

The Minds of God, Mortals, and In-betweens: Children's Developing Understanding of
Extraordinary and Ordinary Minds across Four Countries

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Abstract

Several theory-of-mind (ToM) studies have explored how children differentiate ordinary minds (humans, dogs) and extraordinary minds (God, spirits), but these studies have yielded divergent results and interpretations and have not offered cross-cultural comparisons of samples. To address these limitations, children (3-5 years old) in four different countries (United Kingdom, Israel, Dominican Republic, and Kenya) were given a knowledge-ignorance ToM task and asked to reason about the minds of various ordinary and extraordinary minds, depending upon the culture. All children were asked about a human and God. Results revealed within-group differences based upon age for the human and for God for some samples, but not all; and results showed between-group differences for how children treated God's mind and human minds (as well as other extraordinary minds). The within-group different response patterns across age is not surprising if ToM is considered a developmental accomplishment, improving with age. But the differences in response patterns between samples points to a larger role culture plays for children's understandings of extraordinary minds such as God's.

Fundamental to children's ability to understand the social world is the development of theory of mind (ToM), that is, the ability to read the intentions, desires, beliefs, knowledge, perspectives, or mental states of others (Flavell, 2004; Wellman, Cross, & Watson, 2001). Thirty-five years of research has revealed an increasingly complex picture of ToM development, and more recently, ToM studies have begun to take seriously a broader understanding of the social world, a world including nonhuman minds: pets, wild animals, gods, angels, spirits, even fictional characters and imaginary friends are just some of the other types of minds that may populate a child's socio-cultural landscape. Given that some of these minds that are believed to possess extraordinary powers (e.g., God knows what is in your heart; an angel announces the future), this research is particularly relevant to the development of religious beliefs in children.

Even so, the research into these nonhuman and extraordinary minds (Barrett, Newman, & Richert, 2003; Barrett, Richert, & Driesenga, 2001; Giménez-Dasí, Guerrero, & Harris, 2005; Kiessling & Perner, 2014; Knight, 2008; Knight, Sousa, Barrett, & Atran, 2004; Lane, Wellman, & Evans, 2010, 2012; Makris & Pnevmatikos, 2007; Nyhof & Johnson, 2017; Richert & Barrett, 2005; Richert, Saide, Lesage, & Shaman, 2017; Wigger, Paxson, & Ryan, 2013) has yielded conflicting results, various interpretations, and little cross-cultural comparison. For example, in some cases (detailed below) children understood God's mind like a human's mind; in other cases, children differentiated God's mind from a dog's or human's. And with the exception of two studies with Mayan children (Knight, 2008; Knight et al., 2004) and another with Indonesian children (Nyhof & Johnson, 2017) this research has generally suffered from a lack of attention to socio-cultural context. Not only does this narrow focus potentially distort a fuller understanding of ToM development across various cultures, it obscures ToM development in relation to particular extraordinary minds indigenous to a culture. For example, ancestor spirits of the dead are extremely important in

some cultures (such as in Kenya, described below). How do children reason about their minds? Or, do Orthodox Jewish children think of God's mind the way Protestant Christian children treat God's mind? Theological differences and religious formation could lead to different understandings of "God." The present study is an attempt to take cultural particularity seriously by comparing children's responses in a ToM task from four very different locations: the Dominican Republic, Israel, Kenya, and the United Kingdom. This exploration takes seriously the role of the very social world that ToM opens to a child.

Nonetheless, it could be the case that similar response patterns exist despite culture or type of mind, suggesting a relatively universal phenomenon. Perhaps young children everywhere, early in development, think about other minds—whether God's or another human's—in generally the same way. For example, it might be that children egocentrically project their own minds (knowledge, intentions, feelings) upon any other mind until they are older and can differentiate their own minds from others. Or it could be that a young child anywhere around the world intuitively assumes that others know things, have a fuller grasp of the world (leading to all those "why" questions young children ask). Either possibility would suggest a trans-cultural phenomenon.

But it could be the case that children's understandings of extraordinary minds is deeply impacted by the beliefs, practices, stories, and rituals of a culture. Perhaps even young children perceive God and angels as less limited by time and space—having more powerful minds—than ordinary mortals. Or perhaps this is true in some cultures but not others. Such differences would suggest a stronger influence from the social world and more flexible and various patterns in ToM development.

Background: ToM Studies with Extraordinary Agents

Over three decades of research suggest that a representational understanding of human minds

has some intuitive basis already evident in infancy (Csibra, Gergely, Biro, Koos, & Brockbank, 1999; Gergely & Csibra, 2003; Gopnik & Seiver, 2009; Rochat, Morgan, & Carpenter, 1997), and that a stable and robust representation develops around the age of 5 (e.g., Wellman et al., 2001). However, research regarding children's developing understanding of non-human minds is still relatively new. In one of the earliest ToM studies to examine children's conceptualizations of the knowledge of extraordinary minds, Barrett et al. (2001) gave 3- to 8-year-old children a surprising-contents false-belief task. Children were shown that a cracker box contained rocks instead of crackers and that a brown bag contained crackers. They were asked where a mother, bear, snake, tree, and God would look first if each wanted crackers. Results demonstrated that children of any age overwhelmingly responded that God would know the crackers are in the brown bag. But the younger children attributed such knowledge to the minds of the other agents as well—a bear or snake would know too. Only 5- to 8- year-olds responded that the other agents would be ignorant and look in the cracker box whereas God would know what was in the box. Subsequent studies have generally replicated the findings of Barrett and colleagues (Barrett et al., 2003; Knight, 2008; Knight et al., 2004; Nyhof & Johnson, 2017; Richert & Barrett, 2005; Wigger et al., 2013) in that young children tended to attribute knowledge to all minds—God, dogs, bees, imaginary friends, and Mayan forest spirits for example. These have been helpful studies for better appreciating that children as young as 5 are capable of differentiating an ordinary mind like a dog's from a mind like God's, an ability Piaget (1929) thought developed in later childhood.

Even so, other studies using different ToM tests have shown another pattern. Makris and Pnevmatikos (2007), among Greek Orthodox children, gave two different ToM tests to children. In one test, they also found the same pattern as above when employing a false-belief test (children knew a toy was in a box). If the young child knew, a doll and God would also know. But in a second ToM test, a knowledge-ignorance task, they found a different pattern.

When the child was not shown the contents of a box, 3-year-olds attributed ignorance to the doll and to God at high rates. So, when the children knew something, they thought others would know; when the children were ignorant, they thought others would not know, even God. Subsequent research has demonstrated a similar pattern (Kießling & Perner, 2013; Lane et al., 2010; 2012; and see Heiphetz, Lane, Waytz, & Young, 2016, for a review, and see also Barlev, Mermelstein, & German, 2017, for work with adults).

One reason for this variation may be that young children are simply incapable of reasoning about other minds. They cannot imagine another point of view than their own. Or it could be that they are capable of doing so, but the “curse of knowledge” (Birch, 2005; Birch & Bloom, 2003) overwhelms their reasoning abilities. If children know the contents of a box, this knowledge of reality may be too great to reason more accurately, a dynamic related to the development of executive function in children (Sabbagh, Xu, Carlson, Moses, & Lee, 2006). The less developed a child’s executive function, the stronger the pull of reality. But in a knowledge ignorance test, there is no pull, no knowledge that has to be suppressed while reasoning about other minds.

Knowledge ignorance tasks, therefore, may be particularly useful for exploring whether young children across different cultures consistently attribute ignorance to others. If they do, there is strong evidence that young children are simply projecting their own knowledge states upon other minds, despite cultural messages or religious formation that may even intentionally teach that, for example, “God knows everything.” But if there is variability between cultures, then a child’s developing ToM may be more flexible and open to influence from the social world. In this case, there would be strong motivation for investigating further potential factors impacting the developing ToM, if not the religious and cultural imagination.

Cross-cultural research into children’s understanding of human (only) minds already suggests some variation, with children demonstrating a robust understanding of other minds

(e.g. by passing a false-belief test) as early as 3.5 years and as late as 7 years, depending upon the country or even location within the same country (Lillard, 1998; Liu, Wellman, Tardif, & Sabbagh, 2008; Shahaieian et al., 2014; Tardif, Wellman, & Cheung, 2004; Wellman et al., 2001). Children raised in US and Australia, for example, generally understand others can have different beliefs from their own earlier than children raised in Iran (Shahaieian, Nielsen, Peterson, Aboutalebi, & Slaughter, 2014; Shahaieian et al., 2014; Shahaieian, Peterson, Slaughter, & Wellman, 2011) or China (Wellman, Fang, Liu, Zhu, & Liu, 2006). The rationale given for the differences is cultural, based in the different values of their communities, such as high levels of tolerance for disagreement (US and Australia) or emphasis upon family unity (Iran and China).

Nevertheless, no published study has directly compared children's responses for various extraordinary minds from different countries. If early conceptualization of human minds is shaped by socio-cultural factors, we might expect there to be variation in how children think about a variety of non-human extraordinary minds. Exposure to extraordinary minds, such as God or ancestor spirits, requires both particular linguistic and socio-cultural experience that exposure to ordinary human or animal minds does not. Ordinary human minds are relatively visible, present, and vocal, while extraordinary minds are less available, often known only indirectly through testimony, rituals, and practices (Bergstrom, Moehlmann, & Boyer, 2006; Harris & Koenig, 2006).

The Present Study

The present study explores ToM patterns of development within and across four diverse samples. Children 3-5 years of age were given a knowledge-ignorance test that required them to reason about both ordinary (human) minds and extraordinary (nonhuman) minds. We chose two Protestant Christian samples (the DR and Kenya) for comparisons with the UK (the sample most resembling prior studies), so that some degree of group-level

comparison could be drawn. We also chose a Jewish sample from Israel as a comparison to all three Christian ones. Both Jewish and Christian traditions claim that God is all-powerful and all-knowing God, but there are key differences between the traditions. The fact that the Christian tradition claims that God became human (Jesus), complicates the distinction between human and nonhuman minds, and this could confuse children. Jewish children may not have this confusion. Similar work among Muslim children showed clear differentiation in their attributions of knowledge to God and humans compared to Christian children (Richert et al., 2017). Thus, a child's developing concept of God may differ according to his/her religious tradition and its cultural frames for describing God.

We also included diverse types of minds for each culture. As in much previous research, all children were asked about a human and God. As an exploratory analysis, we also asked children about other extraordinary minds specific to their cultural context. For example, the DR children are taught both formally and informally about the protection of angels; and the Kenyan children are also taught informally about the involvement of ancestor spirits in various aspects of life. Angels and ancestors are culturally-endorsed extraordinary beings but may or may not necessarily be all-knowing in the same ways as God is considered to be. They were chosen in part because of the studies by Knight (2008) and Wigger et al. (2013) who found several "in-between" minds (Mayan spirits, Sun, imaginary friends): minds that were less likely to have special knowledge than God, but more likely to compared to humans or animals (see also Greenway et al. 2017).

Method

Participants and Countries

Overall, 243 children participated in the study.

Dominican Republic. Fifty-one children (28 girls, 23 boys; 3:0 to 5:11; $M = 3.96$, $SD = .85$) were interviewed. Age groups by year were: 3s ($n = 19$), 4s ($n = 15$), and 5s ($n = 17$).¹ Children were drawn from three different Protestant schools within one hundred miles of the capital. Protestant denominations are a religious minority (18%) in the country, with Catholicism (69%) being the official religion (USDOS, 2013). Most parents of the children had no secondary education (high school). The children we interviewed receive religious instruction weekly in church, hear daily readings from the Bible in school, and biblical lessons are often integrated into other studies. Children lived in an area where there are high rates of poverty, with an average annual income for the country of about \$5500 (UNICEF, 2014). All children completed the task in Spanish.

Israel. Sixty-four children (39 girls, 25 boys; 2:11 to 5:6; $M = 4.26$, $SD = .87$) from Jerusalem, Israel participated. Children were recruited via fliers at local synagogues and with the help of the members of each synagogue. Age groups by year were: 3s ($n = 23$), 4s ($n = 18$), and 5s ($n = 23$). Israeli children all identified as Modern Orthodox Jewish and are currently practicing the Jewish faith². Children participated in weekly Shabbat services and most went to mandatory religious classes once a week. Children received informal religious education at home. Parents of children were from middle income families, and were highly educated with one parent having at least an undergraduate degree.

The tasks were conducted in the language (English or Hebrew) with which the child was most comfortable. Thirty-six children chose to participate in Hebrew.

¹ A limitation is that birthdays were not celebrated among the households of the children interviewed in either Kenya or the Dominican Republic. Ages (in years only) were provided by the schools and, we believe, represent a reasonably accurate method of grouping the children developmentally. Nonetheless, great caution will be exercised when drawing general conclusions based upon specific age.

² We chose Modern Orthodox Jewish Israeli participants because of their potential openness to discussing religion and participating in these experiments. Modern Orthodox Judaism emerged in response to nineteenth-century tensions within Judaism concerning the degree to which embrace or reject modern, secular culture. Modern Orthodox Judaism seeks to adhere “to traditional religious commitments while at the same time [to] embrace, albeit ambivalently, many aspects of modern culture” (Cohen-Malayev, Assor, & Kaplan, 2009, p.237).

Kenya. Fifty-seven Luo children (29 boys, 28 girls; 3:0 years to 5:11 years; $M = 4.08$ years, $SD = .85$) were interviewed. Age groups by year were: 3s ($n = 18$), 4s ($n = 16$), and 5s ($n = 23$). Children were recruited from a Protestant school in a rural, agrarian village outside of Kisumu, Kenya, a city on a northeastern bay of Lake Victoria in the Nyanza province. The Luo are one of over fifty ethno-linguistic groups of Kenya. The children are all Christian but practice traditional cultural customs, including practices related to ancestor spirits. Children generally start school between 3 to 4 years and the curriculum includes Christian religious education. While English and Swahili are both national languages of Kenya, these children primarily spoke Luo in homes, school, and in church, and was the language chosen in which to participate by all the children.

These children lived in some of the poorest villages and families in the region. The area has been hit particularly hard by HIV/AIDS at a rate of 13.9% (UN data 2012) and the post-election violence of 2007-2008 during which over 1,100 died and over 600,000 were displaced (Humans Rights Watch, 2011). Nearly half of the Kenyan population lives under the international poverty line of \$1.25 per day and over half of children suffer from malnutrition (UNICEF, 2013). Most of the parents of the children had little to no secondary education; many did not complete primary school.

United Kingdom. Seventy-one children (33 girls, 38 boys; 3:0 to 5:11 years; $M = 4.26$, $SD = .89$) were interviewed from towns in both the midlands of England and in the Southeast of Scotland. Children were recruited via local nurseries, playgroups, and church groups. Age groups were: 3s ($n = 26$), 4s ($n = 24$), 5s ($n = 21$). We sampled British children to directly compare any methodological issues with previous samples collected in Western, and historically “Christian,” cultures (Lane et al., 2012; Makris & Pnevmatikos, 2007). All children were from Protestant homes, where children attended church once a week, and were given informal religious education at home. Children sampled were from middle to high

income families, with parents who were highly educated and who had obtained at least an undergraduate or graduate degree. All children spoke English.

Procedure

Interviews were conducted in a quiet area of a child's home (UK, Israel), nursery (UK, Israel), school (DR, Kenya), or synagogue (Israel). They were conducted in the language most comfortable to the child. All protocols were back-translated and nativespeaking research assistants were employed to carry out interviews in each country. The study was approved by the institutional review boards for research with human subjects at the University of Oxford and Louisville Presbyterian Theological Seminary. Written consent was obtained from all parents or guardians and assent was obtained from each child (most of whom were pre-literate). Before children began any of the tasks the researcher asked individually whether they were willing to participate, that they would be asked some questions and that there were no wrong answers and they could stop at any point. Following a short period where the researcher made the child comfortable the experiments began by showing them a non-descript container (unmarked bag or box) and asked whether they knew the contents. Some children indicated that they did not, while many children guessed, assuming the researcher might be asking for a specific answer. If a child guessed, the interviewer said, "No, it's not that" and clarified that, "This task is not a guessing game. I'm curious to know whether you really know what is inside this container." Since it was pivotal to our task that children recognized their own ignorance of the contents of the container, we took extra care to make sure these children realized and admitted that they had no idea what could be inside. We did this by asking further questions, such as "can you see inside the box" or "do you know for sure what is inside the bag?" After these questions, all children in each sample admitted they did not know.

After children admitted they did not know what was inside the box, they were asked whether the other minds (in random order) would know the contents. The interviewer asked: “If I showed this bag/box to [mind] and [mind] did not see what is inside the bag, would [mind] know what’s inside?” Children were never shown the actual contents. Following the task, we asked children to tell us a little about God. All children could give us a description of who God was (e.g., that “God answers prayers”, “is always with me”, or “is in my heart”). After the experiment finished, children were given stickers for participation.

Minds. Children were asked about two general types of minds—ordinary and extraordinary. British and Israeli children were asked about their Mom. However, children were asked about a Friend in the Kenyan sample because several children did not have a mother. Data collection had already been completed in Israel and the UK when data collection in Kenya began. To be consistent with Kenya, children in the DR were also asked about a Friend. All samples included God. The additional extraordinary minds, such as Ancestors and Angels, are explained below. All children, when asked, said that they knew who each of the extraordinary minds were. In light of Lane et al. (2010, 2012), we also used invented minds in some samples in order to explore how children think about minds when based only upon a simple description and not upon experience or enculturation.

Dominican Republic. Minds used: Friend, God, Angel. Angels abound in the biblical stories told to children and children are made aware of them in the home and during church and school lessons. Angels are not necessarily all-knowing, but they are often said to hear the prayers and thoughts of people, and children are taught that angels can protect them and that they can deliver messages to and from God.

Kenya. Minds used: Friend, God, Ancestors, Sun. Ancestors are integral to Luo culture, historically and presently. Ancestors are buried on the family homestead and are

considered present and involved in the affairs of the living. Ancestors are talked about frequently in the home and especially during burials and anniversaries of deaths. They are said to be allies to the family, frequenting dreams to provide wisdom when honored and to give parents the names of their children; but they can cause trouble for those who would dishonor them or the homestead (Schwartz, 2000; Shipton, 1992). They are not necessarily all-knowing but are aware of what is going on in the family life and can intervene in daily life. According to an interview with an adult member of the sample group, the Sun is part of the traditional pantheon of Luo religion, sometimes prayed to as “the Eye of God” (OlouchOdour, May 25, 2012). The Sun is not necessarily an all-knowing mind but can hear prayers, so may be considered to have access to information that ordinary minds do not.

While the children were all Christian, Luo traditional religion is frequently practiced alongside Christian practices (Olouch-Odour, May 25, 2012). An important difference is that children learn about traditional religion (e.g., the ancestors and Sun) informally, in the midst of everyday conversations or practices. On the other hand, children receive more formal and intentional Christian education on a daily basis in school (as it is part of the national curriculum), Sunday school, and worship services in addition to everyday conversations and practices in the home.

United Kingdom and Israel. Minds used: Mom, Swec, and God. British and Israeli children were introduced to novel minds, similar to Lane et al. (2010; 2012), with names that children would not easily associate with any other being. Children were told about Swec, a person “who has superpowers and can see through things.” We chose a fictional, extraordinary mind for these samples because some extraordinary minds in these cultures are not strongly culturally-endorsed elsewhere (e.g., some Christian and Jewish families do not

speak frequently of angels). We decided to test children's intuitive response to a fictional extraordinary mind with perceptual power, one the children just learned about.

Results

Children's answers were coded as 0 if children responded "yes" that the mind knew what was inside the container, and 1 if they responded "no" that the mind would not know what was in the container. We first analyzed whether children attribute knowledge or ignorance to ordinary minds and whether this developmental trend is consistent across cultures. We then compared these results to children's attributions to God. Finally, we explore and compare how children in different countries attribute knowledge or ignorance to other extraordinary minds.

Ordinary Minds. We first examined children's knowledge/ignorance attributions to ordinary minds by using a logistic regression model to examine whether age and sample predicted responses for the ordinary minds. We then compared British children's responses with responses in Israel, Kenya, and the DR, as the UK sample most closely resembles samples from prior studies.

Age was a significant predictor for children's responses for humans, $WALD = 3.48, p = .0005, \beta = 1.42, OR = 4.15$. British children's responses also significantly differed from responses in the Israeli sample, $WALD = 2.56, p < .0104, \beta = 5.99, OR = 397.69$. The odds ratio and beta are so large because Israeli children's responses consistently attributed ignorance in each age group, see Table 1. However, British children's responses did not differ compared to children's responses in Kenya, $WALD = -.877, p = .3807, \beta = -2.25, OR = .11$, and the DR, $WALD = -1.145, p = .2523, \beta = 2.46, OR = 1.69$. Using dummy codes for sample, there was a significant interaction between children's responses in the British sample,

Age, and responses in the Israeli sample, $WALD = -2.285$, $p = .0222$, $\beta = -1.31$, $OR = .27$.

There were no interaction effects when comparing British responses, Age, and responses in the DR, $WALD = -1.181$, $p = .2376$, $\beta = -.64$, $OR = .52$, and Kenya, $WALD = .227$, $p = .8203$, $\beta = .14$, $OR = 1.15$.

We also tested children's responses within each sample to explore developmental trends (Age) for each site. Individual logistic regressions revealed that, except for Israel, older children in each cultural group were more likely to attribute ignorance to the ordinary minds than younger children and the odds of children being more likely to attribute ignorance significantly increases with age, see p-values and effect sizes in Table 1. Compared to the other samples, Israeli children attributed ignorance to Mom consistently from an early age.

[Table 1 here]

Because of the differences across age, we ran separate binomial tests to examine the proportion of knowledge versus ignorance attributions against chance for each ordinary mind according to cultural sample and age group, see Table 2. These analyses showed different ages across samples at which children began attributing ignorance to a human (either Mom or Friend). Overall, Kenyan children were 5 years old, British children were 4 years old, and Israeli children were 3 years old before reliably attributing ignorance to either their Mom or Friend. The responses of Dominican children approached significance at 5 years. With the exception of the Israel sample, the general pattern was increasing attribution of ignorance to the ordinary minds with age, see Fig. 1.

[Figure 1 here]

God's Mind. Similar to the analyses for the ordinary minds, we first compared British children's responses for God with the DR, Israel, and Kenya. As suggested above, the UK sample is used as the comparison as this sample is similar to prior work. We used a logistic

regression model to examine whether age and sample predicted responses for God. Age was not a significant predictor, $WALD = -1.754, p = .079, \beta = -.65, OR = .52$. Excluding age, there were significant differences between responses for God from the British sample compared to children's responses in Kenya, $WALD = -2.07, p = .038, \beta = -6.45, OR = .002$, but not for responses in the DR, $WALD = -1.759, p = .079, \beta = -3.75, OR = 0.02$, or Israel, $WALD = .588, p = .556, \beta = 1.24, OR = 3.44$. Using a logistic regression with dummy codes for sample, there were significant interaction effects between children's responses in the British sample and Age for the DR, $WALD = 2.08, df = 3, p = .038, \beta = 1.06, OR = 2.91$, and marginally between the British sample, Age, and Kenya, $WALD = 1.92, df = 3, p = .055, \beta = 1.38, OR = 3.97$. There was no interaction effect between British children's responses, Age and the Israeli sample, $WALD = -.394, df = 3, p = .694, \beta = -.20, OR = .815$. These results suggest that the developmental progression of children's attributions of ignorance follow slightly different trajectories. Children's ignorance responses from Israel and the UK demonstrated patterns that decreased whereas children's ignorance responses in the DR and Kenya showed a pattern that increased. In other words, the developmental trajectory of responses from children in the DR and Kenya appeared different from the pattern of responses in the British children.

We also explored the developmental trends (Age) for children's responses within their own sample. We used logistic regressions to explore Age by each sample, generating four different logistic regressions, see Table 1. Children in all samples and across all ages responded that God would know the contents of the unmarked container. In other words, the odds that older children compared to younger children from the DR, Israel, Kenya, and the UK would respond differently, such as attribute God with ignorance, was very low, see odd ratios in Table 1.

[Table 2 here]

God's Mind vs. Human Minds

We also compared the responses from each sample for God and for a human as in prior studies (e.g. Makris & Pnevmatikos, 2007). We used a Wilcoxon Signed-Ranks test for matched pairs to analyze differences among answers for both the human mind and God used in each country. Results showed significant differences between the two minds at every age for every sample (UK, Kenya, and Israel) except for responses from 3- and 4-year-olds from the DR, see Table 3. That is, except for the DR, even the youngest children were differentiating the human minds from God's mind. Additionally, older children consistently differentiated between these minds for all samples; note effect sizes in Table 3. On the whole, Israeli, British, and Kenyan children were more likely to attribute ignorance to the human mind than to God. The children in the DR show a different pattern not because they attributed ignorance to God, but because they were attributing knowledge to humans.

[Table 3 here]

Other Extraordinary Minds. Children's responses for extraordinary minds showed little variation across development. We ran individual logistic regressions, examining whether age predicted responses for each mind in each cultural group. These logistic regressions revealed that age was not a significant predictor for whether children attributed knowledge to an Angel or Swec, and ignorance to the Ancestors and Sun god, see both Table 1 and Fig. 1. Thus, children saw an Angel and Swec as having sufficient qualities to know what would be inside an unknown box, whereas Ancestors and the Sun god would not. Binomial tests confirmed the logistic regression analyses that responses for extraordinary minds showed similar trends across ages, see Table 2.

Comparisons of children's responses for the extraordinary minds to God appear in

Table 4. Among responses for extraordinary minds, Swec (UK and Israel) and the Angel (DR) were attributed knowledge of the container's contents, and from 3 years children did not distinguish these minds from the mind of God (except for British 4-year-olds). In other words, children at every age attributed knowledge to each of these minds. Conversely, there was no differentiation in responses among the Ancestors, Sun, and Friend: the Ancestors, Sun and Friend were attributed with ignorance at all ages, see Table 4.

Finally, we compared ordinary and extraordinary minds (not God). British and Israeli children at all ages significantly differentiated between Swec and Mom, whereas children from the DR did not distinguish their Friend from the Angel until 5 years, again, because younger children also attributed knowledge to their Friend, see Table 2. Kenyan children did not attribute similar knowledge to the Ancestors and Sun as to God. Children attributed ignorance to the Ancestors and Sun. From age 3, children significantly differentiated between the Ancestors and God, and from age 4, significantly responded differently regarding the Sun and God.

[Table 4 here]

Discussion

Extraordinary and ordinary minds are central to the social lives of children, yet we still do not fully understand the cognitive processes and cultural influences that encourage children to understand a variety of minds. The present study advances our understanding by contributing valuable cross-cultural data using a knowledge-ignorance task and featuring several different types of minds. Our results show various patterns between cultural groups for many different minds, suggesting a strong role for social influence upon understanding ordinary and extraordinary minds, even at the youngest ages. ToM development would not

appear to be a universally fixed pattern for either considering God, humans, or “in-betweens.” Consider, for example, that 80% of Israeli 3-year-olds attributed ignorance to an ordinary mind while only 5% of the Dominican 3-year-olds did. Dominican children were not projecting their own knowledge state upon others. At the same time, Israeli children clearly differentiated a human’s knowledge from God’s. Or consider that Kenyan children’s attributions of ignorance to God actually rose with age while British and Israeli children’s attributions of God’s ignorance dropped with age. In addition, there was no predictable pattern for the various other extraordinary minds either between samples or within them. An angel may know like God does among 5-year-old Dominican children, whereas the Ancestors may be more like humans among 5-year-old Kenyan children, with the Sun somewhere inbetween.

The goal of this study was to address whether each sample followed a similar pattern of responses, particularly for God and a human mind. If patterns were largely the same, this would help the claim that the developmental trajectory for understanding ordinary and extraordinary minds follows a predictable pattern globally. That is not what we found. Based on the variance in our results, we conclude, along with a growing body of researchers, that further work exploring this cultural variation across samples is needed to better understand the interaction of cognitive and cultural processes that influence these differences (Henrich, Heine, & Norenzayan, 2010; Kline, Shamsudheen, & Broesch, 2018; Legare, 2017; Nielsen & Haun, 2016; Nielsen, Haun, Kartner, & Legare, 2017).

Such exploration will need to focus upon both large cultural factors (e.g. religion, conflict tolerance, national history) that may differ between groups, as well as possible factors that may differ within a group (e.g. education levels, religious participation intensity, parenting philosophy, family dynamics). For example, the recent study mentioned above

(Richert, Saide, Lesage, & Shaman, 2017), found not only cultural differences between Muslim children's responses on ToM tests compared to children from Christian and nonreligious households, more specifically they found a strong correlation between parents' understanding of God's mind and their children's. Simply "being Muslim" or being "nonreligious" is not a discrete factor but instead implies a host of social interactions and communications that potentially impact ToM development even, or maybe especially, in relation to extraordinary figures. As suggested by Richert et al. (2017), future work could explore the frequency and the content of prayer in the home or the ways in which parents talk about God. Indeed, children's ability to differentiate human from God's mind was predicted by their parent's tendency to anthropomorphize (Richert et al., 2017). Related, measuring frequency and content of any Credibility Enhancing Displays (CREDS), such as particular rituals or attendance at ceremonies, that families engage in on a regular basis could provide finer-grained analyses of ToM development, especially in relation to children's understanding of extraordinary minds (Henrich, 2009; Lanman & Burhmester, 2017). For example, Epley, Waytz, and Cacioppo (2007) suggest that cultures that are predominantly Catholic have a higher propensity for anthropomorphism because of a belief and devotional practices that assume the presence of God in immanent, or tangible, forms. The point is that once the social world is recognized as playing a powerful role in ToM development, the possible subfactors within a child's social world are legion.

We believe the present study opens the door and increases the promise that more finetuned analyses will yield deeper understanding into the ToM development in a wide-ranging social world that includes nonhuman and extraordinary minds.

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Table

Table 1. Individual logistic regressions examining age as a predictor for attributing knowledge or ignorance to each mind by sample.

	<i>B</i>	<i>Wald</i>	<i>p</i>	<i>R</i> ² Cox & Snell (Nagelkerke <i>R</i>)	Exp(<i>B</i>)
Ordinary minds					
Mom (UK)	1.42	12.09	<.001	.20 (.29)	4.16
Mom (Is)	.118	.087	>.250	.001 (.002)	1.13
Friend (K)	.780	4.660	.031 ⁺	.08 (.12)	2.18
Friend (DR)	1.565	11.317	<.001	.26 (.35)	4.78
Extraordinary minds					
God (UK)	-.646	3.07	.079	.04 (.07)	.52
God (Is)	-.851	5.41	.020 ⁺	.09 (.13)	.43
God (K)	.418	1.389	.236	.03 (.04)	1.52
God (DR)	.773	1.404	.238	.03 (.06)	2.08
Angel (DR)	.872	.770	>.250	.02 (.07)	2.39
Ancestors (K)	.625	3.107	.078	.06 (.08)	1.87
Sun (K)	.634	3.642	.056 ⁺	.07 (.09)	1.88
Swec (UK)	-.13	.179	>.250	.002 (.004)	.88
Swec (Is)	-.548	3.175	.075	.05 (.07)	.58

+

Note. These individual logistic regression analyses are not significant because they are subject to family-wise error (Bonferroni-adjusted *p*-values for God and ordinary minds = .0125, and for other extraordinary minds = .01).

Table 2.

Number of children attributing ignorance or knowledge in the ignorance-belief task by each mind, cultural group, and age group.

Mind (Sample)	Age Group								
	3 years			4 years			5 years		
	<i>I</i>	<i>K</i>	<i>p/RR</i>	<i>I</i>	<i>K</i>	<i>p/RR</i>	<i>I</i>	<i>K</i>	<i>p/RR</i>
Ordinary minds									
Mom (UK)	15	15	>.250/ 1.00	20	4	<.001/ 1.66	19	2	<.001/ 1.81
Mom (Is)	19	4	.001/ 1.65	16	2	<.001/ 1.78	19	4	.013/ 1.65
Friend (K)	9	9	>.250/ 1.00	11	5	.105/ 1.36	19	4	.013/ 1.65
Friend (DR)	1	18	<.001/ 1.89	6	9	>.250/ 1.20	11	6	.166/ 1.29
Extraordinary minds									
God (UK)	10	20	.049/ 1.33	2	22	<.001/ 1.83	2	19	<.001/ 1.81
God (Is)	9	13	>.250/ 1.18	5	13	.048/ 1.44	2	21	<.001/ 1.83
God (K)	4	14	.015/ 1.56	4	11	.039/ 1.47	9	14	.202/ 1.23
God (DR)	0	19	<.001/ 2.00	3	12	.018/ 1.60	2	15	.001/ 1.76
Angel (DR)	0	15	<.001/ 2.00	1	9	.012/ 1.80	1	12	.001/ 1.85
Ancestors (K)	9	9	>.250/ 1.00	12	4	.038/ 1.50	17	5	.009/ 1.54
Sun (K)	7	11	.240/ 1.22	10	6	.227/ 1.25	16	7	.046/ 1.39
Swec (UK)	8	22	.008/ 1.47	6	18	.011/ 1.50	5	16	.013/ 1.52
Swec (Is)	12	11	>.250/ 1.04	8	10	>.250/ 1.11	6	17	.017/ 1.48

Notes. *I* = Ignorance. *K* = Knowledge. The *p* values indicate the probability levels of binomial tests. Relative Risk (RR) is calculated as an effect size measure for whether children attributed more ignorance or knowledge, with an expected probability of .5, or chance responding.

Table
Table 3.

Comparison of children's responses for God and a human mind

Cultural Group	Age Group								
	3 years			4 years			5 years		
	<i>z</i>	<i>p</i>	<i>r</i>	<i>z</i>	<i>p</i>	<i>r</i>	<i>z</i>	<i>p</i>	<i>r</i>
United Kingdom+	-2.45	.014	.244	-4.24	< .001	.612	-4.12	< .001	.636
Israel+	-2.17	.007	.404	-3.12	.001	.553	-4.12	< .001	.607
Kenya	-2.24	.025	.373	-2.45	.014	.440	-3.16	.002	.619
Dominican Republic	-1	.310	.162	-1.73	.083	.316	-3.00	.003	.514

Note. *Z* scores represent standardized score from Wilcoxon-Signed Rank test. +We used Mom as the human mind in the UK and Israel.

4.

Comparison of children's responses for extraordinary minds, God, and human minds

Cultural Group	Age Group								
	3 years			4 years			5 years		
	<i>z</i>	<i>p</i>	<i>r</i>	<i>z</i>	<i>p</i>	<i>r</i>	<i>z</i>	<i>p</i>	<i>r</i>
United Kingdom									
Swec & God	-1.00	.317	.129	-2.00	.046	.289	-1.73	.083	.267
Swec & Mom	-2.33	.020	.301	-3.30	.001	.476	-3.74	<.001	.577
Israel									
Swec & God	-1.41	.157	.208	-1.73	.083		-1.63	.102	.240
Swec & Mom	-2.33	.020	.334	-2.83	.005	.288	-3.60	<.001	.531
						.472			
Kenya									
Ancestors & God	-2.24	.025	.373	-2.65	.008				
Ancestors & Friend	.000	1.00	.000	-.447	.655	.476	-3.00	.003	.447
Sun & God	-1.34	.180	.223	-2.24	.025	.079	-.447	.655	.067
Sun & Friend	-1.00	.317	.000	-.577	.564				
						.402	-2.33	.020	.344
						.102	-1.34	.180	.198
Dominican Republic									
Angel & God	.000	1.00	.000	.000	1.00		.000	1.00	.000
Angel & Friend	.000	1.00	.000	-1.41	.157		-2.33	.020	.425
						.282			

Note. Z scores represent standardized score from Wilcoxon-Signed Rank test.

MINDS ACROSS FOUR CULTURES

Figure 1. Children's knowledge/ignorance attribution to each mind by culture and age group

