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I've got a feeling: Urban and rural indigenous children's beliefs about early life mentality

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ABSTRACT

This cross-cultural investigation explored children's reasoning about their mental capacities during the earliest period of human physical existence—the prenatal period. For comparison, children's reasoning about the observable period of infancy was also examined. A total of 283 5- to 12-year-olds from two distinct cultures (urban Ecuador and rural indigenous Shuar) participated. Across cultures, children distinguished the fetal period from infancy, attributing fewer capacities to fetuses. However, for both the infancy and fetal periods, children from both cultures privileged the functioning of emotions and desires over epistemic states (i.e., abilities for thought and memory). Children's justifications to questions about fetal mentality revealed that although epistemic states were generally regarded as requiring physical maturation to function, emotions and desires were seen as functioning as a de facto result of prenatal existence and in response to the prospect of future birth and being part of a social group. These results show that from early in development, children across cultures possess nuanced beliefs about the presence and functioning of mental capacities. Findings converge with recent results to suggest that there is an early arising bias to view emotions and desires as the essential inviolable core of human mentality. The current findings have implications for understanding the role that emerging cognitive biases play in shaping conceptions of human mentality across different cultures. They also speak to the cognitive foundations of moral beliefs about fetal rights.

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Introduction

Psychological studies have illustrated that from very early on in development, humans possess remarkable cognitive abilities. For example, young infants can represent abstract categories such as "agent" and the number "2" (Baillargeon & Carey, 2012; Carey, 2009; Gopnik, Meltzoff, & Kuhl, 1999), and even fetuses can learn the prosodic features of their native language (Mampe, Friederici, Christophe, & Wermke, 2009) and remember their mother's voice (De Casper & Fifer, 1980; Querleu, Renard, Versyp, Paris-Delrue, & Crèpin, 1988). These findings, although fascinating, are in many ways surprising given popular folk perceptions of what infants and especially fetuses are mentally capable of doing. Rather than viewing humans as able to think and remember during these early life stages, adults tend to deny infants and particularly fetuses with higher order cognitive abilities, instead only ascribing them with the mental capacities for basic emotions and desires (Gray, Gray, & Wegner, 2007). This distinction highlights that adults can and do treat certain human agents as possessing some aspects of mentality while lacking others (see also Bain, Park, Kwok, & Haslam, 2009; Haslam, 2006; Haslam, Bain, Douge, Lee, & Bastian, 2005; Haslam, Kashima, Loughnan, Shi, & Suitner, 2008; Loughnan & Haslam, 2007). Importantly, the types of mental capacities adults selectively ascribe to human fetuses have the potential to unconsciously shape the way in which they think and behave toward them (e.g., by biasing decisions on what to eat during pregnancy, whether to talk to fetuses in the womb, and whether to have an abortion). Indeed, research shows that perceptions about the kind of mind an agent has often guide judgments about moral standing and whether an agent is deemed worthy of moral consideration and care (Gray & Wegner, 2009, 2012; Gray, Young, & Waytz, 2012).

In the current investigation, we cross-culturally examined whether children, like adults, ascribe mental capacities to the human fetus by asking them about their own mental capacities during the prenatal period. We were particularly interested in which aspects of mentality children judge to be present from the earliest period of human physical development because ideas about enduring and inviolable characteristics underlie essentialist beliefs and are tightly connected to ideas about essential human natures (e.g., Gelman, Coley, & Gottfried, 1994; Gelman & Hirschfeld, 1999; Haslam, 2006; Rhodes, 2013; Solomon, 2002; see Gelman, 2003, for a review). Specifically, adults have been found to have two senses of humanness—an "essentially human" sense that comprises basic emotions and desires and a "uniquely human" sense that comprises higher order cognitive abilities (Haslam, 2006). Notably, adults treat only essentially human traits as early emerging and universal, which suggests that they are viewed as more central to concepts of humanness than uniquely human traits that are treated as more variable and acquired later in life (Haslam, 2006; see also Gray et al., 2007). Therefore, children's inferences about the unobservable fetal period have the potential to shed light on their largely untutored intuitions about those abilities perceived to be the most fundamental, early arising, and stable aspects of persons' minds (Emmons & Kelemen, 2014; Haslam, 2006; see also Gelman, 2003). To see whether mental state attributions would differ for an observable, and thus less abstract, period of human development than the in utero period, we also examined children's beliefs about their mental life as infants.

Although adults assume that fetuses have some—but not all—mental abilities (Gray et al., 2007), why might we expect children to ascribe any mental states at all to an unobservable fetus? Research shows that infants and children readily perceive minds and engage in perspective taking when reasoning about other children and adults (Kovács, Téglás, & Endress, 2010; Onishi & Baillargeon, 2005; Wellman, Cross, & Watson, 2001). These early emerging abilities help to illustrate that mind perception is a core aspect of social reasoning and central to representations of persons (Baron-Cohen, 2000; Baron-Cohen, Tager-Flusberg, & Lombardo, 2013; Bloom, 2004; Emmons & Kelemen, 2014; Gray & Wegner, 2012). The centrality of mind perception in reasoning about people is further highlighted by findings from developmental research on intuitive afterlife beliefs. These show that from early on, children, like adults, have a bias to view mental states as the enduring aspects of persons, capable of functioning independently of a physical material body (Astuti &

Harris, 2008; Bering & Bjorklund, 2004; Bering, Hernández Blasi, & Bjorklund, 2005; Harris & Giménez, 2005).

Although these studies reveal the importance of mind attribution in social reasoning, they are unable to inform our understanding of children's beliefs about the specific mental capacities they view as the most essential and inviolable features of persons' minds. This is because prior research has tended to employ stimuli involving agents assumed to be developmentally mature enough to possess a full range of mental abilities (i.e., abilities for higher order cognition as well as basic emotions and desires). For example, in afterlife reasoning research, children were asked to make judgments about characters described as though they were mature agents prior to death (Astuti & Harris, 2008; Bering & Bjorklund, 2004; Bering et al., 2005; Harris & Giménez, 2005). Given the perceived maturity of the targets, children's mental state attributions in these contexts, therefore, did not tap intuitions about early emerging, stable, and thus essential features of the human mind (Gelman, 2003; Haslam, 2006). As a result, the current study sought to explore what mental capacities, if any, children view as so essential to human mentality that they are construed as present from the very beginning of life.

Recent developmental findings provide some clues on children's intuitions about core features of the mind. Specifically, in a study aimed at examining the development of untutored notions of eternal life, 7- to 12-year-old urban Ecuadorian and rural indigenous Shuar children were asked about the functioning of their mental and bodily capacities prior to biological conception—that is, during the highly abstract period known as "prelife." Results showed that despite the two groups' very different cultural backgrounds, the lack of any religious prelife beliefs in either culture, and children's tendencies to judge themselves as lacking bodily states during that time, children nevertheless displayed a propensity to endorse that their emotions and desires did function before they were conceived. Indeed, they consistently privileged these capacities over higher order cognitive abilities for thought and memory (Emmons & Kelemen, 2014). This culturally recurrent pattern of judging emotions and desires as predating one's physical existence is noteworthy; as noted earlier, social psychology research with adults has consistently shown that feelings and wants are the mental states most linked to construing entities as "essentially human" and, concomitantly, as moral patients who deserve to be protected from harm (Gray et al., 2007, 2012; Haslam, 2006; Haslam et al., 2005). Given the moral significance of attributing entities with capacities to experience emotions and desires, findings from the current study are relevant to understanding the cognitive basis of beliefs about the moral standing of fetuses and why ethical debates about fetal rights are likely to endure.

To explore children's understanding of fetal mentality, we adapted the method from Bering and Bjorklund's (2004) afterlife study, which conveniently divided mentality into three subcategories (see also Emmons & Kelemen, 2014, on use of this method for studying prelife reasoning). In the current study, children were asked about the functioning of three distinct kinds of mental capacities during the fetal period: emotion, desire, and higher order cognitive states—specifically epistemic capacities for thought and memory. For comparison purposes, children were also asked about the functioning of these mental capacities during the infancy period, which unlike the fetal period is directly observable. In addition, children were asked about the functioning of three distinct kinds of bodily capacities during both the fetal and infancy periods: biological, psychobiological, and perceptual states.[1] Questions about bodily capacities were included because they provided a baseline for interpreting children's reasoning about mental state functioning and also because they allowed us to maintain methodological consistency with prior work (Bering & Bjorklund, 2004; Bering et al., 2005; Emmons & Kelemen, 2014).

Given the physical cues available from maternal anatomy during pregnancy (e.g., the distended abdomen) and some limited prior research suggesting that children ascribe body parts to fetuses (Zoldosova & Prokop, 2007), we presumed that children would attribute some biological, psychobiological, and possibly even perceptual capacities to a fetus (e.g., capacities for a heartbeat, hunger, and listening). However, the more central question was whether young children would assume that

[1] Although Bering and Bjorklund (2004) originally described psychobiological and perceptual states as "psychological" states, their findings revealed that these capacities were viewed as more body dependent than emotions, desires, and epistemic states. For simplicity, therefore, we collectively refer to them as "bodily" capacities.

fetuses have mental capacities and, if so, which ones. No prior research has addressed this issue; nevertheless, three response patterns seemed possible given children's patterns of reasoning about mentality during the disembodied periods of afterlife and prelife (Astuti & Harris, 2008; Bering & Bjorklund, 2004; Bering et al., 2005; Emmons & Kelemen, 2014; Harris & Giménez, 2005). Namely, children could reason that fetuses have (a) no mental states, consistent with the idea that no aspects of mentality are viewed as essential features of the human mind; (b) a full repertoire of mental states, consistent with the idea that emotion, desire, and epistemic mental states are all viewed as essential features of the human mind; or (c) only emotions and desires, consistent with the idea that only emotion and desire mental states are viewed as essential features of the human mind.

Children from 5 to 12 years of age were included in the investigation to explore how reasoning about fetal mentality might change as children develop and become enculturated to the beliefs and attitudes most prevalent in their society. Furthermore, and to explore the generalizability of children's intuitions, we examined the development of children's reasoning in two distinct cultures—a large-scale, urban, nature-impoverished society more typical of most cognitive development research (i.e., urban Ecuadorians from the Pichincha province) and a small-scale, rural, nature-immersed society (i.e., rural indigenous Ecuadorian Shuar from the Amazon Basin of the Morona-Santiago province). Use of these samples addresses recent criticisms in the field about the need to extend psychological research beyond Western, highly educated populations, especially when exploring the possibility of cognitive universals (see Henrich, Heine, & Norenzayan, 2010, for a review). To evaluate potential cultural differences in the treatment of the fetus, the first author conducted fieldwork with both cultural groups for more than a year, engaging in intensive direct observation and conversations with community members, cultural informants, and other anthropological experts (e.g., H. Clark Barrett, who has worked with the Shuar for more than two decades). This anthropologically based approach ensured the cultural sensitivity of study designs and provided a rich basis for considering possible cultural differences. Therefore, it is advocated as standard practice among interdisciplinary researchers (e.g., Astuti & Bloch, 2012; Astuti, Solomon, & Carey, 2004; Heine, 2010).

In addition to addressing the overrepresentation of North American and European samples in psychological research (see also Arnett, 2008), our particular cross-cultural comparison was also theoretically motivated by prior cross-cultural findings. Specifically, due to their differential exposure to the natural world, urban and rural populations can profoundly differ in the types of attributions they make to various biological entities (Atran et al., 2001; Bang, Medin, & Atran, 2007; Medin, Waxman, Woodring, & Washinawatok, 2010; Ross, Medin, Coley, & Atran, 2003; Tarlowski, 2006). Fieldwork by the first author (Emmons, 2012) as well as other findings (e.g., Atran et al., 2001; Medin et al., 2010) indeed revealed that several cultural factors had the potential to shape urban and rural children's beliefs about the mental states of fetuses over the course of childhood. To start, urban Ecuadorian children, like urban children elsewhere, live in a congested urban environment. As a result, and in contrast to rural Shuar children, urban Ecuadorian children are not routinely exposed to biological processes that yield a depth of knowledge about the natural world and a robust understanding of the commonalities between nonhuman animals and humans (see also Atran et al., 2001; Bang et al., 2007; Medin et al., 2010; Ross et al., 2003; Tarlowski, 2006). Thus, it seems that urban Ecuadorian children are unlikely to draw on their knowledge about animals or more specifically animal fetuses to inform their judgments about human fetal capacities. If and when urban children are exposed to a fetus, it is most likely to be an indirect experience via the technological medium of ultrasound images. Ultrasound images offer a perceptually degraded depiction of a human fetus that, arguably, might serve to highlight fetal physical immaturity and thus heighten assumptions that fetuses lack certain capacities. However, the social context surrounding urban children's possible exposure to ultrasound images could effectively counteract this.

In particular, unlike Shuar families, urban Ecuadorian families often converse about human pregnancy. These conversations are frequently initiated by child queries and, according to cultural informants, can concern not only bodily aspects of a fetus (e.g., how the fetus eats) but also mental and social aspects (e.g., that the fetus is happy because it hears people outside the womb). Exposure to such testimony over the course of development seems likely to enhance children's assumptions that fetuses have bodily and mental capacities. The effects of such testimony are likely further compounded by cultural exposure to, and endorsement of, formal Roman Catholic doctrine regarding

the human fetus (Morgan, 1998). This teaches that God plays a role in human creation and that a human fetus is ensouled from the point of conception (Catholic Church, 1994/2000). As urban Ecuadorian children's religious enculturation progresses with age, it is possible that the increased exposure to this religious doctrine serves to promote beliefs that fetuses have mental capacities, consistent with possessing a soul (Richert & Harris, 2006, 2008). However, competing cultural influences mean that a prediction about a developmental trajectory is not straightforward; at the same time that urban children are becoming increasingly religiously enculturated, they are also being formally and informally schooled about the biology of reproduction and human physical development (see also Goldman & Goldman, 1982; Gordon, Schroeder, & Abrams, 1990). Children's developing understanding that fetal capacities may be limited due to physical immaturity has the potential to compete with religious teachings and thus counteract any related increases in their tendency to endorse that certain capacities function in utero (see Bering & Bjorklund, 2004; Emmons & Kelemen, 2014; Legare, Evans, Rosengren, & Harris, 2012, for other evidence of the complex interaction between religions and scientific beliefs). In sum, although it was possible that the social and religious contexts of urban children's experiences around pregnancy might enhance beliefs that fetuses have mental capacities over the course of childhood, competing cultural factors meant that it was unclear how their reasoning would progress.

Different dynamics exist for rural indigenous Shuar children. In general, several aspects of Shuar culture seem to consistently support a view of the fetus as lacking those capacities observed in more mature agents. First, as confirmed by prior and recent fieldwork (H. C. Barrett, personal communication, October 10, 2013; Emmons, 2012), family discussions about fetuses that might elevate the endorsement of fetal capacities are generally absent among Shuar families. Unlike urban Ecuadorian mothers, pregnant Shuar women do not make a point of conversing with their children or other adults about an expected child. This lack of discourse appears to stem from multiple cultural factors that include: Shuar women's often negative construal of pregnancy due to maternal and fetal health risks associated with limited health care access in remote Amazonia (Hagen & Barrett, 2007); the diminished impact of Christianity on traditional Shuar culture and religion (Barrett & Haley, 2014; Descola, 1996; Emmons & Kelemen, 2014; Harner, 1972); and broad cultural tendencies to avoid speculating about uncertain events (e.g., the details of pregnancy) and to focus pedagogical conversations on conveying practical skills (H. C. Barrett, personal communication, October 10, 2013; Hagen & Barrett, 2007; Harner, 1972). Notably, although the Shuar community where the current investigation took place nominally affiliates with Evangelical Protestantism, most community members do not attend religious services on a regular basis (H. C. Barrett, personal communication, November 10, 2011). Fieldwork by the first author further revealed that neither the Shuar's traditional nor largely nominal Christian religious affiliation seemed to promote discussions of the fetus as a mental or social being. This stood out in contrast to the pattern observed among urban Ecuadorian Catholics.

Because of the general absence of explicit talk about the human fetus, it is possible that Shuar children draw on their knowledge about nonhuman animal fetuses as a basis for making judgments about human fetuses. Recent findings indicating that rural children are more likely than urban children to make powerful inductive inferences from animals to humans support this possibility (Atran et al., 2001; Bang et al., 2007; Medin et al., 2010; Ross et al., 2003; Tarlowski, 2006). As members of a hunter–horticulturalist society who subsist primarily through hunting, fishing, and farming in the Amazon rainforest, Shuar children's knowledge about animal fetal biology primarily derives from rich firsthand observations (see also Emmons & Kelemen, 2014). For example, Shuar children are exposed to dead mammalian fetuses when pregnant animals such as peccaries and pacas are hunted, killed, and prepared for consumption. Furthermore, the Shuar sometimes eat animal fetuses along with other meat procured from an animal's carcass (H. C. Barrett, personal communication, July 21, 2010). Witnessing animal fetuses in such contexts—typically lifeless, immobile, and as a possible food source—would probably promote views that fetuses lack mental and perhaps also bodily capacities (see Barrett & Behne, 2005; Bilewicz, Imhoff, & Drogosz, 2011; Bratanova, Loughnan, & Bastian, 2011; and Loughnan, Haslam, & Bastian, 2010, for details on individuals denying mental states to meat animals). Exposure to these practices is likely further compounded by Shuar children's increased involvement in hunting and food preparation with age.

Given the different cultural attitudes and practices toward human and animal fetuses, we anticipated that Shuar children might be more likely than urban Ecuadorian children to reject the idea of having a wide range of mental and bodily capacities in utero. Indeed, the cultural background of the Shuar meant that children from this culture offered a particularly strong test of whether there is a cognitively natural untutored tendency to attribute human fetuses with any kind of mental life. Evidence of converging patterns of reasoning about the prenatal period from early in development and across the two cultures would provide support for the claim that intuitive cognitive biases guide children's thinking about early life mentality beyond what can be explained by culturally specific factors.

Although differences between urban Ecuadorian and rural indigenous Shuar children's cultures had the potential to lead to differences in reasoning about the unobservable fetal period, there were reasons to suspect that children's judgments about the observable infancy period might differ less. This is because from young ages, both urban Ecuadorian and rural indigenous Shuar children have similar firsthand opportunities to engage with infants and observe signs of their mental and bodily capacities. Household sizes are large in both cultures, averaging five or six people (Barrett & Haley, 2014; Emmons et al., 2013), and children and adults in both cultures spend a substantial amount of time surrounded by extended family and friends, which includes infant children (Emmons, 2012; Hagen & Barrett, 2009; Hagen, Barrett, & Price, 2006; Price, 1987). Prior findings suggest that by 4 or 5 years of age, Western, English-speaking children are at least implicitly aware that infants have diminished thinking and knowledge capacities (Miller, Hardin, & Montgomery, 2003), which could explain why they modify their speech accordingly when talking to infants (Dunn & Kendrick, 1982; Sachs & Devin, 1976; Shatz & Gelman, 1973; Tomasello & Mannle, 1985). Although prior work has not systematically examined the specific kinds of mental states children ascribe to infants, it seemed possible that despite their broad cultural differences, urban Ecuadorian and rural Shuar children's direct experiences with babies might lead them to share a similar view, particularly with regard to infant epistemic states.

Method

Participants

Urban children

Children in the urban sample were predominantly Catholic, of mixed Spanish–Amerindian descent, and from low to middle socioeconomic backgrounds (Emmons & Kelemen, 2014). They were recruited from three public schools in Conocoto, Ecuador and were tested at school. A total of 211 urban boys ($n = 110$) and girls ($n = 101$) participated in the study and were divided into four age groups: 5- and 6-year-olds ($n = 63$, $M = 6;2$ [years;months], $SD = 7$ months), 7- and 8-year-olds ($n = 49$, $M = 8;0$, $SD = 8$ months), 9- and 10-year-olds ($n = 59$, $M = 9;11$, $SD = 7$ months), and 11- and 12-year-olds ($n = 40$, $M = 11;9$, $SD = 6$ months).

Rural indigenous children

Children in the rural indigenous sample were from a Shuar village located in the Amazon Basin of Ecuador. To ensure an ample sample size, all families in the village with appropriately aged children for the study were contacted about the study, and nearly all agreed to participate. Most children were tested at the local school run by community members, and 7 were tested at home. Two children were excluded from data analysis due to inattention. The remaining 72 boys ($n = 37$) and girls ($n = 35$) were divided into four age groups: 5- and 6-year-olds ($n = 13$, $M = 6;3$, $SD = 6$ months), 7- and 8-year-olds ($n = 21$, $M = 7;11$, $SD = 7$ months), 9- and 10-year-olds ($n = 17$, $M = 10;0$, $SD = 6$ months), and 11- and 12-year-olds ($n = 21$, $M = 12;3$, $SD = 11$ months).

Materials and procedure

The current study was one aspect of a larger scale investigation exploring children's reasoning about different life periods. In addition to questions about the infancy and fetal periods, the

investigation included a separate set of questions on the prelife period. Results from the prelife study have been reported in detail elsewhere (Emmons & Kelemen, 2014). However, providing a complete picture of the current study requires outlining some aspects of that research here.

To ensure children's understanding of the three periods and the temporal relationship among them, children initially were shown three culturally appropriate drawings presented left to right (see Fig. 1): (a) a woman prior to becoming pregnant (i.e., the prelife period), (b) a pregnant woman with a distended abdomen (i.e., the fetal period), and (c) an infant lying on its back (i.e., the infancy period). All procedures were conducted in Latin American Spanish.[2] Children were told, "Look at these drawings. We know that these are not the people from your family, but we are going to imagine that it is you and your mom." While pointing to the infant image, the experimenter told children, "This is you when you were a baby. Can you imagine yourself then? That was a long time ago, wasn't it?" The experimenter then pointed to the image depicting the pregnant woman and said, "This is your mom when she was pregnant with you. This [pointing to the fetal period image] is before this [pointing to the infancy period image], right?" Details about the gestational age of the fetus were not provided to avoid confusing children given their limited understanding of fetal maturation rates (Goldman & Goldman, 1982; Kreitler & Kreitler, 1966; Zoldosova & Prokop, 2007). Importantly, children had no difficulty in representing that they were inside their mother's body during pregnancy (see also Springer, 1996; Zoldosova & Prokop, 2007).

Finally, the experimenter pointed to an image depicting a younger woman (i.e., the prelife period image) and said, "This is your mom before she was pregnant with you, that is, before you were in your mom's belly. This [pointing to the prelife period image] is before this [pointing to the fetal period image], right? Do you think that is true?" The setup for all questions was couched in terms of the self because pilot work indicated that it was less confusing for children, particularly younger age groups, when reasoning about temporally distant and abstract periods (e.g., the fetal and prelife periods). Furthermore, a large body of prior work has shown that adults and children reason about their own and others' mentality similarly (e.g., Bek & Lock, 2011; Miller et al., 2003; see Wellman et al., 2001, for a review). Therefore, it was assumed that children's reasoning about their own early life mentality would reflect their intuitions about the mental life of fetuses and infants broadly.

To check children's understanding of the temporal relationship between the periods, following the introduction of drawings, the experimenter collected and mixed up the images and asked children to order them in terms of what came before and after. All children completed the ordering task successfully. Children were then asked 12 "yes/no" questions about their mental (i.e., emotion, desire, and epistemic) and bodily (i.e., biological, psychobiological, and perceptual) capacities during the infancy period. Following this, they were asked the same set of questions about their capacities during the fetal period (see Table 1). The tactic of asking about infancy and then the fetal period was adopted in order to temporally anchor each period, which was necessary because questions about the infancy and fetal periods were ultimately followed by questions about the culturally unfamiliar and highly conceptually and temporally abstract prelife period. In general, this sequence, which involved gradually moving backward through time, was useful given the known limits of young children's abilities to represent time and the temporal order of historically distant events (e.g., Barton & Levstik, 1996; Fivush & Mandler, 1985; Friedman, 1986, 1992). Furthermore, pilot work indicated that a relational temporal scaffold enabled children, particularly the youngest age groups, to more easily contextualize the different time periods (see also Emmons & Kelemen, 2014).

Questions about infancy were framed with the statement, "Think about this time when you were a baby. During that time, [e.g.] could you feel hungry?" Questions about the fetal period were framed with the statement, "Think about this time when you were in your mom's belly. During that time, [e.g.] could you see things?" Questions about the prelife period were asked after questions about the infancy and fetal periods. Following each forced-choice question, children were prompted with "why" or "why not" to solicit their justifications. Notably, it was children's justifications rather than their initial "yes/no" responses that were the central focus of the coding scheme described shortly.

[2] Spanish was the first language for urban Ecuadorian children. Shuar children grow up bilingual in both Spanish and Shuar, with Spanish being emphasized because it is the language used in school and also in the surrounding non-Shuar towns that community members visit.

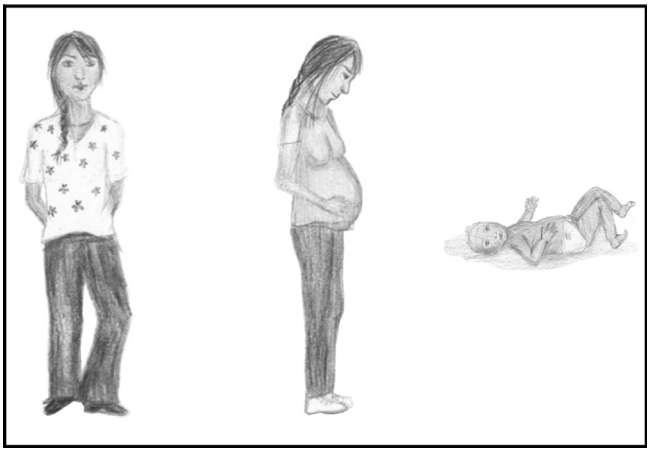

Fig. 1. Images depicting three developmental periods (left to right): prelife period, fetal period, and infancy period. Original images were in color.

Table 1
Questions about capacities of infants and fetuses.

Question category	Questions	Question presentation order	
		Infancy period	Fetal period
Biological	Could your eyes work?	8	10
	Could your heart beat?	4	5
Psychobiological	Could you be thirsty?	6	6
	Could you be hungry?	10	8
Perceptual	Could you watch something?	1	2
	Could you listen to something?	7	11
Epistemic	Could you think things?	3	12
	Could your remember things?	5	9
Emotional	Could you feel sad?	12	1
	Could you feel happy?	9	4
Desire	Could you want anything?	11	3
	Could you desire anything?	2	7

Note. Half of urban children received questions framed as "did" rather than "could." This variable had no effect on responding and was collapsed for purposes of analyses. Only the "could" framing was used in the rural indigenous sample.

For each developmental period probed, a fixed but unique question order was used (see Table 1). Each question order was randomly determined such that questions about mental and bodily capacities were interspersed. Question order was fixed within each period because preventive steps were needed to reduce any chance of experimenter error given three significant considerations: (a) the finite number of available child participants in the Shuar community; (b) the heightened chance of error arising from the unpredictable testing conditions and field locations, particularly in the Amazon rainforest; and (c) the large scope of the investigation (i.e., children from four age groups were ultimately asked about three different periods). The unique question order used for each period guarded against an interpretation that findings were due to any one specific question order. Furthermore, the requirement that children needed to reflect on their reasoning by providing a justification following their initial "yes" or "no" answer guarded against response sets, as the results reveal (see also Emmons & Kelemen, 2014).

Coding

A native Spanish speaker from Ecuador transcribed all interview sessions. Prior to coding, a bilingual English and Spanish speaker translated sessions into English, working in consultation with another bilingual speaker. Following Bering and Bjorklund's (2004) coding scheme, responses were coded as "functional" (i.e., the capacity worked), "nonfunctional" (i.e., the capacity did not work), or "unscorable" due to ambiguity. Children's justifications—not their initial "yes" or "no" answers—determined how their responses were coded (see also Bering & Bjorklund, 2004; Emmons & Kelemen, 2014).

Children's functional responses were largely justified with appeals to current or future biological considerations (e.g., "Yes, [my heart could beat] because I had blood," "Yes, [I could want] that I would be outside of my mom") as well as social considerations (e.g., "Yes, [I could be happy] because I have my mom"). Therefore, responses were coded as functional when children provided a consistent functional explanation following their initial "yes" answers. Following Bering and Bjorklund (2004), responses were also coded as functional if children's justifications following their initial "no" answers betrayed a belief that their capacity was in fact functional (e.g., "No, [I couldn't feel sad] because I played inside my mom's belly"). In this example, the capacity to feel sad was implied but not expressed due to another emotion being expressed (i.e., joy from playing). In addition, children sometimes claimed that they did not feel hungry or thirsty during the fetal period because the mother's body was feeding or hydrating them (e.g., "No, [I couldn't be hungry] because my mom ate and passed me the nutrients"). These responses were coded as "functional" because children's justification logic assumed that bodily capacities were working even though their needs were being met (for evidence of psychobiological states being tied to bodily representations, see Bering & Bjorklund, 2004; Cohen, Burdett, Knight, & Barrett, 2011; Emmons & Kelemen, 2014). Finally, initial "yes" answers followed by "I don't know" were coded as functional because they demonstrated a bias toward believing that a particular capacity worked (7% of functional responses; see also Bering & Bjorklund, 2004, Experiments 2 and 3).

Children's nonfunctional responses were predominantly justified by appealing to developmental or maturational limitations (e.g., "No, [I couldn't listen] because I was too small to hear"). Thus, responses were coded as nonfunctional when children followed their initial "no" answers by providing a consistent nonfunctional explanation referencing maturational or other perceived constraints. These included mentions of the absence of a prerequisite capacity. Responses were also coded as nonfunctional when justifications to initial "no" answers demonstrated a belief that the capacity could not function because it lacked stimulation (e.g., "No, [I couldn't desire] because there wasn't anything, only me"). Finally, initial "no" answers followed by "I don't know" were coded as nonfunctional because they reflected a bias toward reasoning that a particular capacity did not work (10% of nonfunctional responses). All remaining responses were coded as unscorable (<1% of total responses). Additional examples are provided in Appendix A.

One individual coded all responses, and another individual blind to the hypotheses of the study, as well as the ages and gender of participants, coded half of the responses. Interrater reliability indicated excellent agreement (urban children, kappa = .92; rural indigenous children, kappa = .95). All disagreements were resolved by discussion.

Results

Functional responses analysis

Children's functional responses were analyzed to explore which mental and bodily capacities they ascribed to infants and fetuses. For each developmental period, children could receive between zero and two functional responses for each of the six question categories. Fig. 2 provides a breakdown of results by culture, question category, and period. Preliminary analyses did not demonstrate a main effect of gender, so it was excluded from subsequent analyses. For all reported post hoc tests, the standard error of the mean is reported in brackets.

A 2 (Period: infancy or fetal) × 6 (Question Category: emotional, desire, epistemic, biological, psychobiological, or perceptual) × 2 (Culture: urban or rural) × 4 (Age Group: 5- and 6-year-olds, 7- and 8-year-olds, 9- and 10-year-olds, or 11- and 12-year-olds) mixed analysis of variance (ANOVA) was conducted to explore which factors affected children's functional judgments. The analysis revealed two large main effects: period, $F(1,275) = 227.67$, $p < .001$, $\eta_p^2 = .45$, and question category, $F(5,1375) = 82.22$, $p < .001$, $\eta_p^2 = .23$. It also revealed two small main effects: culture, $F(1,275) = 5.78$, $p = .02$, $\eta_p^2 = .02$, and age group, $F(3,275) = 4.37$, $p < .01$, $\eta_p^2 = .05$.

Period effects

The large effect of period occurred because across both cultures and all ages children viewed the infancy and fetal periods as distinct. Specifically, children attributed more capacities to infants ($M = 81\%$ [1%]) than to fetuses ($M = 59\%$ [2%]), confirming that they were able to differentially represent early periods of developmental prior to maturation.

Question category effects

Bonferroni's adjusted comparisons further demonstrated that the large effect of question category occurred because, across both periods, children ascribed more emotions ($M = 84\%$ [2%]) and desires ($M = 65\%$ [2%]) to themselves than higher order epistemic capacities ($M = 49\%$ [2%]); emotion state functioning was also judged as operating at a higher level than desire states (significant adjusted $ps < .05$). In addition, only emotions and desires were viewed as operating at similar levels as bodily states. Specifically, in contrast to epistemic states, which were viewed as less functional than all other capacities, emotions were treated as more functional than both biological states ($M = 79\%$ [2%]) and perceptual states ($M = 65\%$ [2%]) and as functional as psychobiological states ($M = 80\%$ [2%]). Desire states were also treated as functioning at the same level as perceptual states, although they were viewed as less functional than biological and psychobiological states (significant adjusted $ps < .05$). These patterns of findings lend support to the idea that emotions and desire mental states are privileged in a way that epistemic states are not, with emotions treated as the most privileged mental states of all.

Culture effects

In terms of the impact of culture, the main effect of this factor on children's functional responses was surprisingly small. In fact, two-way interactions between question category and period and between culture and period were subsumed by a three-way interaction effect among period, culture, and question category, $F(5,1375) = 2.68$, $p = .02$, $\eta_p^2 = .01$. This occurred because the only effect of culture was on reasoning about the fetal period, and then only for certain fetal capacities. Specifically, Shuar children were less likely than urban children to view psychobiological, perceptual, and emotional states as functional during the fetal period, $t(281) = 4.35$, $p < .001$, $t(281) = 3.68$, $p < .001$, and $t(281) = 2.34$, $p = .02$, respectively (see Fig. 2). Despite rural indigenous Shuar children's suppressed responses for these three question categories, they nevertheless demonstrated the same bias to view fetal emotions and desires as more functional than fetal epistemic states, $t(71) = 6.33$, $p < .001$, and $t(71) = 3.77$, $p < .001$, respectively, as displayed among urban children, $t(210) = 11.82$, $p < .001$, and $t(210) = 4.55$, $p < .001$, respectively. Both rural and indigenous children's tendencies to privilege emotion and desire state functioning even during the unobservable fetal period supports that viewing these mental states as central features of persons' minds is a largely untutored bias that operates even in cultural contexts that do not support the mentalizing of fetuses.

Age group effects

Turning to developmental trends, the surprisingly small main effect of age group was subsumed by two interaction effects: an age by question category interaction, $F(15,1375) = 2.26$, $p < .01$, $\eta_p^2 = .02$, and a marginally significant age by period interaction, $F(3,275) = 2.49$, $p = .06$, $\eta_p^2 = .03$. Examination of the age by question category interaction showed that the youngest age group gave more functional responses for epistemic states ($M = 65\%$ [4%]) than 9- and 10-year-olds ($M = 40\%$ [3%]) and 11- and 12-year-olds ($M = 40\%$ [4%]), $t(150) = 4.88$, $p < .001$, and $t(135) = 4.48$, $p < .001$, respectively. The youngest age group also gave more functional responses for desire states ($M = 74\%$ [4%]) than the

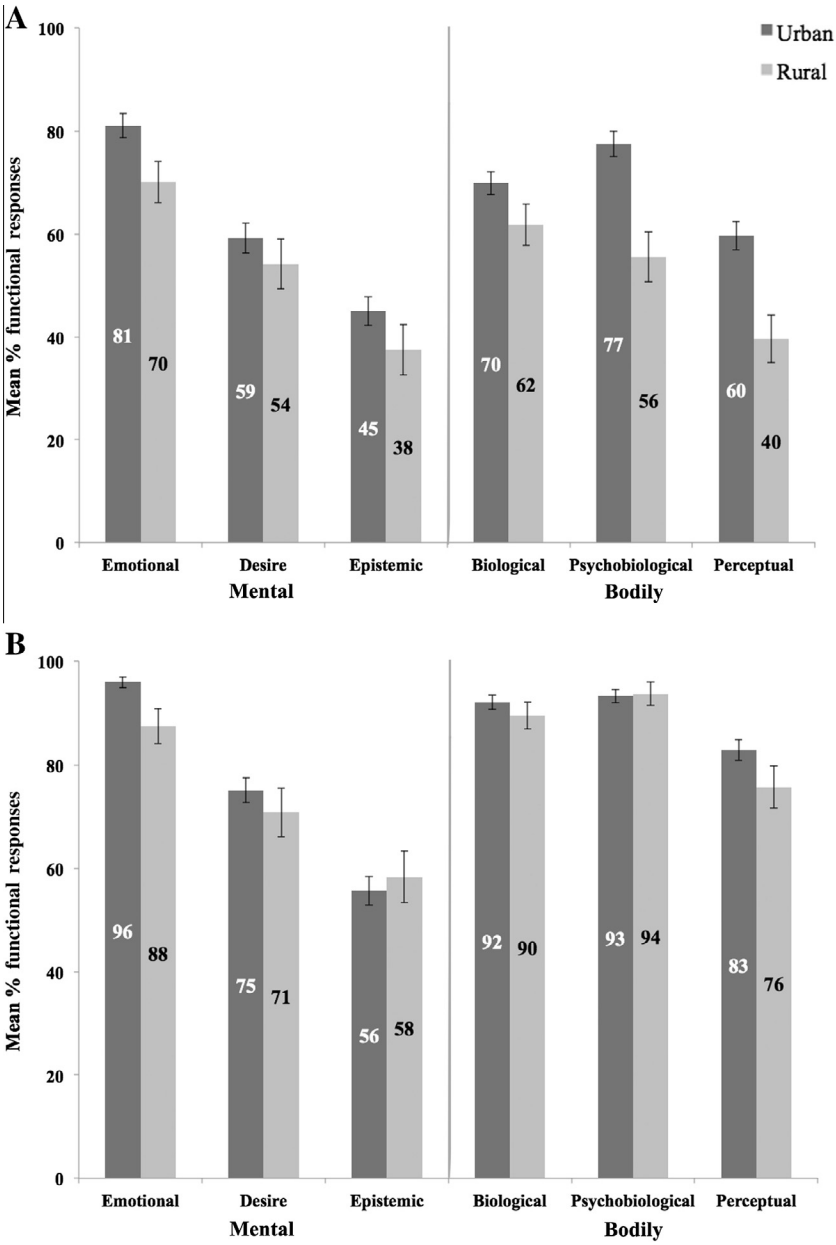

Fig. 2. Mean percentages of urban and rural indigenous children's functional responses by question category for the fetal period (A) and the infancy period (B). Error bars reflect standard errors.

oldest age group (58% [4%]), $t(135) = 2.82$, $p < .01$. Despite these elevated endorsements among the youngest age group, even these children were found to discriminate and privilege the functioning of emotions ($M = 90\%$ [2%]) and desires ($M = 74\%$ [4%]) over epistemic states ($M = 65\%$ [4%]), $t(75) = 6.83$, $p < .001$, and $t(75) = 2.22$, $p = .03$, respectively. They also privileged emotions over desires, $t(75) = 4.76$, $p < .001$. This early emerging pattern further supports that viewing emotions and desires

as more fundamental aspects of the mind than epistemic states does not require extensive tutoring and exposure to culturally specific beliefs.

Examination of the marginal age group by period interaction also revealed that age primarily affected reasoning about the more abstract fetal period than the infancy period. Specifically, 5- and 6-year-olds attributed more capacities to fetuses ($M = 73\%$ [3%]) than older children (7- and 8-year-olds: $M = 60\%$ [3%], $t(144) = 3.14$, $p < .01$; 9- and 10-year-olds: $M = 59\%$ [3%], $t(150) = 3.40$, $p = .001$; 11- and 12-year-olds: $M = 56\%$ [3%], $t(135) = 4.09$, $p < .001$; see Table S1 in online supplementary material for a breakdown of responses by age group and question category). Notably, by contrast, t-tests failed to show any age-related changes in children's overall attributions to infants ($ps > .05$). It is worth underscoring that although 5- and 6-year-olds ascribed more capacities to fetuses than older children, they, like their older counterparts, still ascribed more capacities to infants ($M = 84\%$ [2%]) than to fetuses ($M = 73\%$ [3%]), $t(75) = 4.58$, $p < .001$. This confirms that the ability to distinguish between different early life periods emerges early.

Justification content analysis

Given our focus on children's reasoning about the mentality of fetuses, we conducted a qualitative analysis to further examine developmental trends and explore why children demonstrated a bias to judge that their emotions and desires functioned more than their epistemic states during the fetal period. Specifically, by adopting the justification content coding scheme used by Emmons and Kelemen (2014), we aimed to evaluate the scope of children's reasoning, which included examining their biological knowledge, knowledge about general limitations during the fetal period, fate-based reasoning, social reasoning, psychological reasoning, and religious reasoning.

Content coding

Children's justifications of their nonfunctional responses during the fetal period were coded into two main categories: "nonfunctional biological," when children specifically appealed to explicit reproductive or developmental factors responsible for the capacity not functioning (e.g., "No, [I couldn't remember] because I was still a baby"), and "nonfunctional limited," when children appealed to some other kind of environmental, physical, or other general constraint (e.g., being in a different state in the womb, lacking a prerequisite capacity, lacking stimulation) without specific reference to reproductive or developmental factors (e.g., "No, [I couldn't want] because I was sleeping there inside"). Although the particular biological mechanism underlying nonfunctional limited responses was not clear, these responses nevertheless demonstrated knowledge about factors limiting the functioning of fetal mentality. These two nonfunctional categories were mutually exclusive in order to capture the specificity of the reasoning behind children's rejection of their fetal mental state functioning.

By contrast, children's justifications of their functional responses were coded into four main categories: "functional biological," when children appealed to a biological process or their biological nature (e.g., being alive, being in the womb) to explain the functionality of a capacity (e.g., "Yes, [I could feel happy] to know how to breathe"); "functional fate," when children appealed to their future unrealized biological state (e.g., "Yes, [I could want] ... when I left from there to begin in a new world"); "functional social," when children appealed to social others (e.g., "Yes, [I could feel sad] because I don't see my parents"); and "functional psychological," when children referred to a mental state not part of the original question (e.g., "Yes, [I could think] to be happy"). Children often appealed to several of these categories, and in such cases multiple functional codes were applied. Finally, to explore whether children's response patterns were due to religious-based reasoning, a "spiritual" category was used when a spiritual justification was provided for either a functional or nonfunctional response (e.g., "No, [I couldn't feel sad] because I was with God"). All remaining responses were coded as "other."

One individual coded all responses, and another coder blind to the hypotheses of the study and the age and gender of participants coded half of responses. Interrater reliability was excellent (kappa = .83), and disagreements were resolved by discussion. Additional examples of children's justifications and how they were coded are provided in Appendix B.

Nonfunctional responses

Children's knowledge relating to reproduction and development, as well as other perceived limitations, accounted for the vast majority of nonfunctional judgments (see Table S2 in supplementary material). A 4 (Age Group: 5- and 6-year-olds, 7- and 8-year-olds, 9- and 10-year-olds, or 11- and 12-year-olds) × 3 (Question Category: emotional, desire, or epistemic) mixed ANOVA on children's nonfunctional biological responses revealed main effects of age group, $F(3,279) = 4.81$, $p < .01$, $\eta_p^2 = .05$, and question category, $F(2,558) = 28.22$, $p < .001$, $\eta_p^2 = .09$, as well as an interaction effect between age group and question category, $F(6,558) = 2.47$, $p = .02$, $\eta_p^2 = .03$. Bonferroni's adjusted comparisons revealed that the two oldest age groups produced the most nonfunctional biological justifications, whereas 5- and 6-year-olds produced the least (adjusted significant *p*s < .01). Epistemic states also elicited the most of these justifications, whereas emotional states elicited the least (adjusted *p*s < .01). Examination of the interaction effect revealed that although 5- and 6-year-olds tended to provide fewer of these justifications for all fetal mental states, it was only for epistemic states that they provided fewer of these responses than all other age groups (independent *t*-test *p*s < .05). These patterns demonstrate that although children readily applied their biological knowledge about reproduction and development to deny epistemic state functioning in utero, they marshaled it less often when reasoning about fetal emotions and desires. Furthermore, 5- and 6-year-olds' more limited knowledge about reproduction and fetal development seems to account for why this age group displayed a weaker distinction between epistemic states and emotion and desire mental states; older age groups increasingly distinguished these aspects of mentality as their biological knowledge increased.

A 4 (Age Group) × 3 (Question Category) mixed ANOVA on children's nonfunctional limited responses indicated main effects of age group, $F(3,279) = 9.22$, $p < .001$, $\eta_p^2 = .09$, and question category, $F(2,558) = 17.68$, $p < .001$, $\eta_p^2 = .06$. Bonferroni's adjusted comparisons revealed that the oldest age group gave more of these justifications than the two youngest age groups, and 9- and 10-year-olds gave more than the youngest age group (adjusted significant *p*s < .05). Furthermore, nonfunctional limited justifications were produced least often for emotion states (adjusted *p*s < .05). These patterns closely mirror findings on children's nonfunctional biological justifications to demonstrate that awareness of other perceived constraints during the fetal period increases with age and is selectively deployed to reject the functioning of certain fetal mental capacities.

Functional responses

Mixed ANOVAs on the content categories of children's functional responses revealed that content varied by question category and, in some cases, by age group. First, a main effect of question category, $F(2,558) = 14.79$, $p < .001$, $\eta_p^2 = .05$, indicated that emotions and desires were privileged over epistemic states, in part because of their heightened tendency to elicit functional fate justifications. Bonferroni's adjusted comparisons confirmed that fate justifications were provided least often for epistemic states (adjusted significant *p*s < .01). This revealed that reasoning about one's fetal emotions and desires, but not one's epistemic states, prompted children to consider their future biological states such as how they would be born and how they would come to exist in the world.

A mixed ANOVA on children's functional biological responses revealed main effects of age group, $F(3,279) = 6.25$, $p < .001$, $\eta_p^2 = .06$, and question category, $F(2,558) = 39.40$, $p < .001$, $\eta_p^2 = .12$, as well as an interaction effect between age group and question category, $F(6,558) = 2.20$, $p = .04$, $\eta_p^2 = .02$. Bonferroni's adjusted comparisons indicated that 5- and 6-year-olds produced more functional biological justifications than 9- and 10-year-olds and 11- and 12-year-olds (adjusted significant *p*s < .01). Epistemic states also elicited the least of these justifications, whereas emotion states elicited the most (adjusted *p*s < .01). Examination of the interaction effect revealed that it occurred because 5- and 6-year-olds gave more functional biological justifications for desire states than all other age groups (independent *t*-test *p*s < .05). Such patterns show that emotions and desires were further privileged because children judged that these states—unlike epistemic states—could function simply by virtue of having a physical existence (e.g., being alive). The 5- and 6-year-olds defaulted to this line of reasoning more than older children, which is consistent with this age group possessing less countervailing knowledge about reproductive, developmental, and other known limitations during the fetal period.

Additional mixed ANOVA analyses revealed main effects of question category for functional social justifications, $F(2,558) = 20.86$, $p < .001$, $\eta_p^2 = .07$, and functional psychological justifications, $F(2,558) = 18.40$, $p < .001$, $\eta_p^2 = .06$. Although social justifications were produced at high rates across all age groups and all mental state questions (see Table S2), they were particularly pronounced for emotion states: Emotions also elicited the most references to psychological states that were not part of the original question (adjusted significant ps < .001). These findings seem to suggest that ideas about social and mental existence appear to be highly interconnected. Finally, analyses on children's spiritual justifications were not carried out because this type of justification occurred only twice. This final result supports that acquired religious teachings did not directly underlie children's response patterns, which was somewhat unexpected given urban Ecuadorian children's Roman Catholic background.

Discussion

This investigation sought to examine whether children, like adults, ascribe mentality to the human fetus and, if so, which aspects of mentality they judge to be present from the earliest period of human physical development. To explore generalizability, children from two unique cultural backgrounds were asked about the functioning of a wide range of mental and bodily capacities during the unobservable fetal period and, for comparison purposes, the observable infancy period. Because no prior research has addressed children's intuitions about fetal mental life, we expected that three possible response patterns could emerge; within each culture, children could attribute fetuses with (a) no mental states, consistent with the idea that no aspects of mentality are viewed as essential features of the mind; (b) a full repertoire of mental states, consistent the idea that emotions, desires, and epistemic states are all viewed as essential; or (c) only emotions and desires to fetuses, consistent with the idea that only emotion and desire mentality are viewed as essential and inviolable aspects of the mind.

Results revealed that regardless of whether children were from a large-scale, nature-impoverished urban Ecuadorian society or a small-scale, nature-immersed rural indigenous Shuar society, they inferred that they had mental capacities as fetuses. Furthermore, they privileged the functioning of their emotion and desire mental states over their epistemic states during that time. Indeed, only emotion and desire mental states were viewed as functioning on a par with bodily capacities during the two early life periods, and children's justifications suggested that these mental states were viewed as less affected by physical immaturity and other perceived constraints than epistemic states (see also Haslam, 2006). The finding of this pattern from early in development, even among Shuar children—who are not privy to rich discussions about the human fetus and who witness biological events that could motivate a view that fetuses lack capacities—supports the claim that conceptualizing emotions and desires as the core, earliest emerging features of the human mind is an untutored bias that endures over childhood and into adulthood (see also Emmons & Kelemen, 2014; Gray & Wegner, 2012; Haslam, 2006).

Although children displayed the same bias to privilege emotion and desire state functioning for both infancy and the fetal period, they nevertheless treated the two periods as distinct. In particular, children across both cultures ascribed fewer capacities overall to fetuses relative to infants. This distinction (see also Emmons & Kelemen, 2014, for children's distinction between the fetal and prelife periods) coupled with interaction effects between the period factor and other factors speaks against lower level or general processing limitation interpretations of the current findings (e.g., response sets due to question order, indiscriminate responding between periods, an inability to reason counterfactually). For example, the only effects of culture observed were limited to the more abstract fetal period, and then only to questions concerning psychobiological, perceptual, and emotional states. This evidence of Shuar children's reduced attributions of particular capacities to fetuses is consistent with the Shuar's lack of discourse surrounding the human fetus and their hunting and food preparation practices described earlier. It also demonstrates an element of flexibility in children's notions of prenatal capacities and suggests that culture does contribute, albeit to a small degree, to shaping children's ideas about a period of development for which they have no direct perceptual access.

Even as the nuanced effects in children's reasoning about the two early life periods reveal the subtle influences of cultural and age-related factors, they also highlight an important result: Despite the pronounced differences in their cultural backgrounds, children's judgments in both cultures were remarkably similar. This supports that children's beliefs about the stable essential aspects of human mentality emerge early in development and are difficult to override in the face of countervailing knowledge and culture-specific input. Although urban children's selective tendency to privilege emotion and desire state functioning over epistemic state functioning could perhaps be partly attributed to early exposure to widespread social ideas supporting these ascriptions, the consistency of this reasoning pattern among the rural indigenous Shuar highlights that even in the absence of cultural support, children are biased to assume that emotions and desires are core inviolable aspects of human mentality present from the very beginning of life. Notably, emotions were particularly essential to children's conceptions of the mind, which further demonstrates the sophistication of children's nuanced thinking about the mind from young ages and across cultures. In light of developmental research suggesting that there is a stronger connection between the brain and higher order epistemic abilities relative to other cognitive capacities such as feelings (see Gottfried, Gelman, & Schultz, 1999; Johnson, 1990; Johnson & Wellman, 1982; Winer, Cottrell, & Bica, 2009), future work should seek to further explore how ideas about the brain and its development may shape children's nuanced thinking about different mental capacities.

Children's justifications in the current study provide some insight on this point. Both urban and rural children displayed a greater awareness of biological limitations connected to reproduction and development as they got older. This suggests that regardless of cultural background, children become increasingly sensitive to the implications of physical maturation on mental state functioning with age (see Rosengren, Gelman, Kalish, & McCormick, 1991, for other evidence of children's sensitivity to biological growth). Notably, some children specifically referred to the lack of brain maturation when denying fetal mentality. The way in which children's reasoning was influenced by their increasing biological knowledge helps to account for how acquired knowledge interacts with preexisting biases. Namely, children's biological knowledge served to deepen their rejection of epistemic state functioning with age even as it left their beliefs about prenatal emotions and desires largely unaffected. Interestingly, these developmental trends and selective marshaling of biological knowledge largely held for children's knowledge about other constraints that they perceived as operating during the in utero period.

Results from the current investigation align closely with findings on children's reasoning about the time prior to biological conception known as prelife. This study found that urban Ecuadorian and rural indigenous Shuar children view emotions and desires as so central to representations of human mentality that, unlike epistemic states, they tend to view them as predating their own physical existence (Emmons & Kelemen, 2014). Across the prelife and early life periods, a consistent theme arises in children's justifications, namely that emotion and desire state functioning is understood to be largely independent of possessing a physical body or being physically mature. Furthermore, these capacities are often viewed as operating in response to the prospect of future life and being part of a social group and, in the case of early life, as a de facto result of physically existing, albeit in an immature form. Although it may have become a truism to state that humans are social animals, what the current findings uniquely demonstrate is that even across dramatically different cultures, children from young ages conceive of themselves as social and mental beings with a fate to exist from the start. The finding that these intuitions extend beyond conceptions of early life mentality to influence beliefs about mental existence even prior to conception is indicative of deep-seated representations that emotions and desires are core to conceptions of people and their minds such that denying these capacities presents a significant cognitive hurdle.

Although the current findings shed light on children's representations of the essential features of the human mind, they also contribute to our understanding of the roots of certain ethical controversies, particularly those concerning fetal rights. Recent research suggests that capacities for feeling and desiring are fundamental to adults' conceptions of persons (Gray & Wegner, 2012; Haslam, 2006) and are central to their notions of moral patients—entities regarded as the recipients of moral behavior and worthy of protection and care (Gray et al., 2012). The current findings suggest that this tendency to represent fetuses as moral patients derives from a largely untutored, early emerging bias that endures over development and is difficult to override with countervailing biological knowledge (see Eidson &

Coley, 2014; Kelemen & Rosset, 2009; and Kelemen, Rottman, & Seston, 2013, for evidence of other belief suppression failures). Even factoring out specific religious concerns, what this means is that debates about the ethics of abortion are likely to persist because believing that acts that threaten fetal life are acceptable is not automatic but instead requires psychological effort and reflection. In particular, such acceptance likely requires suppressing an early emerging and culturally recurrent bias to construe fetuses as beings who possess core features of human mentality that confer standing as moral patients and thus rights to be protected from harm (see DeScioli, Gilbert, & Kurzban, 2012, for details on abortion acceptance and victim perception). It remains for future work to explore how children's conceptions of human mental states operate in a range of contexts and inform the moralization of different human and nonhuman entities.

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Appendix A. Coding examples for primary analysis of children's mental and bodily state responses (all examples taken from the fetal period)

Coding category	
Nonfunctional	
Epistemic:	
Could you think things?	No, I didn't have a brain that was advanced.
Could you remember things?	No, because my mind wasn't developed yet.
Could you think things?	No, I was still very small and I didn't know anything.
Biological:	
Could your eyes work?	No, I had only closed eyes.
Psychobiological:	
Could you be hungry?	No, because I was in my mom's belly and I was tiny.
Perceptual:	
Could you watch something?	No, because we are just now forming and all that.
Functional	
Emotional:	
Could you feel happy?	Yes, because I wanted to know all of my family and my grandmother and she was the eldest and she wanted to know me much more.
Could you feel sad?	Yes, when my mom was sad. When we are in the belly, and our moms feel sad, we do too.
Could you feel happy?	Yes, because I was there, I could swim in liquid and see different things.

(*continued on next page*)

Appendix A (*continued*)

Desire:
Could you desire anything?
Yes, maybe to leave [the womb].
Could you want anything?
Yes, to leave quickly in order to be with my family.
Biological:
Could your heart beat?
Yes, because the heart moves blood around.
Perceptual:
Could you listen to something?
Yes, it's that my mom's heart was jumping.

Appendix B. Coding examples for justification content analysis of children's mental state responses for the fetal period

Example question: *Could you think things?*

Coding category
Nonfunctional biological:
No, because when I am in my mom's belly, I can't think anything.
No, it's that I was a baby and I couldn't think.
No, because children in the belly don't think when they are immature.
No, I didn't have a brain that was developed.
No, I don't think so. My brain still hadn't arrived to the world and I don't see anything and it's still empty.
Nonfunctional limited:
No, I couldn't think because I didn't know anything.
No, it's that I can't see what they do.
Functional biological:
Yes, that I was swimming or something. I was feeling weird things.
Yes, that my mom gave me something to eat.
Functional fate:
Yes, I knew to think that I would leave my mom's belly [also coded as functional psychological].
Yes, to grow quickly.
Functional social:
Yes, like that my parents wanted me a lot.
Yes, a little bit, to think that I have a father and mother.
Functional psychological:
Yes, to be happy.
Spiritual:
Yes, that I would be born well and that God gives me protection so I won't die [also coded as functional fate and functional biological].
Other:
No, because I couldn't think [simple restatement].

Appendix C. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jecp.2015.05.001.

References

Arnett, J. J. (2008). The neglected 95%: Why American psychology needs to become less American. *American Psychologist, 63*, 602–614.

Astuti, R., & Bloch, M. (2012). Anthropologists as cognitive scientists. *Topics in Cognitive Science, 4*, 453–461.

Astuti, R., & Harris, P. L. (2008). Understanding mortality and the life of the ancestors in rural Madagascar. *Cognitive Science, 32*, 713–740.

Astuti, R., Solomon, G. E., & Carey, S. (2004). Constraints on conceptual development: A case study of the acquisition of folk biological and folk sociological knowledge in Madagascar. *Monographs of the Society for Research in Child Development, 69*(3, Serial No. 277).

Atran, S., Medin, D., Lynch, E., Vapnarsky, V., Ucan Ek', E., & Sousa, P. (2001). Folkpsychology doesn't come from folkpsychology: Evidence from Yukatek Maya in cross-cultural perspective. *Journal of Cognition and Culture, 1*, 3–42.

Baillargeon, R., & Carey, S. (2012). Core cognition and beyond: The acquisition of physical and numerical knowledge. In S. Pauen (Ed.), *Early childhood development and later outcome* (pp. 33–65). London: Cambridge University Press.

Bain, P., Park, J., Kwok, C., & Haslam, N. (2009). Attributing human uniqueness and human nature to cultural groups: Distinct forms of subtle dehumanization. *Group Processes & Intergroup Relations, 12*, 789–805.

Bang, M., Medin, D. L., & Atran, S. (2007). Cultural mosaics and mental models of nature. *Proceedings of the National academy of Sciences of the United States of America, 104*, 13868–13874.

Baron-Cohen, S. (2000). Theory of mind and autism: A review. *International Review of Research in Mental Retardation, 23*, 169–184.

Baron-Cohen, S., Tager-Flusberg, H., & Lombardo, M. V. (Eds.). (2013). *Understanding other minds: Perspectives from social cognitive neuroscience* (3rd ed. New York: Oxford University Press.

Barrett, H. C., & Behne, T. (2005). Children's understanding of death as the cessation of agency: A test using sleep versus death. *Cognition, 96*, 93–108.

Barrett, H. C., & Haley, K. J. (2014). Economic game behavior among the Shuar. In J. Henrich & J. Ensminger (Eds.), *Experimenting with social norms: Fairness and punishment in cross-cultural perspective* (pp. 259–274). New York: Russell Sage.

Barton, K. C., & Levstik, L. S. (1996). "Back when God was around and everything": Elementary children's understanding of historical time. *American Educational Research Journal, 33*, 419–454.

Bek, J., & Lock, S. (2011). Afterlife beliefs: Category specificity and sensitivity to biological priming. *Religion, Brain, & Behavior, 1*, 5–17.

Bering, J. M., & Bjorklund, D. F. (2004). The natural emergence of reasoning about the afterlife as a developmental regularity. *Developmental Psychology, 40*, 217–233.

Bering, J. M., Hernández Blasi, C., & Bjorklund, D. F. (2005). The development of "afterlife" beliefs in secularly and religiously schooled children. *British Journal of Developmental Psychology, 23*, 587–607.

Bilewicz, M., Imhoff, R., & Drogosz, M. (2011). The humanity of what we eat: Conceptions of human uniqueness among vegetarians and omnivores. *European Journal of Social Psychology, 41*, 201–209.

Bloom, P. (2004). *Descartes' baby: How the science of child development explains what makes us human*. New York: Basic Books.

Bratanova, B., Loughnan, S., & Bastian, B. (2011). The effect of categorization as food on the perceived moral standing of animals. *Appetite, 57*, 193–196.

Carey, S. (2009). *The origin of concepts*. New York: Oxford University Press.

Catholic Church. (2000). *Catechism of the Catholic Church* (2nd ed.). Washington, DC: U.S. Conference of Catholic Bishops (Original English work published in 1994).

Cohen, E., Burdett, E., Knight, N., & Barrett, J. (2011). Cross-cultural similarities and differences in person–body reasoning: Experimental evidence from the United Kingdom and Brazilian Amazon. *Cognitive Science, 35*, 1282–1304.

De Casper, A. J., & Fifer, W. P. (1980). Of human bonding: Newborns prefer their mothers' voices. *Science, 208*, 1174–1176.

DeScioli, P., Gilbert, S. S., & Kurzban, R. (2012). Indelible victims and persistent punishers in moral cognition. *Psychological Inquiry, 23*, 143–149.

Descola, P. (1996). *The spears of twilight: Life in the Amazon*. New York: New Press.

Dunn, J., & Kendrick, C. (1982). The speech of two- and three-year-olds to infant siblings: "Baby talk" and the context of communication. *Journal of Child Language, 9*, 579–595.

Eidson, R. C., & Coley, J. D. (2014). Not so fast: Reassessing gender essentialism in young adults. *Journal of Cognition and Development, 15*, 382–392.

Emmons, N. A. (2012). *Children's reasoning about themselves as babies, in utero, and prior to conception: A developmental approach to understanding personal origins*. Unpublished doctoral dissertation, Queen's University (Belfast, UK).

Emmons, N. A., Russell, Y., Bjorklund, D., Gobet, F., Kiessling, F., & Whitehouse, H. (2013, October). *Children's reasoning about the capacities of plants, animals, humanoids, and spirits: A cross-cultural investigation*. Poster presented at the biennial meeting of the Cognitive Development Society, Memphis, TN.

Emmons, N. A., & Kelemen, D. (2014). The development of children's prelife reasoning: Evidence from two cultures. *Child Development, 85*, 1617–1633.

Fivush, R., & Mandler, J. M. (1985). Developmental changes in the understanding of temporal sequence. *Child Development, 56*, 1437–1446.

Friedman, W. J. (1986). The development of children's knowledge of temporal structure. *Child Development, 57*, 1386–1400.

Friedman, W. J. (1992). Children's time memory: The development of a differentiated past. *Cognitive Development, 7*, 171–187.

Gelman, S. A. (2003). *The essential child: Origins of essentialism in everyday thought*. New York: Oxford University Press.

Gelman, S. A., Coley, J. D., & Gottfried, G. M. (1994). 13 Essentialist beliefs in children: The acquisition of concepts and theories. In L. Hirschfeld & S. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 341–365). New York: Cambridge University Press.

Gelman, S. A., & Hirschfeld, L. A. (1999). How biological is essentialism. In D. Medin & S. Atran (Eds.), *Folk biology* (pp. 403–446). Cambridge, MA: MIT Press.

Goldman, R. J., & Goldman, J. D. (1982). How children perceive the origin of babies and the roles of mothers and fathers in procreation: A cross-national study. *Child Development, 53*, 491–504.
Gopnik, A., Meltzoff, A. N., & Kuhl, P. K. (1999). *The scientist in the crib: Minds, brains, and how children learn*. New York: William Morrow.
Gordon, B. N., Schroeder, C. S., & Abrams, J. M. (1990). Age and social-class differences in children's knowledge of sexuality. *Journal of Clinical Child Psychology, 19*, 33–43.
Gottfried, G. M., Gelman, S. A., & Schultz, J. (1999). Children's understanding of the brain: From early essentialism to biological theory. *Cognitive Development, 14*, 147–174.
Gray, H. M., Gray, K., & Wegner, D. M. (2007). Dimensions of mind perception. *Science, 315*, 619.
Gray, K., & Wegner, D. M. (2009). Moral typecasting: Divergent perceptions of moral agents and moral patients. *Journal of Personality and Social Psychology, 96*, 505–520.
Gray, K., & Wegner, D. M. (2012). Feeling robots and human zombies: Mind perception and the uncanny valley. *Cognition, 125*, 125–130.
Gray, K., Young, L., & Waytz, A. (2012). Mind perception is the essence of morality. *Psychological Inquiry, 23*, 101–124.
Hagen, E. H., & Barrett, H. C. (2007). Perinatal sadness among Shuar women: Support for an evolutionary theory of psychic pain. *Medical Anthropology Quarterly, 21*, 22–40.
Hagen, E. H., & Barrett, H. C. (2009). Cooperative breeding and adolescent siblings. *Current Anthropology, 50*, 727–737.
Hagen, E. H., Barrett, H. C., & Price, M. E. (2006). Do human parents face a quantity–quality tradeoff? Evidence from a Shuar community. *American Journal of Physical Anthropology, 130*, 405–418.
Harner, M. (1972). *The Jivaro: People of the sacred waterfalls*. Berkeley: University of California Press.
Harris, P. L., & Giménez, M. (2005). Children's acceptance of conflicting testimony: The case of death. *Journal of Cognition and Culture, 5*, 143–164.
Haslam, N. (2006). Dehumanization: An integrative review. *Personality and Social Psychology Review, 10*, 252–264.
Haslam, N., Bain, P., Douge, L., Lee, M., & Bastian, B. (2005). More human than you: Attributing humanness to self and others. *Journal of Personality and Social Psychology, 89*, 937–950.
Haslam, N., Kashima, Y., Loughnan, S., Shi, J., & Suitner, C. (2008). Subhuman, inhuman, and superhuman: Contrasting humans with nonhumans in three cultures. *Social Cognition, 26*, 248–258.
Heine, S. J. (2010). Cultural psychology. In D. T. Gilbert, S. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., pp. 1423–1464). New York: John Wiley.
Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences, 33*, 61–83.
Johnson, C. N. (1990). If you had my brain, where would I be? Children's understanding of the brain and identity. *Child Development, 61*, 962–972.
Johnson, C. N., & Wellman, H. M. (1982). Children's developing conceptions of the mind and brain. *Child Development, 53*, 222–234.
Kelemen, D., & Rosset, E. (2009). The human function compunction: Teleological explanation in adults. *Cognition, 111*, 138–143.
Kelemen, D., Rottman, J., & Seston, R. (2013). Professional physical scientists display tenacious teleological tendencies: Purpose-based reasoning as a cognitive default. *Journal of Experimental Psychology: General, 142*, 1074–1083.
Kovács, Á. M., Téglás, E., & Endress, A. D. (2010). The social sense: Susceptibility to others' beliefs in human infants and adults. *Science, 330*, 1830–1834.
Kreitler, H., & Kreitler, S. (1966). Children's concepts of sexuality and birth. *Child Development, 37*, 363–378.
Legare, C. H., Evans, E. M., Rosengren, K. S., & Harris, P. L. (2012). The coexistence of natural and supernatural explanations across cultures and development. *Child Development, 83*, 779–793.
Loughnan, S., & Haslam, N. (2007). Animals and androids: Implicit associations between social categories and nonhumans. *Psychological Science, 18*, 116–121.
Loughnan, S., Haslam, N., & Bastian, B. (2010). The role of meat consumption in the denial of moral status and mind to meat animals. *Appetite, 55*, 156–159.
Mampe, B., Friederici, A. D., Christophe, A., & Wermke, K. (2009). Newborns' cry melody is shaped by their native language. *Current Biology, 19*, 1994–1997.
Medin, D., Waxman, S., Woodring, J., & Washinawatok, K. (2010). Human-centeredness is not a universal feature of young children's reasoning: Culture and experience matter when reasoning about biological entities. *Cognitive Development, 25*, 197–207.
Miller, S. A., Hardin, C. A., & Montgomery, D. E. (2003). Young children's understanding of the conditions for knowledge acquisition. *Journal of Cognition and Development, 4*, 325–356.
Morgan, L. M. (1998). Ambiguities lost: Fashioning the fetus into a child in Ecuador and the United States. In N. Scheper-Hughes & C. F. Sargent (Eds.), *Small wars: The cultural politics of childhood* (pp. 58–74). Berkeley: University of California Press.
Onishi, K. H., & Baillargeon, R. (2005). Do 15-month-old infants understand false beliefs? *Science, 308*, 255–258.
Price, L. (1987). Ecuadorian illness stories: Cultural knowledge in natural discourse. In D. Holland & N. Quinn (Eds.), *Cultural models in language and thought* (pp. 313–342). New York: Cambridge University Press.
Querleu, D., Renard, X., Versyp, F., Paris-Delrue, L., & Crèpin, G. (1988). Fetal hearing. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 28*, 191–212.
Rhodes, M. (2013). How two intuitive theories shape the development of social categorization. *Child Development Perspectives, 7*, 12–16.
Richert, R. A., & Harris, P. L. (2006). The ghost in my body: Children's developing concept of the soul. *Journal of Cognition and Culture, 6*, 409–427.
Richert, R. A., & Harris, P. L. (2008). Dualism revisited: Body vs. mind vs. soul. *Journal of Cognition and Culture, 8*, 99–115.
Rosengren, K. S., Gelman, S. A., Kalish, C. W., & McCormick, M. (1991). As time goes by: Children's early understanding of growth in animals. *Child Development, 62*, 1302–1320.
Ross, N., Medin, D. L., Coley, J. D., & Atran, S. (2003). Cultural and experiential differences in the development of biological induction. *Cognitive Development, 18*, 25–47.

Sachs, J., & Devin, J. (1976). Young children's use of age-appropriate speech styles in social interaction and role-playing. *Journal of Child Language, 3*, 81–98.
Shatz, M., & Gelman, R. (1973). The development of communication skills: Modifications in the speech of young children as a function of listener. *Monographs of the Society for Research in Child Development, 38*(5, Serial No. 152).
Solomon, G. E. (2002). Birth, kind, and naive biology. *Developmental Science, 5*, 213–218.
Springer, K. (1996). Young children's understanding of a biological basis for parent–offspring relations. *Child Development, 67*, 2841–2856.
Tarlowski, A. (2006). If it's an animal, it has axons: Experience and culture in preschool children's reasoning about animates. *Cognitive Development, 21*, 249–265.
Tomasello, M., & Mannle, S. (1985). Pragmatics of sibling speech to one-year-olds. *Child Development, 56*, 911–917.
Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development, 72*, 655–684.
Winer, G. A., Cottrell, J. E., & Bica, L. A. (2009). When hearts, hands, and feet trump brains: Centralist versus peripheralist responses in children and adults. *British Journal of Developmental Psychology, 27*, 343–364.
Zoldosova, K., & Prokop, P. (2007). Primary pupils' preconceptions about child prenatal development. *Eurasia Journal of Mathematics, Science, & Technology Education, 3*, 239–246.