Woolley, Ma, & Lopez-Mobilia, 2011). Children may infer that the beings about whom they receive testimony are similar to one another. For example, a parent may say that "God knows your favorite color" and also that "Grandma knows your favorite color." These statements do not clarify that the two agents obtained their knowledge in different ways; thus, children may conclude that God's knowledge is similar to humans' knowledge. Similarly, children may not understand metaphors underlying adults' testimony and may conclude, for example, that God can "see" and "hear" them the way other people can.

Because adults' explicit representations of God's mind distinguish it from human minds (e.g., Gray et al., 2007; Luhrmann, 2012), adults may also seek to directly teach this distinction to children. For example, religious educators may say that "God knows everything" and may, in fact, contrast this perfect knowledge with humans' more limited knowledge. However, children may notice more subtle testimony that paints a more anthropomorphic picture. For example, adults may claim that God does not have a physical body while at the same time referring to God as "He." Children may notice the use of this gendered pronoun and therefore represent God as gendered, much like a person.

The early-learning account explains the process of social transmission by which children learn about God's mind. It takes as its starting point the beginning of a human life—once children are born, how do they come to reason about God's mind? Other accounts provide hypotheses concerning the historical origins of this representation. To teach

children about God's mind, parents would need to have a representation to transmit, which they would have learned from their own parents, and so on. In this chain, how did anthropomorphic representations of God's mind originate?

Drawing on evolutionary theory, some scholars have argued that anthropomorphism may initially arise as a byproduct of other, evolutionarily adaptive processes. For example, drawing on the work of Guthrie (1993), Barrett (2004) argued that concepts of intentional supernatural beings are a byproduct of what he calls a hypersensitive agency detection device. The argument goes like this. Imagine that you are walking in the woods at nighttime. Suddenly, you hear a twig snap. It could have snapped due to an agent (e.g., a bear stepped on it) or a non-agent (e.g., the wind brushed against it). If you assume that a bear snapped the twig, you might run and save your life. If you are mistaken, the cost is relatively minimal. However, if you mistakenly assume that the wind snapped the twig when in fact a bear is coming after you, you are likely to become bear food. Barrett (2004) argued that perceiving agents is evolutionarily adaptive for this reason—mistakenly perceiving an agent is less costly than failing to perceive an agent. Thus, anthropomorphic concepts of God's mind (as well as other anthropomorphic concepts) may have evolved as a byproduct of humans' generalized tendency to perceive agents (see also Atran, 2002; Boyer, 1994, 2001) and draw on the same cognitive processes as perceptions of human minds (Barrett, 2004; Gervais, 2013; Guthrie, 1993; Lawson & McCauley, 1990). In this framework, humans may represent God as agentic because it is evolutionarily adaptive to perceive agents even when no agents are present. Currently, empirical evidence for the byproduct account is limited; however, future studies could investigate the extent to which this account explains the earliest origins of anthropomorphism.

Of the three accounts presented here, the heuristic account and the social learning account are supported by the greatest amount of empirical evidence. The heuristic account offers a strong explanation of the usefulness of anthropomorphism in adulthood, and the social learning account provides a compelling explanation of anthropomorphism's childhood origins. Though the byproduct account has limited empirical support at this time, future studies could provide additional evidence in its favor.

## **7. Future research directions**

Thus far, we have highlighted several distinct lines of research that lead to the conclusion that anthropomorphism is intuitive. Children perceive God's mind as predominantly human-like, and this perception is maintained at an implicit level in adulthood. These data suggest that distinguishing God's mind from human minds requires both cognitive development and deliberate reasoning.

The development of religious cognition is a burgeoning literature, and many interesting questions remain ripe for future investigation. One area for future research is the extent to which individual differences account for anthropomorphism. Previous work has shown that the use of heuristics depends on individual differences in factors such as dopamine

signaling (Cocker, Dinelle, Kornelson, Sossi, & Winstanley, 2012), upbringing (Reifen et al., 2014), and the tendency to engage in cognitive reflection (Toplak, West, & Stanovich, 2011). Such individual differences could influence the extent to which heuristic use accounts for anthropomorphism in individual adults. For example, because heuristics are intuitive, adults who prefer to engage in intuitive, pre-potent thinking may be more likely to rely on this heuristic than adults who prefer to engage in cognitive reflection.

Individual differences in children's exposure to religion and individual differences in children's cognitive capacities predict their ability to conceptualize extraordinary minds as less anthropomorphic (Lane & Harris, 2014; Lane, Harris, et al., 2014). Relatedly, individual differences among parents could contribute to differences in their children's anthropomorphism. For example, children of parents who avoid using gendered pronouns for God and avoid referring to God's perceptual abilities may be less likely to anthropomorphize God's mind in adulthood, compared to individuals who receive much early testimony about God's anthropomorphic properties. Individual differences could also contribute to individuals' propensity to perceive agents. Some work has shown that greater religiosity is associated with a greater tendency to perceive agents generally (van Elk, 2013; Petrican & Burris, 2012). Therefore, the byproduct account may apply especially strongly to individuals who are already religious.

In addition to investigating the types of people who anthropomorphize, future research can also examine domains where anthropomorphism is especially likely to occur. One promising possibility is that anthropomorphism is more likely to occur in non-moral domains. The heuristic account argues that if people anchor on human minds, they should attribute human characteristics (such as caring about morality) to God. Though empirical support for the presence of a hypersensitive agency detection device is limited, the byproduct account—as well as related research in evolutionary and social psychology—also argues that God is perceived as a specific kind of agent: an anthropomorphized being who, like humans, cares about morality (Barrett, 2004; Boyer, 2001; Norenzayan & Shariff, 2008).

We consider representations of God as an agent who *cares about* morality to be anthropomorphic because people often perceive moral concerns to be distinctly human (Bastian, Laham, Wilson, Haslam, & Koval, 2011; Kagan, 2004; Loughnan et al., 2010). At the same time, if people attribute complete *knowledge* of morally relevant actions to God, they would be demonstrating non-anthropomorphic representations because people do not have access to all morally relevant information.

Empirical evidence suggests that adults consider God the “ultimate moral agent” (Gray & Wegner, 2010, p. 7), representing God's mind as occupied with moral concerns (like humans) and, at the same time, as having superhuman knowledge of morally relevant information. They judge that God, like humans, cares about morality. In one line of work (Purzycki, in press), American Christian adults and Tyvan Buddhist adults attributed more knowledge of morally relevant rather than non-moral behaviors to God. Furthermore, though American adults attributed some knowledge of non-moral behaviors to God, they also reported that God cared more about morally relevant information. This research may shed light on the paradox introduced at the start of this paper. Why was Schmitt deemed

crazy for arguing that God commanded him to commit a crime despite the fact that in many other circumstances, adults readily accept that God communicates with humans? The judge in Schmitt's case may have perceived Schmitt's claim that God commanded him to commit a crime as crazy because she did not believe that God would command an act that she herself considered immoral.

Separate lines of work show that adults also represent God non-anthropomorphically by attributing a special knowledge of morally relevant information to God. In one study (Purzycki et al., 2012), Christians who endorsed God's omniscience responded to questions concerning God's knowledge of morally relevant events (e.g., Does God know that Ann gives to the homeless? Does God know that John cheats on his taxes?) more quickly than questions concerning non-moral knowledge (e.g., Does God know that Richard's cat is hungry?). Furthermore, participants responded to questions concerning morally blameworthy behavior more quickly than questions concerning morally praiseworthy behavior. These findings indicate that adults are particularly likely to distinguish God's mind from a human mind in morally relevant contexts, where adults find it especially intuitive to represent God as having special knowledge.

Notably, though developmental and implicit approaches reveal that people often attribute less than perfect knowledge to God (Barrett & Keil, 1996; Lane et al., 2010, 2012), a different result has emerged in the domain of morality. On both an explicit and an implicit level, adults represent God as knowing morally relevant information (Purzycki, *in press*; Purzycki et al., 2012). In this domain, adults' implicit and explicit representations converge, leading to the societal benefits that result from people's perception that God knows all morally relevant behaviors. In other words, adults are more capable of representing God as an omniscient agent—both explicitly and implicitly—when reasoning about moral knowledge rather than other knowledge domains.

Why do adults anthropomorphize less in moral domains than in non-moral contexts? Some scholars (Alcorta & Sosis, 2005, 2006; Johnson & Bering, 2006; Johnson & Krüger, 2004) argue that the evolution of religion promoted cooperation among individuals who are not genetically related. Anthropomorphism—particularly the perception that God, like humans, cares about morality—may play an important role in fostering such cooperation. Individuals who believe that God knows about their morally relevant actions and can act on this knowledge may be more likely to engage in behaviors they believe God may favor—pro-social actions such as cooperating with others and refraining from cheating (Norenzayan, 2013; Norenzayan & Shariff, 2008; Shariff & Norenzayan, 2007, 2011; Slingerland, Henrich, & Norenzayan, 2013; for cross-cultural evidence concerning the role of national levels of religiosity, see Stavrova & Siegers, 2014). This hypothesis has been supported by a study conducted with American participants in Christian youth groups (Morewedge & Clear, 2008). This research showed that the more these devout Christians anthropomorphized God, the more morally wrong they perceived violations of the Ten Commandments to be. Thus, it may also be the case that the more Christians anthropomorphize God's mind, the less likely they are to violate the Ten Commandments themselves.

Interdisciplinary work is necessary to address the questions laid out here—how individual differences influence anthropomorphism and how anthropomorphism varies across domains. Work investigating evolutionary origins, developmental origins, and the adult end state of anthropomorphism forms an invaluable component of scientific understanding of how people represent God’s mind. Such interdisciplinary endeavors will shed more light on religious cognition than is possible from any single disciplinary approach and will greatly enhance scholars’ understanding of human cognition.

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## References

- Alcorta, C. S., & Sosis, R. (2005). Ritual, emotion, and sacred symbols: The evolution of religion as an adaptive complex. *Human Nature, 16*, 323–359. doi:10.1007/s12110-005-1014-3.
- Alcorta, C. S., & Sosis, R. (2006). Why ritual works: A rejection of the by-product hypothesis. *Behavioral and Brain Sciences, 29*, 613–614. doi:10.1017/S0140525X06009344.
- Ariely, D., Loewenstein, G., & Prelec, D. (2006). Tom Sawyer and the construction of value. *Journal of Economic Behavior and Organization, 60*, 1–10. doi:10.1016/j.jebo.2004.10.003.
- Armstrong, K. (1993). *A history of God: The 4,000-year quest of Judaism, Christianity, and Islam*. New York: Random House.
- Atkinson, Q. D., & Whitehouse, H. (2011). The cultural morphospace of ritual form: Examining modes of religiosity cross-culturally. *Evolution and Human Behavior, 32*, 50–62. doi:http://dx.doi.org.proxy.bc.edu/10.1016/j.evolhumbehav.2010.09.002.
- Atran, S. (2002). *In gods we trust: The evolutionary landscape of religion*. New York: Oxford University Press.
- Baillargeon, R., Spelke, E. S., & Wasserman, S. (1985). Object permanence in five-month-old infants. *Cognition, 20*, 191–208. doi:10.1016/0010-0277(85)90008-3.
- Balmer, R. (1989). *Mine eyes have seen the glory: A journey into the evangelical subculture in America*. New York: Oxford University Press.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*, 462–479. doi:10.1037/0003-066X.54.7.462.
- Barrett, J. L. (1999). Theological correctness: Cognitive constraint and the study of religion. *Method and Theory in the Study of Religion, 11*, 325–339.
- Barrett, J. L. (2004). *Why would anyone believe in God?* Walnut Creek, CA: AltaMira Press.
- Barrett, J. L., & Keil, F. C. (1996). Conceptualizing a non-natural entity: Anthropomorphism in God concepts. *Cognitive Psychology, 31*, 219–247. doi:10.1006/cogp.1996.0017.

- Barrett, J. L., Newman, R. M., & Richert, R. A. (2003). When seeing is not believing: Children's understanding of humans' and non-humans' use of background knowledge in interpreting visual displays. *Journal of Cognition and Culture*, 3, 91–108. doi:10.1163/156853703321598590.
- Barrett, J. L., & Richert, R. A. (2003). Anthropomorphism or preparedness? Exploring children's God concepts. *Review of Religious Research*, 44, 300–312.
- Barrett, J. L., Richert, R. A., & Driesenga, A. (2001). God's beliefs versus mother's: The development of nonhuman agent concepts. *Child Development*, 72, 50–65. doi:10.1111/1467-8624.00265.
- Bastian, B., Laham, S. M., Wilson, S., Haslam, N., & Koval, P. (2011). Blaming, praising, and protecting our humanity: The implications of everyday dehumanization for judgments of moral status. *British Journal of Social Psychology*, 50, 469–483. doi: http://dx.doi.org.proxy.bc.edu/10.1348/014466610X521383.
- Baumard, N., & Boyer, P. (2013). Religious beliefs as reflective elaborations on intuitions: A modified dual-process model. *Current Directions in Psychological Science*, 22, 295–300. doi:http://dx.doi.org.proxy.bc.edu/10.1177/0963721413478610.
- Bering, J. M. (2002). Intuitive conceptions of dead agents' minds: The natural foundations of afterlife beliefs as phenomenological boundary. *Journal of Cognition and Culture*, 2, 263–308. doi:10.1163/15685370260441008.
- Bering, J. M., & Johnson, D. D. P. (2005). "O Lord. You perceive my thoughts from afar": Recursiveness and the evolution of supernatural agency. *Journal of Cognition and Culture*, 5, 118–142. doi:10.1163/1568537054068679.
- Boyer, P. (1994). *The naturalness of religious ideas: A cognitive theory of religion*. Berkeley, CA: University of California Press.
- Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. New York: Basic Books.
- Boyer, P. (2003). Are ghost concepts "intuitive," "endemic" and "innate"? *Journal of Cognition and Culture*, 3, 233–243. doi:10.1163/156853703322336661.
- Canfield, C., & Ganea, P. (2014). "You could call it magic": What parents and siblings tell preschoolers about unobservable entities. *Journal of Cognition and Development*, 15, 269–286. doi:10.1080/15248372.2013.777841.
- Carpendale, J. I. M., & Lewis, C. (2004). Constructing an understanding of mind: The development of children's social understanding within social interaction. *Behavioral and Brain Sciences*, 27, 79–151. doi:10.1017/S0140525X04000032.
- Chaiken, S., & Trope, Y. (Eds.) (1999). *Dual-process theories in social psychology*. New York: Guilford Press.
- Chan, C. C. Y., & Tardif, T. (2013). Knowing better: The role of prior knowledge and culture in trust and testimony. *Developmental Psychology*, 49, 591–601. doi:10.1037/a0031336.
- Clement, F., Koenig, M., & Harris, P. (2004). The ontogenesis of trust. *Mind and Language*, 19, 360–379. doi:10.1111/j.0268-1064.2004.00263.x.
- Cocker, P. J., Dinelle, K., Kornelson, R., Sossi, V., & Winstanley, C. A. (2012). Irrational choice under uncertainty correlates with lower striatal D<sub>2/3</sub> receptor binding in rats. *The Journal of Neuroscience*, 32, 15450–15457. doi:10.1523/JNEUROSCI.0626-12.2012.
- Cohen, E., & Barrett, J. L. (2008). Conceptualizing spirit possession: Ethnographic and experimental evidence. *Ethos*, 36, 246–267. doi:10.1111/j.1548-1352.2008.00013.x.
- Dasgupta, N. (2009). Mechanisms underlying the malleability of implicit prejudice and stereotypes: The role of automaticity and cognitive control. In T. D. Nelson (Ed.), *Handbook of prejudice, stereotyping, and discrimination* (pp. 267–284). New York: Psychology Press.
- Demoulin, S., Leyens, P., Paladino, M., Rodriguez-Torres, R., Rodriguez-Perez, A., & Dovidio, J. F. (2004). Dimensions of "uniquely" and "non-uniquely" human emotions. *Cognition and Emotion*, 18, 71–96. doi:10.1080/02699930244000444.
- Demoulin, S., Saroglou, V., & Van Pachterbeke, M. (2008). Infra-humanizing others, supra-humanizing gods: The emotional hierarchy. *Social Cognition*, 26, 235–247. doi:10.1521/soco.2008.26.2.235.
- Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, 56, 5–18. doi:10.1037/0022-3514.56.1.5.

- Dungan, J., & Saxe, R. (2012). Matched false-belief performance during verbal and nonverbal interference. *Cognitive Science*, 36, 1148–1156. doi:10.1111/j.1551-6709.2012.01248.x.
- van Elk, M. (2013). Paranormal believers are more prone to illusory agency detection than skeptics. *Consciousness and Cognition*, 22, 1041–1046. doi:10.1016/j.concog.2013.07.004.
- Epley, N., Akalis, S., Waytz, A., & Cacioppo, J. T. (2008). Creating social connection through inferential reproduction: Loneliness and perceived agency in gadgets, gods, and greyhounds. *Psychological Science*, 19, 114–120. doi:10.1111/j.1467-9280.2008.02056.x.
- Epley, N., Converse, B. A., Delbosch, A., Monteleone, G. A., & Cacioppo, J. T. (2009). Believers' estimates of God's beliefs are more egocentric than estimates of other people's beliefs. *Proceedings of the National Academy of Sciences of the United States of America*, 106, 21533–21538. doi:10.1073/pnas.0908374106.
- Epley, N., & Gilovich, T. (2004). Are adjustments insufficient? *Personality and Social Psychology Bulletin*, 30, 447–460. doi:10.1177/0146167203261889.
- Epley, N., & Gilovich, T. (2005). When effortful thinking influences judgmental anchoring: Differential effects of forewarning and incentives on self-generated and externally provided anchors. *Journal of Behavioral Decision Making*, 18, 199–212. doi:10.1002/bdm.495.
- Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism. *Psychological Review*, 114, 864–886. doi:10.1037/0033-295X.114.4.864.
- Falk, R. (1994). Infinity: A cognitive challenge. *Theory & Psychology*, 4, 35–60. doi:10.1177/0959354394041002.
- Gervais, W. M. (2013). Perceiving minds and gods: How mind perception enables, constrains, and is triggered by belief in gods. *Perspectives on Psychological Science*, 8, 380–394.
- Gervais, W. M., & Norenzayan, A. (2012). Like a camera in the sky? Thinking about God increases public self-awareness and socially desirable responding. *Journal of Experimental Social Psychology*, 48, 298–302. doi:10.1016/j.jesp.2011.09.006.
- Gimenez-Dasi, M., Guerrero, S., & Harris, P. L. (2005). Intimations of immortality and omniscience in early childhood. *European Journal of Developmental Psychology*, 2, 285–297. doi:10.1080/17405620544000039.
- Ginges, J., Atran, S., Sachdeva, S., & Medin, D. (2011). Psychology out of the laboratory: The challenge of violent extremism. *American Psychologist*, 66, 507–519. doi:10.1037/a0024715.
- Ginges, J., Hansen, I., & Norenzayan, A. (2009). Religion and support for suicide attacks. *Psychological Science*, 20, 224–230. doi:10.1111/j.1467-9280.2009.02270.x.
- Goldberg, R. F., & Thompson-Schill, S. L. (2009). Developmental “roots” in mature biological knowledge. *Psychological Science*, 20, 480–487. doi:10.1111/j.1467-9280.2009.02320.x.
- Gopnik, A. (2012). Scientific thinking in young children: Theoretical advances, empirical research, and policy implications. *Science*, 337, 1623–1627. doi:10.1126/science.122341.
- Gopnik, A., & Astington, J. W. (1988). Children's understanding of representational change and its relation to the understanding of false belief and the appearance-reality distinction. *Child Development*, 59, 26–37. doi:10.2307/1130386.
- Gopnik, A., & Slaughter, V. (1991). Young children's understanding of changes in their mental states. *Child Development*, 62, 98–110. doi:10.2307/1130707.
- Gorsuch, R. L. (1968). The conceptualization of God as seen in adjective ratings. *Journal for the Scientific Study of Religion*, 7, 56–64. doi:10.2307/1385110.
- Gray, H. M., Gray, K., & Wegner, D. M. (2007). Dimensions of mind perception. *Science*, 315, 619.
- Gray, K., Knobe, J., Sheskin, M., Bloom, P., & Barrett, L. F. (2011). More than a body: Mind perception and the nature of objectification. *Journal of Personality and Social Psychology*, 101, 1207–1220. doi:10.1037/a0025883.
- Gray, K., & Wegner, D. M. (2010). Blaming God for our pain: Human suffering and the divine mind. *Personality and Social Psychology Review*, 14, 7–16. doi:10.1177/1088868309350299.
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, 102, 4–27. doi:10.1037/0033-295X.102.1.4.

- Guthrie, S. E. (1993). *Faces in the clouds: A new theory of religion*. New York: Oxford University Press.
- Harris, P. L., & Corriveau, K. H. (in press). Learning from testimony about religion and science. In E. Robinson & S. Einar (Eds.), *Children's trust in testimony*. Hove, East Sussex, UK: Psychology Press.
- Harris, P. L., & Koenig, M. A. (2006). Trust in testimony: How children learn about science and religion. *Child Development*, 77, 50–524. doi:10.1111/j.1467-8624.2006.00886.x.
- Haslam, N., Bain, P., Douge, L., Lee, M., & Bastian, B. (2005). More human than you: Attributing humanness to self and others. *Journal of Personality and Social Psychology*, 89, 937–950. doi:10.1037/0022-3514.89.6.937.
- Haslam, N., Kashima, Y., Loughnan, S., Shi, J., & Suitner, C. (2008). Subhuman, inhuman, superhuman: Contrasting humans with nonhumans in three cultures. *Social Cognition*, 26, 248–258. doi:10.1521/soco.2008.26.2.248.
- Jaswal, V. K. (2010). Believing what you're told: Young children's trust in unexpected testimony about the physical world. *Cognitive Psychology*, 61, 248–272. doi:10.1016/j.cogpsych.2010.06.002.
- Johnson, D., & Bering, J. (2006). Hand of God, mind of man: Punishment and cognition in the evolution of cooperation. *Evolutionary Psychology*, 4, 219–233.
- Johnson, D. D., & Krüger, O. (2004). The good of wrath: Supernatural punishment. *Political Theology*, 5, 159–176.
- Jost, J. T., Federico, C. M., & Napier, J. L. (2009). Political ideology: Its structure, functions, and elective affinities. *Annual Review of Psychology*, 60, 307–337. doi:10.1146/annurev.psych.60.110707.163600.
- Kagan, J. (2004). The uniquely human in human nature. *Daedalus*, 133, 77–88.
- Kay, A. C., Moscovitch, D. A., & Laurin, K. (2010). Randomness, attributions of arousal, and belief in God. *Psychological Science*, 21, 216–218. doi:10.1177/0956797609357750.
- Kelemen, D., Rottman, J., & Seston, R. (2013). Professional physical scientists display tenacious teleological tendencies: Purpose-based reasoning as a cognitive default. *Journal of Experimental Psychology: General*, 142, 1074–1083. doi:10.1037/a0030399.
- Kellman, P. J., & Spelke, E. S. (1983). Perception of partly occluded objects in infancy. *Cognitive Psychology*, 15, 483–524. doi:10.1016/0010-0285(83)90017-8.
- Keysar, B., Lin, S., & Barr, D. J. (2003). Limits on theory of mind use in adults. *Cognition*, 89, 25–41. doi:10.1016/S0010-0277(03)00064-7.
- Kiessling, F., & Perner, J. (2014). God—mother—baby: What children think they know. *Child Development*, 85, 1601–1616. doi:10.1111/cdev.12210.
- Knight, N. (2008). Yukatek Maya children's attributions of belief to natural and non-natural entities. *Journal of Cognition and Culture*, 8, 235–243. doi:10.1163/156853708X358164.
- Knight, N., Sousa, P., Barrett, J. L., & Atran, S. (2004). Children's attributions of beliefs to humans and God: Cross-cultural evidence. *Cognitive Science*, 28, 117–126. doi:10.1016/j.cogsci.2003.09.002.
- Koenig, M. A., & Echols, C. H. (2003). Infants' understanding of false labeling events: The referential roles of words and the speakers who use them. *Cognition*, 87, 179–208. doi:10.1016/S0010-0277(03)00002-7.
- Lane, J. D., & Harris, P. L. (2014). Confronting, representing, and believing counterintuitive concepts: Navigating the natural and the supernatural. *Perspectives on Psychological Science*, 9, 144–160. doi:10.1177/1745691613518078.
- Lane, J. D., Harris, P. L., Gelman, S. A., & Wellman, H. M. (2014). More than meets the eye: Young children's trust in claims that defy their perceptions. *Developmental Psychology*, 50, 865–871. doi:10.1037/a0034291.
- Lane, J. D., Wellman, H. M., & Evans, E. M. (2010). Children's understanding of ordinary and extraordinary minds. *Child Development*, 81, 1475–1489. doi:10.1111/j.1467-8624.2010.01486.x.
- Lane, J. D., Wellman, H. M., & Evans, E. M. (2012). Sociocultural input facilitates children's developing understanding of extraordinary minds. *Child Development*, 83, 1007–1021. doi:10.1111/j.1467-8624.2012.01741.x.
- Lane, J. D., Wellman, H. M., & Evans, E. M. (2014). Approaching an understanding of omniscience from the preschool years to early adulthood. *Developmental Psychology*, 50, 2380–2392. doi:10.1037/a0037715.

- Laurin, K., Kay, A. C., & Moscovitch, D. A. (2008). On the belief in God: Towards an understanding of the emotional substrates of compensatory control. *Journal of Experimental Social Psychology, 44*, 1559–1562. doi:10.1016/j.jesp.2008.07.007.
- Lawson, E. T., & McCauley, R. N. (1990). *Rethinking religion: Connecting cognition and culture*. New York: Cambridge University Press.
- Loughnan, S., Haslam, N., Murnane, T., Vaes, J., Reynolds, C., & Suitner, C. (2010). Objectification leads to depersonalization: The denial of mind and moral concern to objectified others. *European Journal of Social Psychology, 40*, 709–717. doi:10.1002/ejsp.755.
- Luhrmann, T. (1989). *Persuasions of the witch's craft: Ritual magic in contemporary England*. Cambridge, MA: Harvard University Press.
- Luhrmann, T. (2012). *When God talks back: Understanding the American evangelical relationship with God*. New York: Vintage Books.
- Lynn, R., Harvey, J., & Nyborg, H. (2009). Average intelligence predicts atheism rates across 137 nations. *Intelligence, 37*, 11–15. doi:10.1016/j.intell.2008.03.004.
- Makris, N., & Pnevmatikos, D. (2007). Children's understanding of human and super-natural mind. *Cognitive Development, 22*, 365–375. doi:10.1016/j.cogdev.2006.12.003.
- McCauley, R. N., & Lawson, E. T. (2002). *Bringing ritual to mind: Psychological foundations of cultural forms*. New York: Cambridge University Press.
- Morewedge, C. K., & Clear, M. E. (2008). Anthropomorphic God concepts engender moral judgment. *Social Cognition, 26*, 182–189. doi:10.1521/soco.2008.26.2.182.
- Mould, T. (2011). *Still, the small voice: Narrative, personal revelation, and the Mormon folk tradition*. Logan, UT: Utah State University Press.
- New England Yearly Meeting of Friends (1985). *Faith and practice*. Worcester, MA: New England Yearly Meeting of Friends.
- Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review, 84*, 231–259. doi:10.1037/0033-295X.84.3.231.
- Noffke, J. L., & McFadden, S. H. (2001). Denominational and age comparisons of God concepts. *Journal for the Scientific Study of Religion, 40*, 747–756. doi:10.1111/0021-8294.00089.
- Norenzayan, A. (2013). *Big gods: How religion transformed cooperation and conflict*. Princeton, NJ: Princeton University Press.
- Norenzayan, A., Gervais, W. M., & Trzesniewski, K. H. (2012). Mentalizing deficits constrain belief in a personal God. *PLoS ONE, 7*, doi:10.1371/journal.pone.0036880.
- Norenzayan, A., & Shariff, A. F. (2008). The origin and evolution of religious prosociality. *Science, 322*, 58–62. doi:10.1126/science.1158757.
- Nosek, B. A. (2007). Implicit–explicit relations. *Current Directions in Psychological Science, 16*, 65–69. doi:10.1111/j.1467-8721.2007.00477.x.
- Onishi, K. H., & Baillargeon, R. (2005). Do 15-month-old infants understand false beliefs? *Science, 308*, 255–258. doi:10.1126/science.1107621.
- Pea, R. D. (1982). Origins of verbal logic: Spontaneous denials by two- and three-year-olds. *Journal of Child Language, 9*, 597–626. doi:10.1017/S0305000900004931.
- Petrican, R., & Burris, C. T. (2012). Am I the stone? Overattribution of agency and religious orientation. *Psychology of Religion and Spirituality, 4*, 312–323. doi:10.1037/a0027942.
- Pew Forum. (2008). *U.S. Religious Landscape Survey*. Available at <http://www.pewforum.org/2008/06/01/chapter-1-religious-beliefs-and-practices/>. Accessed October 7, 2014.
- Piaget, J. (1929). *The child's conception of the world*. New York: Harcourt Brace.
- Potvin, P., Turmel, E., & Masson, S. (2014). Linking neuroscientific research on decision making to the educational context of novice students assigned to a multiple-choice scientific task involving common misconceptions about electrical circuits. *Frontiers in Human Neuroscience, 8*. doi:10.3389/fnhum.2014.00014.

- Purzycki, B. G. (2013). The minds of gods: A comparative study of supernatural agency. *Cognition*, *129*, 163–179. doi: 10.1016/j.cognition.2013.06.010.
- Purzycki, B. G., Finkel, D. N., Shaver, J., Wales, N., Cohen, A. B., & Sosis, R. (2012). What does God know? Supernatural agents' access to socially strategic and non-strategic information. *Cognitive Science*, *36*, 846–869. doi:10.1111/j.1551-6709.2012.01242.x.
- Pyysiäinen, I. (2004). Intuitive and explicit in religious thought. *Journal of Cognition and Culture*, *4*, 123–150. doi:10.1163/156853704323074787.
- Reifen Tagar, M., Federico, C. M., Lyons, K. E., Ludeke, S., & Koenig, M. A. (2014). Heralding the authoritarian? Orientation toward authority in early childhood. *Psychological Science*, *25*, 883–892. doi:10.1177/0956797613516470.
- Richert, R. A., & Barrett, J. L. (2005). Do you see what I see? Young children's assumptions about God's perceptual abilities. *International Journal for the Psychology of Religion*, *15*, 283–295. doi:10.1207/s15327582ijpr1504\_2.
- Ross, L. D., Lelkes, Y., & Russell, A. G. (2012). How Christians reconcile their personal political views and the teachings of their faith: Projection as a means of dissonance reduction. *Proceedings of the National Academy of Sciences of the United States of America*, *109*, 3616–3622. doi:10.1073/pnas.1117557109.
- Rudman, L. A. (2004). Sources of implicit attitudes. *Current Directions in Psychological Science*, *13*, 79–82. doi:10.1111/j.0963-7214.2004.00279.x.
- Saxe, R., & Young, L. (2013). Theory of mind: How brains think about thoughts. In K. Ochsner & S. Kosslyn (Eds.), *The handbook of cognitive neuroscience* (pp. 204–213). New York: Oxford University Press.
- Schjoedt, U., Stodkilde-Jorgensen, H., Geertz, A. W., & Roepstorff, A. (2009). Highly religious participants recruit areas of social cognition in personal prayer. *Social Cognitive and Affective Neuroscience*, *4*, 199–207. doi:10.1093/scan/nsn050.
- Schulz, L. E. (2012). The origins of inquiry: Inductive inference and exploration in early childhood. *Trends in Cognitive Sciences*, *16*, 382–389. doi:10.1016/j.tics.2012.06.004.
- Schulz, L. E., Goodman, N. D., Tenenbaum, J. B., & Jenkins, A. C. (2008). Going beyond the evidence: Abstract laws and preschoolers' responses to anomalous data. *Cognition*, *109*, 211–223. doi:10.1016/j.cognition.2008.07.017.
- Senju, A., Southgate, V., Snape, C., Leonard, M., & Csibra, G. (2011). Do 18-month-olds really attribute mental states to others? A critical test. *Psychological Science*, *22*, 878–880. doi:10.1177/0956797611411584.
- Shariff, A. F., & Norenzayan, A. (2007). God is watching you: Priming God concepts increases prosocial behavior in an anonymous economic game. *Psychological Science*, *18*, 803–809. doi:10.1111/j.1467-9280.2007.01983.x.
- Shariff, A. F., & Norenzayan, A. (2011). Mean gods make good people: Different views of God predict cheating behavior. *International Journal for the Psychology of Religion*, *21*, 85–96. doi:10.1080/10508619.2011.556990.
- Shtulman, A. (2008). Variation in the anthropomorphization of supernatural beings and its implications for cognitive theories of religion. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *34*, 1123–1138. doi:10.1037/0278-7393.34.5.1123.
- Shtulman, A., & Carey, S. (2007). Improbable or impossible? How children reason about the possibility of extraordinary events. *Child Development*, *78*, 1015–1032. doi:10.1111/j.1467-8624.2007.01047.x.
- Shtulman, A., & Valcarcel, J. (2012). Scientific knowledge suppresses but does not supplant earlier intuitions. *Cognition*, *124*, 209–215. doi:10.1016/j.cognition.2012.04.005.
- Slingerland, E., Henrich, J., & Norenzayan, A. (2013). The evolution of prosocial religions. In P. J. Richerson & M. H. Christiansen (Eds.), *Cultural evolution: Society, technology, language and religion* (pp. 335–348). Cambridge, MA: MIT Press.
- Slone, J. (2004). *Theological incorrectness: Why religious people believe what they shouldn't*. New York: Oxford University Press.

- Spilka, B., Armatas, P., & Nussbaum, J. (1964). The concept of God: A factor analytic approach. *Review of Religious Research*, 6, 28–36.
- Stavrova, O., & Siegers, P. (2014). Religious prosociality and morality across cultures: How social enforcement of religion shapes the effects of personal religiosity on prosocial and moral attitudes and behaviors. *Personality and Social Psychology Bulletin*, 40, 315–333. doi:10.1177/0146167213510951.
- Tamir, D. I., & Mitchell, J. P. (2013). Anchoring and adjustment during social inferences. *Journal of Experimental Psychology: General*, 142, 151–162. doi:10.1037/a0028232.
- Toplak, M. E., West, R. F., & Stanovich, K. E. (2011). The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks. *Memory and Cognition*, 39, 1275–1289. doi:10.3758/s13421-011-0104-1.
- Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185, 1124–1131. doi:10.1126/science.185.4157.1124.
- Waytz, A., Epley, N., & Cacioppo, J. T. (2010). Social cognition unbound: Insights into anthropomorphism and dehumanization. *Current Directions in Psychological Science*, 19, 58–62. doi:10.1177/0963721409359302.
- Waytz, A., Gray, K., Epley, N., & Wegner, D. M. (2010). Causes and consequences of mind perception. *Trends in Cognitive Sciences*, 14, 383–388. doi:10.1016/j.tics.2010.05.006.
- Waytz, A., Morewedge, C., Epley, N., Monteleone, G., Gao, J., & Cacioppo, J. T. (2010). Making sense by making sentient: Effectance motivation increases anthropomorphism. *Journal of Personality and Social Psychology*, 99, 410–435. doi:10.1037/a0020240.
- Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, 72, 655–684. doi:10.1111/1467-8624.00304.
- Wigger, J. B., Paxson, K., & Ryan, L. (2013). What do invisible friends know? Imaginary companions, God, and theory of mind. *International Journal for the Psychology of Religion*, 23, 2–14.
- Woolley, J., Ma, L., & Lopez-Mobilia, G. (2011). Development of the use of conversational cues to assess reality status. *Journal of Cognition and Development*, 12, 537–555. doi:10.1080/15248372.2011.554929.
- Zahl, B. P., & Gibson, N. J. S. (2012). God representations, attachment to God, and satisfaction with life: A comparison of doctrinal and experiential representations of God in Christian young adults. *International Journal for the Psychology of Religion*, 22, 216–230. doi:10.1080/10508619.2012.670027.
- Zaitchik, D., & Solomon, G. E. A. (2008). Animist thinking in the elderly and in patients with Alzheimer's disease. *Cognitive Neuropsychology*, 25, 27–37. doi:10.1080/02643290801904059.