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Process dissociation of familiarity and recollection in children: Response deadline affects recollection but not familiarity



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ABSTRACT

According to dual-process theories, recollection (slow and associated with contextual details) and familiarity (fast and automatic) are two independent processes underlying recognition memory. An adapted version of the process dissociation paradigm was used to measure recognition memory in 5-, 7-, and 11-year-olds and adults. In Experiment 1, it was found that 5-year-olds already recollect details of items (i.e., number). Recollection increased particularly between 5 and 7 years. Familiarity differed between 5 years and adulthood. In Experiment 2, under limited response time during retrieval, recollection was eliminated in 5-year-olds and reduced across all ages, whereas familiarity was left unaffected. Together, these findings are consistent with dual-process theories of recognition memory and provide support for two processes underlying recognition memory from a developmental perspective.

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Introduction

A large body of research over the past 20 years has focused on quantitative changes in children's true and false memories (for a review, see Raj & Bell, 2010). Little is known about the qualitative mental state that accompanies a child's memory. A fundamental question is whether a child's memory is

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associated with a specific memory of a past event (recollection) or a sense of “oldness” (familiarity). For example, if a child brings some toy cars to school that get lost, the memory of the cars can be specific (e.g., two red cars) (recollection) or can be accompanied by a vague feeling of bringing some toys to school (familiarity). According to dual-process theories, recollection is defined as an effortful and slow acting process where qualitative details about an event are recalled, whereas familiarity is automatic, fast acting, and not associated with contextual details (Jacoby & Dallas, 1981; Yonelinas, 2002).

The aim of the current study was to examine the role of recollection and familiarity in 5-, 7-, and 11-year-olds’ and adults’ memories implementing the process dissociation paradigm (Jacoby, 1991) and to explore whether there is evidence for a dual-process model across childhood. If there is evidence for dual processes, then limiting response time during retrieval is expected to lead to a reduction in recollection but not in familiarity (Yonelinas & Jacoby, 1994).

Investigating the mental states that accompany memory is of particular theoretical relevance because developmental changes in quality of memories can occur independent of a change in quantity (Brainerd, Holliday, & Reyna, 2004). That is, theoretical explanations in quantitative changes in children’s true and false memories and their underlying processes such as source monitoring, associative activation, gist, and verbatim extraction (Brainerd & Reyna, 2005; Howe, Wimmer, Gagnon, & Plumpton, 2009; Johnson, Hashtroudi, & Lindsay, 1993) do not currently account for mental states that accompany memories and, thus, do not explain developmental changes in memories fully.

To get a complete picture of recognition memory development throughout childhood, it is important to investigate the full age range between 5 years up to young adulthood. However, to date the few studies that examined recollection and familiarity in children either have focused on children older than 8 years or have not examined age groups between 5 years and adulthood (Anooshian, 1999; Billingsley, Smith, & McAndrews, 2002; Brainerd et al., 2004; Brainerd, Reyna, & Howe, 2009; Czernochowski, Mecklinger, Johansson, & Brinkmann, 2005; Friedman, de Chastelaine, Nessler, & Malcolm, 2010; Ghetti & Angelini, 2008; Holliday & Hayes, 2000, 2001, 2002; Mecklinger, Brunneemann, & Kipp, 2011). One reason why evidence of recognition memory is lacking in younger children is that the standard paradigm applied in research with adults (i.e., the remember–know paradigm; Tulving, 1985) requires accurate self-report of memory experience (metacognitive monitoring). This aspect of metamemory develops around 8 years of age and increases in accuracy until early adulthood (Ghetti, Miranda, Angelini, Cornoldi, & Ciaramelli, 2011). Recent evidence also suggests that the remember–know procedure distinguishes strong memories from weak ones rather than distinguishing recollection from familiarity (Wixted & Mickes, 2010). Moreover, remember–know responses might not be a proxy for recollection and familiarity per se but rather reflect the subjective experience of the recognition process (Knott & Dewhurst, 2007). Thus, the remember–know procedure may measure how metacognitive monitoring develops during childhood (Ghetti, Lyons, Lazzarin, & Cornoldi, 2008; Ghetti et al., 2011) instead of examining the development of differing remembering processes per se.

Other procedures assume a positive correlation between memory accuracy and confidence (e.g., receiver operating characteristic [ROC] procedure; Yonelinas, 1994). However, the ability to monitor memory strength continues to develop during middle childhood (Ghetti et al., 2008; Hembacher & Ghetti, 2013; Roebbers, 2002; Roebbers, Gelhaar, & Schneider, 2004).

Ghetti and Angelini (2008) examined recollection and familiarity development in 6-, 8-, and 10-year-olds and young adults using ROCs (Yonelinas, Dobbins, Szymanski, Dhaliwal, & King, 1996). ROCs were derived by plotting hits and false alarms as a function of confidence. A dual-process signal detection model that assumes that recollection and familiarity are independent processes was fitted to the ROCs to provide estimates for recollection and familiarity. Here, recollection was modeled as a single-threshold process and familiarity was assumed to be a continuous process. In their Experiment 2, children studied pictures and judged their characteristics (e.g., hard vs. soft) under either short (1500 ms) or long (4500 ms) study duration. Increases in recollection occurred throughout childhood until 10 years independent of study duration. Age-related increases in familiarity were observed after the short study duration but not after the long one. These findings indicate that recollection and familiarity have different developmental trajectories. Furthermore, short study duration reduced familiarity but not recollection. To our knowledge, to date this is the only study revealing clear evidence for a dissociation between the developmental trends in familiarity and recollection between 6 and 10 years.

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