



# The role of executive functions in accessing specific autobiographical memories in 3- to 6- year-olds

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## ABSTRACT

Autobiographical memory develops gradually across preschool years (ages 3–6 years) through processes of social interaction and cognitive development. This study analyzed the role of executive functions, age, and verbal abilities in the capacity to retrieve specific autobiographical memories in a convenience sample of 228 Spanish 3- to 6- year-olds (ages 3.42–6.50 years). Participants were administered an autobiographical memory test and executive functions and verbal tests. We analyzed the relation between these variables and autobiographical memory specificity. All the variables analyzed were positively related to autobiographical memory specificity. However, using structural equation modeling, our results showed that autobiographical memory specificity was better explained by executive functions and age was indirectly related to higher AM specificity through higher levels of executive functioning. These findings are in agreement with previous research suggesting that specific autobiographical memory occurs with the development of executive functions during preschool years.

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## 1. Introduction

Autobiographical memory (AM) refers to a knowledge base of personal information that includes specific episodic memories of past events and more conceptual, self-related information (Conway & Pleydell-Pearce, 2000). Autobiographical memories (AMs) are key elements of human experience with diverse functions: self, social, and directive (Bluck, Alea, Habermas, & Rubin, 2005). Importantly, all three functions are related to individual well-being (Fivush, 2011; Waters, 2013) and are transcultural (Alea & Wang, 2015).

Autobiographical knowledge is hierarchically organized across different levels of specificity (Conway & Pleydell-Pearce, 2000). At the general level, we can find extended memories, which are general memories associated with events that last more than a day (e.g., “the weekend I spent at my friend’s house”), and categorical memories, which are general, repeated events grouped together in a category (e.g., “Christmas dinners with my family”). At the lowest level of the hierarchy are specific AMs, which are personally significant memories associated with a particular time and place that lasted a day or less than a day (e.g., “when I got my bike”).

Difficulty in retrieving specific AMs (i.e., a cognitive style consisting of retrieving general memories from the AM, commonly known as overgeneral memory) is one of the most widely studied aspects of AM, due to its association with certain types of psychopathology, such as depressive disorders or post-traumatic stress disorder (Moore & Zoellner, 2007; see Ono, Devilly, & Shum, 2016, for a meta-analytic review; Williams et al., 2007). However, very little research has been conducted with normative samples to study the capacity for retrieving specific memories in preschoolers (McDonnell, Valentino, Comas, & Nuttall, 2016; Nieto, Ros, Mateo, Ricarte, & Latorre, 2017; Nuttall, Valentino, Comas, McNeill, & Stey, 2014).

AM develops gradually from the age of three years through processes of social interaction and cognitive development (Fivush, 2011; Nelson & Fivush, 2004). Language has been identified as one of the contributors to the emergence of AMs in early childhood (Reese, 2002). Moreover, developmental researchers have underlined the role of executive functions in the normative development of AM specificity (Conway & Pleydell-Pearce, 2000; Williams et al., 2007). The aim of this work is to analyze the relation between AM specificity, age, executive functions, and language in a sample of Spanish preschoolers aged 3–6 years.

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## 2. Development of AM specificity and associated variables

### 2.1. AM specificity and age

The development of AM is the result of the influence and interrelation of sociocultural and cognitive factors from 1 to 5 years of age (Nelson & Fivush, 2004). AM is typically consolidated by adolescence, when individuals are able to create a fully detailed and coherent life story (Heron et al., 2012). Some approaches to AM integrate Vygotskian social interaction theories of development with information processing views (e.g., Bauer, 2007; Nelson & Fivush, 2004; see Reese, 2014, for a review). Others approaches are more Piagetian-influenced in their emphasis on cognitive changes during early development (e.g., Howe & Courage, 1993, 1997; see Reese, 2002, 2014, for reviews).

Critical factors involved in the development of AM in early childhood include developments in neurocognitive functioning and basic memory abilities, language, understanding of temporal relations, narrative skills, self-awareness, and mental states. Additionally, the sociocultural context in which the child develops also influences AM specificity (see Fivush, 2011, 2014, for reviews; see Howe, 2014; Wang, 2004, 2006). For example, the individualistic orientation of Western cultures (e.g., North America and Europe) or the collectivistic orientation of Eastern cultures (e.g., China and Japan) have been associated with the accessibility, style, specificity, and content of AM (Wang, 2011). Finally, other involved processes include the quality of maternal reminiscing style (Valentino et al., 2014), the defensive avoidance<sup>1</sup> (see Valentino, 2011; Williams, 2006) or the development of executive functions between the ages of 3–4 years (Nelson & Fivush, 2004).

It has been suggested that children represent and retrieve general event memories from an early age (Nelson & Grundel, 1981) and, as they develop, they acquire a more specific AM style (Williams, 1996). It has been proposed that the ability to retrieve specific AMs begins to emerge from 3 years and consolidates from the age of 4.5 years (Bruce, Dolan, & Phillips-Grant, 2000). In this line, recent research with preschoolers finds that AM specificity is positively associated with age (Mc Donnell et al., 2016; Nieto et al., 2017; Nuttall et al., 2014).

### 2.2. AM specificity and executive functions

Several authors have noted that age-related improvement in AM specificity could involve a process of controlled retrieval based on executive functions (Conway & Pleydell-Pearce, 2000; Fivush & Nelson, 2004; Williams et al., 2007). Executive functions involve several complex cognitive processes related to the activation, maintenance and selection of different courses of action needed to achieve different goals (Miyake & Friedman, 2012). It is generally agreed there are three main processes: *inhibition* (suppression of prepotent or affectively driven behaviors), *working memory* (to hold information active in mind and to mentally work with that information as a platform for guiding our behavior), and *cognitive flexibility* (switching flexibly between tasks or mental sets) (Miyake et al., 2000). Executive functions develop significantly in the preschool years (Garon, Bryson, & Smith, 2008) and are vital for cognitive, social and psychological development (Diamond, 2013).

Reduced executive function resources may influence the retrieval of specific AMs (Williams, 2006). Empirical research

<sup>1</sup> Bowlby (1980) and Main (1990) proposed the hypothesis that individuals develop defensive avoidance strategies if frequently exposed to rejection experiences by their caregivers. This strategy would thus allow individuals to avoid exposure to negative emotions associated with attachment relations as it limits the information that may activate the attachment system.

corroborates that the lack of AM specificity appears to be especially associated with deficits in: a) inhibition (Piolino et al., 2010); b) working memory (Birch & Davidson, 2007; Neshat-Doost, Dalgleish, & Golden, 2008; Ros, Latorre, & Serrano, 2010); c) the ability to update and maintain information in working memory (Piolino et al., 2010; Rutherford, 2010; Yanes, Roberts, & Carlos, 2008); and d) verbal fluency<sup>2</sup> (Heeren, Van Broeck, & Philippot, 2009). These results have been found in a variety of sample types, including healthy adults/older adults (Heeren et al., 2009; Neshat-Doost et al., 2008; Piolino et al., 2010; Ros et al., 2010; Rutherford, 2010; Yanes et al., 2008) and dysphoric older adults and adults with eating disorders (Birch & Davidson, 2007; Dalgleish et al., 2007), adults with depression (Haddad, Harmer, & Williams, 2014) and patients with schizophrenia (Potheegadoo, Cordier, Berna, & Danion, 2014).

Research with samples of children/adolescents has provided no conclusive findings on the relation between executive functioning and AM specificity (see Hitchcock, Nixon, & Weber, 2014b, for a review). Regarding inhibition, in a sample of primary school children, Raes, Verstraeten, Bijttebier, Vasey, and Dalgleish (2010) found that deficits in personality inhibition were related to low AM specificity. However, studies by Valentino, Bridgett, Hayden, and Nuttall (2012) and Nuttall et al. (2014) found no relation between different measures of inhibition and AM specificity. With regard to working memory, whilst various studies suggest that working memory is associated with AM specificity (Hitchcock, Nixon, & Weber, 2014a; Nixon, Ball, Sterk, Best, & Beatty, 2013, see study 1), others report no correlation (de Decker, Hermans, Raes, & Eelen, 2003). Finally, measures of verbal fluency have also been examined. Kuyken, Howell, and Dalgleish (2006) reported no relation between verbal fluency and AM specificity. However, Valentino et al. (2012) found that category fluency negatively correlated with difficulty in retrieving specific AMs.

### 2.3. AM specificity and verbal variables

It has been suggested that language is one of the direct and clear contributors to children's AMs in early childhood (Reese, 2002). Language skills strengthen children's nonverbal and verbal memory for events (Simcock & Hayne, 2003). Children who display adequate command of language skills are able to process events at a deeper level, which facilitates the verbal expression of a memory (Cheatham & Bauer, 2005). However, once basic command of language is achieved, the contribution of linguistic differences to individual differences in AM is greatly reduced (Fivush, Haden, & Reese, 2006). Furthermore, correlations between executive functions and language skills are frequently reported (e.g., Carlson, Davis, & Leach, 2005; Gooch, Thompson, Nash, Snowling, & Hulme, 2016; Nieto, Ros, Medina, Ricarte, & Latorre, 2016). For example, Viterbori, Gandolfi, and Usai (2012) suggest that more efficient processing of executive functions may promote better language skills in typical language development in young children. Their findings show that inhibition is a predictor of intelligibility and phonological accuracy, whereas morphological and syntactic abilities are associated with inhibitory control and cognitive flexibility.

## 3. The Current Study

Due to the psychological consequences of the AM retrieval (Williams et al., 2007), we consider it important to determine the variables associated with the emergence and development of AM

<sup>2</sup> Verbal fluency is considered a broad measure of executive control that reflects the ability to organize retrieval, initiate and maintain a search set, and inhibit inappropriate responses (Swan & Carmelli, 2002).

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