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Episodic future thinking as a predictor of children's prospective memory

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ABSTRACT

The primary goal of this study was to investigate the relationship among retrospective memory, episodic future thinking, and event-based prospective memory performance in preschool, first-grade, and second-grade children. A total of 160 children took part in the experiment. The study included participants from four age groups: 4-year-olds, 5-year-olds, 6-year-olds, and 7-year-olds. Participants were administered a recognition memory task, a task to test the ability to pre-experience future events, and an event-based prospective memory task. Data were submitted to correlational analyses, analyses of variance (ANOVAs), and logistic regression analyses. Results showed that, overall, all of these abilities improve with age and are significantly correlated with one another. However, when partialling out age and retrospective memory, episodic future thinking and prospective memory performance remained correlated. Logistic regression further showed that age and episodic future thinking abilities were significant predictors of prospective memory performance independent of retrospective memory abilities.

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Introduction

Over the past decade, the topic of mental time travel—that is, the faculty that allows humans to mentally project themselves backward in time to re-live, or forward in time to pre-live, events

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(Suddendorf & Corballis, 1997; Tulving, 1985)—has attracted growing interest in cognitive psychology, neuroscience, comparative psychology, and developmental psychology (for reviews, see Atance & O'Neill, 2001; Burgess, Gonen-Yaacovi, & Volle, 2011; D'Argembeau and Mathy, 2011; Schacter, Addis, & Buckner, 2008; Schacter et al., 2012; Suddendorf & Corballis, 2007; Szpunar, 2010). This capacity has been described using a variety of expressions such as *episodic future thinking* (or EFT; Atance & O'Neill, 2001), *prospection* (Buckner & Carroll, 2007; Gilbert & Wilson, 2007), *episodic simulation of future events* (Schacter & Addis, 2007), and *episodic foresight* (Martin-Ordas, Atance, & Louw, 2012; Suddendorf, 2010).

Recently, research on EFT has focused mainly on better understanding the similarities and differences between EFT and episodic memory. Converging evidence from cognitive studies (e.g., D'Argembeau and Demblon, 2012; Gamboz, Brandimonte, & de Vito, 2010), neuropsychological studies (e.g., Addis, Sacchetti, Ally, Budson, & Schacter, 2009; Hassabis, Kumaran, & Maguire, 2007; Klein, Loftus, & Kihlstrom, 2002; Race, Keane, & Verfaellie, 2011), and neuroimaging studies (e.g., Schacter & Addis, 2009; Schacter, Addis, & Buckner, 2007) suggest that EFT and episodic memory rely on common psychological and neural processes and that the mental simulation of the future may assume different functions according to its temporal distance (D'Argembeau, Renaud, & Van der Linden, 2011). For instance, the vast majority of near-future thoughts seem to deal with action planning, whereas far-future thoughts are more evenly distributed across various functions (i.e., decision making, emotion regulation). In particular, it has been shown that one of the primary purposes of thinking about near-future events may be to implement mental simulations of action plans leading to goal attainment (D'Argembeau et al., 2011). This seems to suggest the existence of a close relationship between EFT and another well-known future-oriented process, that is, prospective memory (or PM).

Prospective memory is the ability to remember to carry out intended activities in the future. On some occasions the action must be performed at a particular time (time-based PM tasks), whereas on others the action can be performed only when a particular event occurs (event-based PM tasks). It is commonly accepted that any PM tasks involve two components: a retrospective component and a prospective component (e.g., Einstein & McDaniel, 1990, 1996; Graf & Utzl, 2001). The retrospective component includes remembering *when* the action is to be carried out and *what* the action is. The prospective component is remembering *that* something must be done.

Although research in the area of prospective memory has seen a veritable explosion of interest during the past decades, the number of studies on prospective memory development is surprisingly small and our knowledge on the mechanisms underlying the development of such a fundamental cognitive function is still at an embryonic stage (Kvavilashvili, Kyle, & Messer, 2008; see also Kliegel, Mackinlay, & Jäger, 2008). The few developmental studies in this area indicated that prospective memory may be relatively well developed in preschool children (3- to 5-year-olds) (Guajardo & Best, 2000; Kvavilashvili, Messer, & Ebdon, 2001), although very young children may have difficulties with the retrospective component of the prospective memory task. More recently, Smith, Bayen, and Martin (2010) compared event-based prospective memory performance in 7-year-olds, 10-year-olds, and adults. These authors used the multinomial processing tree (MTP; Smith & Bayen, 2004), a mathematical model designed to separately measure the prospective and retrospective components of an event-based task, to disentangle the two components of the PM task. Results showed that the two groups of children differed from each other on the retrospective component, but not the prospective component, of the task. The results from this study demonstrated an improvement in the ability to remember *when* something must be done between 7 and 10 years of age, with continuing improvement into young adulthood of remembering both the *that* and *when* aspects of event-based prospective memory.

The mechanisms and characteristics of PM have been widely explored during the past decades (Brandimonte, Einstein, & McDaniel, 1996; Brandimonte & Ferrante, 2008; Brandimonte, Ferrante, Bianco, & Villani, 2010; Burgess, Quayle, & Frith, 2001; Einstein, McDaniel, Marsh, & West, 2008; Kliegel, McDaniel, & Einstein, 2008; McDaniel & Einstein, 2007; Simons, Schölvinck, Gilbert, Frith, & Burgess, 2006); however, much is still to be investigated. For instance, the relationship between EFT and PM represents a relatively new field of research that is increasingly attracting researchers' attention. Yet, this relationship has been investigated mainly with adult participants, whereas it has been largely neglected in the developmental literature (with the only exception of Atance & Jackson, 2009).

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