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The development of prospective memory in young schoolchildren: The impact of ongoing task absorption, cue salience, and cue centrality



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ABSTRACT

This study presents evidence that 9- and 10-year-old children outperform 6- and 7-year-old children on a measure of event-based prospective memory and that retrieval-based factors systematically influence performance and age differences. All experiments revealed significant age effects in prospective memory even after controlling for ongoing task performance. In addition, the provision of a less absorbing ongoing task (Experiment 1), higher cue salience (Experiment 2), and cues appearing in the center of attention (Experiment 3) were each associated with better performance. Of particular developmental importance was an age by cue centrality (in or outside of the center of attention) interaction that emerged in Experiment 3. Thus, age effects were restricted to prospective memory cues appearing outside of the center of attention, suggesting that the development of prospective memory across early school years may be modulated by whether a cue requires overt monitoring beyond the immediate attentional context. Because whether a cue is in or outside of the center of attention might determine the amount of executive control needed in a prospective memory task, findings suggest that developing executive control resources may drive prospective memory development across primary school age.

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Introduction

The processes associated with the task of carrying out delayed intentions are referred to as *prospective memory* (Einstein & McDaniel, 1990; Ellis, 1996; Ford, Driscoll, Shum, & Macaulay, 2012; see Kliegel, McDaniel, & Einstein, 2008, for an overview). Examples of prospective memory tasks in everyday life are remembering to pass on a message to a teacher when you next see her or to call the football coach at 12 o'clock. Conceptually, the successful completion of a prospective memory task requires the timely detection of the prospective cue and the self-initiated execution of the prospective action (prospective component associated with executive control processes; see, e.g., Einstein & McDaniel, 1996; Kliegel, Altgassen, Hering, & Rose, 2011; McDaniel & Einstein, 2000) as well as the correct retrieval of the to-be-performed intention (retrospective component mostly associated with memory-related processes). Methodologically, the cue for the intended action is almost always embedded within ongoing activities, referred to as the ongoing task that needs to be interrupted before being able to switch to execute the prospective task. Hence, prospective memory has been described as a combination of memory and executive control processes (e.g., Ellis, 1996; Kliegel et al., 2011).

There are two main types of prospective memory tasks: event-based and time-based (Kvavilashvili & Ellis, 1996). *Event-based* prospective memory tasks require an individual to initiate the intended action after the occurrence of an external event signaling the appropriate context for the execution (e.g., "remember to take the cake out of the oven when the timer rings"), whereas *time-based* tasks require an individual to remember to perform the intended action at a specific point in time or after a specified period of time has elapsed (e.g., "remember to feed the dog at 6 pm").

Development of prospective memory during childhood: Current evidence

The focus of the current study was on the development of event-based prospective memory, specifically on the developmental changes that occur over the primary school years. Although there is a vast body of research on prospective memory development across late adulthood (see Henry, MacLeod, Phillips, & Crawford, 2004; Ihle, Hering, Mahy, Bisiacchi, & Kliegel, in press; Kliegel, Jäger, & Phillips, 2008, for meta-analytic overviews), surprisingly few studies have investigated the development of prospective memory during childhood (see Kvavilashvili, Kyle, & Messer, 2008, for a review). This lack of research on prospective memory development is particularly concerning because prospective memory is a central and necessary skill to cope with the demands of children's everyday lives (Meacham, 1982; Winograd, 1988), especially in regard to the development of independence and autonomy during childhood (e.g., Kvavilashvili, Messer, & Ebdon, 2001; Meacham, 1982). To date, only a handful of studies have examined event-based prospective memory during the late preschool to early school years, and these few studies have revealed somewhat contradictory results.

An early study examined age differences in event-based prospective memory across the late preschool and early school years by focusing on retrieval context (Kvavilashvili et al., 2001). In three experiments, 4-, 5-, and 7-year-old children were asked to name objects pictured on cards (ongoing task) and also to remember to put cards with animals on them into a box (prospective memory task). Ongoing task interruption was targeted as a possible mechanism underlying developmental differences in prospective memory performance. Therefore, task interruption was experimentally manipulated so that for some children the prospective cue appeared in the middle of the deck of cards (task interruption condition) and for other children the cue appeared at the end of the deck of cards after the ongoing task had been completed (no interruption condition). Task interruption resulted in worse prospective memory performance compared with the no interruption condition. A small age effect was revealed, with 7-year-olds showing better prospective memory performance than 4- and 5-year-olds. Even in the face of minimal demands on task interruption (i.e., in the no interruption condition), older children outperformed younger children; hence, increasing ability to interrupt the ongoing task was not found to contribute to developmental change in prospective memory, and so the question of which processes underlie prospective memory development remains open.

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