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Older (but not younger) preschoolers understand that knowledge differs between people and across time

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We examined 3- to 5-year-olds' understanding of general knowledge (e.g., knowing that clocks tell time) by investigating whether (1) they recognize that their own general knowledge has changed over time (i.e., they knew less as babies than they know now), and (2) such *intra*individual knowledge differences are easier/harder to understand than *inter*individual differences (i.e., Do preschoolers understand that a baby knows less than they do?). Forty-eight 3- to 5-year-olds answered questions about their current general knowledge ('self-now'), the general knowledge of a 6-month-old ('baby-now'), and their own general knowledge at 6 months ('self-past'). All age groups were significantly above chance on the self-now questions, but only 5-year-olds were significantly above chance on the self-past and baby-now questions. Moreover, children's performance on the baby-now and self-past questions did not differ. Our findings suggest that younger preschoolers do not fully appreciate that their past knowledge differs from their current knowledge, and that others may have less knowledge than they do. We situate these findings within the research on knowledge understanding, more specifically, and cognitive development, more broadly.

'Theory of mind' is broadly defined as mental state understanding. Although the development of belief understanding – false beliefs, in particular – has been the most studied topic in theory of mind research (Wellman, Cross, & Watson, 2001), examining children's understanding of intentions, desires, and knowledge is equally important. With respect to knowledge, in particular, children must come to understand that knowledge can differ between people, and also that one's own knowledge can change over time. Consider an adult who engages a little boy in conversation about dinosaurs, cartoons, and going to the park, rather than about topics that reflect her own personal knowledge of income taxes, politics, and fine wine. This example illustrates how effective communication hinges on the understanding that others' general knowledge may differ from our own. Adults also understand that knowledge changes over time. For example, most 40-year-olds would agree that they know more now (about most things) than they did at age 20.

In this article, we are particularly interested in when children begin to understand differences between their own and others' general knowledge, and also that one's own general knowledge can change over time. By 'general knowledge', we mean an awareness

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of generic facts about the world – for example, that Ottawa is the capital of Canada, that clocks tell time, or that grey mammals with big floppy ears and long trunks are called 'elephants'. Knowledge about such generic facts can be distinguished from knowing specific facts about an object (e.g., that a particular elephant's name is 'Moe'), or what Cimpian and Scott (2012) refer to as knowledge about 'non-generic' facts. Our interest is in children's understanding of generic facts (hereafter referred to as 'general knowledge') and, more specifically, their understanding of *pre-existing* (or 'already-present', Miller, 2000) differences in such knowledge – this, as compared to differences in knowledge that come about due to 'situational' factors (Miller, 2000). Judging that an adult knows more words than a preschooler reflects an understanding of pre-existing differences in knowledge. Judging that someone who has looked into a box will know the box's contents but that someone who has not looked inside will not reflects an understanding of situational differences in knowledge.

Developmental research about knowledge understanding has mainly targeted children's ability to judge situational differences in knowledge (Rohwer, Kloo, & Perner, 2012), with considerably less research addressing pre-existing differences in knowledge (e.g., the typical knowledge differences between a child and adult; Miller, 2000). Moreover, no research of which we are aware has systematically examined preschoolers' understanding of differences between their own current and past general knowledge. Yet, as we outline later in the Introduction, understanding that different groups of individuals (e.g., preschoolers vs. adults) have different levels of knowledge, and that our own knowledge changes over time, has important links to communicative competence, learning, and memory development.

Around age 4, children begin to understand that general knowledge increases with age (e.g., that older children know more letters and colours than younger children; Diamond, 1994) and, around age 6, that adult and child knowledge does not always overlap (e.g., children might know more about certain toys or television shows than adults would; Fitneva, 2010). Lutz and Keil (2002) have also shown that 4- and 5-year-olds understand that adults possess different general knowledge depending on their areas of expertise (e.g., a physician vs. a car mechanic).

Particularly relevant to the study we report here is an investigation by Taylor, Cartwright, and Bowden (1991) in which 4- and 5-year-olds answered questions about the knowledge of a baby, peer, and adult. Half the questions referred to facts that both children and adults would know (e.g., 'Does she know what a square looks like?'), and half the questions referred to facts that only adults would know (e.g., 'When she looks at a newspaper, does she know what the words say?'). Four- and 5-year-olds correctly answered that the baby would not know any of the facts, the peer would know some of the facts, and the adult would know all of the facts. Taylor *et al.*'s (1991) findings support the claim that older preschoolers understand that knowledge differs *between* people, but these findings do not address whether (and when) children understand that general knowledge also varies *within* people. For example, do preschoolers understand that they knew less as babies than they know now (i.e., 'within-person' knowledge changes over time)?

Although we are unaware of previous studies that have directly examined preschoolers' understanding of their own past levels of general knowledge, research about false belief and hindsight bias, or the 'curse of knowledge' (Birch & Bloom, 2003), is consistent with the idea that children's current knowledge can bias their reasoning about their own previous states of ignorance. With respect to false belief, specifically, 3-year-olds have difficulty acknowledging that although a crayon box currently contains candles, when

they first saw the box, they believed that it contained crayons (Gopnik & Astington, 1988). Relatedly, the curse of knowledge is described as individuals' difficulty taking the perspective of a more naïve person (Birch & Bloom, 2003). For example, once a person learns that the Rideau Canal is the largest ice skating rink in the world, she might have difficulty predicting that someone else would not know this fact. The curse of knowledge has been observed across the lifespan, including in preschoolers (Bernstein, Erdfelder, Meltzoff, Peria, & Loftus, 2011; Birch & Bloom, 2003; Taylor, Esbensen, & Bennett, 1994). Given such findings, it is conceivable that young children might also have difficulty understanding that there was a time in the past when they did not possess the general knowledge that they do now (e.g., they have not always known that clocks tell time).

We also wished to address whether reasoning about someone else's (e.g., a prototypical baby's) current knowledge is easier/harder for preschoolers than reasoning about their own past knowledge (i.e., what they, themselves, knew as babies). Bélanger, Atance, Varghese, Nguyen, and Vendetti (2014) tackled this 'between-within' distinction in the realm of children's reasoning about their future preferences. Specifically, they showed children pairs of objects in which one item was child-preferable (e.g., Kool-Aid), and the other item adult-preferable (e.g., coffee). In one condition ('self-future'), children were asked to choose the items they currently preferred, as well as the items they would prefer when they were 'all grown up'. In a second condition ('adult-now'), children chose the items they currently preferred, as well as the items a prototypical adult/grown-up would prefer. Bélanger *et al.* found that children had more difficulty reasoning about their own future preferences (i.e., acknowledging that they would prefer coffee as grown-ups) than about the preferences of an adult (acknowledging that a grown-up prefers coffee). This finding suggests that appreciating that our own mental states (in this case desires/preferences) can change over time is more difficult than appreciating that another person's mental states may differ from our own (see Renoult, Kopp, Davidson, Taler, & Atance, 2016, for similar findings in adults).

Bélanger *et al.* (2014) explained this difference by arguing that children have relatively fewer opportunities to experience changes in their own preferences/perspectives over time (e.g., that, as babies, they preferred rattles but now prefer puzzles) than differences between their own preferences and those of another person (e.g., they prefer puzzles, whereas their baby brother prefers rattles). Similarly, in the context of the current study, children may have witnessed more instances in which differences in knowledge between themselves and a younger child/baby are apparent than instances in which they recognize/witness their own changing knowledge states.

Understanding differences in people's general knowledge is critical to the development of communicative competence and information-seeking. To be an effective communicator, it is important to adjust one's message with the listener in mind (e.g., an older child using simpler words when addressing a younger child; Dunn & Kendrick, 1982). Similarly, effective information-seeking (e.g., figuring out the meaning of a new word) requires perceiving differences in knowledge between self and other (Miller, 2000). Equally important is the understanding that knowledge changes within the same person across time. For example, the awareness that knowledge is gained over time, and that you know more now than you did in the past, may have important implications for one's motivation to learn. Indeed, inherent to the learning process is the understanding that we knew less in the past than we currently know and, similarly, learning leads to more knowledge than we currently possess.

Finally, determining whether (and when) young children begin to acknowledge differences between their current and past levels of knowledge has important

implications for such areas as episodic/autobiographical memory and eyewitness testimony. For example, an important component of episodic memory entails remembering *when* a specific event took place; this component may be especially related to children's ability to judge differences in their own knowledge across time. Similarly, with respect to eyewitness testimony, children's ability to 'quarantine' specific events (e.g., those that may have preceded vs. followed an event about which they are being questioned) may also rely on similar processes to those involved in making judgments about past vs. present differences in general knowledge.

Current investigation

We built on Taylor *et al.*'s (1991) study in which 4- and 5-year-olds were asked questions about the general knowledge of a baby, peer, and adult. Accordingly, we asked 3-, 4-, and 5-year-olds both about another person's general knowledge and about their own *past* general knowledge. Children answered 'yes–no' questions about their current knowledge (self-now condition; e.g., 'Do you know that clocks tell time?'), their previous knowledge at 6 months of age (self-past condition; 'When you were a baby, did you know that clocks told time?'), and the knowledge of a prototypical 6 month old (baby-now condition; 'Does Tracy/Tommy know that clocks tell time?'). The baby-now questions served to replicate and extend Taylor *et al.*'s (1991) findings, while the self-past items addressed children's understanding that their own knowledge changes over time. The self-now questions served as control items; we expected children of all ages to answer 'yes' to these questions.

We expected 3-year-olds to incorrectly answer questions about their past general knowledge and a baby's current general knowledge, in part because of difficulties ignoring what they, themselves, currently know. Conversely, based on Taylor *et al.*'s (1991) results, we predicted that 4- and 5-year-olds would correctly answer questions assessing a baby's general knowledge. We also expected 5-year-olds to have some insight about the fact that they knew less as babies than they know now, with 3- and 4-year-olds having significantly less insight about this fact. Finally, for the reasons outlined earlier, we expected that children would have more difficulty answering questions about their own past knowledge than questions about a baby's current knowledge.

Method

Participants

Forty-eight children were recruited in a medium-sized University city and its surrounding areas using magazine, Internet, and community billboard advertisements. Most participants were White and middle-class; however, other ethnicities and classes were also represented. All children were fluent in English. Children received a small prize for participating, and parents received free parking. Sixteen 3-year-olds (8 girls; M_{age} = 41.7 months; range = 36–46 months), 16 4-year-olds (8 girls; M_{age} = 55.8 months; range = 51–59 months), and 16 5-year-olds (8 girls; M_{age} = 66.3 months; range = 60–70 months) participated. Four additional children were tested but excluded from analyses because they failed the yes–no bias questions (three children), or answered 'maybe' to more than half the questions (one child).

Procedure and measures

Our *general knowledge task* was a modified version of the one used by Taylor *et al.* (1991). Children answered four yes–no questions about their current general knowledge (self-now condition; correct responses = 'yes'), four yes–no questions about the general knowledge of a 6-month-old (baby-now condition; correct responses = 'no'), and four yes–no questions about their own general knowledge at 6 months of age (self-past condition; correct responses = 'no'). The four questions in each condition were about the same piece of 'knowledge' but were worded slightly differently depending on condition (Table 1).

Before the experimenter asked these general knowledge questions, children answered four yes–no bias questions (e.g., 'Do fish have feet?') to determine whether they had a tendency to answer 'yes' or 'no' to everything. Children who scored below 3/4 on the yes–no bias items (n = 3) were excluded from analyses because they displayed a clear response bias: Perhaps they did not understand the questions or were confused by the procedure.

The three knowledge conditions (self-now, self-past, baby-now) were administered in fully counterbalanced order, and questions were randomized within each of the conditions. Before each condition, children were shown a sex-matched photograph corresponding to the target person in that condition to ensure they understood to whom the experimenter was referring (i.e., children saw a picture of themselves before answering the self-now items, a 6-month-old baby before answering the baby-now questions, and another 6-month-old baby before answering the self-past questions). Each of the general knowledge questions had a corresponding image (e.g., children saw a picture of a clock while answering the clock question; see Table 1). When children responded to a question with something other than 'yes' or 'no', the experimenter prompted them by saying, 'Remember, you have to answer the question with "yes" or with "no"' (the "yes" and "no" were counterbalanced). Children received a score ranging from 0 to 4 for each condition.

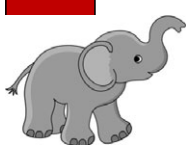
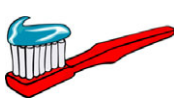
Parents completed a *child-knowledge questionnaire* before the session. The questionnaire included the four items from the general knowledge task with the corresponding images to confirm that the child participants knew what we assumed they would know (e.g., 'Does your child know that clocks tell time?'). We recognize, however, that parents' estimates of their children's knowledge should only be viewed as a proxy for whether their children possessed the knowledge in question (though we expected that, due to the nature of the knowledge – e.g., knowing the colour 'red' – all children would).

We took an instant photograph of the child before the session for use in the self-now condition. Children were tested individually in a laboratory setting by a male experimenter while the parent observed via a computer in the adjacent room. All sessions were video- and audio-recorded. Children played a marble game for two minutes between each condition to prevent boredom.

Results

Preliminary analyses revealed no significant effects of sex, $F(1, 46) = 0.18$, $p = .674$, partial $\eta^2 = .004$, or knowledge condition order, $F(1, 46) = 0.52$, $p = .759$, partial $\eta^2 = .058$, so we excluded these variables from subsequent analyses. We entered data from 48 children into a 3 × 3 split-plot ANOVA with age (3–5) as a between-subjects factor and knowledge condition (self-now, self-past, baby-now) as a within-subjects

Table 1. General knowledge task with accompanying images

Image	Condition		
	Self-Now	Self-Past	Baby-Now
	Do you know that this colour is called *red*?	When you were a baby, did you know that this colour was called *red*?	Does Tracy/Tommy know that this colour is called *red*?
	Do you know that this animal is called an *elephant*?	When you were a baby, did you know that this animal was called an *elephant*?	Does Tracy/Tommy know that this animal is called an *elephant*?
	Do you know that a toothbrush is used to clean teeth?	When you were a baby, did you know that a toothbrush was used to clean teeth?	Does Tracy/Tommy know that a toothbrush is used to clean teeth?
	Do you know that a clock tells time?	When you were a baby, did you know that a clock told time?	Does Tracy/Tommy know that a clock tells time?

factor. This analysis revealed a significant effect of age, $F(2, 45) = 21.43$, $p < .001$, partial $\eta^2 = .488$, and knowledge condition, $F(2, 90) = 60.33$, $p < .001$, partial $\eta^2 = .573$, qualified by a significant age × knowledge condition interaction, $F(4, 90) = 8.00$, $p < .001$, partial $\eta^2 = .262$ (Figure 1).

Knowledge condition × age interaction

We investigated condition simple main effects to determine whether there were any effects of age within each of the three knowledge conditions (Bonferroni-adjusted alpha levels of .016). Specifically, did older children outperform younger children in the baby-now and self-past conditions (but not in the self-now condition)? As expected, all three age groups performed equally well and near ceiling in the self-now condition, $F(2, 45) = 1.05$, $p = .360$, partial $\eta^2 = .044$, a result that is consistent with parents' predictions of their children's knowledge. In contrast, there was a significant effect of age in the self-past condition, $F(2, 45) = 12.52$, $p < .001$, partial $\eta^2 = .358$: 3-year-olds performed worse than 4-year-olds ($p = .006$) and 5-year-olds ($p < .001$). Although there was no significant difference in performance between 4- and 5-year-olds ($p = .042$), there was a trend in the expected direction. There was also a significant effect of age in the baby-now condition, $F(2, 45) = 16.49$, $p < .001$, partial $\eta^2 = .423$: 3-year-olds performed worse than 4-year-olds ($p = .001$) and 5-year-olds ($p < .001$). Although there was no significant difference in performance between 4- and 5-year-olds ($p = .025$), there was again a trend in the expected direction.

We also investigated age simple main effects to detect any differences among knowledge condition means within each age group (Bonferroni-adjusted alpha levels of .016). This was to test the hypothesis that children would perform better in the baby-now condition than in the self-past condition. Although there was an effect of knowledge condition for 3-year-olds, $F(2, 30) = 53.01$, $p < .001$, partial $\eta^2 = .779$, and 4-year-olds, $F(2, 30) = 12.76$, $p < .001$, partial $\eta^2 = .460$, this was due to children performing better in the self-now condition than in either the self-past condition ($p < .001$, for both 3- and 4-year-olds) or the baby-now condition ($p < .001$, for both 3- and 4-year-olds). In contrast,

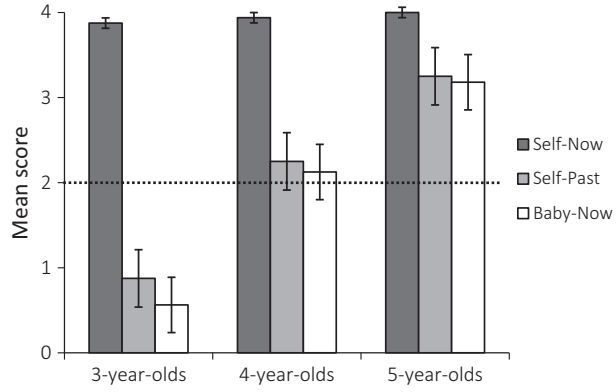


Figure 1. Mean scores (of 4) by age in the Self-Now (e.g., 'Do you know that clocks tell time?'), Self-Past (e.g., 'When you were a baby, did you know that clocks told time?'), and Baby-Now (e.g., 'Does Tracy/Tommy know that clocks tell time?') conditions. Error bars represent standard error of the mean. Dotted line represents chance responding.

there was no difference in performance between the self-past and baby-now conditions ($p = .387$ and $p = .728$, respectively). Finally, there was a significant effect of knowledge condition for 5-year-olds, $F(2, 30) = 5.62$, $p = .008$, partial $\eta^2 = .273$, but none of the individual comparisons met the $p = .016$ cut-off (all ps $> .018$). It is also important to note that scores on individual items did not differ significantly within each age group and condition, nor did scores tend to differ as a function of trial order.

Chance analyses

One-sample *t*-tests (Bonferroni-adjusted alpha levels of .006) revealed that 3- and 4-year-olds performed significantly above chance in the self-now condition, $t(15) = 21.96$, $p < .001$, $d = 5.53$; $t(15) = 31.00$, $p < .001$, $d = 7.76$, respectively (note that no test could be conducted for the 5-year-olds because their performance was at ceiling). Again, this confirmed that none of the age groups had difficulty accurately responding to questions about their *current* knowledge. Additional one-sample *t*-tests revealed that 5-year-olds were also significantly above chance (i.e., 2/4) in the self-past, $t(15) = 4.23$, $p = .001$, $d = 1.06$, and baby-now, $t(15) = 3.72$, $p = .002$, $d = 0.93$, conditions. In contrast, neither 3- nor 4-year-olds' performance was significantly above chance in the self-past condition, $t(15) = -3.09$, $p = .007$, $d = 0.77$, and $t(15) = 0.72$, $p = .483$, $d = 0.18$, respectively, or baby-now condition, $t(15) = -4.76$, $p < .001$, $d = 1.19$, and $t(15) = 0.36$, $p = .728$, $d = 0.09$, respectively. Notably, the 3-year-olds' performance in the baby-now condition was significantly *below* chance, and performance in the self-past condition trended in this direction.

Discussion

We conducted this study to determine whether preschoolers understand that others may know less than they do and that, relatedly, they knew less as babies than they know now. We also wondered whether children would reason similarly about these two types of knowledge differences. Our results showed that only 5-year-olds fully understood that babies know less than they do (baby-now condition), and also that they knew less as babies than they know now (self-past condition). Thus, 5-year-olds acknowledged that although they currently know that a toothbrush is used to clean teeth, babies would not possess this piece of knowledge, nor would their past 'baby' selves. Although 4-year-olds outperformed 3-year-olds in our baby-now and self-past conditions, as a group, 4-year-olds' correct responses were not higher than chance in either of these two conditions.

With respect to the baby-now condition, our results only partially replicate Taylor *et al.*'s (1991). In their study, both 4- and 5-year-olds successfully answered questions about babies' general knowledge (3-year-olds were not tested in their study). These inconsistent findings might be due to slight methodological differences between Taylor *et al.*'s study and ours. For example, we re-worded Taylor *et al.*'s questions in a way that focused less on perceptual 'knowledge' such as colour or form (e.g., judging whether a baby knows what a square looks like), and more on linguistic and instrumental knowledge (e.g., knowing the *purpose* of a toothbrush).

Finally, 3-year-olds' performance in the baby-now condition was significantly *below* chance, and their performance in the self-past condition trended in this direction. These results suggest that 3-year-olds were answering the self-past and baby-now questions similarly to how they answered the self-now questions; that is, 3-year-olds were answering

questions about babies' knowledge as if the questions were about their own knowledge. This finding is consistent with our expectation that 3-year-olds would have difficulty with these questions, and also with false belief, source monitoring, and curse of knowledge research showing that younger preschoolers consistently have trouble ignoring their own current mental states when reasoning about a naïve perspective (Birch & Bloom, 2003; Drummey & Newcombe, 2002; Taylor *et al.*, 1994; Wellman *et al.*, 2001).

However, it is important to note that the patterns of development we obtained likely reflect more than simply 'ignoring' one's current knowledge to reason about the perspective of a more naïve other. For example, improvements during the preschool years in meta-cognition, episodic/autobiographical memory (with respect to the 'self-past' condition in particular), and an understanding of time, more generally, may also play a role. With respect to meta-cognitive abilities, our task involves children's understanding of pre-existing, as opposed to situational, differences in knowledge and thus evidence for 'who knows what' is not readily available/visible from the situation. As such, children may need to rely on an understanding of *how* knowledge is acquired (e.g., to acquire knowledge, one must pay attention) and, hence, that the process of acquiring knowledge of the sort that 'clocks tell time' is not within the realm of an infant's cognitive capacities. Indeed, only starting around age 5 or so (which coincides with success on our task) do children begin to develop such 'meta-knowledge' skills (Miller, 2000). Also important for our task may be episodic memory development and, more specifically, children's ability to remember the 'what', 'where', and 'when' of a specific episode (Tulving, 1972). The 'when' component, in particular, may scaffold children's judgments about what they knew as babies and, similarly, what other babies know. For example, by age 5, children may begin to remember the kinds of instances (e.g., episodes at day care) in which they learned new information of the sort that 'clocks tell time' and, from this, deduce that, when they were babies, they were unlikely to hold such knowledge. Relatedly, improvements during the preschool and early school years in children's abilities to judge the distances of past and future events (Friedman, 2000) likely contribute to children's awareness of roughly 'when' in time they began to learn certain kinds of information.

One interesting aspect of our findings is that the patterns of development we obtained did not differ as a function of whether the perspective in question was a 'naïve' other's (i.e., baby-now condition), or one's own 'naïve' past self (i.e., self-past condition). This contrasts with Bélanger *et al.*'s (2014) finding that preschoolers had more difficulty reasoning about their own future preferences than about the current preferences of an adult. One explanation for the difference between our findings and Bélanger *et al.*'s is that children may learn more about their own previous mental states than their future mental states. For example, parents might explain to a preschooler that a younger sibling is less knowledgeable by saying, 'When you were a baby, you didn't know that either!' This information can then help children recognize that they knew less in the past than they know now. As such, the role of experience – both in the form of exposure to those less knowledgeable than self (e.g., babies) and having people (e.g., parents) who explicitly point out differences in knowledge – may influence children's reasoning about differences in general knowledge and past knowledge states, in particular.

In contrast, there may be fewer contexts in which similar talk about future mental states occurs, thus making children's ability to predict future changes in their own preferences more difficult than predicting differences in preferences between self and other, as Bélanger *et al.* (2014) found. However, the fact that Bélanger *et al.* asked about future preferences, whereas we asked about past knowledge, is an important difference – in terms of both the temporal dimension and the mental state in question. As such, it

would be interesting to determine whether children's understanding of changes in their own mental states differs depending on the particular state asked about (e.g., desire, knowledge, belief), and also whether children are reasoning about past changes or predicting future ones. Interestingly, research in social psychology has shown that although adults recognize that their preferences and personalities have changed in the past, they have relatively more difficulty understanding that these same attributes will change in the future (Quoidbach, Gilbert, & Wilson, 2013). As such, in the context of our study, it would be interesting to add a condition that targets children's understanding that they will know *more* in the future than they know now, and compare this to our self-past condition.

Future research in this area could also test whether our general knowledge task is related to other conceptually similar tasks, including those that measure false belief and curse of knowledge. Although we would predict some overlap/relation between our task and these, our task involves knowledge that children have possessed for an extended period of time and that is thus considered 'pre-existing'. In contrast, false belief and curse of knowledge tasks both pertain to recently acquired information that was gleaned by virtue of one's particular situation (e.g., witnessing a ball being moved from a box to a basket). In this sense, our knowledge task differs from such tasks along two important dimensions: (1) *when* the knowledge was acquired (i.e., recent vs. long ago) and (2) the *type* of knowledge that was acquired (i.e., specific/non-generic vs. generic). With respect to the former, some data suggest that it may be *more* difficult for children to appreciate that recently acquired (as opposed to 'longer-standing') knowledge was not always known. For example, Taylor *et al.* (1994) taught 4- and 5-year-olds novel words, such as 'chartreuse'. Even 5-year-olds had difficulty stating that they had just learned this fact, with some claiming that they had always known it.

An open question, however, and one that pertains to the second distinction noted above, is whether children would also claim to have always known a *non-generic* (Cimpian & Scott, 2012) fact about a particular object. More specifically, in our study 3-year-olds tended to consistently claim that, as babies, they knew that grey animals with floppy ears and long trunks are called elephants and that toothbrushes are for cleaning teeth. Would these same children, after learning that a particular elephant's name is 'Moe', or that a particular toothbrush belongs to a little girl named 'Molly', claim to have also possessed this non-generic knowledge as babies? A recent study by Sutherland and Cimpian (2015) showed that 4-year-olds (3-year-olds were not tested), at least, displayed fewer 'knew it all along'/hindsight errors for non-generic (e.g., 'Last night, this dog got sick after eating carbamates'), as compared to generic (e.g., 'Dogs get sick after eating carbamates'), information. Whether 3-year-olds would also make this differentiation and whether Sutherland and Cimpian's results might differ when asking children about knowledge held during specific periods of development (e.g., 'babyhood') are both interesting directions for future research.

Indeed, the answers to such questions could have important implications for such areas as eyewitness testimony. For example, it may be that, until about age 5, children claim to have always known generic facts about the world but, by age 4 (or even 3), children will not make this same claim for non-generic facts. This kind of finding could then help to establish guidelines about the type of information children will typically report with more or less accuracy during forensic interviews. Moreover, from a methodological standpoint, such findings would help to rule out the possibility that 3-year-olds, for example, tend to indiscriminately respond 'yes' to all questions about their own and others' knowledge – a tendency that may have led to artificially low scores for our

3-year-olds on the self-past and baby-now conditions (but see Fritzley & Lee, 2003, for more nuanced findings about 'yes' biases in 3-year-olds). As such, identifying contexts in which even 3-year-olds are more apt to claim 'ignorance' when they were babies, for example, as well as developing methods that require responses other than 'yes' or 'no' may be particularly important.

Finally, a notable aspect of our findings was the uniformity of children's response patterns, regardless of whether they were reasoning about their own past knowledge, or the current knowledge of a baby. This, in combination with 3-year-olds' below-chance performance, 4-year-olds' at-chance performance, and 5-year-olds' above-chance performance, is consistent with genuine conceptual change in children's understanding of general knowledge during the preschool years (and is similar to the developmental trajectories obtained with false belief reasoning, e.g., Wellman *et al.*, 2001). Although our findings do not preclude an earlier understanding of differences in general knowledge (i.e., similar to debates about 'early/implicit' vs. 'later/explicit' false belief understanding; see Low & Perner, 2012, for a review), they nonetheless suggest that preschoolers' conception of the mental world and knowledge in particular is far from complete.

Conclusion

Much research in the past few decades has demonstrated that young preschoolers have difficulty understanding that their mental states may differ from those of others. The most documented of these difficulties is a failure to understand that what they believe or think is sometimes different from reality, or from the beliefs of others, that is the classic 'false belief' error (Wellman *et al.*, 2001). However, much less research has focused on children's understanding of other mental states such as desires and – the focus of this study – long-held knowledge. Our results highlight that young preschoolers have difficulty understanding that others may have less knowledge than they do, and also that they, themselves, had less knowledge in the past than they do now.

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