Future Thinking in Young Children

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ABSTRACT—The study of future thinking is gaining momentum across various domains of psychology. Mentally projecting the self forward in time (i.e., mental time travel) is argued to be uniquely human and of vital importance to the evolution of human culture. Yet it is only recently that developmentalists have begun to study when, and how, this capacity emerges. I begin by outlining the concept of mental time travel, along with newly developed methodologies to test children’s ability to mentally project the self into the future. Data suggest that this ability is in place by ages 4 or 5 but also reveal conditions under which children may experience difficulty accurately predicting their future desires. I conclude by discussing how the research on children’s mental time travel can be used to further our understanding of the development of future-oriented behaviors, including planning and delaying gratification.

KEYWORDS—future thinking; mental time travel; episodic memory; conceptual development; planning

Humans spend a great deal of time anticipating, planning for, and contemplating the future. Our future thinking is directed toward such ordinary events as what to wear the next day or where to go for lunch, but also toward more significant choices that will potentially impact our long-term happiness and success, such as accepting a job or getting married. The fact that we think (and often ruminate) about these and numerous other aspects of our personal futures is argued to be a reflection of our cognitive capacity for mental time travel (e.g., Atance & Meltzoff, 2005; Suddendorf & Corballis, 2007; Tulving, 2005).

MENTAL TIME TRAVEL

Tulving’s (1984) distinction between “semantic” and “episodic” memory has deeply influenced theory and research in human cognition. Semantic memory is described as an early-developing system that allows one to retrieve facts about the world (e.g., knowing that Paris is the capital of France). It is often contrasted with episodic memory, which is described as a later-developing system that mediates one’s memory for personally experienced events (e.g., remembering the first time I strolled down the Champs-Elysées). Episodic memory is argued to be unique to humans and critical to mental time travel (Tulving, 2005). Although research and theory have focused almost exclusively on mental time travel into the past, the adaptive significance of the episodic system may be that it allows humans to mentally travel into the future and thus anticipate and plan for needs not currently experienced (e.g., imagining a state of hunger when currently satiated; Suddendorf & Corballis, 2007; Tulving, 2005).

Although other animal species engage in future-oriented behaviors (e.g., food hoarding, nest building, and planning), there is substantial debate about whether these behaviors are carried out with the future in mind. For example, food hoarding may be driven by genetically programmed, species-specific behavioral tendencies (Roberts, 2002), whereas planning (e.g., a chimpanzee preparing a stick for retrieving termites) may be driven largely by the animal’s current motivational state rather than by an anticipated future one (e.g., Roberts, 2002; but see Mulcahy & Call, 2006; and Raby, Alexis, Dickinson, & Clayton, 2007). Debates about mental time travel in nonhuman animals have led to the interesting question of when this capacity emerges in human development.

THE DEVELOPMENT OF MENTAL TIME TRAVEL

Busby and Suddendorf (2005) tested preschoolers’ ability to mentally project into the future by asking them to verbally report something that they would do “tomorrow.” Whereas 4- and 5-year-olds were quite successful in providing reports that their parents judged as plausible (69% and 63% of total reports, respectively), 3-year-olds were not (31%). Meltzoff and I (Atance & Meltzoff, 2005) adopted a different approach requiring verbal and nonverbal responses. Preschoolers were asked to pretend that they would make an outing to various locations (e.g., mountains, desert) and were asked to choose one item from a set...
of three to bring with them. Only one of these could be used to address a future physiological state. For example, in the mountain scenario, a lunch—which could address the future state of hunger—was the correct choice, whereas a bowl and a comb were incorrect. Scenarios were designed to be ones for which children would have little direct experience, thus reducing the likelihood that children could succeed based on semantic knowledge alone. Across scenarios, 3-year-olds chose the correct item significantly more often than would be expected by chance, with the performance of the older children being nearly perfect. Moreover, to explicitly test whether children recognized that the correct item could be used to address a future state, they were asked to verbally explain their choices. Four- and 5-year-olds were significantly more likely (62% and 71% respectively) than 3-year-olds (35%) to reference a future state of the self (e.g., “I might get hungry”).

These two studies suggest that 4- and 5-year-olds are able to mentally travel into the future to consider what they may do the next day and to anticipate a variety of states that could arise across different situations. In contrast, 3-year-olds only show the rudiments of these abilities.

### Mental Time Travel and Verbal Ability

Might limitations in verbal ability mask young children’s understanding of the future? Comprehension of temporal terms such as tomorrow and yesterday emerges only gradually during the preschool and early school years. Tomorrow, in particular, is understood by most 3-year-olds to refer to the future, but not necessarily the next day (Harner, 1975). Asking a young child to report an event that will occur “tomorrow” may result in the child stating an anticipated event, but not necessarily one that falls within the conceptual boundaries of this term. At the other end of the spectrum is debate about whether a child who can talk about the future should be credited with mental time travel into the future (e.g., Suddendorf & Busby, 2005). Children as young as 2 years of age talk about the future, but such talk may reflect pre-existing knowledge (or “scripts”) of how routine activities such as “bedtime” unfold, rather than a true projection into the future (Atance & O’Neill, 2001). To guard against under- or over-estimating children’s future thinking ability, researchers have strived to create tasks that rely as little as possible on verbal ability and that are structured to test when children’s behavior evidences the anticipation of a state that they are not currently experiencing—the litmus test of mental time travel into the future.

### Acting Now in Anticipation of Later

Suddendorf and Busby (2005) tested preschoolers’ ability to act in the present to avoid a future state of boredom. Children in the experimental group were led to an empty room (Room A) containing only a puzzle board, whereas children in the control group were also led to Room A, but with no puzzle board present. After a brief stay in Room A, children were led to Room B.

Several minutes later, they were told that they would return to Room A and were asked to select an item to bring with them—one of these being puzzle pieces. Whereas 4- and 5-year-olds in the experimental group chose puzzle pieces significantly more often than those in the control group, 3-year-olds’ choices did not differ across groups, suggesting that only the older children were able to act in the present (i.e., choose puzzle pieces) in anticipation of a future state (i.e., play/avoid boredom).

Using a different behavioral paradigm, Meltzoff and I (Atance & Meltzoff, 2006) manipulated preschoolers’ current state to observe how this would impact their choices for the future. Three-, 4-, and 5-year-olds were assigned either to intervention groups, in which they were given pretzels to snack on, or baseline groups, in which they were not. After a delay (which allowed children in the intervention groups to eat the thirst-inducing pretzels), one group of intervention children and one group of baseline children were asked to choose between pretzels and water. Most intervention children, who were presumably thirsty, chose water, whereas most baseline children chose pretzels. More importantly, the remaining two groups of children (one intervention and one baseline) were asked to choose for tomorrow. Again, most baseline children chose pretzels, showing that when they were not in a state of thirst they preferred pretzels. In contrast, the intervention children were unable to override their current desire for water to anticipate that pretzels would be desirable the next day (see Fig. 1). This was true of all three age groups, despite the fact that most 4- and 5-year-olds correctly responded to comprehension questions about tomorrow, which suggests that their difficulty did not lie in an inability to comprehend the temporal reference of the test question.

Rather, the 4- and 5-year-olds’ difficulty may involve what social psychologists (e.g., Loewenstein & Schkade, 1999) refer to as “empathy gaps.” This term captures the difficulty that people experience when trying to imagine themselves in a different

#### Table 1: Number of children making choice

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Pretzels</th>
<th>Water</th>
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<tbody>
<tr>
<td>Now</td>
<td></td>
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<tr>
<td>Tomorrow</td>
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<tr>
<td>Intervention</td>
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<td>Baseline</td>
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**Fig. 1.** Number of children choosing pretzels or water as a function of whether they had been given pretzels to snack on (intervention groups) or not (baseline groups), and whether they had been asked to choose for now or tomorrow. B + N = Baseline + Choice for Now; B + T = Baseline + Choice for Tomorrow; I + N = Intervention + Choice for Now; I + T = Intervention + Choice for Tomorrow.
state than their current one. Most notably, people in a “hot” state (e.g., hunger or thirst) tend to have difficulty imagining that they will eventually “cool off” (i.e., become satiated or quenched). Consequently, predictions, or choices, for the future are biased in the direction of current states. Buying more groceries when hungry than when satiated is a common consequence of empathy gaps. It is likely that the children in our study (Atance & Meltzoff, 2006) were falling prey to this very phenomenon (i.e., they could not imagine a future desire for pretzels while in a state of thirst). Arguably, the children in Suddendorf and Busby’s (2005) “two rooms” study did not need to bridge as wide an empathy gap because imagining playing with the puzzle (or avoiding boredom) was not directly conflicting with their current state, nor was their current state one as salient as thirst or hunger. Our (Atance & Meltzoff, 2006) findings do not contradict the claim that mental time travel emerges in the preschool years, but they identify conditions in which the capacity to do so is compromised.

MENTAL TIME TRAVEL AND FUTURE-ORIENTED BEHAVIORS

Planning

Studies examining the development of planning rarely discuss how it is affected by children’s growing knowledge about the future (cf. Haith, 1997). Because components of planning, including goal representation and the envisioning of actions necessary to achieve a goal, require thought about the future, planning capacity should shift qualitatively at ages 4 or 5, mirroring episodic-memory development and the emergence of mental time travel. Reinterpretation of data from Hudson, Shapiro, and Sosa (1995) is consistent with this claim. One group of 3- to 5-year-olds was asked to provide scripts for going to the beach and going grocery shopping (e.g., “Can you tell me what happens when you go to the beach?”), whereas another group was asked to formulate plans (e.g., “Can you tell me a plan for going to the beach?”). Because plans are more future-oriented than scripts, and arguably rely more heavily on the episodic system, a prediction is that they should show more development than scripts during the preschool years.

Results are consistent with this prediction: Children’s scripts did not improve significantly with age, whereas their plans did. Moreover, by age 5, children’s plans and scripts for the same event were noticeably different. According to Hudson et al., this difference reflected the awareness that planning an event entails more than simply recounting “what happens.” Indeed, the older children’s plans included more mention of advance preparations than did their scripts, suggesting foresight. Their planning behavior was also more flexible, as evidenced by the capacity to state both how they could remedy an occurrence (e.g., forgetting to bring food to the beach) and prevent its recurrence. This suggests that older children were not merely drawing on their knowledge of how an event typically unfolds (semantic system) but rather were able to imagine different outcomes and how these could be addressed. The foresight and flexibility of the older preschoolers’ plans are characteristic of the episodic system and may signal that it, and the mental time travel that it supports, are in place. In contrast, in the absence of a well-developed episodic system, the younger children may have been drawing largely on the semantic system for both script and plan construction.

Delay of Gratification

Future thinking may also be crucial for an important aspect of self-control: delaying gratification. In a delay of gratification paradigm, children are asked to choose between a smaller (e.g., one mini-marshmallow) or a larger (e.g., 10 mini-marshmallows) reward. They are then told that the larger reward can only be obtained after a delay. Although children’s ability to delay for the larger, more desirable reward improves with age (e.g., Mischel, Shoda, & Rodriguez, 1989; Moore, Barresi, & Thompson, 1998), there is also individual variability due to self-regulatory strategies (e.g., not looking directly at the reward), for example (Mischel, Shoda, & Rodriguez, 1989). Might an additional source of variability stem from differences in mental time travel capacity? Mischel, Shoda, and Peake (1983) report that 4-year-olds who were good at delaying gratification became adolescents whose parents rated them as being, among other characteristics, better at planning and thinking ahead than the adolescents who were less able to delay gratification. Although these results do not address whether these adolescents also planned more and were future-oriented as preschoolers (an interesting issue for future research), they suggest a mutual interdependence between future thinking and delaying gratification. Indeed, were an organism not able to conceptualize a time other than the present, then delaying would make little sense. These findings also raise the interesting issue of individual differences in mental time travel capacity in both children and adults.

FUTURE DIRECTIONS

An intriguing issue to consider is the overlap between adopting the perspective of one’s future self and the perspective of another person. Research suggests that people experience not only “intrapersonal” empathy gaps but also “interpersonal” ones, such that judgments about the emotional states of others are influenced by one’s own (Van Boven & Loewenstein, 2003). Our (Atance & Meltzoff, 2006) state-manipulation paradigm offers a potential means of addressing this issue from a developmental perspective. For instance, do children’s current states (e.g., thirst) affect judgments about not only their own future desires but also those of others (both current and future)? A related issue is how thinking about, or planning, one’s own future may differ from planning someone else’s (e.g., that of one’s child or elderly parent). Both processes likely draw on mental time travel but may draw differentially on theory of mind (i.e., mental state attribution).
Because research on the development of future thinking is in its early phases, a primary goal has been to devise methods to assess what young children know about the future. However, in addition to refining existing methodologies, it is important to explore how this knowledge develops. According to Suddendorf and Corballis (2007), mental time travel is not an encapsulated capacity but relies on a host of cognitive processes such as theory of mind, inhibitory control, and working memory. By this view, an organism that lacks some (or all) of these processes will have impaired mental time-travel ability. Exploring whether children’s mental time-travel ability is related to individual differences in such skills as theory of mind and inhibitory control will be useful in evaluating this claim.

There is also growing consensus from neurophysiological (e.g., Addis, Wong, & Schacter, 2007) and behavioral (e.g., Busby & Suddendorf, 2005) data that thinking about the future and thinking about the past are intricately entwined; our memories form the basis from which we construct possible futures. Young children (and arguably nonhuman animals) who are limited in their sense of the past will likely also show limitations with respect to the future. Despite this proposed overlap, research findings also suggest neural differentiation between thinking about the past and imagining the future, which may be due to the fact that future events involve some novelty (Addis, Wong, & Schacter, 2007). This view echoes that of Haith (1997), who noted that humans do not just base their future thinking on past events but can also “imagine and create things and events that have never occurred before” (p. 34). Future research efforts will undoubtedly result in significant increases in our knowledge about how the human brain is capable of such a feat, when it becomes attainable in development, and why it may be unattainable for nonhuman animals.

**Recommended Reading**

Atance, C.M., & Meltzoff, A.N. (2006). (See References). This paper introduces a paradigm to test how children’s current states affect their reasoning about the future.

Atance, C.M., & O’Neill, D.K. (2001). (See References). This paper discusses the role of future thinking in different areas of human cognition and behavior.


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**REFERENCES**


