



The development of 'afterlife' beliefs in religiously and secularly schooled children

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Children aged from 4;10 to 12;9 attending either a Catholic school or a public, secular school in an eastern Spanish city observed a puppet show in which a mouse was eaten by an alligator. Children were then asked questions about the dead mouse's biological and psychological functioning. The pattern of results generally replicated that obtained earlier in an American sample, with older children being more apt to state that functions cease after death than younger children (11- to 12-year-olds > 8- to 9-year-olds > 5- to 6-year-olds), and all children being more likely to attribute epistemic, desire, and emotion states to the dead mouse than biological, psychobiological, and perceptual states. Although children attending Catholic school were generally more likely to state that functions continue after death than children attending secular school, the pattern of change with regard to question type did not differ between the Catholic and secular groups. The results were interpreted as reflecting the combined roles of religious instruction/exposure and universal ontogeny of cognitive abilities on the development of children's afterlife beliefs.

In a recent series of experiments, Bering and Bjorklund (2004) found that questions dealing with the mental capacities of dead agents lead young children to make a number of perplexing 'errors' during such interrogations. For example, although kindergartners reason that biological imperatives (e.g. the need to eat food) cease at death, they continue to reason that the psychological states attending these biological imperatives persist after death (e.g. dead agents retain the capacity for hunger). Bering and Bjorklund also reported that the frequency of mental cessation responses (i.e. responses indicating a belief that agents lose the capacity for experiencing mental states upon death, referred to as discontinuity responses by Bering and Bjorklund) increased with age. They interpreted these findings as evidence against a strict learning model of religious indoctrination on the topic of the afterlife, as this hypothesis would predict that mental cessation responses would actually decrease over time as children become

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more culturally aligned with prevailing metaphysical beliefs. An overwhelming majority of adult Americans believe in life after death, and this general belief system is strongly culturally recurrent (Boyer, 2001; Greeley & Hout, 1999; Reynolds & Tanner, 1995).

Bering and Bjorklund (2004, Experiment 3) also showed that although older children ($M = 11;8$) and adults gave significantly more mental cessation responses than kindergartners overall, they were more likely to state that the capacity to experience certain types of mental states (i.e. psychobiological¹ [e.g. hunger, thirst] and perceptual [e.g. seeing, hearing]) was lost at death than they were for other types of mental states (i.e. emotion [e.g. love, anger], desire [e.g. wanting, wishing], and epistemic [e.g. knowing, believing]). In contrast, the youngest children ($M = 5;3$) treated four of the five categories equivocally by stating that the psychological states associated with each category were equally likely to continue after death (The exception was for the perceptual category, which elicited more mental cessation responses than the emotion and desire questions).

This trend, whereby certain psychological states are more resistant to cessation reasoning than others, has been replicated in a separate, age-appropriate study with adults (Bering, 2002). In this modified study, Bering showed that even people who classified themselves as 'extinctivists' (individuals who believe that personal consciousness ceases to exist, or becomes extinct, at death; Thalbourne, 1996) found it more cognitively effortful (as measured by percentage of mental cessation responses and latencies to make such responses) to state that emotion, desire, and epistemic states ended upon a protagonist's accidental death than they did for psychobiological and perceptual states (for commentaries on this study, see Barrett, 2003; Bering, 2003; Boyer, 2003; Pyysiäinen, 2003). The author interprets these findings from a simulationist perspective, arguing that because knowledge about the fate of mental states after death cannot be informed by firsthand experience, theoretical constructs dealing with the self and others' minds after death suffer from the logical impoverishment of hypothesis disconfirmation. Consciously representing states of un-consciousness poses an impassable cognitive constraint.

However, by virtue of experiencing their absence during waking life, some psychological states (e.g. seeing, taste) are more amenable to cessation attributions to dead agents than states that the self is never consciously without (e.g. thinking, wanting). For example, perceptual states may be generally amenable to materialist reasoning when individuals contemplate the minds of dead agents, since people frequently experience the absence of such states (e.g. being in a dark, quiet environment; see also Barrett, 2004; Clark, 1994; Nichols, unpublished manuscript).

Whether one relies on simulation or not, however, reasoning about dead agents' minds is a difficult task because individuals cannot appeal to the same explanatory frame used in the regular social domain. According to Gopnik and Wellman (1992), young children use the behaviours of social others to test and refine their hypotheses about psychological states and thus to develop their theory of mind. If this 'theory theory' view of the ontogenetic emergence of theory of mind is correct, then dead agents pose special challenges to such theory construction because dead agents' 'behaviour' (i.e. their inactivity) provides limited information about underlying mental states (the absence of

¹ We use the term 'psychobiological' to refer throughout to psychological states that are associated with the vitalistic maintenance of the body (e.g. hunger, thirst, sleepiness, etc.). The subjective experience of these states usually prompts adaptive responses designed to regain physiological equilibrium and to support the biological continuation of the organism.

action does not necessarily imply the absence of mental states). The same can be said for children's reasoning about the minds of sleeping agents, or those who are otherwise behaviourally inert. Flavell and his colleagues (Flavell, Green, Flavell, & Lin, 1999) have shown that young children reason incorrectly that a sleeping person who is not dreaming nevertheless is experiencing mental states, and that a person simply sitting with her eyes open (e.g. day-dreaming) is thinking about 'nothing' (for a review, see Flavell, 1999). However, reasoning about the capacity to have mental states and reasoning about the contents of mental states are different issues. In asking children to think about the minds of dead agents, we are inquiring into their views of the former.

In addition, bodies of dead agents are often absent from children's view altogether and provide them little means for theory disconfirmation. In such cases, a 'mature' scientific theory concerning the psychological status of dead agents must be informed primarily by biological facts, for example by applying vitalistic knowledge (e.g. food involves nutrient intake and digestion and is required to support life) to related questions about death (e.g. 'Food is required to support life. Dead people are no longer alive. Therefore, dead people cannot be hungry'; Inagaki & Hatano, 1993, 2002). Because of their apparent connection to life, questions about the psychobiological status of dead agents (e.g. their capacity to experience hunger) may more readily lend themselves to such cessation reasoning than other categories of mental experience, such as desire, emotion, and epistemic states.

Slaughter and her colleagues, for instance, found evidence that preschoolers who are taught about the vitalistic purpose of particular behaviours (e.g. the need to eat food) are better able to reason that these activities no longer occur at death than those who are not given such information (Slaughter, Jaakkola, & Carey, 1999; Slaughter & Lyons, 2003). However, because the authors did not ask these preschoolers whether the psychological states (e.g. hunger) accompanying these vitalistic activities occurred after death, it is unclear whether such explicit instruction can also lead to increased cessation responses for mental states at this early age.

Preschoolers may acquire a corpus of various facts about the body without necessarily placing them in a larger theoretical context related to the subject of death (Atran, 1994; Carey & Spelke, 1994; Jaakkola & Slaughter, 2002; Keil, 1994). For example, Jaakkola and Slaughter found that it is only after children begin to use teleological reasoning about the biological functions of life-sustaining body parts (e.g. the heart is for pumping blood) that they become 'life theorizers' and are able to reason that, without these parts, one would die. Simply having knowledge about the location of body parts, however, was unrelated to children's life theorizing. According to Jaakkola and Slaughter, this is because simply having such information concerning body part location cannot contribute to children's understanding of life and death. Instead, one has to know what the functions of body parts are.

Because desire, emotion, and epistemic states are not directly associated with vitalistic maintenance of the physical body (as are psychobiological states) nor directly tied to observable sensory organs (as are perceptual states), more advanced biological knowledge (e.g. knowledge that the brain, which stops working at death, is responsible for wanting, remembering, and loving) may be necessary for children to make cessation responses for these psychological state categories. Furthermore, if individuals, by default, apply the laws of regular social cognition to dead agents (i.e. that they have minds that can hold mental states; e.g. Boyer, 2001), then it should require special cognitive effort to override this intuitive stance for states that are disconnected from the vitalistic needs and sensory apparatuses of the body. Therefore, attributing such states to dead agents

should be relatively frequent, as previous research suggests (Bering, 2002; Bering & Bjorklund, 2004). Consider a task requiring materialist reasoning about your own mental functioning after death: would you be quicker to reason about your inability to experience thirst, or your inability to know that you have died?

It is too simplistic, of course, to assert that children's judgments about the mental status of a dead agent depend solely on normative developmental patterns of cognitive change and advances in biological knowledge. These changes occur in tandem with culturally variable sources of biological and religious instruction and therefore the developmental picture in this area is probably very complex. The current study concerns variables of the latter sort, and asks whether children who have been exposed to different degrees of religious instruction at school differ in their reasoning about the minds of dead agents. Although children who attend secular school are often involved in religious activities outside of school, and religiously schooled children are not unanimously raised in a religious household, the educational curricula of secular and religious schools may be divergent enough to contribute to children's beliefs about 'life after death.' Spanish schoolchildren between the ages of 4 and 12 years, half from a secular school and half from a Catholic school, were presented with the same experimental procedure used by Bering and Bjorklund (2004) in their study with American secularly schooled children. The procedure involved presenting children with a puppet show in which the main story character, an anthropomorphized mouse previously enriched with mental state terms in the context of a puppet show, is killed and eaten by an alligator puppet. Following this, children are asked a series of questions about the biological and psychological functioning of the dead mouse.

Our hypotheses were as follows. Because of a tautological emphasis on souls in religious schools, children receiving religious instruction should exhibit fewer cessation responses overall. That is, differences in religious instruction should lead to different rates of cessation responses, with secularly schooled children being more likely to say that death renders the mouse psychologically incapacitated than their religiously schooled peers. The pattern of cessation responses for the different mental state categories, however, should be the same for both religiously and secularly schooled children. In other words, we predicted that religiously schooled children would have overall lower levels of mental cessation responses than secularly schooled children because this is generally supported by their educational background. However, for the foregoing reasons, we also predicted that both groups of schoolchildren would be less likely to state that desire, emotion, and epistemic states cease at death than psychobiological and perceptual states.

Another set of hypotheses concerned age-related changes in mental cessation reasoning. We predicted that the findings from Bering and Bjorklund (2004) would be replicated such that there would be an overall increase in cessation responses with age. Previous findings have shown that kindergarten children reason that biological imperatives cease at death (Barrett, 2004; Bering & Bjorklund, 2004), but then fail to apply this knowledge to related questions concerning psychological states that are linked with biological functioning (Bering & Bjorklund, 2004). The youngest children in the study should therefore have relatively low rates of cessation responses overall because they should not be able to 'reason out of' a basic social strategy that involves attributing psychological states to agents (dead or otherwise).

In contrast, older children, who have accrued more biological facts (particularly in relation to biological teleology), should be able to apply this knowledge to the psychobiological and perceptual questions and consistently give cessation responses for

these items. Children at all ages, however, should find it relatively difficult to deny dead agents the capacities for desires, emotions, and epistemic states because such reasoning requires fairly sophisticated knowledge about the relationship between the mind and the body and more effortful scientific deduction.

Finally, the present study allowed us to test the cross-cultural hypothesis that the same natural determinants of beliefs in psychological continuity after death are at work in both American and Spanish schoolchildren. Although socio-religious differences between these two cultures are admittedly negligible, replication of the findings by Bering and Bjorklund (2004) with a distinct cultural sample would be impressive evidence of the generalizability of these data to non-American populations.

Method

Participants

The sample consisted of 56 5- to 6-year-olds, 26 boys and 30 girls, with an average age of 5;10 (range = 4;10-6;10); 56 8- to 9-year-olds, 23 boys and 33 girls, with an average age of 8;11 (range = 7;11-9;10); and 56 11- to 12-year-olds, 25 boys and 31 girls, with an average age of 11;10 (range = 10;10-12;9). Half of the participants (84) attended a Catholic school, taught by nuns, and the other half attended a public, secular school.² Both schools were located in Castellón, Spain. Children at both schools came from diverse backgrounds and represented a broad range of socio-economic levels.

Material and procedure

All participants were tested individually in a small private room in their school. Children were initially asked whether they would like to watch a puppet show and help the experimenter answer some questions about the puppets. After agreeing to participate, they saw a puppet show demonstrated by a male experimenter. Children sat in a chair in front of the experimenter and the puppet-theatre display. The puppet-theatre display consisted of a green wooden board, 29.5 cm × 80 cm, artificial bushes, two small plastic flowers, one small artificial tree, a small circular mirror (representing a pond of water), one mouse finger puppet, and an alligator hand puppet. Prior to the puppet show, participants were introduced to the puppets and told, 'Now we both know that this isn't a real mouse and this isn't a real alligator, but let's pretend that they're real, ok?' (following Barrett, 2004). They were then given the following information about the characters: (1) The alligator's favourite food is mice; and (2) The mouse is a baby mouse. Immediately thereafter, the puppet show was presented to the participant. The experimenter manipulated the puppets while children listened to a taped story from a small audio recorder next to the puppet display.

The puppet shows involved one of two standardized scripts in which the mouse was eaten by the alligator (Scripts are presented in Appendix A). The presentation of the two scripts was counterbalanced across participants. Each script was followed by a series of questions concerning the 'dead' mouse's biological and psychological status (The two stories and their respective interview questions are identical to those used by Bering & Bjorklund, 2004, Experiment 3, translated into Spanish from the original English

² The mission statement of the Catholic organization ('*Hermanas de la Consolación*') affiliated with the religious group in the current study includes among its general aims: 'that the educational community becomes a Christian community that, making its specific task cultural transmission, favours Christian values and their development inside and outside of the school.'

version). After the show, both puppets were removed from the children's view and children were asked if Baby Mouse was still alive. Only after agreeing that Baby Mouse was not alive did the interview proceed (Only a handful of children answered that the mouse was still alive, and they were easily persuaded that he was indeed dead. The few children who persisted were not tested). Children were then told that the experimenter was only interested in what they thought, that there were no right or wrong answers, and that this was not a school test.

Children were then asked a series of 12 questions about Baby Mouse's current biological and psychological status. Questions were translations of those used by Bering and Bjorklund (2004, Experiment 3) and involved two questions about each of the following states: biological (e.g. 'Now that Baby Mouse is not alive anymore, do you think he will ever need to eat food again?'), psychobiological (e.g. 'Now that Baby Mouse is not alive anymore, do you think he's still hungry?'), perceptual (e.g. 'Now that Baby Mouse is not alive anymore, do you think he still hears the birds singing?'), desire (e.g. 'Now that Baby Mouse is not alive anymore, do you think he still wants to go home?'), emotion (e.g. 'Now that Baby Mouse is not alive anymore, do you think he's still angry with his brother?'), and epistemic (e.g. 'Now that Baby Mouse is not alive anymore, do you think he's still thinking about his brother?'). Children received one of two sets of questions corresponding to the script they had heard, each set consisting of two questions from each question type. Thus, collapsed across children, a total of four questions for each question type were asked. Table 1 presents all questions used in the experiment. Children received the questions in one of four counterbalanced orders.

Following children's response to each question (usually a 'yes' or a 'no'), they were asked to provide a justification for their answer (e.g. 'Why do you think that?' or 'How come?'). The experimenter offered confirmatory but neutral feedback to encourage all answers by the children regardless of their content. Participants' answers to the questions were recorded on audiotape for later transcription and were also coded on-line by the experimenter, anticipating audio recorder malfunctioning or inaudible responses by the children (neither of which occurred).

Coding

Answers to interview questions were conservatively scored according to operational criteria establishing likely capacity reasoning (i.e. the operation is envisioned to function despite the mouse's death) or cessation reasoning (i.e. the operation is envisioned to have ceased functioning as a result of the mouse's death), following Bering and Bjorklund (2004). Approximately 10% (9.97%) of the total responses could not be coded because of ambiguity of responses or failure of the child to respond. Criteria used to classify a response as denoting capacity reasoning and cessation reasoning (as well as unscorable responses) are provided in Appendix B, along with examples of children's responses.

Initial affirmative ('yes') responses to the interview questions were considered unequivocal evidence of capacity reasoning (i.e. the process continues after death), unless the children's answers to the follow-up question did not match their initial responses. Conversely, initial negative ('no') responses were classified as denoting cessation reasoning (i.e. the process ceases after death) only if children's answers to the follow-up question indicated unambiguously a cessation of the biological imperative or psychological faculty as a result of the mouse's death. When the answers to the follow-up questions did not match this requirement, they were reclassified either as denoting capacity reasoning (e.g. after saying Baby Mouse cannot see where he is anymore, a child

Table 1. Percentage of children, by age group and type of school, providing cessation responses for each question

	5- to 6-year-olds			8- to 9-year-olds			11- to 12-year-olds		
	Catholic	Secular	Total	Catholic	Secular	Total	Catholic	Secular	Total
Biological									
1. Will he ever need to eat food again?	36	56	47	69	75	72	85	83	84
2. Does his brain still work?	71	81	77	100	100	100	100	100	100
3. Will he ever grow up to be an old mouse?	36	58	46	100	88	94	100	100	100
4. Will he ever need to drink water again?	29	50	39	67	75	71	80	94	87
Psychobiological									
1. Is he still thirsty?	21	38	30	46	75	60	69	100	84
2. Is he still hungry?	21	50	37	69	83	76	92	100	96
3. Is he still sleepy?	36	58	46	67	88	77	87	100	94
4. Does he still feel sick?	29	25	27	53	75	65	93	81	87
Perceptual									
1. Can he still hear the birds singing?	57	69	63	69	92	80	85	68	76
2. Can he still taste the yucky grass he ate?	14	63	40	62	75	68	77	83	80
3. Can he still smell the flowers?	50	68	58	47	75	61	73	75	74
4. Can he see where he is?	79	58	69	53	75	65	87	88	87
Desire									
1. Does he still wish he didn't have a brother?	7	13	10	23	42	32	31	58	44
2. Does he still want to go home? (1)	7	13	10	39	50	44	54	58	56
3. Does he still hope he gets better at maths?	14	50	31	40	44	42	67	75	71
4. Does he still want to go home? (2)	14	17	15	33	19	26	53	31	42
Emotional									
1. Is still sad because he can't find his way home?	14	13	13	31	50	40	39	83	60
2. Is still angry at his brother?	14	44	30	39	58	48	54	92	72
3. Still loves his mom?	14	25	19	20	13	16	27	31	29
4. Is still scared of the alligator?	21	25	23	40	63	52	53	75	65

Table 1. (Continued)

	5- to 6-year-olds			8- to 9-year-olds			11- to 12-year-olds		
	Catholic	Secular	Total	Catholic	Secular	Total	Catholic	Secular	Total
Epistemic									
1. Is still thinking about his brother?	29	63	47	31	75	52	69	92	80
2. Still believes he's smarter than his brother?	21	25	23	39	75	56	46	92	68
3. Knows that he's not alive?	64	58	62	53	69	61	60	94	77
4. Still believes his mom is the nicest grown-up?	7	33	19	33	25	29	40	63	52

Note. Each child received only two questions for each question type, corresponding to the particular script they heard.

adds that this is because the alligator's stomach is dark and it is therefore impossible for him to see anything), or as unscorable (e.g. after saying that now Baby Mouse cannot taste the yucky grass anymore, children add that this is because he actually does not like grass).

Two people naïve to the purposes of the study served as independent coders for the entire data set. Initial inter-rater reliability was 96% (Cohen's $\kappa = .84$, $p < .01$). All disagreements were subsequently resolved by reviewing the episodes in question with the second author.

Results

Preliminary analyses showed no significant effects of gender and question order on children's answers, and thus all subsequent analyses were collapsed across these variables. All significant effects are reported at $p < .05$, with Bonferroni t tests used to evaluate significant main and interactive effects.

Percentage of cessation responses

Percentage of cessation responses, based on all responses (i.e. capacity, cessation, unscorable), are presented by school-type (Catholic vs secular) and question type, separately by age (5- to 6-year-olds, 8- to 9-year-olds, 11- to 12-year-olds) in Table 1 (Patterns of results were nearly identical when analyses were based only on scoreable responses; i.e. omitting unscorable responses in computing percentage of cessation responses). As can be seen, cessation responses tended to increase with age, were generally higher for children attending secular rather than Catholic school, and varied with question type.

A 3 (age group) \times 2 (school-type) \times 6 (question type) ANOVA with repeated measures on the question-type factor yielded significant main effects of age, $F(2, 162) = 29.27$, (11- to 12-year-olds, $M = 73.36\% > 8-$ to 9-year-olds, $M = 57.44\% > 5-$ to 6-year-olds, $M = 36.61\%$), school-type, $F(1, 162) = 10.91$ (secular, $M = 62.30\% > Catholic$, $M = 49.31\%$), and question type, $F(5, 810) = 61.70$ (biological, $M = 76.49\% > perceptual$, $M = 68.16\% = psychobiological$, $M = 64.88\% > epistemic$, $M = 51.79\% > emotional$, $M = 38.39\% = desire$, $M = 35.12\%$). The age \times question type interaction was also significant, $F(10, 810) = 2.97$, and is shown in Fig. 1. Importantly, there were no significant interactions involving the school-type factor.

Subsequent examination of the significant interaction revealed that the 11- to 12-year-old children made significantly more cessation responses than the 5- to 6-year-olds for each of the six question types. Differences between the 11- to 12-year-olds and the 8- to 9-year-olds were significant for three question types (psychobiological, desire, epistemic) and non-significant for the remaining three question types (biological, perceptual, emotion). Similarly, the 8- to 9-year-old children made significantly more cessation responses than the 5- to 6-year-olds for the biological, psychobiological, and desire question types, but not for the perceptual, emotion, and epistemic question types. The percentage of cessation responses between the question types within each age group were also examined. For the 5- to 6-year-olds, the biological and perceptual questions were undifferentiated and both produced significantly higher levels of cessation responses than the remaining four question types; cessation responses were significantly greater for the psychobiological than the desire and emotion questions, but not the epistemic questions, with responses for the latter three question types being equal (i.e. biological = perceptual $>$ psychobiological $>$ desire = emotion;

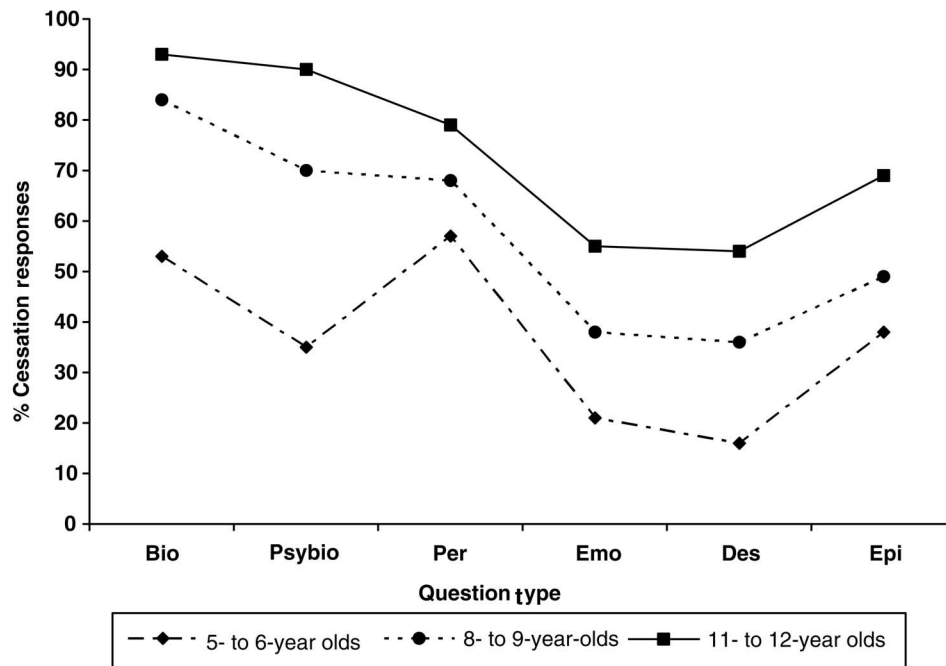


Figure 1. Percentage of participants providing cessation responses, by age and question type.

psychobiological = epistemic; epistemic = desire = emotion). For the 8- to 9-year-olds, the biological questions yielded significantly more cessation responses than all other question types; the psychobiological and perceptual question types were comparable and produced significantly more cessation responses than the epistemic, desire, and emotion question types; the epistemic questions produced higher levels of cessation responses than the desire and emotion ($p = .051$) questions, with the latter two being undifferentiated from one another (i.e. biological > psychobiological = perceptual > epistemic > desire = emotion). For the 11- to 12-year-olds, the biological and psychobiological questions produced equal levels of cessation responses which were significantly greater than all other question types; the perceptual questions yielded higher levels than the remaining three question types, and the epistemic questions had significantly higher levels of cessation responses than the desire and emotion questions, which did not differ (i.e. biological = psychobiological > perceptual > epistemic > emotion = desire).

Responses to specific items

An inspection of Table 1 reveals that, although patterns of performance on the various questions within each question type were generally similar, there were some exceptions. For example, cessation responses were disproportionately high for the 5- to 6-year-old children for the question, 'Does his brain still work?' (77%) relative to the other three questions in the biological category (range 39–47%). This question received 100% cessation responses for each of the two older groups of children. The high level of performance on this question seems to reflect that even young children understand that death produces cessation of brain activity. This was also the question that received the

most cessation responses for kindergarten children in the Bering and Bjorklund (2004) study (88%).

Two questions that stood out for their especially low levels of cessation responses were, 'Does he still love his mother' (emotion category, 19%, 16%, and 29% for 5- to 6-, 8- to 9-, and 11- to 12-year-olds, respectively), and, 'Does he still believe his mom is the nicest grown-up?' (epistemic category, 19%, 29%, and 52% for 5- to 6-, 8- to 9-, and 11- to 12-year-olds, respectively). Similarly low levels of cessation responses were found for these questions by Bering and Bjorklund (2004) for the kindergarten and elementary school children in their sample ('Does he still love his mother': 6% and 20%, respectively; 'Does he still believe his mom is the nicest grown-up?': 11% and 33%, respectively). The commonality between these two questions is obvious, where both refer to Baby Mouse's mother.

Few within-category differences were observed for the psychobiological, perceptual, and desire categories. The exceptions were especially low levels of cessation responses for the question, 'Can he still taste the yucky grass he ate?' for 5- to 6-year-old children attending Catholic schools (14%), 'Does he want to go home' for 8- to 9-year-old secular school children who received Script B (19%), and atypically high levels of cessation responses for the question, 'Does he still hope he gets better at maths?' for the 5- to 6-year-olds attending secular schools (50%) and both groups of 11- to 12-year-old children (71%). We have no explanation for these differences, and suggest that they are spurious.

However, when the outlier items mentioned above in each category were omitted and means recalculated, the age \times question-type patterns (as well as the patterns between the Catholic and secular schools) were virtually unchanged. Thus, although children of all ages did occasionally respond differently to items within each of our predetermined question-type categories, this did not affect the overall pattern of results.

Consistent cessation theorizing

To assess the degree to which children were consistent in their cessation reasoning, we classified children as 'consistent cessation theorists' if they provided at least 10 of 12 cessation responses (i.e. more than 80% of cessation responses). χ^2 analyses of the distribution of cessation theorists by age showed overall significant differences among the three age groups (11- to 12-year-olds = 63% > 8- to 9-year-olds = 32% > 5- to 6-year-olds = 13%, χ^2 [df = 2, N = 168] = 30.96, p < .01), confirmed by follow-up comparisons (e.g. 5- to 6- vs 8- to 9-year-olds; χ^2 [df = 1, N = 112] = 6.23; and 8- to 9- vs 11- to 12-year-olds; χ^2 [df = 1, N = 112] = 10.35). Interestingly, within every age group, more secular school children were classified as consistent cessation theorists than Catholic school children (11- to 12-year-olds = 79% vs 46%; 8- to 9-year-olds = 43% vs 21%; 5- to 6-year-olds = 18% vs 7%). Because of the relatively small sample sizes, this difference was statistically significant only for the 11- to 12-year-old group, χ^2 (df = 1, N = 56) = 6.17, p = .013.

We also classified children as consistent cessation theorists separately for each question type, requiring that children give cessation responses for both questions (i.e. 100%) to be classified as an cessation theorist for a question type. These data are presented in Table 2. As can be seen, the pattern of consistent cessation theorists by age, school-type, and question type was similar to that observed for the percentage of cessation responses, with the percentage of consistent cessation theorists increasing with age, being more frequent for secular school than Catholic school children, and being highest for the biological, psychobiological, and perceptual questions and lowest

Table 2. Percentage of consistent cessation theorists, by age and school-type, for each question type

	5- to 6-year-olds			8- to 9-year-olds			11- to 12-year-olds		
	Catholic	Secular	Total	Catholic	Secular	Total	Catholic	Secular	Total
Biological	18	46	32	68	71	70	82	89	86
Psychobiological	18	29	23	43	75	59	79	89	84
Perceptual	29	54	41	43	71	57	68	61	64
Emotional	11	18	14	21	25	23	32	50	41
Desire	7	11	9	25	25	25	29	29	29
Epistemic	11	29	20	29	36	32	32	71	52

for the emotion, desire, and epistemic questions. With respect to differences between children in the Catholic and secular schools, of the 18 contrasts (6 at each of three ages), the percentage of consistent cessation theorists was greater for children attending secular than Catholic schools for 15 of them, with the reverse being true for only 1 contrast (2 were equal).

Finally, we performed the converse analysis, classifying children as 'consistent capacity theorists' (that is, children who provided mental capacity responses for at least 10 of 12 questions). As might be expected, the pattern was quite different. Of the 5- to 6-year-old children, 18% were classified as consistent capacity theorists (18% in Catholic schools, 18% in secular schools), with only 7% of 8- to 9-year-old children (11% Catholic, 4% secular), and 2% of 11- to 12-year-old children (4% Catholic, 0% secular) being thus classified. χ^2 analyses of the distribution of capacity theorists by age was significant, χ^2 ($df = 2$, $N = 168$) = 9.22, $p = .01$, with subsequent tests indicating a significant difference between youngest and oldest groups of children only, χ^2 ($df = 1$, $N = 112$) = 8.17, $p = .004$.

Discussion

In general, the findings from the current study support our hypotheses concerning cognitive constraints on age-related patterns of reasoning about psychological continuity after death and those related to the effects of religious schooling on afterlife beliefs. The percentage of cessation responses (i.e. responses that indicated a cessation of function for particular mental and biological properties as a direct consequence of death) increased with age overall, and was significantly higher for children who attended a secular school than a religious school. Moreover, the percentage of cessation responses was mediated by question type such that, for all children, interview items dealing with psychobiological and perceptual states tended to evoke more cessation responses than those dealing with desire, emotion, and epistemic mental states. These data also replicated the findings of Bering and Bjorklund (2004, Experiment 3), who discovered nearly identical age-related and mental state category-specific responses in a group of secularly schooled American kindergartners and grade-school children (adults tested in the earlier study performed equivocally to the oldest children). Finally, these data provide evidence that this general response pattern is not limited to American schoolchildren. However, this statement should be tempered by a note of caution about the generalizability of these data, as cultural groups with more divergent afterlife beliefs than American and Spanish samples would make a more convincing case for their universality.

Several interesting findings emerged from inspection of the age by question-type interaction. The most substantial contrast was between the youngest children ($M = 5; 10$) and the oldest children ($M = 11; 10$), where for every question type (including those dealing with biological imperatives), the oldest children gave significantly more cessation responses than the youngest children. Nevertheless, even the youngest children (particularly those from the secular school) gave mostly cessation responses for the biological imperative question set (e.g. that the physical body and vitalistic activities of the dead mouse had ceased to function).

According to Barrett (2004), these findings of young children's knowledge of the biological verities associated with death may hint at adaptations that solved basic and recurrent problems (e.g. contamination and predators) but that are not clearly grounded in representational competencies (see also Boyer, 2001). For example, emotional reactions of disgust to dead bodies appear to trigger adaptive behavioural responses of avoidance (Rozin, Haidt, & McCauley, 1993), and children's recognition that dead bodies are no longer biologically viable may be associated with this aversion. These findings also suggest that kindergartners' answers to questions about the psychological status of the dead agent were not simply a function of their biological naïvety about death. Finally, it is important to note that these findings do not support those of Speece and Brent (1984), who reported that children do not begin to reason that the body stops functioning after death until they are around 7 years of age.

In the current study, the percentage of cessation responses to the 'does his brain still work?' question was especially high (81% for the secular school sample and 71% for the Catholic school sample) among these youngest children. In previous work, Johnson and Wellman (1982) reported that even 4-year-olds understand that the brain is 'for thinking', and thus it is somewhat surprising that the youngest children's percentage of cessation responses for the epistemic questions was relatively low (38% collapsed across questions and the school-type factor), given their understanding that the dead mouse's brain no longer 'works.' This was the only question in the biological category, however, that asked specifically about the functioning of an organ. The remaining questions asked about the need to eat and drink and the eventuality of growing old. Although responses to these other questions were also generally higher than responses in other categories, the more direct question about the functioning of an important organ produced the highest level of cessation responses. Perhaps similar levels of performance would have been attained had we asked if the dead mouse's stomach still worked rather than whether it could 'still eat food' and 'still drink water.'

Among the older age groups, the percentage of cessation responses as a function of question type was especially apparent when considering the consistent cessation theorists factor. For example, whereas nearly all (84%) of the oldest children in the sample consistently reasoned (i.e. gave cessation responses for both within-category questions) that the capacity for experiencing psychobiological states ended at death, only 29% of same-aged children did so for the desire state questions. A similar trend was revealed for children in the middle age group ($M = 8; 11$; to a somewhat lesser degree, this pattern of consistent cessation theorizing was found even for the youngest children). Thus, the notion that desire, emotion, and epistemic mental states are more likely to be attributed to dead agents than psychobiological and perceptual states was strongly supported.

When looking at children's responses to individual questions from the emotion category, children were somewhat more likely to attribute positive states to the dead mouse than negative ones. It seems that it is particularly difficult to contemplate

cessation when it comes to experiencing affection for one's (perhaps anyone's) mother. Similarly, the emotional valence of these items may have affected inhibition processes. Although children's latencies to answer questions were not measured, the interviewer (and second author) observed that the children's responses to the 'mom' questions were typically rapid, suggesting that children gave these items less thought before answering than other items. Thus, we suspect that the strong emotional valence of the questions was responsible for the disproportionately low levels of cessation responses on these items (Note that levels of cessation responses were low for all four questions in the emotion category for the 5- to 6-year-olds).

It is also possible that asking children to ponder whether the dead mouse retained the capacity to harbour particular mental states (for example, asking if the dead mouse wants to go home now rather than 'can want' more generally) led to the age-related distribution of cessation responses reported here. Perhaps children (and adults, for that matter) are simply prone to attribute mental capacities to dead agents when they are asked about the specific contents of dead agents' minds. Although this interpretation may account for the youngest children's responses, it cannot account for the differential effects of the various psychological state categories among the older groups of children. We would expect this contextual effect to work across the board when it comes to the different psychological state categories. In addition, although the interpretation may have some merit with regard to the youngest children's infrequent cessation responses, asking children about the capacity of a dead agent to experience specific mental states (rather than capacity in general) seems more in tune with people's everyday theorizing about dead agents' minds. For most people, death is not an abstraction but rather a sudden, often unexpected, end to a complex social relationship with a specific agent who very recently experienced particular mental states.

These developmental data provide preliminary support for the idea that certain aspects of afterlife beliefs are grounded in cognitive factors that likely operate independently of religious instruction. One of the roles served by religious instruction concerning 'life after death' may be to conceptually enrich a default stance that involves attributing mental states to dead agents. Although the present study did not directly test for this, religious pedagogy on the topic of the afterlife might serve to quarantine biologically relevant information such that this information is not used for theoretical applications concerning the fate of agents' minds after death. It is important to clarify that we are not arguing that biological knowledge among religiously schooled children is more impoverished than that of their secularly schooled peers, but only that these children may encounter a greater degree of conflict, and hence separation, between biological verities and their religious beliefs. As such, biological reasoning about the psychological status of dead agents may be set aside in favour of explicit religious ideas that defy naturalistic principles and that are regularly communicated to these children by adult authority figures (Harris & Giménez, 2003; Woolley, 1997). Indeed, it may be precisely this disparity between biological facts and religious ideas that contributes to the memorability of the latter, fostering their cultural transmission to children (Boyer, 2001; Sperber, 1996). This was supported by the present data in that, at every age, there were fewer Catholic school students who could be classified as consistent cessation theorists than there were secular school students who had such a response profile.

However, the only significant difference for the religious factor in this regard was for the oldest children in the sample. Although this may partially be due to the small sample sizes, it may also be that with age, religious instruction increasingly comes into conflict with a more sophisticated biological understanding of the mind. For instance, recent

findings reported by Harris and Giménez (2003) show a similar pattern in age-related differences in susceptibility to religious factors. These investigators presented 7- and 11-year-old children with two separate stories, one religious and one secular, concerning the death of a protagonist's grandparent and then asked whether the dead person's mind and body still functioned. The two stories were identical with the exception that in the religious story the grandparent was said by a priest to 'be with God now' whereas in the secular version the grandparent was said by a physician to 'be dead and buried.' Only the responses of the oldest children were influenced by this change in the story. For the 11-year-olds, the religious context was more likely than the secular context to prompt metaphysical justifications for continuation of the grandparent's mind after death. In contrast, the 7-year-olds' responses were not affected by this subtle manipulation of the narrative and they were less likely to give metaphysical explanations for continuation of mental functioning in general. These findings suggest to us that, with age, children's intuitive dualistic stance becomes bolstered by explicit religious ideas.

Although in the present study, we were not as interested in metaphysical explanations as we were more general explanations for the functioning of specific psychological states after death, the findings of Harris and Giménez (2003), when combined with those reported here, suggest that unique theoretical orientations concerning life after death may not fully develop until late childhood. These orientations are probably strongly shaped by educational differences as well as the attitudes and beliefs of family members and social others. Emotive factors associated with an awareness of personal mortality are also important (Florian & Mikulincer, 1998; Harris & Giménez, 2003). For example, Florian and Mikulincer argue that it is not until children understand the universality of death - and hence their own inevitable biological demise - at around age 10 that they experience existential anxiety.

However, ideas concerning the fate of the mind after death also grow out of an organized cognitive base. This underlying structure appears to initially promote beliefs in psychological continuity after death. Over time, these beliefs become progressively pruned to accommodate advances in biological knowledge. Religious instruction may encourage children to escape these conflicts by quarantining biological facts from religious beliefs, thus preserving a default stance toward viewing dead agents as having active minds. In contrast, naturalistic instruction about the body and mind may send children's initial reasoning about life after death into some disarray such that this default stance (that the mind survives death) must be abandoned in favour of one that reflects cessation of all mental processes at death, including those that are not clearly linked to vitalistic and bodily properties.

Because children's reasoning about the fate of mental states after death was probed in the current study by using a make-believe task with puppets, it may be premature to claim that these age-related patterns would be identical for a task involving 'real' characters. Although experimental designs investigating children's reactions to realistic portrayals of death (particularly of human characters) may be seen as ethically dubious to some, future studies should strive to address this important methodological concern. Many children's first experiences with death are with family pets (Inagaki & Hatano, 2002), and researchers may incorporate these experiences into experimental designs. In addition, investigators might present children with a videotape vignette in which an actor is lying in a coffin - a relatively innocuous and familiar television scene. For example, if children are intuitive dualists (e.g. Kuhlmeier, Bloom, & Wynn, 2004) in relation to death, then when they are asked where the dead person is (e.g. 'Now that John is not alive anymore, where is John?'), they may answer that he is somewhere other

than the coffin (though follow-up questioning might show that they believe the soul to dwell with the physical body). At what age might children begin to answer 'nowhere'? Future work in this area should continue to tease out the specific roles of biological knowledge, representational processes, and scientific reasoning in children's understanding of mental states after death.

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Appendix A: Afterlife vignettes and interview questions

Script A

Hi, I am going to do a puppet show for you today, and the first thing I'm going to do is introduce you to the two characters. Do you know what kind of animal this is? That's right! It's a mouse. And this mouse is a baby mouse. One day, he's going to grow up to become an old mouse. Do you know what kind of animal this is? Right again! It's an alligator. And this alligator's favourite food is baby mice. Now, we both know that these animals aren't real, they're just puppets, but for today let's just pretend that they are real.

'One day Baby Mouse decides to take a walk in the woods. While he's walking he is thinking about a lot of things. He is thinking about how angry he is at his brother because his brother is always fighting with him. Sometimes he wishes that he was an only child and he did not have a brother to worry about. Baby Mouse's mom always tell

Baby Mouse how smart he is, so Baby Mouse believes that he is much smarter than his brother. Baby Mouse is also thinking about food. He hasn't had anything to eat all day, and he is getting very hungry. He decides to eat some grass, but he takes one bite and spits it out because it leaves a very bad taste in his mouth. Yuck! He's also very thirsty, but he does not want to drink out of the pond because the water is dirty. The birds are singing very loudly outside and he is listening to their songs. Baby Mouse really wants to go home now but he is lost! He pulls out his map to try to figure out how to get home but he does not understand what the map says. This makes him very sad because now he does not know how to get home. He doesn't know where he is. Just then, he notices something strange. The bushes are moving! An alligator jumps out from behind the bushes and eats Baby Mouse. The alligator gobbles him all up. Baby Mouse is not alive anymore.'

Is the mouse still alive? Continue with testing only after participant says *no* and agrees that mouse is dead.

Interview questions

Biological

- (1) Do you think that Baby Mouse's brain still works now?
- (2) Do you think that Baby Mouse will ever need to eat food again now?

Psychobiological

- (1) Do you think that Baby Mouse is still hungry now?
- (2) Do you think that Baby Mouse is still thirsty now?

Perceptual

- (1) Do you think that Baby Mouse can still hear the birds singing now?
- (2) Do you think that Baby Mouse can still taste the yucky grass that he ate now?

Emotional

- (1) Do you think that Baby Mouse is still angry with his brother?
- (2) Do you think that Baby Mouse is still sad because he can't find his way home now?

Desire

- (1) Do you think that Baby Mouse still wants to go home now?
- (2) Do you think that Baby Mouse still wishes that he didn't have a brother now?

Epistemic

- (1) Do you think that Baby Mouse is still thinking about his brother now?
- (2) Do you think that Baby Mouse still believes that he is smarter than his brother now?

Script B

Hi, I am going to do a puppet show for you today, and the first thing I'm going to do is introduce you to the two characters. Do you know what kind of animal this is? That's right! It's a mouse. And this mouse is a baby mouse. One day, he's going to grow up to become an old mouse. Do you know what kind of animal this is? Right again! It's an alligator. And this alligator's favourite food is baby mice. Now, we both know that these animals aren't real, they're just puppets, but for today let's just pretend that they are real.

'One day Baby Mouse decides to take a walk in the woods. There are flowers and Baby Mouse loves how the flowers smell. The flowers smell very nice. While he's walking, he is thinking about a lot of things. He is thinking about his mom and how much he loves her. He believes that his mom is the nicest grown-up Mouse in the whole world. He is also thinking about numbers. He likes numbers but he is not very good at

using them! He does not even understand how to add numbers together! He hopes that one day he will be better at using numbers. Baby Mouse's feet are very tired and he wants to go home now, but he realizes that he is lost and he does not know the way back to his house! He is so sleepy, and he really wants to go to bed. Baby Mouse has a sore throat and he feels sick. Maybe if he drank some water he would feel better. He decides to drink some water out of the pond, but before he gets there, he notices something very funny. The bushes are moving. Uh oh! An alligator jumps out from behind the bushes! Baby Mouse is very scared. Baby Mouse and the alligator stare at each other for a minute. Baby Mouse does not know what the alligator is thinking. Then the alligator eats Baby Mouse and gobbles him up. Baby Mouse is not alive anymore.'

Is the mouse still alive? Continue with testing only after participant says *no* and agrees that the mouse is dead.

Interview questions

Biological

- (1) Do you think that Baby Mouse will grow up to be an adult mouse now?
- (2) Do you think that Baby Mouse will ever need to drink water again now?

Psychobiological

- (1) Do you think that Baby Mouse is still sleepy now?
- (2) Do you think that Baby Mouse still feels sick now?

Perceptual

- (1) Do you think that Baby Mouse can see where he is now?
- (2) Do you think that Baby Mouse can still smell the flowers now?

Emotional

- (1) Do you think that Baby Mouse still loves his mom now?
- (2) Do you think that Baby Mouse is still scared of the alligator now?

Desire

- (1) Do you think that Baby Mouse still wants to go home now?
- (2) Do you think that Baby Mouse still hopes he gets better at maths now?

Epistemic

- (1) Do you think that Baby Mouse knows that he is not alive now?
- (2) Do you think that Baby Mouse still believes that his mom is the nicest grown-up mouse in the world now?

Appendix B: Coding guidelines

Criteria establishing capacity reasoning (i.e. the specific psychological faculty is envisioned to continue functioning despite the mouse's death), cessation reasoning (i.e. the specific psychological faculty is envisioned to have ceased functioning as a result of the mouse's death), and unscorable responses are reported below, along with examples of children's actual responses.

Capacity - Child responds 'yes' to initial target question and does not contradict this answer in his or her response to the follow-up question(s); see Example 1a). If child does not provide answer at follow-up questioning for initial 'yes' response (e.g. shrugs shoulder, states 'I don't know, etc.), then a capacity score is recorded (see Example 1b). A capacity score is also recorded when child responds 'no' to initial target question, but

his or her answer to subsequent follow-up questioning indicates capacity reasoning (see Example 1c).

Example 1a

E: 'Now that the mouse is not alive anymore, is he thinking about the alligator?'
C: 'Yes.'
E: 'Why?'
C: 'Because he scared him.'

Example 1b

E: 'Now that the mouse is not alive anymore, does he know where he is now?'
C: 'Yes.'
E: 'How come?'
C: 'I don't know.'

Example 1c

E: 'Now that the mouse is not alive anymore, can he see this tree?'
C: 'No.'
E: 'Why not?'
C: 'He's inside of an alligator's body and can't see anything but his mouth.'

Cessation – Child responds 'no' to initial target question, and provides a justification for this response indicating cessation of function for particular faculty during follow-up questioning (see Example 2a and 2b below).

Example 2a

E: 'Now that the mouse is not alive anymore, is he thinking about alligator?'
C: 'No.'
E: 'How come?'
C: 'Because he doesn't have a brain that's attached and working.'

Example 2b

E: 'Now that the mouse is not alive anymore, is he still sleepy?'
C: 'No.'
E: 'And why not?'
C: 'Because he's dead.'

Unscoreable (U) – Child provides contradictory responses for initial target question, and follow-up question (see Example 3a). In addition, an unscoreable response is recorded if the child's response to follow-up questioning is ambiguous after initial 'no' responses for target questions (see Example 3b).

Example 3a

E: 'Now that the mouse is not alive anymore, can he see this tree?'

C: 'Yes.'

E: 'Because?'

C: 'Because he's . . . um . . . no.'

E: 'So can he see the tree?'

C: 'No.'

Example 3b

E: 'Now that the mouse is not alive anymore, does he know he's not alive?'

C: 'No.'

E: 'No, why?'

C: 'Because he's in the alligator's stomach.'

E: 'So he doesn't know he's not alive?'

C: 'Yeah.'