# Variation in the Anthropomorphization of Supernatural Beings and Its Implications for Cognitive Theories of Religion

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The cognitive study of religion has been highly influenced by P. Boyer's (2001, 2003) claim that supernatural beings are conceptualized as persons with counterintuitive properties. The present study tests the generality of this claim by exploring how different supernatural beings are conceptualized by the same individual and how different individuals conceptualize the same supernatural beings. In Experiment 1, college undergraduates decided whether three types of human properties (psychological, biological, physical) could or could not be attributed to two types of supernatural beings (religious, fictional). On average, participants attributed more human properties to fictional beings, like fairies and vampires, than to religious beings, like God and Satan, and they attributed more psychological properties than nonpsychological properties to both. In Experiment 2, 5-year-old children and their parents made both open-ended and closed-ended property attributions. Although both groups of participants attributed a majority of human properties to the fictional beings, children attributed a majority of human properties to the religious beings as well. Taken together, these findings suggest that anthropomorphic theories of supernatural-being concepts, though fully predictive of children's concepts, are only partially predictive of adults' concepts.

Keywords: concept representation, supernatural concepts, religious cognition, belief formation, cultural transmission

Belief in the existence of supernatural beings is a cultural universal (Brown, 1991). Every culture observed by anthropologists or unearthed by archeologists has endorsed beliefs and practices predicated on the existence of human-like beings with nonhuman properties, such as beings who change shape, beings who read minds, or beings who control the weather. Belief in the existence of supernatural beings is widespread not only across cultures but within cultures as well. In the United States, for example, an estimated 70% of individuals believe in the existence of Satan, 78% believe in the existence of angels, and 94% believe in the existence of God (Winseman, 2004).

The prevalence of such beliefs is of interest to cognitive psychologists for at least two reasons. First, supernatural beings are not directly observable—at least not by ordinary means of perception (see Livingston, 2005, for a discussion of religious hallucinations)—and must therefore be learned about through testimony. As a source of knowledge, testimony has been understudied relative to observation, experimentation, and inference, yet, in many domains, it is both more convenient and more prolific than any other source of knowledge (see Harris & Koenig, 2006; Rogoff, 2003; Vygotsky, 1978). Second, much of our understanding of conceptual structure is based on the study of natural-kinds concepts, like

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ANIMAL, OBJECT, and SUBSTANCE (see Carey, 1985; Gelman & Markman, 1987; Keil, 1989), and it is unclear whether these findings are applicable to supernatural-kinds concepts, whose referents are, by definition, "above" or "beyond" the natural world. Studying how individuals make sense of concepts that do not conform to our everyday expectations promises to elucidate further constraints on concept acquisition and concept representation in general.

Anthropologists interested in explaining the origin and transmission of supernatural concepts have often appealed to anthropomorphism, or the tendency to attribute human properties to nonhuman entities (Guthrie, 1993). Proponents of this approach point out that even though supernatural beings are attributed properties never possessed by human beings, like the ability to fly, the ability to live forever, or the ability to be everywhere at once, they are also attributed properties possessed only by humans, like the ability to talk, the ability to plan, and the ability to reason. Proponents of this approach also point out that the practice of attributing human properties to supernatural beings is less variable across cultures than the practice of attributing nonhuman properties to those beings. Accordingly, many have speculated that supernatural-being concepts stem from a universal predisposition to interpret changes in one's environment as products of intentional agency, particularly human agency.

In recent years, Boyer (1994, 2001, 2003) has rearticulated this view of supernatural-being concepts within the vocabulary of cognitive science. In particular, he has argued that individuals represent information about supernatural beings using a cognitive template normally used to represent information about other people: the ontology PERSON. By appending one or more counterintuitive properties to this otherwise intuitive ontology, individuals

create what Boyer describes as a *minimally counterintuitive* concept—that is, a concept intuitive enough to be acquired but not so intuitive as to be forgotten. Boyer (2001) illustrates this process with the following list of examples:

Omniscient God = PERSON + special cognitive powers Visiting ghost = PERSON + no material body Zombie = PERSON + no cognitive functioning

To be fair, Boyer's (2001, 2003) theory is meant to apply to all supernatural concepts, not just supernatural-being concepts, yet, because supernatural beings figure more prominently in the world's religions than any other type of supernatural entity (e.g., statues that weep, mountains that see, animals that talk), the present study focuses exclusively on concepts of the form "PERSON + counterintuitive properties."

Following Boyer (2001, 2003), many studies have shown that minimally counterintuitive concepts are, indeed, highly memorable (Barrett & Nyhoff, 2001; Boyer & Ramble, 2001; Gonce, Upal, Slone, & Tweney, 2006; Norenzayan & Atran, 2004; Norenzayan, Atran, Faulkner, & Schaller, 2006; Upal, Gonce, Tweney, & Slone, 2007). In these studies, participants memorize a list of artificial concepts varying in their degree of counterintuitiveness. When later asked to recall those concepts, participants tend to recall concepts with one counterintuitive property (e.g., a person who casts no shadow) more often than they tend to recall concepts with multiple counterintuitive properties (e.g., a person who casts no shadow and eats no food), concepts with no counterintuitive properties (e.g., a person who laughs at jokes) or concepts with bizarre, yet ontologically acceptable, properties (e.g., a person who weighs more than an ox). Although this effect is moderated by the context in which a concept is embedded and the longevity with which a concept is retained, the finding that minimally counterintuitive concepts are more memorable than other types of concepts is robust.

This research demonstrates that concepts of the form "PER-SON + counterintuitive properties" are likely to be remembered, and, thus, likely to be transmitted from one mind to another, but no research has shown that our supernatural-being concepts actually fit this template. All studies demonstrating a memory advantage for minimally counterintuitive concepts have used artificial concepts, unfamiliar to the participants involved. It is thus unclear whether any of the supernatural-being concepts people actually hold—let alone all such concepts—are well characterized by Boyer's (2001, 2003) theory. The present study attempts to address this question by measuring the extent to which (a) different individuals anthropomorphize the same supernatural beings and (b) the same individuals anthropomorphize different supernatural beings.

There are at least two reasons to doubt, a priori, that all individuals conceptualize all supernatural beings as persons with counterintuitive properties. First, there is extensive variation in the believability of different supernatural beings, which may, in turn, reflect variation in the conceptualization of those beings. Even though belief in the existence of supernatural beings is a cultural universal, not all supernatural beings are believed to exist. In the United States, for example, most individuals believe in the existence of angels, Satan, and God (Winseman, 2004), but most individuals do not believe in the existence of ghosts, witches, and demons (Moore, 2005). Moreover, belief in the existence of an-

gels, Satan, and God is far from unanimous, just as disbelief in the existence of ghosts, witches, and demons is far from unanimous as well. Because the question of whether a supernatural being exists is distinct from the question of how that being is conceptualized, it is possible that all supernatural beings are conceptualized in a similar manner but some just happen to be more believable than others for reasons that are independent of their conceptualization. It is also possible, however, that individuals conceptualize believable supernatural beings in different ways than they conceptualize unbelievable ones. (Note that I use the term *believable*, here and throughout, as shorthand for "typically believed to exist by the members of one's culture").

Second, there is extensive variation in the public representation of supernatural beings-that is, representations of supernatural beings in art, literature, and discourse—which, like variation in believability, may reflect variation in individuals' mental representations of those beings. Although some supernatural beings, like fairies and vampires, are anthropomorphized in virtually all of the contexts in which they appear, other supernatural beings, like angels and God, are anthropomorphized in some contexts but not in others. Indeed, historical analyses of the concepts God (Armstrong, 1994), Satan (Forsyth, 1987), angel (Peers, 2001), and messiah (Pelikan, 1999) have found that the public representations of these concepts have differed across time and across cultures, with some representations being more anthropomorphic than others. Representations of God, for example, have ranged from highly anthropomorphic (e.g., "heavenly father," "divine ruler," "intelligent designer") to highly abstract (e.g., "unmoved mover," "first cause," "universal spirit"). Nowadays, the nature and scope of such representational diversity can be observed firsthand on the internet; searching the internet for the word *God* reveals representations as diverse as Michelangelo's depiction of God as a bearded old man on the ceiling of the Sistine Chapel to Anselm's depiction of God as "that than which nothing greater can be conceived."

Do abstract public representations of supernatural beings influence individuals' mental representations of those beings or are such representations epiphenomenal? Given that information about supernatural beings is learned primarily, if not exclusively, from their public representations, one might expect a tight correlation between public representations and mental representations. Nevertheless, a study by Barrett and Keil (1996), comparing college undergraduates' self-professed God concepts to the concepts they used when performing a story-recall task, would suggest otherwise.

The participants in this study read stories about divine interventions and were then quizzed on their ability to differentiate events that were included in the story from those that were not. Although virtually all participants claimed that God is omniscient and omnipresent when asked directly, many participants failed to reject story-recall items that presupposed limitations on God's perceptual and/or physical abilities. For example, participants who read the statement, "God was aware of the girl's deed and was pleased by it," often failed to notice the difference between this statement and the statement, "God was pleased by seeing the girl put the bird in its nest," even though the latter (but not the former) implies that God must perceive an event to gain awareness of that event. Likewise, participants who read the statement, "When she woke, she saw no one but the rock had been moved," often failed to notice the difference between this statement and the statement,

"When the woman awoke, God had already left but the rock had been moved," even though the latter (but not the former) implies that God must be physically present to induce changes in the environment.

From these findings, Barrett and Keil (1996) concluded that participants' everyday, real-time concepts of God are more anthropomorphic than the theological concepts they explicitly acknowledge and endorse. Many others have echoed this claim (e.g., Bloom, 2004; Pyysiainen, 2004; Slone, 2004), arguing, as Boyer (2003) does, that because "people's actual religious concepts diverge from what they *believe* they believe, . . . theologies, explicit dogmas, and other scholarly interpretations of religion cannot be taken as a reliable description of either the contents or causes of people's beliefs" (p. 119, italics in original).

There are, however, at least two reasons to doubt this conclusion. First, it is unclear whether Barrett and Keil's (1996) findings reveal a discrepancy between participants' self-professed God concepts and their real-time God concepts or a discrepancy between their self-professed God concepts and the God concepts conveyed in the stories they were asked to recall. Consider, for example, the statement "God was aware of the girl's deed and was pleased by it." Although this statement does not imply that God's awareness is limited by perception, it does imply that God possesses mental states (i.e., awareness and pleasure). Likewise, God was described in other stories as pushing a large stone, looking at the rock, listening to the birds, enjoying the smell, and helping an angel work on a crossword puzzle. Any participants who might have disagreed with the anthropomorphic implications of these statements were still required to reason on their basis. To these participants, stories about a looking, listening, helping God would be as incongruent with their personal beliefs as stories about a looking, listening, helping teapot, yet one could hardly fault them for drawing anthropomorphic inferences consistent with the stories' premises.

Second, even with the demand characteristics described above, participants were still far from ceiling in accepting anthropomorphic descriptions of God. Rather than accept such descriptions 100% of the time, they accepted them only 55% of the time in Experiment 1 and 38% of the time in Experiment 2 (after controlling for baseline accuracy). Although it is notable that participants anthropomorphized God at all, it is difficult to interpret the magnitude of this effect given that participants anthropomorphized a supercomputer 40% of the time under the same conditions. Further complicating the interpretation of this effect is that it was averaged over twenty different recall items, some of which may have been accepted more often than others. Differences of this sort are highly relevant to the claim that individuals anthropomorphize God "on at least some level" or "in at least some contexts," as these differences could help specify what that level is or what those contexts are.

In short, people's reluctance to anthropomorphize God in a story-recall task is potentially as interesting as their propensity to do so, particularly in light of Boyer's (2001, 2003) claim that God, like other supernatural beings, is conceptualized as a special kind of person. To investigate these issues, the present study extends—and improves upon—Barrett and Keil's (1996) research in four ways. First, participants' propensity to anthropomorphize supernatural beings was measured with a property-attribution task, rather than a story-recall task, to ensure that participants' infer-

ences reflected their own concepts rather than concepts imposed upon them by the experimenter. Second, participants were asked about the properties of a variety of supernatural beings, rather than God alone, in order to provide a context for interpreting the magnitude of participants' anthropomorphic inferences. Third, participants' property attributions were analyzed by, rather than summed across, the type of properties involved in order to assess the contribution of different conceptual dimensions (i.e., psychology, biology, physics) to anthropomorphization as a whole. Fourth, individuals of various ages—from 5 to 45 years—were included as participants in order to assess the stability of the observed effects across development.

How should participants treat supernatural beings in a straightforward property-attribution task? On Boyer's (2001, 2003) theory, participants should attribute to them any property attributable to a human, with the exception of those properties explicitly blocked by the being's counterintuitive properties (e.g., participants should refrain from attributing a property like "is alive" to supernatural beings explicitly represented as "not alive"). Participants should also attribute approximately the same number of human properties to all supernatural beings on the assumption that all supernatural beings are minimally counterintuitive and, thus, minimally deviant from a human being. If, on the other hand, participants conceptualize different supernatural beings in different ways, then they should attribute many human properties to some supernatural beings and few human properties to others. Moreover, if differences in conceptualization are related to differences in belief, then participants' property attributions for various supernatural beings should be correlated with their belief in the existence of each being.

# Experiment 1

Before assessing differences in supernatural concepts across development, the concepts of a single age group—college undergraduates—were assessed on their own. Of interest was the extent to which these concepts varied across participants and across referents.

## Method

## **Participants**

Sixty-four college undergraduates from an urban, northeastern university participated in Experiment 1 for course credit in an introductory psychology class. Although participants were not asked to report their particular religious affiliations, the population from which they were drawn was primarily Judeo-Christian. Accordingly, they exhibited moderate to strong belief in the existence of Judeo-Christian beings, like God and Satan, and little to no belief in the existence of non-Judeo-Christian beings, like fairies and vampires (see below).

# Materials

Participants were asked about the properties of two types of supernatural beings: those typically found in fictional contexts, henceforth referred to as "fictional beings," and those typically found in religious contexts, henceforth referred to as "religious beings." Although the distinction between fictional beings and

religious beings is imprecise (demons, for example, appear in both fictional contexts and religious contexts), fictional beings differ from religious beings in two important ways. First, fictional beings tend to be less believable than religious beings. Second, fictional beings tend to be anthropomorphized in art, literature, and discourse more consistently than religious beings (which are depicted anthropomorphically in some contexts but not others). Both differences were hypothesized to reflect an underlying discrepancy in how these beings are conceptualized, as discussed above.

The supernatural beings chosen to exemplify religious beings were angels, messiahs, Satan, and God, and the supernatural beings chosen to exemplify fictional beings were fairies, ghosts, vampires, and zombies. The religious beings were chosen on the basis of national survey data indicating that a majority of Americans believe in their existence (Winseman, 2004), and the fictional beings were chosen on the basis of their overall similarity to one of the four religious beings. Fairies, for instance, were chosen to match angels in that both have wings and both perform magic/ miracles. Ghosts were chosen to match God in that both are invisible and both are undying. Vampires were chosen to match Satan in that both change shape and both possess extraordinary powers of enchantment. And zombies were chosen to match messiahs-at least the Christian messiah-in that both started their existence as humans and both rose from the grave following their humanly death. This correspondence, though far from perfect, was intended to minimize differences in the beings' counterintuitive properties while maximizing differences in (a) their believability and (b) the variability of their public representations. That said, it should be acknowledged that this choice of supernatural beings was more exploratory than confirmatory in nature.

For each of the eight supernatural beings, participants were asked to decide whether each of nine human properties could be attributed to that being (see Table 1). Half of the participants saw one set of properties (Set A) and half saw another (Set B). Three of the properties in each set were characteristic of human psychology, three were characteristic of human biology, and three were characteristic of human physicality. Each property was represented as a pair of adjectives, and participants were asked to decide whether either adjective could be used to describe the particular supernatural being under consideration. To clarify these instructions, participants were provided the following example:

Table 1
The Psychological, Biological, and Physical Properties Used in Experiment 1

Property type	Set A adjectives	Set B adjectives	
Psychological	Awake/asleep	Curious/bored	
,	Honest/dishonest	Happy/sad	
	Talkative/reticent	Shy/outgoing	
Biological	Alive/dead	Hungry/full	
	Healthy/sick	Male/female	
	Skinny/obese	Young/old	
Physical	Heavy/light	Indoors/outdoors	
•	Hot/cold	Large/small	
	Upside down/rightside up	Wet/dry	

Note. Set A was seen by half the participants, and Set B was seen by the other half.

The adjectives *true* and *false* can be used to describe beliefs (as in "that belief is true" or "that belief is false") but not tables because tables are neither true nor false; they are not the kind of thing that has a truth-value. Conversely, the adjectives *heavy* and *light* can be used to describe tables (as in "that table is heavy" or "that table is light") but not beliefs because beliefs are neither heavy nor light; they are not the kind of thing that has a weight.

Participants were urged not to mistake metaphoric properties for literal properties or to mistake uncommon properties for nonsensical properties. To keep participants on task, 10 filler items (cactus, doctor, elephant, hammer, lava, mushroom, piano, platypus, teenager, and water) were interspersed with the eight supernatural beings. Two of the filler items—doctor and teenager—were included as a means of validating the task as a whole, for participants should have attributed to both items all properties characteristic of humans.

This task, modeled after a task used by Keil (1979), differed from standard property-attribution tasks (e.g., Carey, 1985; Gelman & Markman, 1987) in that participants were asked to judge the sensibility, rather than the truth, of each object-property pairing. The rationale for this change was twofold. First, evaluating the truth of statements whose subjects are not believed to exist is pragmatically awkward, for these statements would not actually be truth evaluable. Framing the task in terms of sensibility thus ensured that participants would be able to make judgments about beings they believed to exist only in fiction. Second, most of the property attributions that participants were asked to evaluate were indeterminate from a theological and/or mythological point of view. For instance, a participant who believed in the existence of angels was unlikely to know which of the properties displayed in Table 1 angels do, in fact, possess. That participant should, however, have intuitions about the kinds of properties angels could, in theory, possess.

Despite the fact that sensibility was stressed over truth in the task instructions, it is debatable whether or not this manipulation was necessary to yield intelligible responses. One reason to believe it was not is that participants in Experiment 2 provided a similar pattern of responses without the aid of such instructions.

# Procedure

Property attributions were elicited in the form of a  $9 \times 18$  table whose column headers were the nine properties listed in Table 1 and whose row headers were the eight supernatural beings and 10 filler items listed above. Participants were asked to complete the table by placing a check mark in every cell whose column header (e.g., awake/asleep) was a sensible description of its row header (e.g., fairy). The properties were arranged alphabetically from left to right, and the supernatural beings were arranged alphabetically from top to bottom, with the filler items interspersed accordingly. In addition to making property attributions, participants reported their belief in the existence of each supernatural being by selecting a belief rating from 1 (no belief) to 7 (strong belief). All participants completed the belief-rating task only after having completed the property-attribution task to ensure that their property attributions—the measure of primary interest—were not influenced by their belief ratings.

#### Results

## Property Attributions

Property attributions to the control items, doctor and teenager, were analyzed before any other attributions to ensure that participants had interpreted the task as intended. As expected, most participants (75%) attributed all nine properties to one, or both, beings, and no participant attributed fewer than six properties to either. The mean number of psychological, biological, and physical properties attributed to these two beings, as a pair, were 3.0, 2.9, and 2.7, respectively. The property least often attributed to them was "upside down/right side up," but even that property was attributed to them 67% of the time.

In contrast to doctors and teenagers, which were attributed an overall mean of 8.6 properties per being (SD=0.7), the fictional beings were attributed 6.8 properties per being (SD=2.1) and the religious beings were attributed 5.0 properties per being (SD=2.6). Participants' mean property attributions to the supernatural beings are displayed in Figure 1 as a function of property set (Set A, Set B), property type (psychological, biological, physical), and being type (fictional, religious). As can be seen from this figure, participants attributed more human properties to the fictional beings than to the religious beings and attributed more psychological properties than nonpsychological properties to both types of beings, regardless of what property set they had been given.

A  $2 \times 2 \times 3$  repeated-measures analysis of variance (ANOVA) confirmed that participants' property attributions varied significantly by both property type, F(2, 124) = 48.81, p < .001 and being type, F(1, 62) = 87.39, p < .001, but did not vary significantly by property set. Because property attributions did not vary by property set, they were collapsed across property set for all subsequent analyses. Aside from main effects, the repeated-measures ANOVA also revealed a near-significant interaction between property type and being type, F(2, 124) = 3.02, p = .052, owing to the fact that the difference in property attributions between fictional beings and religious beings was greater for non-psychological properties than for psychological ones.

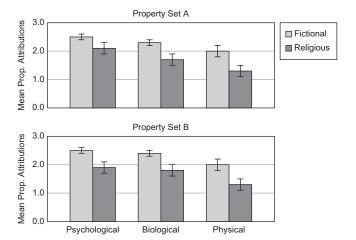


Figure 1. The mean number of psychological, biological, and physical properties (Prop.) attributed to each type of being (fictional, religious) for each set of properties (Set A, Set B) in Experiment 1.

The main effect of property type was further explored with Bonferroni comparisons of the relevant means. These comparisons revealed that participants made significantly more biological attributions than physical attributions and significantly more psychological attributions than biological or physical attributions. The difference between psychological attributions and nonpsychological attributions was particularly robust. At the level of individual beings, participants attributed significantly more psychological properties than biological properties to three of the eight beings, ghosts: t(63) = 2.07, p < .05; Satan: t(63) = 2.16, p < .05; God: t(63) = 4.49, p < .01, and significantly more psychological properties than physical properties to all eight, fairies: t(63) = 4.49, p < .001; vampires: t(63) = 3.55, p < .01; zombies: t(63) =4.03, p < .001; ghosts: t(63) = 5.17, p < .001; angels: t(63) =6.97, p < .001; messiahs: t(63) = 5.67, p < .001; Satan: t(63) =4.92, p < .001; God: t(63) = 6.73, p < .001.

Summed across domain, participants could attribute anywhere from zero to nine human properties. The mean number of properties attributed to each being are displayed in Table 2, along with the standard deviations for those attributions. As can be seen from this table, participants' property attributions for the fictional beings were (a) greater than their property attributions for the religious beings and (b) less variable than their property attributions for the religious beings. The reliability of these effects was assessed with independent-samples t tests comparing the means and standard deviations of each set of attributions. These tests confirmed not only that the means for the fictional beings were significantly greater than the means for the religious beings, t(6) = 2.57, p <.05, but also that the standard deviations for the fictional beings were significantly smaller than the standard deviations for the religious beings, t(6) = -3.53, p < .05, indicating that participants, as a group, anthropomorphized the fictional beings both more frequently and more consistently than they anthropomorphized the religious beings.

Differences in the variability of fictional-being concepts and religious-being concepts are illustrated in Figure 2. The top panel displays frequency distributions of the total number of properties attributed to zombies (the being with the lowest average belief rating), and the bottom panel displays a frequency distribution of the total number of properties attributed to God (the being with the highest average belief rating). Whereas the top distribution is skewed heavily to the right, the bottom distribution is distributed more evenly across the range of all possible attributions, implying that participants agreed on how to conceptualize zombies (i.e., as highly anthropomorphic) but disagreed on how to conceptualized God.

The analyses reported thus far have explored variation in participants' property attributions across beings and across properties. To explore variation across participants, I compared the total number of properties a participant attributed to each supernatural being using Pearson's correlations. These correlations, which are displayed in Table 3, ranged from r=.43 to r=.82 and averaged .61. All were statistically significant (p<.01). Apparently, participants who attributed many human properties to some supernatural beings tended to attribute many human properties to all supernatural beings, despite relative differences within that range of attributions. In other words, even though all participants tended to anthropomorphize fictional beings to a greater extent than they anthropomorphized religious beings, some participants anthropo-

Table 2
Participants' Average Belief Ratings (out of 7) and Property
Attributions (out of 9) for the Supernatural Beings in
Experiment 1, Listed in Order of Increasing Believability

		Belief ratings		Property attributions	
Category	Being	M	SD	M	SD
Fictional	Zombie	1.4	0.9	6.8	2.4
	Vampire	1.5	1.3	7.2	2.1
	Fairy	1.6	1.1	7.2	2.4
	Ghost	3.2	2.0	6.1	2.6
Religious	Satan	3.6	2.3	4.4	3.4
	Messiah	4.2	2.5	5.5	3.4
	Angel	4.3	2.3	6.6	2.6
	God	5.5	2.0	3.6	3.1

morphized both types of beings to a greater extent than other participants did.

It should be noted that this finding is not attributable to individual differences in the interpretation of the properties or the interpretation of the task, for virtually all participants attributed virtually all properties to the control items doctor and teenager. Likewise, this finding is not attributable to the repeated use of one or two response patterns (e.g., attributing the same six properties to all eight beings), for participants provided an average of 4.8 different response patterns across the eight different beings—a frequency significantly greater than four, t(63) = 3.30, p < .01, let alone one or two.

## Belief Ratings

Following the property-attribution task, participants rated how strongly they believed in the existence of each supernatural being on a scale from 1 (not at all) to 7 (very strongly). Across beings, participants' mean belief rating for the fictional beings was 1.9 (SD = 1.0) and their mean belief rating for the religious beings was 4.4 (SD = 1.9). As expected, this difference was highly significant, t(63) = 11.01, p < .001. Participants' belief ratings are broken down by being in Table 2. Inspection of this table reveals that, as a group, participants believed in the existence of each religious being more strongly, yet less consistently, than they believed in the existence of each fictional being. The reliability of both effects was confirmed with independent-samples t tests between the means and standard deviations of each set of ratings, Ms: t(6) = 4.17, p < .01; SDs: t(6) = 3.57, p < .05. Apparently, participants disagreed about the existence of religious beings more than they disagreed about the existence of fictional beings, which virtually everyone agreed were nonexistent.

Pearsons' correlations were used to assess the relationship between property attributions and belief ratings on a being-by-being basis. Across the eight beings, participants' mean belief ratings were negatively correlated with their mean property attributions (r=-0.81, p<.05) but positively correlated with the standard deviations of those attributions (r=.73, p<.05), indicating that, as a group, participants believed more strongly in the beings they anthropomorphized (a) less frequently and (b) more variably.

Similar analyses were performed at the level of the individual, rather than the level of the group, yielding a measure of association (r) between property attributions and belief ratings for each participant (with the exception of five participants who provided the same belief rating for all eight beings and three participants who attributed the same number of properties to all eight beings). These r's ranged from -0.83 to 0.40 and averaged -0.36. Eighty-nine percent were less than zero, 54% were less than -0.30, and 25% were less than -0.60. Given the small number of data points over which each correlation was calculated (eight), only 11% were less than -0.70 and, thus, statistically significant (p < .05, two-tailed). Nevertheless, their direction was highly consistent, indicating that, regardless of how strongly a participant anthropomorphized supernatural beings in general, he or she tended to anthropomorphize unbelievable beings more strongly than believable ones.

Interestingly, there was no relationship between property attributions and belief ratings across participants, within beings (as opposed to within participants, across beings). Atheists, for instance, did not provide significantly more property attributions to God than theists did. This finding, in conjunction with the previous finding, suggests that the relationship between a supernatural being's believability and its perceived similarity to humans is relative, not absolute.

## Discussion

The findings of Experiment 1 are consistent with anthropomorphic theories of supernatural concepts in some ways but not others. Consistent with these theories, a majority of participants (72%) attributed a majority of human properties to a majority of supernatural beings. Averaged across properties and across beings,

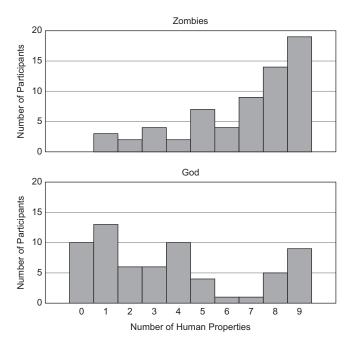


Figure 2. Frequency distributions of the overall number of human properties attributed to the least believable supernatural being (zombies) and the most believable supernatural being (God) by the participants in Experiments 1.

Being	Zombie	Vampire	Fairy	Ghost	Satan	Messiah	Angel	God
Zombie	1.00	.82**	.62**	.62**	.56**	.71**	.63**	.55**
Vampire		1.00	.70**	.61**	.60**	.70**	.60**	.48**
Fairy			1.00	.73**	.48**	.61**	.62**	.48**
Ghost				1.00	.59**	.66**	.71**	.54**
Satan					1.00	.69**	.53**	.72**
Messiah						1.00	.55**	.62**
Angel							1.00	.43**
God								1.00

Table 3

Correlations Among Participants' Overall Property Attributions to the Supernatural Beings in Experiment 1

participants attributed 5.9 (or 66%) of the nine human properties to each supernatural being. Thus, on a continuum from *anthropomorphic* to *nonanthropomorphic*, participants' supernatural-being concepts would appear to be closer to the former than the latter.

That said, a more detailed inspection of the data reveals four findings that are neither predicted by, nor consistent with, anthropomorphic theories. First, participants did not anthropomorphize all supernatural beings to the same extent. Rather, they anthropomorphized fictional beings to a significantly greater extent than they anthropomorphized religious beings, as one might predict solely on the basis of the beings' public representations. In other words, supernatural beings whose public representations range from highly anthropomorphic to highly abstract (e.g., God, Satan) were attributed fewer human properties and a greater assortment of properties than beings whose public representations are exclusively anthropomorphic (e.g., fairies, vampires). Indeed, the categories fictional beings and religious beings were only partially predictive of these differences, for the beings within those categories were anthropomorphized to different extents as well. Ghosts, for example, were attributed fewer human properties than any of the other fictional beings; and angels were attributed more human properties than any of the other religious beings, presumably because most public representations of ghosts do not include bodies but most public representations of angels do (i.e., bodies replete with wings and halos).

Second, participants anthropomorphized the supernatural beings along some conceptual dimensions (i.e., psychological dimensions) more than others (i.e., biological and physical dimensions). This finding implies that individuals' concepts of supernatural beings are only partially contiguous with their concepts of human beings. Rather than being anthropomorphic in the sense of embodying all properties characteristic of humans, these concepts appear to be anthropomorphic in the sense of embodying properties specific to (or best exemplified by) humans. This finding is thus inconsistent with the proposal that supernatural-being concepts are predicated on the ontology PERSON, for this ontology must include more than just psychological properties to be descriptive of human beings in general.

Third, individual participants varied in their overall propensity to anthropomorphize supernatural beings, as evidenced by the strong intercorrelations among participants' property attributions to different supernatural beings. Apparently, some participants relied on the ontology PERSON more than others when drawing novel inferences about the properties of a known being. Individual

differences of this nature should not exist if all participants conceptualized supernatural beings in a similar manner.

Fourth, participants' property attributions were correlated with their belief ratings, such that unbelievable beings were anthropomorphized more strongly than believable ones. This finding suggests that how a supernatural being is conceptualized influences whether or not that being is believed to exist—or, conversely, whether or not a supernatural being is believed to exist influences how that being is conceptualized. Either way, the observed correspondence between belief ratings and property attributions is not easily accounted for by a theory that assumes that all supernatural-being concepts conform to a common template.

Before proceeding to Experiment 2, which tests the generalizability of these findings to older and younger populations, it is worth pondering the question of why the beings that participants regularly anthropomorphized, like fairies and vampires, were rated less believable than the beings they did not regularly anthropomorphize, like God and Satan. One possibility is that the existence of anthropomorphic beings is inconsistent with the experience of a world seemingly devoid of such beings. After all, if anthropomorphic beings actually existed, one would expect to see them from time to time. Nonanthropomorphic beings, on the other hand, are not necessarily thought to possess perceptible properties, so failing to observe such beings would not necessarily be construed as evidence of their nonexistence.

Another possibility is that, as Boyer (2001, 2003) points out, anthropomorphic beings violate our ontological commitments, and numerous studies (e.g., Chinn & Brewer, 2001; Lord, Ross, & Lepper, 1979; Wright & Murphy, 1984) have shown that individuals are loath to accept claims that are inconsistent with their theoretical commitments, particularly their ontological commitments (Shtulman & Carey, 2007). Nonanthropomorphic beings, on the other hand, may be conceptualized in a way that minimizes the counterintuitiveness of their unusual properties. As an illustration, consider the properties "can fly," "is invisible," and "is everywhere at once." Although these properties are counterintuitive if appended to the ontology PERSON, they are not intrinsically counterintuitive. Rather, the first is perfectly intuitive with respect to birds and insects; the second is perfectly intuitive with respect to heat and sound; and the third is a perfectly intuitive with respect to friction and gravity. These properties may thus be rendered less counterintuitive-and, hence, more believable-if appended to an ontology other than PERSON. Exactly what that ontology might be is an issue addressed in the General Discussion.

<sup>\*\*</sup> p < .01.

# Experiment 2

The main objective of Experiment 2 was to extend the scope of inquiry beyond college undergraduates. Many college undergraduates are, after all, in the midst of reevaluating their religious beliefs—a situation that may have led some to overthink their property attributions to the religious beings. Experiment 2 therefore included participants half a generation younger than college undergraduates (i.e., 5-year-old children) and participants half a generation older (i.e., the children's parents).

An additional objective of Experiment 2 was to determine whether, and how, children's concepts of religious beings differ from adults' concepts. Previous research on this topic has focused mainly on one concept (God) and on one question (when it is that children come to represent God's nonhuman properties). These studies have shown that children as young as 3 years of age are aware that God is omniscient (Barrett, Newman, & Richert, 2003; Barrett, Richert, & Driesenga, 2001; Knight, Sousa, Barrett, & Atran, 2004) and that God is immortal (Gimenez-Dasi, Guerrero, & Harris, 2005), yet little is known about the extent to which children anthropomorphize God apart from these properties or the extent to which children anthropomorphize religious beings in general. Although many authors have claimed that children's concepts of God are anthropomorphic in nature (e.g., Goldman, 1964; Harms, 1944; Nye & Carlson, 1984), these claims are based on measures of anthropomorphization that lack any means of external validation (e.g., children's drawings of God).

Experiment 2 attempted to remedy this problem by assessing children's religious-being concepts not only in comparison to their fictional-being concepts (which, by all accounts, should be highly anthropomorphic) but also in comparison to their parents' religious-being concepts (which, if similar to college undergraduates' concepts, should be moderately to weakly anthropomorphic).

## Method

## **Participants**

The participants in Experiment 2 were 25 five-year-old children (M=5.6 years, range=5.0 to 6.2 years) and their parents (one per child, typically the mother). The children and their parents were recruited by phone from the greater Boston area and tested at the Harvard Laboratory for Developmental Studies. Two children recruited for the experiment did not know the meaning of the words *fairy* and *angel* and were subsequently replaced (as were their parents). Once again, participants were not asked to disclose their religious affiliations but were instead asked to rate their belief in the existence of particular religious beings.

# Procedure

Similar to Experiment 1, participants were asked to decide whether three types of human properties (psychological, biological, and physical) could or could not be attributed to two types of supernatural beings (fictional and religious). Unlike Experiment 1, participants were asked about the properties of four supernatural beings, rather than eight, and were asked to judge the truth of each property attribution, rather than its sensibility. Both changes were intended to simplify the task for children, and neither change appears to have affected the overall pattern of adults' responses.

The particular supernatural beings that participants were asked to evaluate were fairies, ghosts, angels, and God, and the particular properties that participants were asked to consider in relation to those beings were thinks, talks, dreams, eats, grows, sneezes, sits, stretches, and jumps. The first three were chosen to represent the psychological properties; the middle three were chosen to represent biological properties; and the last three were chosen to represent physical properties. Participants were asked about the applicability of each property in the form of a yes-or-no question (e.g., "Do ghosts eat?", "Do angels stretch?").

Property attributions were elicited from children in the form of an interview but were elicited from adults in the form of a questionnaire. The questions themselves were grouped by being, rather than property, such that participants answered all questions about one supernatural being before answering questions about any other supernatural being. Participants answered each set of questions in a random order, but that order was kept constant across beings in order to reduce confusion. To ensure that children were familiar with the nine human properties selected as stimuli, each child was asked to define (or demonstrate) those properties prior to making property attributions. They were also asked whether each property could or could not be attributed to the control item *kindergarteners*. As expected, children generally attributed all nine properties to this item.

In addition to making property attributions, participants completed three other tasks. First, they described each supernatural being in their own words. Second, they justified their property attributions for all nonattributed properties (i.e., they explained why they thought that certain properties could not be attributed to certain supernatural beings). Third, they reported their belief in the existence of each supernatural being, with parents selecting a belief rating from 1 (no belief) to 7 (strong belief) and children classifying each being as real or pretend. Coding schemes for the first two types of responses are discussed in the Results section in relationship to the actual data collected.

#### Results

# Descriptions

Before participants were asked to make property attributions, they were asked to describe each supernatural being in their own words. A sample of participants' descriptions of the religious beings is displayed in Table 4. These descriptions were taken from six parent-child dyads; each description provided by a child is followed by the description provided by that child's parent. As can be seen from this table, children's descriptions of religious beings (e.g., God is "a person that ruled the whole world once, even the fish") were much more anthropomorphic than their parents' (e.g., God is "the spiritual presence in all things; that which inspires us to be good").

In an attempt to quantify this difference, participants' descriptions were broken into single-predicate properties. For example, the description of angels as "persons that are very little and can fly" was decomposed into the properties "is a person," "is very little," and "can fly." Likewise, the description of angels as "ethereal beings that escort you in Heaven" was decomposed into the properties "is ethereal" and "escorts you in Heaven." Note that placeholder labels, like *entity*, *thing*, or *being*, were not included as

Table 4

Open-Ended Descriptions of the Religious Beings Provided by
Six Different Child-Parent Dyads, Where "C" Refers to the
Child's Description and "P" Refers to the Parent's Description

Being	Dyad	Description
God	1C	"He's a person that ruled the whole world once, even the fish"
	1P	"The spiritual presence in all things; that which aspires us to be good"
	2C	"He made people and stuff; he made cats and dogs."
	2P	"A spirit who is omnipresent, all powerful, and all knowing"
	3C	"Something invisible that Jews pray to"
	3P	"Omnipotent, omnipresent, omniscient entity worshiped in religion"
Angel	4C	"They're like people, people that are birds"
	4P	"Higher forms of light energy that take care of and guide human beings"
	5C	"Persons that are very little and can fly"
	5P	"Ethereal beings that escort you in Heaven"
	6C	"Sort of like a godmother; I haven't seen one yet"
	6P	"Mythical beings who help people in need"

separate properties, for these labels did not have much intrinsic content apart from their modifiers. Also note that clauses like "escorts you in Heaven" were not broken down further (e.g., into "escorts you" and "is in Heaven") if the entire clause was intended to function as a single modifier.

After participants' descriptions had been decomposed accordingly, the properties included within those descriptions were coded as anthropomorphic or nonanthropomorphic depending on whether or not they could be applied to a human. In the above descriptions, for example, the properties "is a person" and "is very little" were coded as anthropomorphic and the properties "can fly," "is ethereal," and "escorts you in Heaven" were coded as nonanthropomorphic. The reliability of this coding scheme was assessed by comparing the outcome of two independent coders (the first author and a research assistant), both of whom were blind to the age of the

participant who had provided each description. Coding proceeded in two stages. First, the two coders independently decomposed each description into its component parts. Overall agreement between coders was 86%, and all disagreements were resolved via discussion. Once a single set of properties had been agreed upon, the two coders independently classified those properties as anthropomorphic or nonanthropomorphic. Overall agreement at this stage of coding was 95%, and all disagreements were once again resolved via discussion.

Displayed in Table 5 are the most common properties included in children's and parents' descriptions of each supernatural being. Three observations can be gleaned from this table. First, participants provided a mixture of anthropomorphic and nonanthropomorphic properties at each age and for each supernatural being. Second, both groups of participants tended to provide the same properties, though not necessarily with the same frequency. Third, many children explicitly analogized supernatural beings to people whereas few parents ever did so.

Participants' descriptions were analyzed by both their length and their content. With respect to length, children provided an average of 2.5 properties per being, and parents provided an average of 2.2 properties per being. Across participants, each fictional being was provided an average of 2.9 properties, and each religious being was provided an average of 1.8 properties. The question of whether children provided approximately the same number of properties as their parents was addressed with a repeated-measures ANOVA in which parent-child dyads were treated as the basic unit of analysis and participant type (child, parent) and being type (fictional, religious) were treated as withindyad factors. This analysis revealed no main effect of participant type and no interaction between participant type and being type. It did, however, reveal a main effect of being type, F(1, 24) = 68.31, p < .001, with participants providing significantly more properties for the fictional beings than for the religious beings. This finding implies that participants were either less knowledgeable about the religious beings or less forthcoming in what they did happen to know.

Table 5
The Properties Most Often Included in Participant's Open-Ended Descriptions of the Supernatural Beings, Ordered by the Number of Participants in Parentheses (out of 25) Who Mentioned That Property

Being	Children's descriptions	Parents' descriptions		
Fairy	Has wings/can fly (12)	Is mythical/imaginary (17)		
•	Is a person/is like a person (10)	Is little (10)		
	Is little (7)	Has wings/can fly (8)		
	Does magic (5)	Lives in forests (7)		
Ghost	Is evil/scary (17)	Is a spirit/soul (12)		
	Is invisible (9)	Is mythical/imaginary (10)		
	Looks like a sheet (7)	Is evil/scary (7)		
	Says "boo" (7)	Has unsettled business (6)		
Angel	Is a person/is like a person (11)	Guides people/guards people (13)		
C	Has wings/can fly (10)	Is a spirit/soul (7)		
	Guides people/guards people (4)	Helps God/serves God (6)		
	Is little (3)	Is a person/is like a person (4)		
God	Created life/the universe (12)	Created life/the universe (10)		
	Is a person/is like a person (6)	Is everywhere (9)		
	Is everywhere (4)	Guides people/guards people (6)		
	Is in Heaven (4)	Is all powerful (5)		

With respect to content, participants' descriptions were analyzed in terms of the proportion of anthropomorphic properties to total properties provided. Across beings, children provided anthropomorphic properties 56% of the time, and parents provided anthropomorphic properties 42% of the time. Across participants, fictional beings were provided anthropomorphic properties 54% of the time, and religious beings were provided anthropomorphic properties 44% of the time. The reliability of these effects was assessed with the same two-factor, repeated-measures ANOVA described above. This analysis revealed a main effect of participant type, F(1, 24) = 8.69, p < .01, and an interaction between participant type and being type, F(1, 24) = 5.49, p < .05, but no main effect of being type.

To explore the interaction between participant type and being type, the proportion of anthropomorphic properties to total properties provided by children was compared to that of their parents for the two types of beings. These analyses revealed that children were no more likely than their parents to provide anthropomorphic properties for the fictional beings but were significantly more likely than their parents to provide anthropomorphic properties for the religious beings, t(24) = 3.45, p < .01. This finding was true both at the level of being type and at the level of individual beings, fairy: t(24) < 1; ghost: t(24) < 1; angel: t(24) = 2.43, p < .05; God: t(24) = 2.57, p < .05. Indeed, children's average proportion of anthropomorphic properties to total properties was, for the religious beings, 1.8 times higher than their parents' average proportion, indicating that children were nearly twice as likely as their parents to anthropomorphize religious beings in their openended descriptions. Complementing these findings, paired-samples t tests run within participants, rather than within dyads, revealed that only parents provided significantly more anthropomorphic properties for the fictional beings than for the religious beings, t(24) = 2.70, p < .05. Children, on the other hand, provided approximately the same proportion of anthropomorphic properties for each.

# Property Attributions

After providing open-ended descriptions, participants decided whether each of nine human properties could be attributed to each of four supernatural beings. Participants' property attributions are displayed in Figure 3 as a function of property type (psychological, biological, physical), being type (fictional, religious), and participant type (child, parent). Like the participants in Experiment 1, parents attributed more human properties to fictional beings than to religious beings, and they attributed more psychological properties than nonpsychological properties to both. Children, on the other hand, attributed as many human properties to religious beings as they attributed to fictional beings, and they attributed as many psychological properties to both.

The property attributions of each group were analyzed separately for effects of property type and being type using repeated-measures ANOVAs. These analyses revealed that both effects were significant for parents, property type: F(2, 48) = 23.23, p < .001; being type: F(1, 24) = 13.36, p < .01, but neither effect was significant for children. Bonferroni comparisons were used to explore the effect of property type on parents' property attributions. These analyses revealed that, consistent with the previous

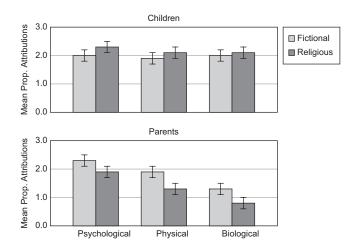


Figure 3. The mean number of psychological, biological, and physical properties (Prop.) attributed to each type of being (fictional, religious) by each type of participant (children, parents) in Experiment 2.

experiment, parents made significantly more psychological attributions than biological attributions or physical attributions. They also revealed that parents made significantly more physical attributions than biological attributions—a departure from the previous experiment, most likely due to differences in the particular non-psychological properties under consideration.

How did children's property attributions differ from their parents' property attributions? This question was addressed with a repeated-measures ANOVA in which participant type (child, parent) was treated as a within-dyad factor and property type (psychological, biological, physical) and being type (fictional, religious) were treated as within-participant factors. This analysis revealed a significant main effect of participant type, F(1, 24) = 10.11, p < .01, with children attributing an overall greater number of properties than their parents (M = 2.2 vs. M = 1.6), as well as significant interactions between participant type and property type, F(2, 48) = 10.30, p < .001, and between participant type and being type, F(1, 24) = 13.62, p < .01.

The interaction between participant type and property type was explored with paired-samples t tests between children's property attributions for each domain (averaged across being type) and their parents' property attributions for those same domains. These analyses revealed a significant effect of participant type for biological properties, t(24) = 5.29, p < .001, and physical properties, t(24) =2.48, p < .05, but not psychological properties. In other words, children made approximately the same number of psychological attributions as their parents did but made significantly more biological and physical attributions than their parents did. The interaction between participant type and being type was explored with paired-samples t tests between children's property attributions for each being (averaged across property type) and parents' property attributions for those same beings. These analyses revealed a significant effect of participant type for the religious beings, t(24) = 4.74, p < .001, but not the fictional beings. Thus, the difference between children's and parents' property attributions was greater for nonpsychological properties than for psychological ones and greater for religious beings than for fictional ones.

The latter finding was observed not only at the level of being type but also at the level of individual beings. Summed across domain, children attributed an average of 7.4 properties to fairies (SD = 1.7), 5.0 properties to ghosts (SD = 3.1), 7.1 properties to angels (SD = 1.5), and 6.5 properties to God (SD = 3.3). Parents, on the other hand, attributed an average of 6.4 properties to fairies (SD = 3.2), 4.6 properties to ghosts (SD = 2.9), 4.4 properties to angels (SD = 2.9), and 3.4 properties to God (SD = 3.1). Pairedsamples t tests between children's and parents' property attributions to the same being revealed a significant effect of participant type for angels, t(24) = 4.11, p < .001, and God, t(24) = 4.27, p < .001.001, but not for fairies or ghosts. Children thus anthropomorphized each fictional being to the same extent as their parents did but anthropomorphized each religious being to a significantly greater extent than their parents did. Note that these findings closely parallel those obtained from the content analyses of participants' open-ended descriptions, summarized in the previous

To assess individual differences in participants' overall rates of anthropomorphism, total property attributions to each supernatural being were compared using Pearson's correlations. These correlations, which are displayed in Table 6, revealed a high degree of consistency among both children's property attributions and their parents'. The average correlation among children's property attributions was 0.57, and the average correlation among parents' property attributions was 0.55. Thus, like the participants in Experiment 1, the participants in Experiment 2 tended to attribute similar numbers of properties to all supernatural beings, with some participants exhibiting a greater propensity to anthropomorphize supernatural beings than others.

Interestingly, participants' propensity to anthropomorphize supernatural beings in the property-attribution task was significantly correlated with their propensity to anthropomorphize those same beings in the description task (as measured by the proportion of anthropomorphic properties to total properties) for two of the four supernatural beings: angels (children: r = .42, p < .05; parents: r = .50, p < .05) and God (children: r = .50, p < .05; parents: r = .41, p < .05). These correlations suggest that both tasks happened to probe the same underlying concepts, at least for the religious beings.

## **Justifications**

Whenever a participant decided that a particular property could not be attributed to a particular being, he or she was asked to

Table 6
Correlations Among Participants' Overall Property Attributions to the Supernatural Beings in Experiment 2

Group	Being	Fairy	Ghost	Angel	God
Children	Fairy Ghost Angel God	1.00	.70** 1.00	.64* .40* 1.00	.72** .48* .51** 1.00
Parents	Fairy Ghost Angel God	1.00	.52** 1.00	.52* .86** 1.00	.19 .64** .60** 1.00

<sup>\*</sup> p < .05. \*\* p < .01.

justify that decision. These justifications were sorted into three categories: those that referenced physiological distinctions between human beings and supernatural beings (e.g., God does not eat because "God has no mouth"), those that referenced ontological distinctions between human beings and supernatural beings (e.g., God does not eat because "God is not a mortal in need of sustenance"), and those that referenced information irrelevant to the comparison of human beings and supernatural beings (e.g., "I don't know," "no one knows," "fairies aren't real," "I don't believe in God"). The reliability of this coding scheme was assessed by comparing the exhaustive classifications of two independent coders, blind to the age of the participants who had provided each justification. Overall agreement between coders was 90%, and all disagreements were resolved via discussion.

Summed across beings and across properties, children provided physiological justifications 54% of the time, ontological justifications 7% of the time, and uninformative justifications 39% of the time. Parents, on the other hand, provided physiological justifications 14% of the time, ontological justifications 60% of the time, and uninformative justifications 26% of the time.

Because participants were asked to justify nonattributions only, different participants provided different numbers of justifications, ranging anywhere from 0 to 36. Thus, in order to compare justifications across individuals, absolute frequencies were converted to relative frequencies by dividing the frequency with which a particular type of justification was provided by the total number of justifications provided. Paired-samples t tests between children's justification frequencies and their parents' revealed that, although both groups provided approximately the same number of uninformative justifications, children provided significantly more physiological justifications than their parents, t(21) = 3.76, p < .01, and significantly fewer ontological justifications, t(21) = -6.36, p <.001. It should be noted that these analyses excluded three parentchild dyads for which at least one member of the dyad attributed all nine human properties to all four supernatural beings, thereby eliminating the possibility of providing any justifications. It should also be noted that it was not possible to analyze justifications by property type or being type given vast discrepancies in the overall number of justifications provided.

Consistent with the description data and the property-attribution data, these justification data suggest that children's supernaturalbeing concepts are, overall, more anthropomorphic than their parents. Whereas children typically justified their judgments by appealing to the absence of specific human body parts (e.g., mouths, noses, knees, legs, arms, brains), adults typically justified their judgments by appealing to ontological distinctions that obscure the relevance of a human body altogether. For instance, 22% of parents' justifications referenced the distinction between material things and immaterial things (e.g., "ghosts are noncorporeal," "God does not take a physical form"), 16% referenced the distinction between living things and nonliving things (e.g., "angels are nonliving energy forms," "God has no mortal needs"), 5% referenced the distinction between mutable things and immutable things (e.g., "ghosts are frozen in time," "angels are in a constant state forever"), and 17% referenced a general, categorical distinction between human beings and supernatural beings (e.g., "God is not a person," "you cannot associate angels with human beings"). Thus, whereas children's justifications tended to presuppose a

PERSON ontology, adults' justifications tended to deny the relevance of such an ontology altogether.

# Belief Ratings

Following the property-attribution task, parents rated how strongly they believed in the existence of each supernatural being on a scale from 1 (not at all) to 7 (very strongly), and children classified each being as real or pretend. As expected, parents' average belief ratings for the religious beings were significantly higher than their average belief ratings for the fictional beings, M = 1.0 vs. M = 4.0; t(24) = 6.19, p < .001. Broken down by being, their average belief ratings closely resembled those obtained in the previous experiment: 1.6 for fairies (SD = 1.1), 3.1 for ghosts (SD = 2.1), 4.2 for angels (SD = 2.6), and 5.4 for God (SD = 2.4).

Replicating previous research on children's beliefs about the reality of unobserved entities (e.g., Harris, Pasquini, Duke, Asscher, & Pons, 2006; Sharon & Woolley, 2004), children tended to classify the religious beings as real and the fictional beings as pretend. That is, 72% claimed that God is real, 64% claimed that angels are real, 48% claimed that fairies are real, and 16% claimed that ghosts are real (the rest claimed that each being is pretend). Point-biserial correlations between children's reality judgments and their parents' belief ratings revealed that children were more likely to classify a religious being as real if their parents also believed that being was real, angels: r(25) = 0.56, p < .01; God: r(25) = 0.44, p < .05. Apparently, children adopt their parents' beliefs about the existence of religious beings even if they do not adopt their parents' beliefs about the properties of those beings.

Within-participant correlations between belief ratings and property attributions were less meaningful in Experiment 2 than in Experiment 1 because participants evaluated only four supernatural beings, not eight. Still, for consistency's sake, these correlations were computed for the 18 adult participants who exhibited variability in both measures. The resultant distribution of correlation coefficients were similar to those obtained in previous experiments: 83% were less than zero, 67% were less than -0.30, and 50% were less than -0.60. Computed over only four data points, none reached statistical significance, yet the direction of these correlations was highly consistent nonetheless.

Similar analyses were conducted for children, though they revealed no systematic relationship between a child's property attributions and his or her reality judgments. Of the 16 children who judged at least one being real and at least one being pretend, 69% attributed more properties to the beings they judged real than to the beings they judged pretend, and 31% attributed more properties to the beings they judged pretend than to the beings they judged real. The overall difference in these means was not statistically significant.

## Discussion

The findings of Experiment 2 replicate and extend the findings of Experiment 1. Like the college undergraduates in Experiment 1, the parents in Experiment 2 attributed more human properties to fictional beings than to religious beings, and they attributed more psychological properties than nonpsychological properties to both. Five-year-old children, on the other hand, attributed as many

human properties to religious beings as they attributed to fictional beings, and they made no distinction between psychological properties and nonpsychological properties. Children were also more likely than their parents to justify their property attributions by appealing to physiological differences, rather than ontological differences, between human beings and supernatural beings. This developmental shift was observed not only in the closed-ended property-attribution task but also in the open-ended description task, where children anthropomorphized fictional beings to the same extent as their parents but anthropomorphized religious beings to a significantly greater extent.

These results suggest that fictional-being concepts are constant across development but that religious-being concepts are not. Whereas the former remain highly anthropomorphic, the latter transition from being highly anthropomorphic to being only moderately (or weakly) anthropomorphic. Indeed, children tended to anthropomorphize religious beings to a greater extent than the very individuals who had taught them about those beings in the first place: their parents. One explanation for this finding is that parents and other adults might attempt to teach children anthropomorphic concepts of religious beings before attempting to teach them the abstract concepts they actually endorse. An alternative explanation is that children might be exposed to both types of concepts from an early age but fail to understand the abstract ones, possibly imposing upon these concepts their own anthropomorphic interpretations. This second explanation is consistent with the informal observation that children were more reluctant to provide openended descriptions of the religious beings than they were to provide open-ended descriptions of the fictional beings. Analyses of child-directed speech, like those contained in the database of the Child Language Data Exchange System (CHILDES, http:// childes.psy.cmu.edu/), could help determine which explanation, if either, is correct.

The difference between children's and parents' concepts of religious beings is particularly interesting in light of the similarity between children's and parents' beliefs about the existence of those beings. Apparently, beliefs about the existence of religious beings are more easily transmitted than beliefs about the properties of those beings—a finding that challenges commonsense views of religious indoctrination that do not make a distinction between these two types of information. For instance, religious skeptics from Freud (1927/1961) to Dawkins (1993) have argued that most individuals acquire their religious beliefs before they are capable of questioning those beliefs and, once capable, refuse to do so because the beliefs themselves have become too deeply entrenched in the individual's overall worldview. In other words, religious concepts are thought to be unanalyzed remnants of childhood credulity. The findings of the present study are inconsistent with this claim, for even though children's beliefs about the existence of religious beings may remain constant across development, their beliefs about the properties of those beings do not (at least with respect to the beings' human properties; see Knight et al., 2004, for examples of nonhuman properties that are attributed to God by both children and adults).

The fact that children differentiated religious beings from fictional beings in their reality judgments but did not do so in their property attributions suggests that conceptualizing religious beings in an abstract, nonanthropomorphic manner is not necessary for acquiring belief in the existence of such beings. Nevertheless, conceptualizing religious beings in such a manner may be necessary for retaining belief in the existence of such beings, at least for individuals bothered by the theoretical inconsistencies inherent in an anthropomorphic concept. For such individuals, it may be necessary to distance religious beings from human beings, either by restricting the scope of the inferential relationship between the two types of concepts or by severing that relationship altogether.

#### General Discussion

Anthropomorphic theories of supernatural concepts, once dismissed as explanatorily unsatisfying (see Guthrie, 1993), have regained popularity in recent years. In particular, Boyer's (2001, 2003) claim that individuals conceptualize supernatural beings as persons with counterintuitive properties has become a cornerstone of the newly emergent cognitive science of religion. Although this theory has helped to explain the cultural transmission of supernatural concepts, it has made a mystery of (a) why some such concepts are more believable than others and (b) why some such concepts are represented in art, literature, and discourse more anthropomorphically than others. The present study has attempted to draw empirical attention to these problems by making explicit four types of variation in the mental representation of supernatural beings neither predicted by, nor consistent with, Boyer's theory. Those four types of variation are (1) variation across beings, (2) variation across properties, (3) variation across individuals, and (4) variation across development.

# Variation Across Beings

In both experiments described above, adults anthropomorphized fictional beings, like fairies and vampires, more strongly and more consistently than they anthropomorphized religious beings, like God and Satan. Anthropomorphization varied not only as a function of "being type" (i.e., fictional beings vs. religious beings) but also as a function of self-reported belief. That is, the more a participant tended to believe in the existence of a supernatural being, the less he or she tended to anthropomorphize that being. Figure 4, which displays a frequency distribution of all within-participant correlations between belief ratings and property attributions for individual participants (n=72), demonstrates exactly how robust this finding is. Across the two experiments, participants' r's averaged -0.38, and almost all were less than zero. In

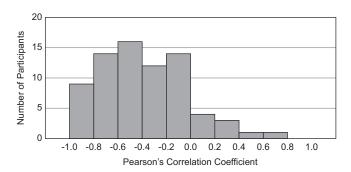


Figure 4. Frequency distribution of the Pearson's correlation coefficients between belief ratings and property attributions for all adult participants in Experiments 1 and 2.

other words, almost all adult participants attributed fewer human properties to the beings they found believable than to the beings they found unbelievable. This finding is problematic for Boyer's (2001, 2003) theory not only because the theory is unable to accommodate variations in conceptualization but also because the theory is meant to be a theory of religion, or, as Boyer (2001) explains, a theory of "those supernatural concepts that *matter*" (p. 137, italics in original). Clearly, the supernatural concepts that mattered most to the participants in the present study are the concepts that conformed least well to the theory.

# Variation Across Properties

Regardless of the particular properties at hand, adult participants attributed more psychological properties to the supernatural beings than biological or physical properties. This finding is important given that Boyer's (2001, 2003) theory makes no a priori distinction between different types of human properties. Although it is possible that this finding is an artifact of the particular supernatural beings used as stimuli, this possibility is unlikely for two reasons. First, two of those beings-zombies and God-possess counterintuitive properties relevant to human psychology (i.e., mindlessness and omniscience, respectively) yet were still attributed more psychological properties than nonpsychological ones by the participants in Experiment 1. Second, one would be hard-pressed to find supernatural beings that are not conceptualized, first and foremost, as intentional agents, for supernatural beings are typically alleged to communicate with human beings and must therefore possess the mental capacity to engage in this type of interac-

### Variation Across Individuals

If all supernatural-being concepts are predicated on a common ontology—PERSON—then all individuals should rely on that ontology to a similar extent when drawing novel inferences about known supernatural beings. Yet, contrary to this prediction, participants in both experiments appeared to rely on that ontology to varying extents, as evidenced by robust intercorrelations among their overall property attributions to different supernatural beings. These individual differences, which were observed among both children and adults, suggest that the inferential relationship between human-being concepts and supernatural-being concepts can take different forms for different individuals.

# Variation Across Development

In all experiments, adults consistently attributed more human properties to fictional beings than to religious beings and attributed some types of human properties (i.e., psychological properties) more frequently than others (i.e., biological and physical properties). Children, on the other hand, did not make either of these conceptual distinctions. Instead, they attributed a majority of the human properties to all supernatural beings, fictional or religious. In fact, the only properties children refrained from attributing to the supernatural beings were those explicitly acknowledged to be inconsistent with the beings' nonhuman properties (as evidenced by their justifications). This response pattern, though qualitatively different from the response pattern provided by adults, is exactly

what is predicted by anthropomorphic theories like Boyer's (2001, 2003). In other words, adults should have provided the same response pattern as children—attributing all human properties to a supernatural being except for those few that are blocked by the being's explicitly represented counterintuitive properties—if we take seriously the claim that supernatural beings are conceptualized as special kinds of persons. Although it is possible that adults from other cultures, socioeconomic classes, or educational backgrounds might provide response patterns more similar to those provided by children, the fact that adults in the present study did not provide such response patterns undermines the universality of Boyer's claim.

# Possible Objections

Having reviewed four types of variation inconsistent with anthropomorphic theories of supernatural-being concepts, we shall now turn to two objections a proponent of such theories might make. First, one could appeal to the distinction between implicit and explicit religious concepts (Boyer, 2003; Pyysiainen, 2004; Slone, 2004), objecting that the present study probed participants' explicit concepts, which, by virtue of their "theological correctness," are less anthropomorphic than participants' implicit concepts of the same beings. Consequently, participants might have anthropomorphized religious beings to the same extent that they anthropomorphized fictional beings if they had been given a less transparent task, like the story-recall task used by Barrett and Keil (1996).

The problem with this objection is that differences in the methodology between the present study and Barrett and Keil's (1996) study did not appear to affect participants' propensity to anthropomorphize God. Indeed, the average percentage of human properties attributed to God in Experiments 1 and 2 of the present study (40% and 38%, respectively) were quite similar to the average percentage of anthropomorphic intrusions in Experiments 1 and 2 of Barrett and Keil's study (55% and 38%, respectively). Thus, Barrett and Keil's claim that individuals hold two concepts of God—an abstract concept used in deliberate, theological reasoning and an anthropomorphic concept used in spontaneous, everyday reasoning—may be somewhat overstated given the similarity between their findings and the findings reported here. It is also worth noting that the general distinction between implicit and explicit knowledge, though initially popular in areas of cognition faced with a discrepancy between what people appear to know and what people say they know (e.g., artificial-grammar learning, metacognitive development) has not faired well under increased empirical scrutiny (see Shanks & St. John, 1994; Vinter & Perruchet, 2000; Whittlesea & Wright, 1997).

Second, one could appeal to a distinction between the counterintuitive properties characteristic of religious beings and the counterintuitive properties characteristic of fictional beings, objecting that the former (e.g., "has no body") block more anthropomorphic inferences than the latter (e.g., "has wings"). The problem with this objection, aside from the fact that the religious beings tended to possess many of the same counterintuitive properties as the fictional beings, is that it calls into question the very meaning of a minimally counterintuitive concept. Whereas a positive property like "has wings" blocks a handful of anthropomorphic inferences (e.g., "is likely to walk") and licenses a handful of nonanthropomorphic inferences (e.g., "is likely to fly"), a negative property like "has no body" blocks a far greater quantity of anthropomorphic inferences (i.e., all inferences regarding human physiology) and licenses a far greater quantity of nonanthropomorphic inferences (i.e., all inferences regarding immaterial substances). Certainly, one could accommodate the findings of the present study by refining what counts as a counterintuitive property or what counts as a minimally counterintuitive concept, but such attempts are likely to undermine the inferential work a conceptual template like "PERSON + counterintuitive properties" is supposed to do in the first place.

# Three Alternative Proposals

If adults do not generally conceptualize supernatural beings as persons with counterintuitive properties, then how do they conceptualize them? At least three possibilities are proposed. First, some adults may represent information about supernatural beings using an ontology inclusive of, but not restricted to, humans—namely, the ontology INTENTIONAL AGENT (see Dennett, 1987; Johnson, 2000; Premack, 1990). Whereas having a mind would allow these beings to maintain their identity as social partners, not having a body would free them from the biological and physical constraints that govern other types of human activity. Interestingly, Boyer makes a similar proposal in the following passage:

Note that gods and spirits are not represented as having *human* features in general but as having *minds*, which is much more specific. People represent supernatural beings who perceive events, have thoughts and memories and intentions. But they do not always project onto these agents other human characteristics, such as having a body, eating food, living with a family or gradually getting older. Indeed, anthropologists know that the *only* feature of humans that is *always* projected onto supernatural beings is the mind. (Boyer, 2001, p. 144, italics in original)

This proposal is consistent with the findings of the present study, yet it is not consistent with the proposal that we represent supernatural beings as "PERSONS + counterintuitive properties." Here, and elsewhere, Boyer treats the ontologies PERSON and INTENTIONAL AGENT as interchangeable, but the former is actually inclusive of the latter. That is, all people are intentional agents, but not all intentional agents are people. Indeed, we regularly construe nature (White, 1992), computers (Nass & Moon, 2000), groups of individuals (Bloom & Veres, 1999), and animated shapes (Heider & Simmel, 1944) as intentional agents without construing them as full-fledged persons. There is currently no evidence that the attribution of a human psychology entails the attribution of a human physiology as well, and, without such evidence, it is theoretically irresponsible to claim that supernatural-beings concepts are predicated on a PERSON ontology when emphasizing their counterintuitiveness but claim they are predicated on an INTENTIONAL AGENT ontology when emphasizing their naturalness.

A second possibility for how individuals might conceptualize supernatural beings nonanthropomorphically is that they might use multiple ontologies—or, more precisely, multiple metaphors—to structure the same concept. For instance, one might use the metaphor "God is a person" to reason about God's intentions but use

the metaphor "God is light" to reason about God's physical form. This proposal is similar to Barrett and Keil's (1996) proposal that individuals have two concepts of God, yet it differs from their proposal in that individuals are purported to hold multiple metaphors, not multiple concepts. This proposal is therefore more akin to what Lakoff and Johnson (1980) have termed "metaphoric representation," or the use of multiple, concrete metaphors to structure a single, abstract concept like time (e.g., time is money, time is a moving object) or love (e.g., love is a journey, love is a war). Supernatural concepts are prime candidates for this type of representation, given the imperceptibility of their referents, yet further research is needed to determine whether they are actually represented in this manner.

A third possibility for how individuals might conceptualize supernatural beings nonanthropomorphically is that they might create a new ontology altogether. That is, some adults might attempt to restructure their religious concepts by reanalyzing the relations among their properties, coalescing previously distinct properties and differentiating previously indistinct properties as they might do in the creation of new scientific ontologies (see Carey, 1999; Nersessian, 2002; Thagard, 1992). The creation of new religious ontologies is presumably the kind of work that theologians undertake and the kind of work that yields new public representations of preexisting religious concepts. Studies of novice-expert shifts in religious cognition might shed light on the extent to which religious concepts can be (and have been) restructured, as well as the mechanisms by which such restructuring occurs.

#### Conclusion

The findings presented in this article highlight four dimensions of variation in individuals' mental representations of supernatural beings and how this variation corresponds to variation in belief. These findings do not, however, undermine the claim that supernatural concepts can, and should, be studied in relation to ordinary cognition (e.g., Atran, 2002; Barrett, 2000; Boyer, 1994). Indeed, all of the aforementioned proposals for how individuals might conceptualize supernatural beings without the use of a PERSON ontology are consistent with this objective. Rather than postulate evolutionarily implausible inference mechanisms, like Alper's (2001) God module, these proposals postulate relationships between supernatural-being concepts and inference mechanisms already known to be involved in ordinary cognition-namely, intentional attribution, metaphoric representation, and conceptual change. Given that much is already known about the development of each mechanism, research exploring the relationship between children's inferential capabilities and the nature of their supernatural-being concepts would appear quite promising. Such research might ultimately broaden our view of the kinds of concepts-supernatural or otherwise-that humans are capable of forming.

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