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Children's and adults' understanding of death: Cognitive, parental and experiential influences

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Abstract

This study explored the development of understanding of death in a sample of 4-11 year-old British children and adults (*N*=136). It also investigated four sets of possible influences on this development – parents' religion and spiritual beliefs, cognitive ability, socioeconomic status, and experience of illness and death. Participants were interviewed using the 'death concept interview' (Slaughter & Griffiths, 2007) that explores understanding of the subcomponents of inevitability, universality, irreversibility, cessation and causality of death. Children understood key aspects of death from as early as 4-5 years and, with age, their explanations of inevitability, universality and causality became increasingly biological. Understanding of irreversibility, and the cessation of mental and physical processes also emerged in early childhood, but by 10 years many children's explanations reflected not an improved biological understanding but the coexistence of apparently contradictory biological and supernatural ideas – religious, spiritual or metaphysical. Evidence for these coexistent beliefs was more prevalent in older than in younger children, and was associated with their parents' religious and spiritual beliefs. Socioeconomic status was partly related to children's biological ideas, whereas cognitive ability, and experience of illness and death, played less important roles. There was no evidence for coexistent thinking among adults, only a clear distinction between biological explanations about death and supernatural explanations about the afterlife.

Keywords. Understanding of death; coexistent thinking; parental influences; religion; afterlife beliefs; conceptual development

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Understanding death is a complex and emotional process that involves the recognition of five key biological facts – the five death subcomponents: a) all humans will die one day (inevitability); b) death applies to all living entities (universality); c) death is permanent (irreversibility); d) with death all physical and psychological functions stop (cessation); and e) death is caused by the breakdown of bodily processes (causality) (Jaakkola & Slaughter, 2002; Speece & Brent, 1984).

Understanding of these subcomponents is acquired at different times and at different rates. Children as young as 5 grasp the ideas that death is inevitable and irreversible but most do not begin to understand universality and cessation until around 6-7 years (Lazar & Torney-Putra, 1991; Nguyen & Gelman, 2002; Panagiotaki, Nobes, Ashraf & Aubby, 2015; Slaughter & Griffiths, 2007; Slaughter & Lyons, 2003). There is also evidence that children understand the cessation of physical processes (i.e., the body stops working) before they grasp the idea that mental processes, such as thoughts and emotions, also come to an end with death (Bering & Bjorklund, 2004; Bering, Hernandez Blasi & Bjorklund, 2005; Misailidi & Kornilaki, 2015). Causality is a more abstract notion and usually the last to be acquired because it involves the understanding of complex processes leading to the body's breakdown (Slaughter & Griffiths, 2007). Children understand causality when thinking about plants as early as 4 years (e.g., Nguyen & Gelman, 2002), but causality of human death is typically not understood until as late as 8-10 years (Panagiotaki et al., 2015; Slaughter & Griffiths, 2007).

Learning about death occurs when children are exposed to biological facts about its inevitability, its irreversibility, and the cessation of physical and psychological processes. During this process, children also encounter different 'supernatural' beliefs - embedded in

religious traditions and cultures - that endorse the notions of the afterlife and spiritual world (Legare, Evans, Rosengren & Harris, 2012). Examples include beliefs that the deceased continue to feel, think and interact with the living; that the spirit or soul of the dead continues to exist in a different realm; or that the dead person is judged, and either enjoys heaven and eternal life with God, or punishment in hell. These supernatural beliefs have previously been defined as immature ways of thinking about death that contradict the superior 'natural' explanations, and are eventually replaced by them (Norris & Ingelehart, 2004; Piaget, 1928; Preston & Epley, 2009). This view accepts natural explanations as the only mature way of understanding and explaining the subcomponents of death.

Recent evidence however suggests that natural and supernatural beliefs about unobservable phenomena such as life, death and the afterlife (Brent et al., 1996; Harris & Gimenez, 2005; Watson-Jones, Busch, Harris & Legare, 2016), but also illness (Busch, Watson-Jones & Legare, 2016; Legare & Gelman, 2009) and evolution (Evans & Lane, 2011; Evans, Legare & Rosengren, 2011; Tenenbaum & Hohestein, 2016), are not necessarily incompatible but often coexist in the same mind to explain the same phenomena (Gelman & Legare, 2011). For example, children may recognise that dead people cannot move or see because their bodies have stopped working, but at the same time believe that they dream or miss their children – a belief consistent with the notion that certain psychological processes persist after death. There is also evidence that this coexistence becomes more prevalent as children grow older and begin to entertain alternative ideas about death (Harris, 2011). Even adults – particularly those from religious and diverse cultural contexts – often endorse afterlife beliefs when reasoning about death (Lane et al., 2016; Rosengren, Gutierrez & Schein, 2014a; Watson-Jones, Busch, & Legare, 2015).

A number of studies support this account. Harris and Gimenez (2005) asked 7-8 and 10-12 year-old Spanish children whether certain biological and psychological processes persist after death. They found that 7-8 year-olds gave biological explanations that supported the cessation of all processes, whereas many 10-12 year-olds said that certain processes persist and gave supernatural justifications with references to God, the soul and heaven. Rosengren et al. (2014a) reported that, although 6-year-old Americans understood the biological facts about inevitability, irreversibility, cessation and causality of death, they also relied on religious and metaphysical explanations about the afterlife. These coexistent explanatory systems were present from 4 years but their prevalence increased with age. Similarly, Lane, Zhu, Evans and Wellman (2016) reported that 4-year-old American children believed that physical and mental functions in people and animals persist after death. By 6 years these beliefs became less common and children reasoned about death in biological terms – only to become more prevalent again from the age of 7.

This dualistic or coexistent reasoning has been evident in studies with participants from the United States and Spain, where Christian beliefs prevail and children are exposed to supernatural ideas about death (Bering, 2002; Bering & Bjorklund, 2004; Harris & Gimenez, 2005; Lane et al., 2016). Studies have also been conducted in diverse cultures such as in Madagascar, where strong beliefs in the presence of dead ancestors among the living exist (Astuti & Harris, 2008), and in Tanna, Vanatu, a Melanesian archipelago, where metaphysical and religious explanations of death are deeply embedded in local beliefs and practices (Busch et al., 2016; Watson-Jones et al., 2016). Despite some degree of variation, these studies provide cross-cultural evidence that: a) children, and often adults, are more likely to believe in the continuation of psychological processes such as thinking or dreaming than in the continuation of biological processes; b) natural (biological) and supernatural

(religious or spiritual) explanations about aspects of death often co-exist in children's and adults' minds without any apparent 'tension' between the two; and c) this co-existence does not reflect immature thinking that is eventually replaced by biological facts, but tends to emerge *after* the biological understanding of death has been acquired (Astuti & Harris, 2008; Watson-Jones et al., 2016).

According to Lane et al. (2016) however, data from such religiously saturated cultures, where religious and metaphysical beliefs are strongly embedded in people's thinking, leave open the possibility that children from more secular backgrounds do not hold coexistent beliefs about death to the same degree. When Lane et al. compared explanations of death given by religious American and secular Chinese 4-12 year-olds they found that the Chinese believed in the persistence of psychological processes after death much less than their American peers. The contrast in culturally transmitted knowledge about death between China, with its recent history of religious intolerance, and America, where religion is widely practiced, may explain why the Chinese relied less on supernatural explanations of death than the Americans. It is possible therefore that the evidence for supernatural and coexistent beliefs about death is more prevalent in children from religious cultures than in those from less religious and secular backgrounds.

The present study

Religion, afterlife beliefs and death understanding. This study explored the understanding of death among a sample of 4-11 year-old children and adults in Britain, where there has been relatively little research in this area (Hopkins, 2014). Like China, Britain is less religiously saturated than the US or Spain, with fewer people considering themselves as religious. Around 77% of Americans, 73% of Spanish but only 48% of British consider

themselves religious, and 72% of Americans versus 49% of British believe in some form of afterlife (British Social Attitudes Survey, 2015; Spanish Centre for Sociological Research, 2016; US Religious Landscape Study, 2015). Despite these differences, many British children come from religious families and attend religious schools. There is, therefore, a wide range of religiosity in Britain – from strongly-held religious and metaphysical beliefs as is typical in countries such as the US and Spain, to the more secular, as is more typical in China.

Previous research with American, Spanish, and Israeli children indicates that religiosity in the family or in children's educational settings can shape many of their explanations of death (Bering et al., 2005; Candy-Gibbs, et al., 1985; Florian and Kravetz, 1985; Harris & Gimenez, 2005; Rosengren et al., 2014a). For example, children from religious backgrounds often believe that biological and psychological processes continue after death. They also tend to give religious explanations about the irreversibility of death and make references to God or heaven. The range of religiosity in British families allows further investigation of these influences of familial background on children's beliefs about death and, more specifically, of Lane et al.'s (2016) suggestion that coexistent thinking is more prevalent in children from religious families. To test these proposals, this study measured both children's beliefs about death and their parents' religiosity. In addition, regardless of their religion, we asked parents what they believed about the afterlife.

Adults and death understanding. Another innovation of this study concerns the inclusion of a sample of adults that were tested with the same questions as children. With some recent exceptions (e.g., Lane et al., 2016; Watson-Jones et al., 2015; 2016), most research in this field has concentrated on children's reasoning about death. Yet, as Coley (2000, p. 82) argues, testing adults with children's tasks has several advantages, not least that "to characterize the process of conceptual development, we need to understand the adult

model, the modal ‘end state’ of development in a given society”. Following Watson-Jones et al.’s (2016) suggestion that, at least among the more religious or traditional cultures that have been studied previously, many adults hold a dual conception of death – death as a biological endpoint and death as the beginning of an afterlife – this study tested whether such coexistent thinking is also evident in British adults’ explanations.

Other possible influences on children’s beliefs about death such as cognitive ability, and previous experience of illness and death, have also been explored. However, there are some inconsistencies in the findings from research in these areas.

Cognitive ability and death understanding. Some studies reveal associations between children’s understanding of death and verbal ability (Jenkins & Cavenaugh, 1986) or performance in the Piagetian tasks of seriation, conservation and classification (e.g., Cotton & Range, 1990; Hunter & Smith; 2008; Reilly et al., 1983). Others report no relationship between cognitive ability and death understanding (Mahon, Goldberg & Washington, 1999; Orbach, Weiner, Har-Evan & Eshel, 1995). Discrepancies in these findings might be explained by differences in the designs and assessment measures used (Hopkins, 2014).

To gain a better understanding of the relationship between cognitive ability and children’s death understanding – independent of age – we tested 4-5 year-olds with the Wechsler Pre-School and Primary Scale of Intelligence (WPPSI-III; Wechsler, 2003), and 6-11 year-olds with the Wechsler Abbreviated Scale of Intelligence (WASI-II; Wechsler & Hsiao-pin, 2011). We used these well-validated measures to avoid the limitations of traditional Piagetian tasks that have been criticised for their lack of validity and reliability, and for largely ignoring individual differences (Fontana, 1995; Hopkins, 2014). These measures allowed us to explore the influence of verbal comprehension and perceptual reasoning – both subsets of WPPSI-III – on children’s reasoning about death.

Socioeconomic status and death understanding. Although it is recognised that family socioeconomic status is a key factor associated with children's cognitive development (Hackman & Farah, 2009), few studies have explored its relationship with the development of children's understanding of death (Hopkins, 2014). According to some early research, urban children from low socioeconomic backgrounds may have a less well developed understanding of aspects of death than their peers from wealthier backgrounds (Tallmer, Formanek & Tallmer, 1974; Atwood, 1984), and children of highly educated parents have a better understanding of illness than those of less educated parents (Lau, Bernard, & Hartman, 1989). The literature on the relationship between socioeconomic status and cognitive development (e.g., Bornstein & Bradley, 2012; Bradley & Robert, 2002) suggests that high socioeconomic status parents have better resources, offer more cognitively stimulating experiences and opportunities for learning, and engage their children in richer conversations about a variety of topics. To explore whether this relationship also applies to the way in which children reason about death, we measured family socioeconomic status by asking children's parents to provide information about their education, occupation and income.

Experience and death understanding. A number of studies suggest that children who have suffered serious illness or hospitalisation are more likely to understand the concepts of universality and irreversibility compared with their healthy peers (Jay, Green, Johnson, Caldwell, & Nitschke, 1987; O'Halloran & Altmaier, 1996). Similarly, children with direct experience of death in their family appear to develop a more realistic and mature understanding of death than their inexperienced peers (Bonoti, Leondari & Mastora, 2013; Hunter & Smith, 2008).

In contrast, experience of death of a loved one has been linked with a *less* biological view of inevitability and causality (e.g., Cotton & Range, 1990), while no differences have

been found between 'experienced' and 'inexperienced' children (Mahon, 1993). Rosengren et al. (2014b) reported that children's death experiences were strongly associated with their understanding of the concept of life but *not* of death. They suggest that parents may use these life events as opportunities to provide their children with detailed information about life processes, but with less specific information about the challenging facts concerning death. To help clarify the role of experience on how children conceptualize death, we compared 'experienced' and 'inexperienced' children's responses to our death concept interview.

Predictions

The first two predictions concerned the development of understanding of the five subcomponents of death. Responses were scored and higher scores corresponded to better biological understanding. Responses were also allocated to a small number of response type categories (e.g., biological, religious etc.). Finally, we coded responses in terms of their overall consistency across the interview and allocated them to a small number of consistent models (e.g., biological, coexistent etc.). Our first prediction was that older children – and adults – would demonstrate a more biological understanding of *inevitability*, *universality* and *causality* of death than younger children (Panagiotaki et al., 2015; Slaughter & Lyons, 2003; Slaughter & Griffiths, 2007). We predicted a linear developmental pattern of knowledge acquisition of these three notions, with older children scoring higher than younger ones and adults scoring higher than all children. Types of responses were also expected to be positively associated with age for these subcomponents.

The second prediction was that for *irreversibility* and *cessation,* older children (10-11 years) would have lower scores and give more supernatural explanations than younger children and adults. We made this prediction for two reasons. First, it is shown that

supernatural explanations become more prevalent as children grow older and become increasingly exposed to alternative explanations of death (see Harris & Gimenez, 2005). Second, irreversibility and cessation tend to elicit more religious or spiritual explanations than the more biologically-focused facts about inevitability, universality and causality. This probably explains why studies that ask questions about these two subcomponents support the coexistence account (e.g., Harris & Gimenez, 2005; Lane & Evans, 2016; Watson-Jones et al., 2015; 2016). Questions asked by these researchers about irreversibility and cessation, such as "When a person dies can he come back to life?"; "What happens when a person dies?"; "Do his eyes work?"; and "Does he see things?", tend to elicit more supernatural explanations because they tap into the spiritual views more than questions such as "Tell me a few things that never die" or "Do all people die?".

Following on from hypotheses one and two, our third prediction was that coexistence of biological and supernatural explanations – if present in our sample – would be more evident in older than in younger children. We made no specific predictions regarding adults' coexistent explanations. The presence of both biological and supernatural explanations in adults' responses would confirm the view that coexistent beliefs characterize adults' reasoning about death, even in the relatively secular context of the British culture (Busch et al., 2015; Harris, 2011; Watson-Jones et al., 2016). On the other hand, a finding that coexistent beliefs are present only in older children's explanations, would suggest that by adulthood, supernatural ideas are replaced by the prevailing biological facts about death. A third possibility is that neither children nor adults have coexistent beliefs. This finding would indicate that coexistence may apply largely to children from cultures with strong religious and traditional beliefs, and less to those from more secular backgrounds such as the British.

This study also investigated the relative influence of a set of associated variables including family religion and afterlife beliefs, cognitive ability, family socioeconomic status, and previous experience of death and serious illness, on how children reason about death. We made a number of predictions for each of these variables.

Our fourth prediction was that children from families with religious beliefs (particularly in relation to the afterlife) would have lower scores on the irreversibility and cessation questions.

The fifth prediction was that children from more secular backgrounds would be less likely than those from religious or spiritual families to hold coexistent biological and metaphysical beliefs (Lane et al., 2016).

Our sixth prediction was that children with higher cognitive ability (IQ) would show better biological understanding of the five death subcomponents than those with lower IQ, and that this would be reflected in both their scores and response types.

The seventh prediction was that children from families with higher socioeconomic status (level of education, income and employment) would score higher than those from families with lower socioeconomic status in terms of their scores and types of responses.

Our eighth prediction was that children exposed to serious family illness and/or death would differ in their understanding of death from children without this exposure, but due to the inconsistent evidence in this area our hypothesis did not have a specific direction.

Method

Participants

A total of 136 participants - 93 children and 43 adults - were recruited. The sample consisted of five age groups: 19 4- to 5-year-olds (6 boys; *M* = 5.4 years, *SD* = 4.9 months);

27 6- to 7-year-olds (13 boys; *M* = 7.1 years, *SD* = 7.5 months); 26 8- to 9-year-olds (8 boys; *M* = 8.9 years, *SD* = 9.0 months); 21 10- to 11-year-olds (14 boys; *M* = 10.7 years, *SD* = 5.6 months); and 43 adults (12 males; range 18-66 years; *M* = 27.6 years, *SD* = 13.5 years). Parents of all 93 children completed questionnaires.

Children were from three state primary schools and one independent school in the East of England. The majority (83%) were White British and came from middle class socio-economic backgrounds. Of the 43 adult participants, 86% were White British: 65% were undergraduate students, 16% professionals and 19% non-professionals.

Measures

We employed the 'death concept' interview used by previous researchers in this area (e.g., Lazar & Torney-Purta, 1991; Panagiotaki et al., 2015; Slaughter & Griffiths, 2007; Slaughter & Lyons 2003; see also Rosengren et al., 2014b). All participants answered 14 questions that assessed the five death subcomponents:

1. Inevitability – Can you tell me some things that die? [If people not mentioned:] Do people die? [If yes:] Do all people die?
2. Universality– Can you tell me a few things that never die?
3. Irreversibility – Can a dead person ever become a living person? If a person dies and they haven't been buried in their grave for very long can they become a live person again?
4. Cessation – When a person is dead do they need food? Do they need to go to the toilet? Do they need air? Can they move around? Do they have dreams? Do they need water?

5. Causality – Can you tell me something that might happen that would make someone die? When this happens why does that person really die?

Cognitive ability in 6-11 year-olds was measured with the WASI-II (Wechsler & Hsiao-pin, 2011), which assesses intellectual functioning in verbal comprehension and perceptual reasoning of individuals aged 6 to 90 years. The four subtests administered were the Block Design (BD), Vocabulary (VC), Matrix Reasoning (MR), and Similarities (SI). For the 4- to 5-year-old group the short-form version (Sattler & Dumont, 2004) of the Wechsler Pre-school & Primary Scale of Intelligence-III (WPPSI-III; Wechsler, 2003) was used. The four subtests used were the Block Design (BD), Vocabulary (VC), Symbol Search (SS), and Word Reasoning (WR). BD and VC measured the same constructs as in the WASI-II. SS tests processing speed, and WR assesses verbal comprehension and reasoning. For both tests, a Full Scale IQ (FSIQ) was calculated for each child.

Parents of all children who took part in the study completed a questionnaire about family SES (their education, occupation and income), their religion and beliefs about death (i.e., 'What particular beliefs do you hold around death such as beliefs in afterlife?'), and their child's previous experience of serious illness and of death in the immediate or extended family. Adult participants also documented their age, occupation, ethnicity, and their religion and beliefs about death, before they were interviewed.

Procedure and coding

Children were individually interviewed in a quiet area of their school. The order of administration of the IQ test and death concept interview was counterbalanced. Interviews

lasted 30-40 minutes and were voice recorded. Adult participants were individually interviewed for around 15 minutes each (they were not administered an IQ test).

Death concept scores. Participants' responses to each of the five death subcomponents were scored 0 (incorrect), 1 (partially correct) or 2 (correct) by the second author (Appendix A). These scores were summed to give an overall death concept score, with a possible maximum of 10. A second independent judge (fourth author) also coded all these responses. The resulting agreement was 95% for inevitability, 94% for applicability, 98% for irreversibility, 96% for cessation, and 99% for causality. All disagreements were resolved through discussion with the first author.

Response type categories. Responses about each death subcomponent were also classified as: 1) *non-biological*, reflecting non-biological understanding without religious or spiritual justifications (e.g., not all people die; living things don't die; a dead person can become a living person again; dead people can move or dream or need air/the toilet/food; people die because of illness/accidents/old age but no reference to biological processes); 2) *religious/spiritual*, reflecting only religious or spiritual ideas; 3) *biological and religious/spiritual*, with responses combining two contradictory explanations; or 4) *biological*, reflecting only biological ideas. For examples of different response type categories, see Appendix B.

Overall consistency. To examine the consistency of participants' types of responses across all five subcomponents, each participant was allocated to one of three consistent death concept categories (models): 1) *non-biological*, if 3, 4 or 5 response type categories were non-biological and the remaining biological; 2) *coexistent (dualistic*), if at least one response type category was religious or spiritual and one or more biological; and 3) *biological*, if 3, 4 or 5 response categories were biological and the remaining non-biological. The

coexistent/dualistic model reflected the coexistence of two apparently opposing views (i.e., biological answers combined with religious or spiritual ideas). There were no participants with consistently religious or spiritual views or other combinations of response categories.

Results

A series of MANOVAs was conducted to explore the relationship between age, religion/afterlife beliefs, IQ, parental socioeconomic status and illness/death experience, and participants' overall death scores. In line with previous research (Panagiotaki et al., 2014; Rosengren et al., 2014b; Slaughter & Griffiths, 2007), participants' scores on each of the five subcomponents (ranging from 0-2) were also examined. This allowed a detailed analysis of the relationship between our variables and explanations of different aspects of death.

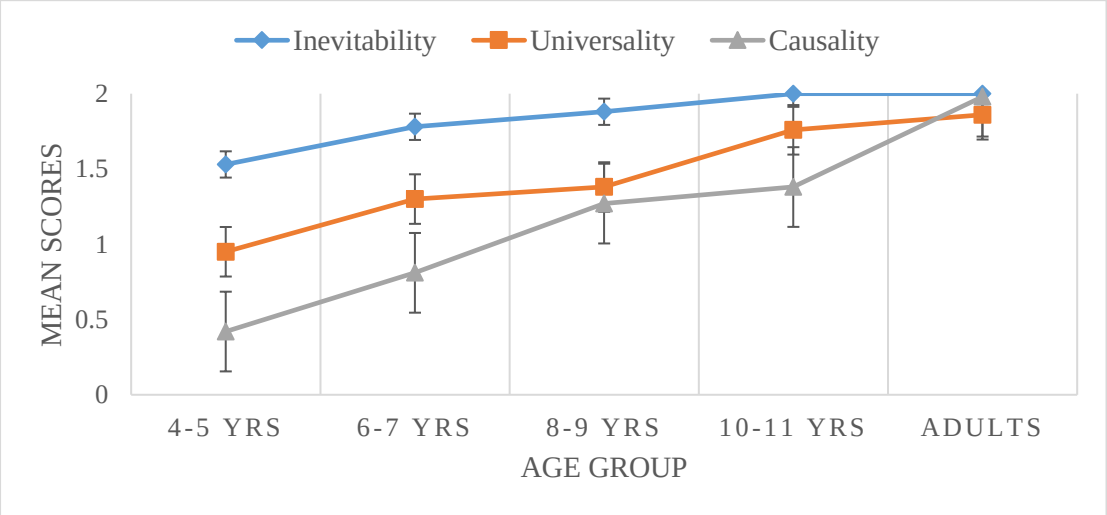
Throughout the scores' analysis we report significance levels (*p* values) and effect sizes (*partial* η^2 values). Following Cohen (1988) and Field (2013), *partial* η^2 effect size magnitudes above .01 were considered small, .06 medium, and .14 large. For chi-square tests, we report *Cramer's V* values as a measure of effect size. For *df*=1, effect sizes of .10, .30, and .50 were considered small, medium and large respectively. For *df*=2, effect sizes of .07, .21, and .35 were considered small, medium and large respectively (Cohen, 1988).

Age and death understanding (scores, response types and consistent models)

Interview scores. There was a large main effect of age on the overall death concept scores (max = 10), $F(4, 135) = 17.34$, $p < .001$, partial $\eta^2 = .35$. Post-hoc pairwise comparisons indicated that biological understanding in 8-9 and 10-11 year-olds was significantly better than in 4-5 year-olds (*p*s < .05) and adults were significantly better than all age groups (*p*s < .001).

A MANOVA further explored the relationship between age and individual death subcomponent scores. Consistent with our first prediction, this indicated a broadly linear relationship between age and inevitability $F(4, 135) = 9.67$, $p < .001$, partial $\eta^2 = .23$, universality $F(4, 135) = 6.01$, $p < .001$, partial $\eta^2 = .15$, and causality $F(4, 135) = 29.27$, $p = .00$, partial $\eta^2 = .47$ (Figure 1). On these three subcomponents, pairwise comparisons indicated that biological understanding in 10-11 year-olds was significantly better than in 4-5 year-olds (ps < .01) and 8-11 year-olds were similar to adults (ps < .05). Adults understood inevitability and universality better than 4-7 year-olds, and causality better than all age groups (ps < .05).

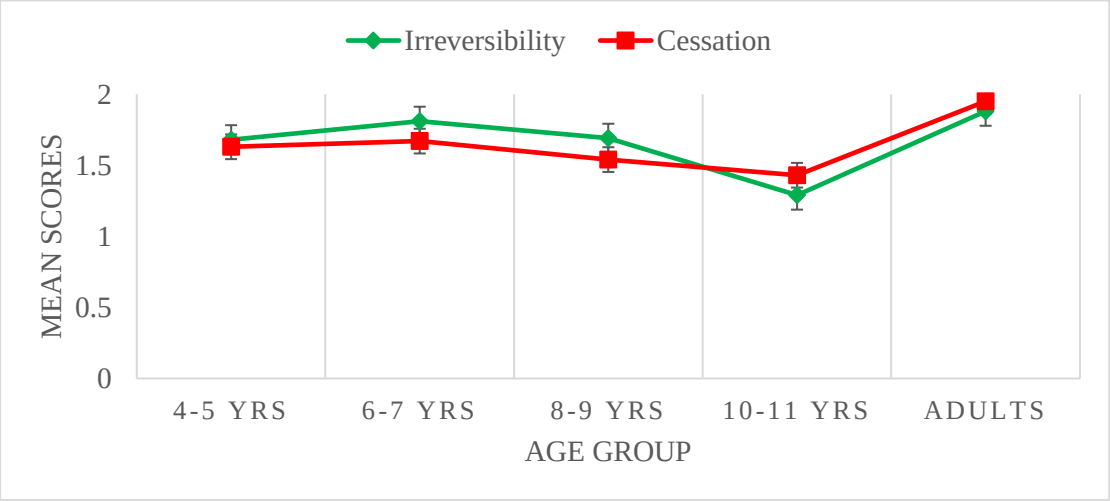
Figure 1. Death subcomponent mean scores (max = 2) by age group for inevitability, universality and causality (error bars indicate standard error)



On irreversibility, there was also a medium main effect of age, $F(4,135) = 4.37$, $p = .002$, partial $\eta^2 = .12$. Consistent with our second prediction, 10-11 year-olds gave significantly fewer biological answers than both 6-9 year-olds and adults (ps < .05). While

the main effect of age on cessation was significant, $F(4, 135) = 5.22$, $p = .001$, partial $\eta^2 = .14$, there was no evidence of increased biological understanding between 4 to11 years: only adults understood cessation better than 8-11 year-olds (ps < .01) (Figure 2).

Figure 2. Death subcomponent mean scores (max = 2) by age group for irreversibility and cessation (error bars indicate standard error)



Response type categories. This analysis provided further insight into the types of responses participants gave to the death subcomponent questions. The 6-7 and 8-9 year-olds gave very similar responses and were therefore collapsed into one group (6-9 years).

For inevitability, universality and causality, biological responses increased with age, suggesting a gradual improvement in children's understanding of these subcomponents. This was consistent with our first prediction and the previous MANOVA results. For inevitability and applicability, biological responses doubled between the ages of 4-5 and 10-11 years (53% vs. 100%, $\chi^2(1) = 10.54$, $p = .001$, $V = .56$); and (42% vs. 86%, $\chi^2(1) = 8.34$, $p = .005$, $V = .45$) respectively. For causality, there was a tenfold increase of biological responses (5% vs. 52%, $\chi^2(1) = 10.54$, $p = .001$, $V = .51$) between 4-5 and 10-11 year-olds. Despite this

improvement, 10-11 year-olds gave fewer biological responses on causality than adults (52% vs. 100%, $\chi^2(1) = 24.26$, $p < .001$, $V = .61$. There was little evidence for religious beliefs in children's or adults' explanations of inevitability and universality, and no evidence in their explanations of causality. Figures 3-5 show the response type categories by age group for inevitability, universality and causality.

Figure 3. Percentages of response type categories by age - inevitability

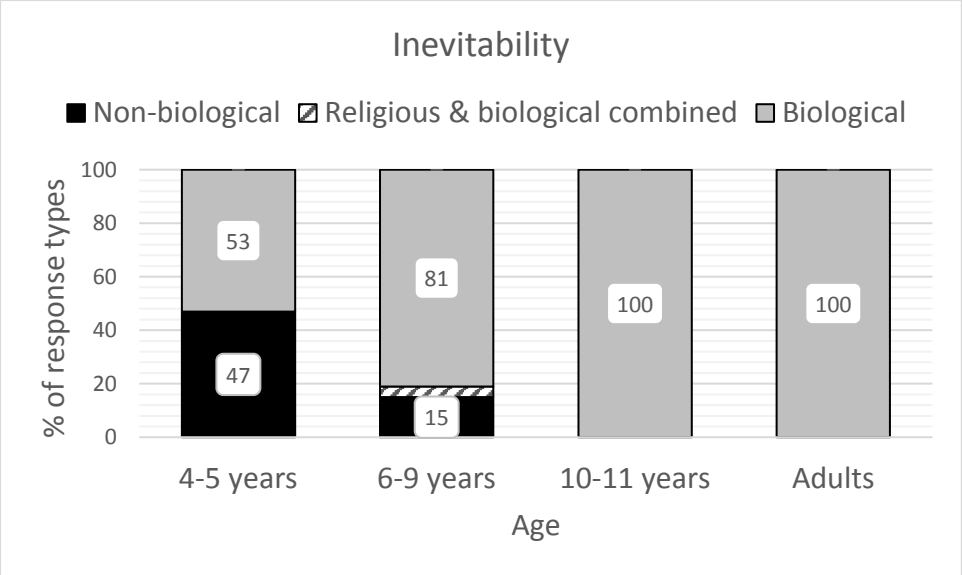


Figure 4. Percentages of response type categories by age - universality

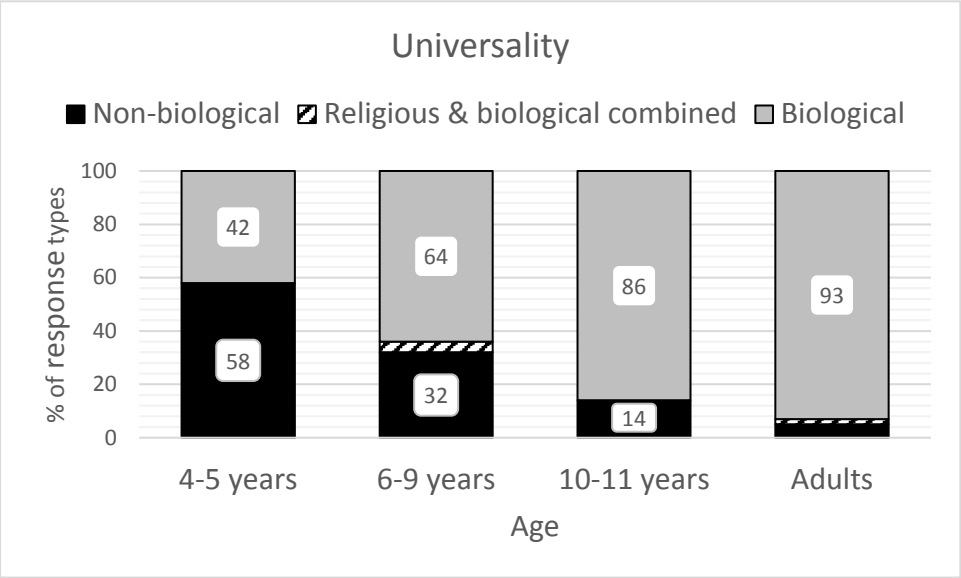
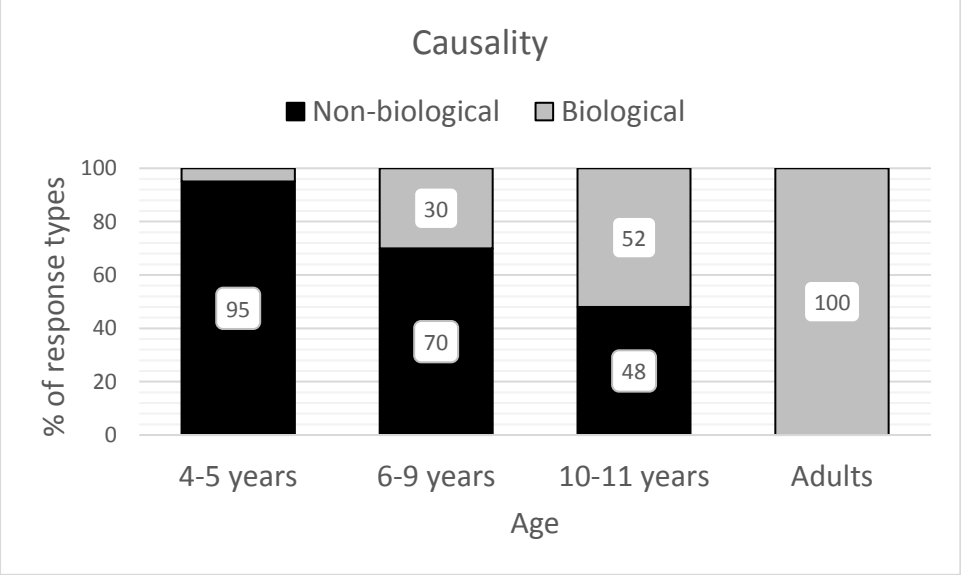


Figure 5. Percentages of response type categories by age - causality



As predicted, the picture for irreversibility and cessation, was different (Figures 6 & 7). The proportion of biological responses concerning irreversibility ranged between 68% and 74% in the first two age groups – suggesting an already biological understanding of the

finality of death in most 4-9 year-olds – only to decrease to 47% in the 10-11 year-olds, $\chi^2(2) = 5.69$, $p = .05$, $V = .24$. As biological ideas decreased, coexistent (religious and biological) ideas increased from 9% among 6-9 year-olds to 29% in 10-11 year-olds.

Similarly, for cessation, biological responses ranged between 68% at 4-5 years and 60% at 6-9 years, but dropped to 38% at 10-11 years, $\chi^2(2) = 7.26$, $p = .03$, $V = .28$. Of the older children who did not give biological explanations, nearly one third gave religious or coexistent explanations when talking about cessation. Interestingly, of the 31 children across all age groups in the non-biological category, 29 believed that a dead person can dream, suggesting some difficulty in children's understanding of the idea that mental processes cease after death. Finally, on each of the five subcomponents, all or nearly all adults' responses were biological.

Figure 6. Percentages of response type categories by age - irreversibility

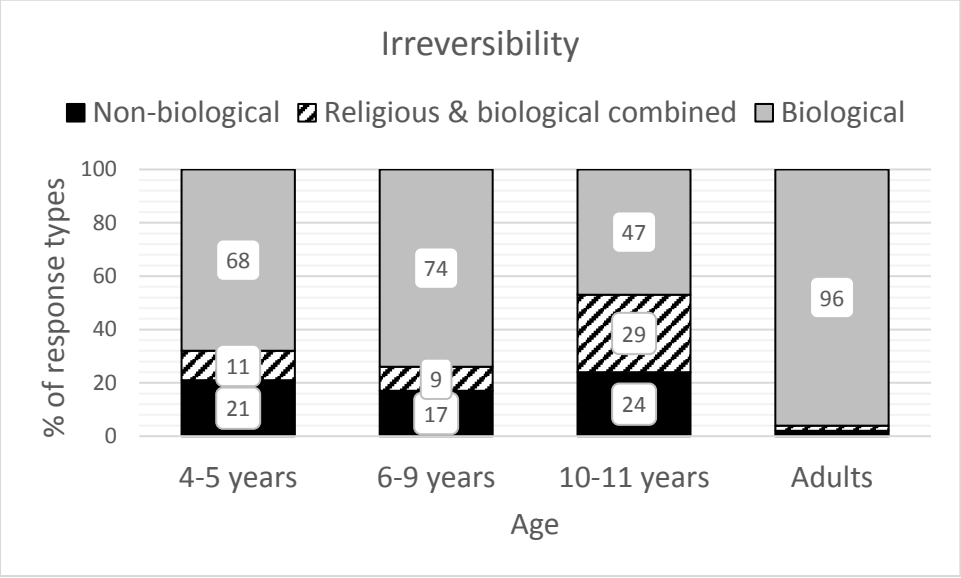
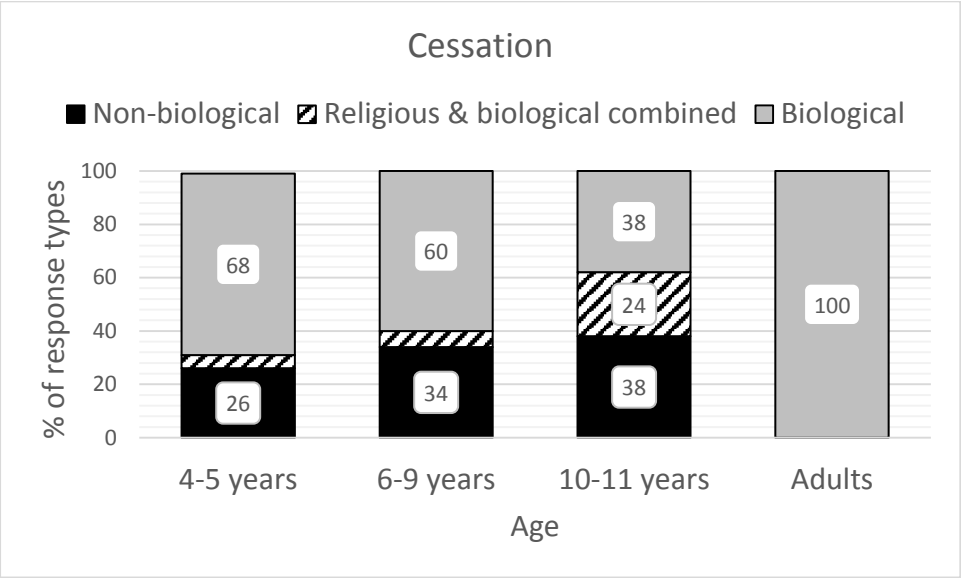
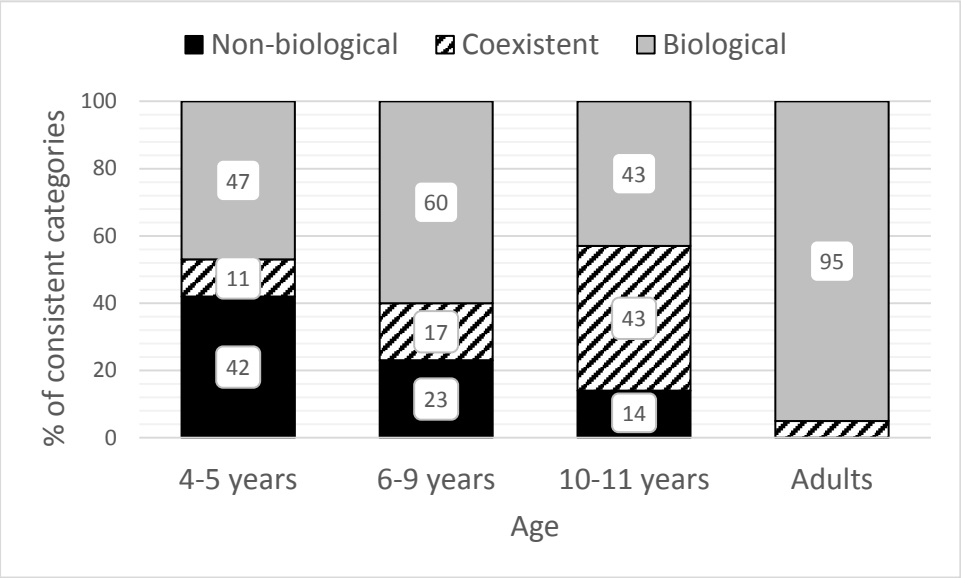


Figure 7. Percentages of response type categories by age - cessation



Overall consistency. To test our third prediction, the percentages of consistent categories (non-biological, coexistent and biological) across the five death subcomponents by age group were also examined (Figure 8). As predicted, chi-square analysis indicated an association between age and consistent model: 10-11 year-olds had nearly four times more coexistent models than 4-5 year-olds, $\chi^2(2) = 6.64$, $p = .03$, $V = .40$, and more than twice as many as 6-9 year-olds, $\chi^2(2) = 5.49$, $p = .05$, $V = .27$. Furthermore, the proportion of consistently biological models in 10-11 year-olds was as low as in 4-5 year-olds. The prevalence of biological models in adults was higher than in all other age groups ($ps < .006$).

Figure 8. Percentages of consistent death concept categories (models) by age group



Religion/afterlife beliefs and death understanding

Nearly half of the children (48%) came from religious families, which is consistent with national data (British Social Attitudes Survey, 2015). Of these, 73% were Christian, 16% Muslim and 11% Hindu, Buddhist or Jewish. In addition, 49% had at least one parent who believed in some form of afterlife. There was a significant association between parents' religiosity and their afterlife beliefs, $\chi^2(2) = 23.23$, $p < .001$, with more religious parents believing in the afterlife than non-religious parents (76% vs. 21%). The majority (64%) of Christian parents made references to eternal life, heaven and God, or said that the spirit moves on to another place. Of the Muslim parents, 80% believed in the existence of heaven.

Of the 43 adult participants, eight (19%) were religious, with five identifying as Christian and 17 (41%) believed in the afterlife. Fourteen of the 36 (39%) non-religious participants also believed in the afterlife. There was no association between religion and afterlife beliefs ($p > .05$). Of those who believed in the afterlife, 50% said that the spirit

moves on to another place, 27% referred to eternal life in heaven, and 23% believed in reincarnation.

The fourth prediction concerned the influence of religion and afterlife beliefs on death understanding. A 5 (age group) x 2 (religion; yes or no) x 2 (afterlife belief and non-afterlife belief) MANOVA revealed no main effect of religion or afterlife beliefs on any death subcomponent. There was a significant interaction between age and religion on the subcomponent of universality, $F(4, 119) = 3.59$, $p < .01$, partial $\eta^2 = .12$. Follow-up ANOVAs showed that 6-7 year-olds of nonreligious parents were more frequently biologically correct than those of religious parents (M=1.67 vs M=.83), $F(1, 26) = 6.80$, $p = .01$, partial $\eta^2 = .21$. Similarly, 8-9 year-olds of nonreligious parents scored higher than those of religious parents (M=1.65 vs M=.89), $F(1, 25) = 4.32$, $p = .04$, partial $\eta^2 = .15$.

To test the fifth prediction we compared children's consistent death concept models in religious and non-religious families as well as in families with and without afterlife beliefs. Age was collapsed into two groups: 4-7 and 8-11 year-olds to ensure expected frequencies were appropriate for this test. Of the older children, those with religious parents had more non-biological (67% vs. 33%), more coexistent (75% vs. 25%) and fewer biological (23% vs. 77%) models than those with nonreligious parents, $\chi^2(2) = 11.13$, $p = .004$, $V = .49$. Similarly, 8-11 year-olds with parents who believed in the afterlife had more non-biological (86% vs. 14%), more coexistent (67% vs. 33%) and fewer biological (35% vs. 65%) models than those with non-believing parents $\chi^2(2) = 6.68$, $p = .02$, $V = .39$.

Children's cognitive ability, family socioeconomic status and death understanding

We tested the sixth and seventh predictions with a 4 (child age group) x 2 (parent education; degree or above and no degree) x 2 (parent income; above and below £50K*) x 2

(occupation; professional and non-professional) MANOVA, with verbal and perceptual reasoning as covariates. With the exception of a marginally significant effect of perceptual reasoning on understanding of causality, $F(1, 55) = 3.28$, $p = .07$, partial $\eta^2 = .08$, perceptual and verbal reasoning did not predict children's responses (ps > .05).

There was however a significant main effect of family income on irreversibility, $F(1, 55) = 7.00$, $p = .01$, partial $\eta^2 = .16$: children from higher income families gave more biological responses about irreversibility than those from lower income families (M=1.83 vs M=1.52). In addition, a significant interaction between education and income, $F(1, 55) = 9.48$, $p = .004$, partial $\eta^2 = .20$, indicated that children from higher income families and with better educated parents scored higher on cessation than those of lower income and less educated parents (M=1.72 vs M=1.32). Finally, a significant interaction between income and age, $F(2, 55) = 3.72$, $p = .03$, partial $\eta^2 = .17$, indicated that, among 10 year-olds, those from higher income families scored higher than those from lower incomes (M=1.75 vs M=1.00) on cessation.

Parents' education $\chi^2(3) = 7.94$, $p = .04$, $V = .29$, and occupation $\chi^2(3) = 10.88$, $p = .01$, $V = .35$ were associated with children's response types on cessation: children of better educated and professional parents gave more biological responses than children of less educated and non-professional parents (74% vs. 26% and 84% vs. 16% respectively).

Parents' education was also associated with the prevalence of the biological model: children with better educated parents were more likely to have consistently biological ideas than children with less well educated parents (76% vs. 24%) $\chi^2(2) = 6.47$, $p = .03$, $V = .26$. Children from families with higher income had fewer non-biological models than those from lower income families (19% vs. 81%), $\chi^2(2) = 6.35$, $p = .04$, $V = .29$. Children from families

with a professional parent also had more biological models (87% vs 13%) than children with non-professional parents, $\chi^2(2) = 10.18$, $p = .006$, $V = .34$.

Experience and death understanding

Twenty-seven per cent of children had been exposed to a serious illness in their family and 60% to the death of a relative, in most cases a grandparent. Adults were not asked this question so this analysis was conducted on children's scores only.

To test our eighth prediction, age groups were collapsed to 4-7 and 8-11 years as only two children in the 4-5 and 10-11 age groups had experienced illness. A 2 (child age group) x 2 (experience of illness; yes or no) x 2 (experience of death; yes or no) MANOVA indicated a modest effect of illness experience on causality, $F(1, 91) = 2.94$, $p = .09$ partial $\eta^2 = .03$: children who had *not* experienced illness of someone close to them gave more biological responses ($M = 1.06$) about causality than those who had ($M = .81$).

Finally, there were no associations between experience of illness/death and either children's response types or their consistent models ($ps > .05$).

Discussion

This research explored how understanding of the five death subcomponents changes with age and whether supernatural beliefs about death are present in British children's and adults' explanations. We also tested whether scientific and supernatural beliefs coexist in children's and adults' explanations, and whether this coexistence is more prevalent in older children. Finally, we investigated four sets of possible influences on the development of death understanding – parents' religion (religiosity and belief in afterlife), cognitive ability, socioeconomic status, and previous experience of illness and death.

Age and death understanding. There were a number of significant age differences and patterns of knowledge acquisition between the five subcomponents. Consistent with our first prediction, there was a broadly linear relationship between age and improving understanding of inevitability, universality and causality. Although children understood inevitability and universality as well as adults by 8 years of age, causality remained less well understood even among the 10-11 year-olds. In contrast, and consistent with our second prediction, there was no significant improvement on understanding of cessation between 4 and 11 years, whereas irreversibility was understood less well at 10-11 years than at any other age.

Our first and second predictions were further supported when we explored the types of responses to the interview questions. For inevitability, universality and causality, biological explanations increased with age and there was little evidence for supernatural beliefs. For irreversibility and cessation however, older children gave significantly more supernatural explanations than their younger peers: 29% and 24% of 10-11 year-olds relied on supernatural ideas to explain irreversibility and cessation respectively. Moreover, on both these subcomponents, the proportion of biological explanations was lower in 10-11 year-olds than in any of the younger groups or adults. There were religious beliefs of irreversibility such as ‘if you had a good life and you've been good that means you'll have another life’, or metaphysical beliefs such as ‘dead people’s souls go into another body and then they have no recollection’. With respect to cessation, many children said that when people die they cannot move, do not need water or food, but can still dream – a finding consistent with previous evidence that many children do not understand, or fully accept, the cessation of psychological processes (Bering et al., 2005; Harris & Gimenez, 2005; Watson et al., 2015).

These findings support the view that a) most children grasp the notions of inevitability, irreversibility and cessation as early as 5 years but find it harder to explain the

causality of death (Panagiotaki et al., 2015; Slaughter & Griffiths, 2007); and b) although most young children understand the irreversibility of death and the cessation of physical and mental processes, older children show less biological understanding and rely more on supernatural explanations (Lane et al., 2016; Rosengren et al., 2014a). This suggests that it is only after children have grasped the irreversibility and inevitability of death that they start entertaining the possibility of an afterlife (Astuti & Harris, 2008).

Despite the largely similar pattern in our findings to those of previous researchers (e.g., Harris & Gimenez, 2005) with respect to irreversibility and cessation, there was no evidence of supernatural explanations for inevitability, universality and causality. We suggest that questions about irreversibility and cessation elicit more supernatural explanations than questions about other subcomponents, simply because of their content. When asked whether a dead person can live again or dream, children are more likely to offer metaphysical explanations than when they are asked to name things that die or never die. Several of the previous studies that support the coexistence account used questions on irreversibility and the cessation of physical and psychological processes (Harris & Gimenez, 2005; Lane & Evans, 2016; Watson-Jones et al., 2015; 2016). If our study had focused primarily on these questions, the evidence for supernatural beliefs might have been stronger.

Although supernatural explanations for irreversibility and cessation were given mainly by older children in our sample, they were less prevalent than in previous research. One possible explanation concerns the *context* of our interview questions. Many studies that evidence supernatural beliefs in children's explanations report that, when children are primed with religious or supernatural narratives (e.g., a grandparent became ill, went to hospital and died, and now is with God), their explanations of cessation reflect supernatural ideas including references to the afterlife, God and the soul (Astuti & Harris, 2008; Busch et al.,

2016; Harris & Gimenez, 2005; Lane et al., 2016). When narratives are medical (e.g., a grandparent became ill, went to hospital and now is dead) children offer more biological explanations for the cessation of physical and mental processes. Since the influence of narrative was beyond the aims of this study, our interview questions did not differentiate between religious and secular contexts and did not prime religious interpretations of death.

Another possible explanation – and also limitation of our study – concerns the small number of questions we asked to explore understanding of cessation. We asked one question about dreaming and five questions about physical processes, which may have restricted the expression of existing supernatural beliefs about the continuation of mental processes. Including more questions about functions such as thinking, feeling or missing a loved one may have elicited more supernatural explanations, at least for cessation.

Finally, this finding may reflect the relatively low rates of religiosity in our British sample. In contrast to the religiously saturated cultures in which previous studies have been conducted (Lane et al., 2016), only half of the children in this study came from religious families or had a parent who believed in the afterlife.

Our third prediction - concerning the coexistence of natural and supernatural explanations in older children's reasoning - was also confirmed. Nearly half of the 10-11 year-olds gave responses that reflected apparently incompatible perspectives on death, such as that death is irreversible yet people continue to exist in some form of afterlife. Moreover, this proportion was nearly four times higher among 10-11 year-olds than 4-5 year-olds, and more than twice that of 6-9 year-olds. This finding supports previous findings and the view that, as they grow older, many children integrate biological and metaphysical ideas to make sense of the complex reality surrounding death (Gutierrez, Miller, Rosengren & Schein, 2014; Harris & Gimenez, 2005; Legare et al., 2012).

Adults and death understanding. Unlike older children, adults in this study gave almost entirely biological answers and showed no evidence for coexistent thinking about death. They did not make any religious or metaphysical references, and did not believe that mental capacities persist after death. At the same time however, 51% said that they believe in life after death, when asked the relevant question on completion of the death interview. Responses such as "when you die you probably come back into another body and you have to learn everything and do everything all over again until you get it right" or "I believe everyone has a soul and when people die they move on to another place" were common among adults and closely resembled 'supernatural' explanations given by participants in Watson-Jones et al.'s (2016) study. There are a number of possible interpretations of this finding.

One reason could be purely methodological. As we argued earlier, if our death interview had targeted the cessation of biological and psychological processes equally, and primed for alternative explanations, then more adults might have integrated existing supernatural beliefs (about the afterlife) with biological explanations.

It is also possible that adults are better than children at recognizing any contradiction in their own thinking between biological facts and supernatural beliefs about death and the afterlife. They may be better at keeping these two explanatory systems separate and shift from one to the other according to the context in which conversations take place. In addition, adults knew that the interview was designed for children. This might have increased their awareness of the purpose of our questions and as result, primed them to use a biological perspective. It is possible therefore that coexistent thinking is also present in some adults' minds. If this is correct, the question that emerges is *when* do children become aware of their coexistent thinking and better at using the 'appropriate' set of principles when they reason

about death? Future research could address this question by investigating the changes that happen in children's thinking about death during the later school years.

Finally, British adults might be less likely to use religious explanations when talking about death than those from more religiously saturated cultures studied by previous researchers (Astuti & Harris, 2008; Lane et al., 2016; Watson-Jones et al. 2015). Many may hold beliefs about the afterlife but these do not necessarily coexist or become integrated with their biological conception of death. This could be attributed to the lack of strong religious or cultural beliefs in our - largely - secular adult sample.

To establish which of these explanations is correct we need a more systematic study of British adults' views on death that first addresses the methodological issues outlined, and second, includes a wider range of religious and cultural beliefs.

Religion, afterlife beliefs and death understanding. Our prediction that parents' religion and afterlife beliefs would be associated with children's scores was partly supported: 6-7 and 8-9 year-olds with religious parents had lower scores on universality than those with non-religious parents. The evidence for the influence of religion and afterlife beliefs was stronger when consistent models were analyzed: children between the ages of 8 and 11 with a religious parent, and those with a parent who believed in the afterlife, had more non-biological and coexistent models than their peers with non-religious and non-spiritual parents. The evidence for this influence was stronger in the consistent model analysis than in the scores' analysis, because response types and their consistency tend to provide a more detailed and accurate description of alternative explanations than scores, which only distinguish between correct and incorrect responses.

These findings support the view that parents' religion and afterlife beliefs can influence, to an extent, the way that children conceptualize aspects of death, especially

between 8 and 11 years (Bering et al., 2005; Harris & Giménez, 2005). The finding that this association was evident mostly in older children further supports the view that death knowledge remains 'fragile' as children try to make sense of it (Lane et al., 2016). We can speculate that it is during this period that children are increasingly exposed to notions of the irreversibility of death, and of the continuation of life beyond death, through conversations within and outside their family. They might also become more fearful of the finality of death, the meaning of which they have already grasped, as our data suggests. It is not surprising that any influence of religious or spiritual interpretations about death becomes more pronounced in these older groups. Children from religious or spiritual families are more exposed to alternative interpretations than children of non-religious parents, and thus more likely to rely on them when they reason about the harsh realities of death.

Cognitive ability, family socioeconomic status and death understanding. Our prediction that cognitive ability influences reasoning about death was not supported, apart from a modest effect of perceptual reasoning on understanding of causality. This suggests that cognitive ability does not play a key role in the way children reason about death.

Better parental education and higher income predicted children's better understanding of irreversibility and cessation. There were no significant interactions between these parental variables and children's perceptual or verbal reasoning. This suggests that cognitive ability was not a confounding variable, that is, the reason for children of better educated and wealthier parents giving more biological explanations is unlikely to be that they were brighter than their peers. Instead, we can speculate that better educated and resourced parents have more detailed and well-informed conversations with their children, in particular when discussing the notions of irreversibility and cessation – the subcomponents for which supernatural explanations are most relevant. They are also likely to address their children's

questions, possible misconceptions or apparent contradictory beliefs in a way that promotes biological reasoning. Another possibility is that better educated and resourced parents are better at exploring the distinction between physical and mental processes in relation to cessation during conversations with their children, and better at acknowledging the fact that different people hold different beliefs about death – another way in which children's ability to construct biological models about death may be promoted.

This study did not examine the content of parent-child conversations about death, therefore we can only speculate about the mechanisms that explain the differences in biological thinking between higher and lower socioeconomic status children in our sample. A systematic examination of child-parent talk and comparison between children from different socioeconomic backgrounds is a promising area of research to clarify the role of these factors in shaping children's conceptualizations of death.

Experience and death understanding. In contrast to our final prediction, children's experiences of illness and death were not associated with their responses, suggesting that these experiences do not influence children's understanding. Rosengren et al. (2014b) suggest that parents often answer their children's questions about death by focusing on explanations of life processes, rather than facts about death. Gutierrez et al. (2014) also report that when they talk to children about death, parents keep information to a minimum and give ambiguous, spiritual or religious explanations in order to offer reassurance.

A number of adults we interviewed (who also happened to be parents) pointed out that what they believe about death and the afterlife is not necessarily what they tell their children during conversations. Some mentioned that, although they do not believe in any form of afterlife, they prefer to give their children spiritual explanations that imply the continuation of psychological processes after death (e.g., "your granny can still see you now that she is in the

sky" or "we'll all reunite again after death in a nice big place"). The reason for offering these explanations, especially when they talk to their children about the death of a loved one, is that they are less threatening and more reassuring.

What seems to be more relevant, therefore, is not the simple distinction between 'experienced' and 'inexperienced' children, but the explanations offered to them when they engage in conversations with adults. Future research could explore the content of these conversations, to establish whether it is the discussions about their experiences (of illness or death), rather than the experiences themselves, that shape children's conceptualizations.

*Implications and conclusion.*These findings have a number of important clinical and educational implications for policy and practice. In particular, they indicate what schoolchildren believe, what they are able to understand, and how this understanding is acquired. These findings can help inform parents and teachers who are asked questions by children about the sensitive and complex issues concerning the meaning and consequences of death. They are also directly relevant to clinicians, practitioners and health professionals who seek to explain to and reassure children who try to make sense of the death of a loved one, or even of their own impending death.

To conclude, our findings from interviews with 4-11 year-old British children and adults support the view that children's understanding of aspects of death such as inevitability, universality and causality follow a linear developmental pattern and become increasingly biological with age. Young children are also very good at grasping the ideas of irreversibility of death, and the cessation of mental and physical processes. With age however, and in particular around the age of 10-11 years, many start to rely less on biological and more on supernatural explanations about these aspects of death. This is also reflected in the proportion of 10-11 year-olds who appear to have coexistent views about death. Our adult sample

showed no evidence of coexistent thinking, but a clear distinction between biological explanations of death and supernatural explanations of the afterlife. Our findings also indicate that, to an extent, parents' education and income, together with religiosity and spiritual beliefs are associated with children's understanding of death. Children's cognitive ability and experience of illness and death are however less relevant.

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Footnote

£1 (UK) was worth approximately $1.70 (US) in January 2014, when fieldwork was conducted

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Appendix A. Scoring criteria for responses to the death concept interview

Inevitability (Tell me some things that die. Do all … die?

[If people not mentioned]Do people die? Do all people die?)

0 - People not mentioned as dying and when asked "do people die?" they answer "no"

1 - People not mentioned as dying. When asked "do people die?" they answer "yes" and when asked "Do all people die?" they answer "no"

1 - People mentioned as dying but when asked "Do all people die?" they answer "no"

2 - People mentioned as dying and all people die

Universality (Can you tell me a few things that don't die?)

0 - Only living things mentioned (e.g., children, dogs, fish)

1 - Mixture of living and non-living things mentioned (e.g., books, trees, people)

2 - Only non-living things mentioned

Irreversibility (Can a dead become a living person? If a person dies and they haven't been buried in their grave for very long can they become alive again?)

0 - Yes to both questions

1 - No to one of the two questions

2 - No to both questions

Cessation (when a person is dead do they: move around / have dreams / need food / water / air / need to go to the toilet?)

0 - One or two questions correctly answered

1 - Three / four / five questions correctly answered

2 - All six questions correctly answered

Causality (Can you tell me something that might happen that would make someone die? When this happens why does that person really die?)

0 - External cause of death without any biological explanation (e.g., knives, wars, illness, old age, accidents, hunger)

1 - Reference to the body (organs) but not to an explicit biological cause (e.g., knives because they cut into your body; heart stops beating; you can't breathe)

2 - Explicit biological explanation (e.g., knives because they cut your body and all your blood comes out so you die; because you need your heart to keep pumping and to be able to keep breathing and to be able to move and work your brain as well)

Appendix B. Extracts from interviews

Religious explanation (10-year-old boy)
I: Can a dead person ever become a living person?
C: Yes. In my religion I believe that once you die you come back to life to be judged, so because of that the answer would be yes
I: If a person dies and they haven't been buried in their grave for very long can they become alive again?
C: Depends if a certain day comes before you get buried. We call it the Day of Judgement where people come back to be judged on their sins so if they've not been buried everyone still comes back to life, wherever they are

Combined biological and spiritual explanation (10-year-old boy)
I: Can a dead person ever become a living person?
C: Kind of yes and kind of not, because I think some people say their soul goes into another body and then they have no recollection. But some think people just die
I: What do you think?
C: Both really
I: If a person dies and they haven't been buried in their grave for very long can they become alive again?
C: No

Combined biological and religious explanation (11-year-old girl)
I: When a person is dead do they need food?
C: Probably not
I: Do they go to the toilet?
C: No
I: Do they need air?
C: No
I: Do they move around?
C: No, well if they go to heaven and hell yes
I: Do they have dreams?
C: I think they probably will, being dead is like having one long dream really
I: Do they need water?
C: Not really

Highlights

Children understand key aspects of death as early as 4-5 years

British children's thinking indicates the co-existence of biological and religious ideas

Parents' SES, religion and afterlife beliefs influence children's concepts

No evidence of coexistent thinking among British adults