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INTRODUCTION

New perspectives on childhood memory: introduction to the special issue

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ABSTRACT
This special issue brings together the scholarship that contributes diverse new perspectives on childhood amnesia – the scarcity of memories for very early life events. The topics of the studies reported in the special issue range from memories of infants and young children for recent and distant life events, to mother–child conversations about memories for extended lifetime periods, and to retrospective recollections of early childhood in adolescents and adults. The methodological approaches are diverse and theoretical insights rich. The findings together show that childhood amnesia is a complex and malleable phenomenon and that the waning of childhood amnesia and the development of autobiographical memory are shaped by a variety of interactive social and cognitive factors. This collective body of work will facilitate discussion and deepen our understanding of the dynamics that influence the accessibility, content, accuracy, and phenomenological qualities of memories from early childhood.

KEYWORDS
Childhood amnesia; infantile amnesia; autobiographical memory; early memory development; forgetting

This special issue of Memory is devoted to research that brings together new perspectives on childhood memory. Since the time Freud (1905/1953) noted the phenomenon of childhood amnesia – the scarcity of memories for very early life events – the fascination with childhood memory has persisted both in popular culture and among memory researchers. In the general public, there is considerable interest in the "mystery of why you can't remember being a baby" (http://www.bbc.com/future/story/20160726-the-mystery-of-why-you-cant-remember-being-a-baby). In psychology and related fields, numerous studies have been done and theories developed to account for the neurological, cognitive, linguistic, social, and cultural mechanisms underlying the paucity of early memories and the flourishing of memory from late preschool years onward (e.g., Bauer, 2015; Hayne, 2004; Howe, 2003; Josselyn & Frankland, 2012; Nelson & Fivush, 2004; Pillemer & White, 1989; Reese, 2009; Rubin, 2000; Wang, 2013).

More recently, there have been some exciting new findings that provide important extensions and empirical evidence to what has already been known about this intriguing phenomenon, while others pose questions and challenges to existing theories and shed critical lights on the forgetting and retention of early memories (e.g., Akhtar, Justice, Morrison, & Conway, 2018; Kingo, Bohn, & Krøjgaard, 2013; Reese, Jack, & White, 2010; Wang & Peterson, 2014). This special issue brings together the scholarship that contributes diverse new perspectives, with the aim to facilitate discussion and deepen our understanding of the dynamics that influence the accessibility, content, accuracy, and phenomenological qualities of memories from early childhood. The contributions reflect two general themes.

First, earliest childhood memories are vulnerable to reconstruction and errors

Although the idea that memory is subject to reconstruction in line with individuals' current goals and general knowledge is not new (Bartlett, 1932), only until recent decades have researchers started to examine the veracity of early childhood memories. Previous studies that attempted to verify participants' memories with parents or other adults who were present at the time of the events have concluded that earliest childhood memories of both children and adults are generally accurate in content and age estimates (Bauer, Burch, Scholin, & Güler, 2007; Bruce, Dolan, & Phillips-Grant, 2000; Howes, Siegel, & Brown, 1993; Jack, MacDonald, Reese, & Hayne, 2009; Peterson, Wang, & Hou, 2009). However, with new methodological and analytical approaches, more recent studies have provided evidence that earliest childhood memories are highly malleable and that the age at earliest memory can shift across contexts and time (e.g., Kingo et al., 2013; Wang & Peterson, 2014, 2016).

Several studies in the special issue have examined the estimated age of adults' earliest childhood memories. Working with two large samples of young adults, Wessel, Schweig, and Huntjens found that the retrieval and dating of earliest childhood memories were highly sensitive to contextual factors such as whether the instructions allowed sketchy memories, consistent with other recent findings (e.g., Kingo et al., 2013). In study 1, participants who read examples of earliest memories from around age 2 prior to the memory task recalled earlier first memories and were more likely to guess their age when

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dating their memories, compared with those who read memory examples from around age 6. Similarly, in study 2, participants who were reminded of personal or public information from their first three years of life recalled earlier first memories than those who were not reminded of any information from an early life-time period. These findings demonstrate that earliest childhood memories are not fixed but malleable. Notably, because the manipulation was done prior to the recall and dating of earliest childhood memories, participants in the early or experimental condition might have recalled memories from an earlier time period or simply dated their memories at an earlier age. Thus, whether the contextual factors facilitate memory retrieval or interfere with memory dating or both remains an open question.

Wang, Peterson and colleagues examined the accuracy of memory dating by verifying young adult participants' age estimates of their earliest childhood memories with independent age estimates collected from the participants' parents. Their findings are consistent with what they have previously observed among children (Wang & Peterson, 2014, 2016; Wang, Peterson, & Hou, 2010). For the memories that parents dated as happening before 48 months, young adults dated significantly later by approximately 12 months (Study 1) and 6 months (Study 2). Adjusting for the telescoping error of postdating memories resulted in an age of earliest memories at 2.5 years, one year earlier than what is commonly believed at 3.5 years. Wang, Peterson and colleagues called the attention of memory researchers that when verifying the dating accuracy of early childhood memories, it is important to take into account the age at encoding. Pooling all memories together by comparing the *mean* age estimate provided by participants against the *mean* age estimate provided by parents or participants themselves previously can lead to the false conclusion that there are no systematic dating errors in early childhood memories (e.g., Bauer et al., 2007; Bruce et al., 2000; Eacott & Crawley, 1998; Howes et al., 1993; Jack et al., 2009).

Ece, Demiray, and Gülgöz provided direct evidence for the importance of considering the age at coding to detect memory dating errors. They tested young adults' earliest childhood memories at two time points, where participants reported their earliest memories, estimated ages, and rated their recollections on memory qualities with a two-year interval. They found that the *mean* age estimates of earliest memories from the two time points were almost identical, consistent with prior studies using a similar analytical approach (e.g., Bauer et al., 20072007; Bruce et al., 2000; Eacott & Crawley, 1998; Howes et al., 1993 Jack et al., 2009). However, when examining the memories on the basis of a 48-month cutoff point, Ece and colleagues found that participants predated their "later" memories for 9.36 months and postdated their "earlier" memories for 3.72 months at time 2 (although the postdating effect was nonsignificant). Furthermore, almost half of the participants (44%) at time 2 recalled a different earliest childhood memory from time 1, which demonstrates again that earliest childhood memories are not fixed but malleable. The rated qualities of earliest memories (e.g., emotional intensity, personal importance) showed high levels of consistency across the two time points, which suggests stable individual characteristics in childhood recollections. Together, these studies point to the necessity to investigate the mechanisms underlying memory dating and how they interact with the context and the processes of remembering.

Modern societies intervene the developmental process by educating the children and thus influencing their development in many respects, including social, cognitive, and linguistic development (Burger, 2010; Cole, 1992). It is therefore pertinent to investigate how literacy and education impact memory processes. The study by de la Mata, Santamaria, Trigo, Cubero, Arias, Antalikova, Hansen, and Ruiz examined the changes associated with the educational levels of adults in the content of memories for early childhood. Across three levels of education – just literate, basic education, and university degree – the researchers compared memory qualities and the autonomous orientation, self-orientation, and individual versus social orientation. They observed both quantitative and qualitative differences in the memories, whereby university graduates reported more voluminous and specific memories than did the other two groups and also reported memories that were more self-focused and individually oriented. These results provide a glimpse of the probable influence of education not only in terms of how and how well childhood events are remembered but also in terms of the role of the self in the construction of autobiographical memory.

Second, developmental research is critical for our understanding of the mechanisms underlying childhood amnesia

Childhood amnesia appears to be an emerging phenomenon. Although adults exhibit limited abilities to retrieve memories from their early childhood, young children, including toddlers, are capable of recalling information about their past experiences following delays of days, months, and even years (e.g., Bauer, 2015; Hayne, Gross, McNamee, Fitzgibbon, & Tustin, 2011; Jack, Simcock, & Hayne, 2012; Reese, 2009). Yet many of the early memories become inaccessible or "forgotten" as children grow older such that by late adolescence, children exhibit childhood amnesia to a similar extent or magnitude as adults do (see Bauer, 2015, for a review). What happened to those very early memories? Can they be accessed under certain conditions? For the memories that survive, what are the factors that make it possible? And what are the cognitive and social origins for the memories that flourish following the childhood amnesia period? These questions key to childhood amnesia need to be answered through developmental research. Several articles in the special issue

illuminate on new methods and approaches to studying the complex process of autobiographical memory development across childhood.

Extending the wealth of developmental research showing the amazing abilities of even very young children to remember past experiences following extended delays (e.g., Bauer, 2015; Hayne et al., 2011; Jack et al., 2012; Reese, 2009), the study by Sonne, Kingo, Berntsen, and Krøjgaard investigated the influence of contextual cues on children's memory for a previously experienced event. Rather than asking young children to recall and talk about their past experiences, a method commonly used in memory research, Sonne and colleagues examined spontaneous verbal memories triggered by contextual cues, which is less cognitively demanding and may thus better reflect young children's memory competence. A group of 35-month old children visited the lab and engaged in some fun activities. One week later the children revisited the lab, with half of them being sent to the same room as the first visit and the other half to a visually distinct new room, as a manipulation of the contextual cues. The children spontaneously talked about the activities they experienced a week before. However, the spontaneous memories were not significantly reduced by the children's returning to a new room, which suggests that the change of room might not be sufficiently salient to the children. The researchers offered several explanations of their findings in relation to childhood amnesia.

Research on childhood memory, and autobiographical memory more generally, has focused on episodic memory for specific, one-moment-in-time events. Yet, in challenging the privileged statues of episodic memory in memory theories and research, there has been increasing evidence that other forms of memory, such as vicarious memory for experiences of other people and general memory for routine or repeated events, can be just as important for individuals' sense of self, connection with important others, and well-being (Peterson, Baker-Ward, & Grovenstein, 2016; Pillemer, Steiner, Kuwabara, Thomsen, & Svob, 2015; Steiner, Pillemer, & Thomsen, 2017; Wang, 2013). In two studies, Leichtman, Steiner, Camilleri, Pillemer, and Thomsen examined life chapter memories – memory for extended lifetime periods – and the socialisation through mother–child conversations. Mothers were asked to discuss with their kindergarten children extended periods in the children's lives (study 1), or with their school-aged children the kindergarten year versus a specific episode (study 2). The researchers found that the life-chapter conversations largely focused on general information (e.g., people, locations, activities) and repeated events; and that the mothers' memory questions and yes/no questions during a conversation were effective to elicit memory responses from children. In addition, individual differences in maternal conversational style and child contribution were consistent across different types of conversations. This work represents a significant extension to research on the contribution of family narrative practices to memory development (Nelson & Fivush, 2004; Reese et al., 2010; Wang, 2013). It calls for more research on general memory and the role such memory plays in childhood amnesia.

Other than asking the question of why we forget memories from the earliest years of life, Bauer and Larkina asked the question of why we remember memories from the late preschool years onward. They conducted a 3-year cohort-sequential study, following samples of 4-year-olds, 6-year-olds, and 8-year-olds to observe age-related changes in autobiographical memory over a 3-year period. In addition to children's memory reports, they measured at each time point a variety of potential correlates, including language skills, maternal narrative style, domain-general cognitive abilities (speed of processing, working memory, sustained attention), and memory-specific abilities (non-autobiographical story recall, deliberate and strategic remembering and metamemory, source memory). The researchers found that the children's memories became increasingly lengthy, complete, and coherent. Non-autobiographical story recall and other memory-specific as well as domain-general cognitive abilities predicted memory growth, whereas language skills and maternal narrative style did not when the other predictors were taken into consideration. This study provides valuable data and insights into the correlates of the flourishing of memories following the childhood amnesia period by including domain-general cognitive variables that may underlie specific skills.

Reese and Robertson's impressive longitudinal study traced the development of childhood amnesia from age 1.5 years through adolescence. The researchers included a battery of measures at the early childhood phase, including self-awareness, attachment security, nonverbal and verbal memory, language and narrative skills, theory of mind, and maternal narrative style. The earliest memories were measured at ages 12 and 16 years. The researchers found that childhood amnesia continued to develop during adolescence such that the age of earliest memory was shifting to older ages over the 4-year period, from 40 months at age 12 to 52 months at age 16. Maternal narrative style emerged to be the single most important predictor for individual differences in the age of earliest memory, whereby higher levels of maternal elaborative reminiscing in early childhood were uniquely associated with earlier first memories at both adolescent ages. At age 16, this association was further moderated by children's self-awareness early on, such as higher levels of elaborative reminiscing were associated with earlier first memories only in adolescents who had lower levels of self-awareness as toddlers. These findings support integrated theories that view the demise of early memories as a result of a complex interplay among a variety of neural-cognitive-social-linguistic factors.

Bridging the first and second themes, the cross-sectional study by Tustin and Hayne examined the malleability of the content of early childhood memories by taking into

account both age at encoding and age at retrieval. The researchers interviewed adults for childhood memories and interviewed children and young adolescents about recent events. The age at encoding could therefore be matched by, for example, asking both adults and 5-year-old children to recall events from when they were age 5. Although adults would have been expected to report less information about the events given that their retention interval was substantially longer than that of the children (more than a decade versus less than a month), Tustin and Hayne found that adults in fact reported more event details than did children. Adults also reported the same amount of information regardless of whether the events took place in their childhood or recently. The researchers suggested that adults' retrospective reports of childhood events might include not just what they originally encoded as children, but also information from other sources such as family stories, photos and videos, as well as inferences based on personal knowledge. Thus, retrospective studies with adults may have overestimated the content of early childhood memories. These findings demonstrate that studying children's memory can provide critical insights about adults' childhood memory. They further have important implications for memory theories and real-life settings (e.g., in the court).

Take home messages

The studies reported in this special issue suggest that childhood amnesia is a complex and malleable phenomenon and that some of the common beliefs about childhood amnesia, such as those pertaining to the age of earliest memory and the content of early childhood memories, need to be revisited (Ece, Demiray, & Gülgöz, 2019; Tustin & Hayne, 2019; Wang et al., 2019; Wessel, Schweig, & Huntjens, 2019). If the "onset" of childhood amnesia is indeed as elusive as the studies have shown, then theories built around a fixed age of earliest memory, namely 3.5 years, beg for reflection and revision. The context of remembering and the individual differences clearly influence the ages of these memories, the estimations of the dates, or both. Interestingly, in the studies by Reese and Robertson (2019) and Tustin and Hayne (2019), the content and age estimates of the memories reported by participating children and adults, when presented to parents for verification, were judged by parents as largely accurate. These findings differ from those of studies when *independent* recall and dating information was obtained from parents (Wang et al., 2010, 2019) or participants themselves at different time points (Ece et al., 2019; Wang & Peterson, 2014, 2016). The methodological differences should be addressed in future research in evaluating memory accuracy and the dating processes. It is evident in Ece et al. (2019) that in some cases, even if the memories reported as earliest memories are consistent across time, the ages attributed to these memories may change, suggesting different processes for remembering and dating. Therefore, it is necessary that future research addresses the influences of contexts of remembering and individual differences both and independently on the processes of remembering and dating.

Moreover, the studies in the special issue reveal that a variety of social and cognitive factors influence the nature of childhood memories in children and adults (e.g., de la Mata et al., 2019; Sonne, Kingo, Berntsen, & Krøjgaard, 2019). They further suggest that social and cognitive factors may interact in determining whether the characteristics of early childhood memories are associated with particular environmental and individual variables. For example, maternal reminiscing style may emerge as a strong predictor for memory development (Leichtman, Steiner, Pillemer, Camilleri, & Thomsen, 2019; Reese & Robertson, 2019) except when other cognitive variables were included in the prediction formula (Bauer & Larkina, 2019). More large scale and longitudinal studies are called for to examine multiple factors and their interactions in shaping memory development throughout childhood and adolescence and the retrospective recollections of early childhood in adults. Such studies may require team science and multilevel approaches and will contribute to the theoretical understanding of childhood amnesia.

Disclosure statement

No potential conflict of interest was reported by the authors.

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