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Thinking about the future early in life: The role of relational memory

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ABSTRACT

The constructive episodic simulation hypothesis suggests that we imagine possible future events by flexibly recombining details of past experiences to produce novel scenarios. Here we tested this hypothesis by determining whether episodic future thinking is related to relational memory ability during the preschool years. Children (3- to 5-year-olds) were asked to remember a past event and imagine a possible future event using an adapted version of the recombination paradigm. Relational learning and inference were assessed using a task adapted from the neuroimaging literature. The results show that preschoolers were able to describe both past and possible future events; however, they produced more specific episodic details in relation to past events relative to future events. Episodic future thinking performance was correlated with performance on the relational inference task, consistent with the idea that the ability to flexibly recombine relational knowledge is critical in episodic future thinking.

Introduction

The abilities to recollect past events and imagine future events are invariably linked (e.g., Atance & O'Neill, 2001; Suddendorf & Corballis, 1997; Tulving, 2005). Whereas memory allows us to recollect our experiences, perhaps more critically, it also allows us to use experience to guide future behavior. Imagining how future events might play out is useful in predicting how we are best to behave in novel circumstances and, thus, is critical for adaptive functioning. Although developmental research has traditionally focused on age-related changes in the retrospective function of episodic memory, during

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recent years there has been a spike in interest in how children come to use experiences of the past to think about the future (Atance, 2008).

Developmental studies of episodic future thinking have predominantly used planning-like tasks that assess children's ability to anticipate states or desires that they may possess in the future (Atance & Meltzoff, 2005, 2006; Suddendorf & Busby, 2005). For example, Atance and Meltzoff (2005) asked 3- to 5-year-old children to choose objects that they could take with them on a hypothetical trip. The scenarios were designed to elicit the anticipation of a particular future state (i.e., walking by a waterfall will involve getting wet). The dependent measure was how likely the children were to choose the object that would alleviate that future state (i.e., a rain jacket). The results showed that 4- and 5-year-olds chose the correct object more frequently than 3-year-olds. In addition, 4- and 5-year-olds were more likely to use future-oriented explanations for why they chose the object they did (e.g., "I'll need a jacket because I'm going to get wet").

Atance and Meltzoff (2006) also showed a shift between 3 and 4 years of age in children's ability to anticipate future *internal* states. In their experiment, 3- to 5-year-olds were given pretzels to snack on, which made the children thirsty. When the children were asked whether they thought that they would like water or pretzels when they visited the next day, 4- and 5-year-olds were able to disregard their current desire for water and anticipate that in the future they would most likely want pretzels. In contrast, 3-year-olds were unable to inhibit current desires and chose the less desirable alternative (i.e., water). Similarly, Suddendorf and Busby (2005) used a "two rooms" task to assess children's ability to anticipate a future state of boredom. Children first played in a room that contained only an empty puzzle board. In a second room, children chose from a number of toys to take back with them to the first room. The dependent measure was the number of children who chose to take puzzle pieces, anticipating that the pieces may alleviate boredom when they returned to the first room. The results showed that 4- and 5-year-olds were more likely to choose puzzle pieces than children in the control group; this effect was not seen for 3-year-olds. The two rooms task has also been adapted to test whether preschoolers will save for the future (Metcalf & Atance, 2011) and whether preschoolers will secure a solution to a future problem (Suddendorf, Nielsen, & von Gehlen, 2011).

As described above, research using behavioral measures has shown that there is marked improvement during the preschool years in children's ability to think about the future and make decisions in anticipation of future states. However, we understand less about children's ability to use memories for past events to imagine and talk about possible future events. Early work showed that children's ability to talk about the future may also improve between 3 and 4 years of age. In Busby and Suddendorf's (2005) study, children were asked to tell the experimenter about an event that had happened yesterday and about one that will happen tomorrow. Parents were asked to rate the accuracy of their children's responses. The results showed that, whereas more than half of 4-year-olds could produce accurate descriptions of both past and future events, only 30% of 3-year-olds could produce descriptions of past or future events that their parents judged to be correct. Atance and Jackson (2009) reported similar results using the "tomorrow task" when children's responses were rated by parents as plausible or not.

In contrast, recent work using an adapted version of the yesterday/tomorrow task has shown that both 3- and 5-year-olds can accurately talk about an event that happened yesterday and one that will happen tomorrow (Hayne, Gross, McNamee, Fitzgibbon, & Tustin, 2011). In this adapted task, parents were asked to provide details of events that had happened in the recent past (earlier today and yesterday) and events that were going to happen in the near future (later today and tomorrow). Children were then interviewed about these events using a personalized timeline that was made up of photographs of the children from birth until their current age. The authors argued that this timeline allows children to see a representation of linear time while they are talking about events and allows the interviewer to refer to periods of time without relying on temporal terms with which children may struggle. The results showed that both 3- and 5-year-olds produced accurate information related to events in the recent past and future. Overall, 5-year-olds produced more information than 3-year-olds; however, there was no difference in the number of clauses produced in relation to past or future events, and there was no age by event type interaction. The amount of information produced in relation to past and future events was not correlated with language skill; however, children who produced highly detailed descriptions of past events also performed well on the future task. These results suggest that,