



Exploring the experience of episodic past, future, and counterfactual thinking in younger and older adults: A study of a Colombian sample

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ABSTRACT

Although extant evidence suggests that many neural and cognitive mechanisms underlying episodic past, future, and counterfactual thinking overlap, recent results have uncovered differences among these three processes. However, the extent to which there may be age-related differences in the phenomenological characteristics associated with episodic past, future and counterfactual thinking remains unclear. This study used adapted versions of the Memory Characteristics Questionnaire and the Autobiographical Interview in younger and older adults to investigate the subjective experience of episodic past, future and counterfactual thinking. The results suggest that, across all conditions, younger adults generated more internal details than older adults. However, older adults generated more external details for episodic future and counterfactual thinking than younger adults. Additionally, younger and older adults generated more internal details, and gave higher sensory and contextual ratings, for memories rather than future and counterfactual thoughts. Methodological and theoretical consequences for extant theories of mental simulation are discussed.

1. Introduction

Recent evidence suggests remarkable overlap in the neural and cognitive mechanisms underlying episodic memory—our capacity to bring to mind specific events of our personal past (Tulving, 1985)—and episodic future thinking—our capacity to imagine specific events that may happen in our personal future (Atance & O'Neill, 2001; Szpunar, 2010). This claim is supported by neuropsychological evidence showing similar deficits in episodic memory and future thinking in individuals with amnesia (Hassabis, Kumaran, Vann, & Maguire, 2007; Klein, Loftus, & Kihlstrom, 2002; Tulving, 1983), severe depression (Dickson & Bates, 2005; Williams, 1996), schizophrenia (D'Argembeau, Raffard, & Van der Linden, 2008), amnesic mild cognitive impairment (Gamboz et al., 2010), and Alzheimer's disease (Addis, Musicaro, Pan, & Schacter, 2010; Addis, Sacchetti, Ally, Budson, & Schacter, 2009), among others. Further support comes from developmental studies showing parallel patterns of development for episodic memory and future thinking in

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young children (Busby & Suddendorf, 2005; Perner, Kloo, & Rohwer, 2010; Suddendorf & Busby, 2005) and older adults (Addis, Wong, & Schacter, 2008; Spreng & Levine, 2006), as well as neuroimaging studies showing significant overlap in brain regions engaged during episodic memory and future thinking (Addis, Wong, & Schacter, 2007; Okuda et al., 2003; Szpunar, Watson, & McDermott, 2007; for a recent review see Schacter et al., 2012). Finally, studies exploring the experience of episodic memory and future thinking have uncovered similarities in their phenomenological characteristics (D'Argembeau & Van der Linden, 2004, 2006; Szpunar & McDermott, 2008; Winfield & Kamboj, 2010), further supporting the claim that common mechanisms underlie both processes.

Although many initially interpreted the striking similarities between past and future thinking as evidence in favor of a cognitive system for mental time travel (Suddendorf & Corballis, 1997, 2007; Tulving, 1985)—the capacity to mentally travel back to our experienced past and forward to our imagined future—soon it became evident that this characterization needed to be extended to cover mental simulations of possible ways in which past events could have occurred but did not—a cognitive process known as *episodic counterfactual thinking* (De Brigard, 2014; De Brigard & Giovanello, 2012; Roese, 1997; Schacter, Benoit, De Brigard, & Szpunar, 2015). Support for this observation comes from neuroimaging results showing common engagement of brain regions during episodic memory, future and counterfactual thinking (De Brigard, Addis, Ford, Schacter, & Giovanello, 2013; De Brigard, Spreng, Mitchell, & Schacter, 2015; Van Hoeck et al., 2013; see also Addis, Pan, Vu, Laiser, & Schacter, 2009; Addis, Sacchetti et al., 2009). Further evidence comes from neuropsychological studies reporting abnormalities in counterfactual thinking in individuals with impairments in episodic memory and future thinking, such as schizophrenia (Hooker, Roese, & Park, 2000) and amnesia (Mullally & Maguire, 2014), both of which are associated with damage in the medial temporal lobes. Finally, recent behavioral results exploring episodic past, future and counterfactual thoughts found similarities in phenomenological features (De Brigard & Giovanello, 2012) as well as in the reliance of cultural life scripts as a function of temporal distance across these three kinds of simulations (Özbek, Bohn, & Berntsen, 2016).

Despite the similarities between episodic memory, future, and counterfactual thinking, a number of systematic differences have also been documented. Studies comparing episodic memory and future thinking have uncovered developmental differences, such as the fact that 3–4 year-old children appear to be able to discriminate (Friedman, 2005) and reason sequentially (McColgan & McCormack, 2008) about past events before they can do so with future events. Additionally, 9–15 year-old children seem to generate more coherent stories about past than future events (Bohn & Bernsten, 2013), although these are more creative and narratively richer than episodic memories (Busby & Suddendorf, 2005). As for healthy young adults, it has been found that during both involuntary and voluntary mental time travel, they report more positive thoughts when thinking about the future than the past (Bernsten & Jacobsen, 2008; Rasmussen & Bernsten, 2013). Furthermore, thoughts about the future tend to be more schematic and prototypical (Kane, Van Boven, & McGraw, 2012), and contain fewer details (D'Argembeau & Van der Linden, 2004) than thoughts about the past (see also Painter & Kring, 2015, for further differences).

Significantly less is known about differences between episodic counterfactual thinking as compared to episodic memories and future thoughts. De Brigard and Giovanello (2012) compared phenomenological characteristics of episodic past, future and counterfactual thoughts in young adults, and found that episodic memories were rated as more vivid, spatially coherent, and as containing more sensory details than both episodic future and counterfactual thoughts. Additionally, they found that emotion ratings for counterfactual thoughts were lower than for past and future thoughts. Repeated simulation also appears to affect episodic future and counterfactual thinking differently, as it seems to increase perceived plausibility in the former (Szpunar & Schacter, 2013) while decreasing it in the latter (De Brigard, Szpunar, & Schacter, 2013; Stanley, Stewart, & De Brigard, 2016). More recently, Özbek et al. (2016) also demonstrated that episodic memories were more specific, easily remembered and more likely to be experienced from a field perspective than both episodic future and counterfactual thoughts. Furthermore, they showed that future thoughts were experienced as more positive, important, voluntarily rehearsed and central to the person's life than episodic counterfactual thoughts.

These findings notwithstanding, there are still a number of open questions regarding the experience of engaging in episodic past and future thinking relative to episodic counterfactual thinking. One such question is whether or not there are age differences in the subjective experience of episodic counterfactual thinking between younger and older adults and, if so, whether or not these differences parallel those documented for episodic memory and future thinking. Although not many, a handful of studies have explored age-related differences in the subjective experience of episodic memory. Hashtroudi, Johnson, and Chrosniak (1990), for instance, asked younger and older participants to either remember or imagine ordinary situations, after which they were asked to complete the Memory Characteristics Questionnaire (MCQ, Johnson, Foley, Suengas, & Raye, 1988). Although they found that older adults reported more thoughts and feelings than younger adults, no differences were found in sensory and contextual ratings. However, a subsequent memory test revealed that older adults remembered fewer sensory and contextual details than younger adults, which is consistent with evidence showing that older adults exhibit more difficulties retrieving relations among elements than younger adults (Chalfonte & Johnson, 1996; Lyle, Bloise, & Johnson, 2006). Comblain, D'Argembeau, and Van der Linden (2005) also employed the MCQ to examine similarities and differences in the phenomenological experience of emotional versus neutral autobiographical memories in younger and older adults. They found that while both younger and older adults gave higher ratings for sensorial and contextual features of emotional relative to neutral memories, older adults reported more positive feelings and intensity for negative memories than younger adults, a results consistent with the documented “positivity bias” in old age (Mather & Carstensen, 2005). Finally, using a novel Autobiographical Interview (AI) Levine, Svoboda, Hay, Winocur, and Moscovitch (2002) showed that older adults recovered fewer episodic details but more external information when remembering autobiographical episodes than young adults.

Studies exploring age differences in episodic memory and future thinking are even scarcer, yet these few extend and complement previous findings in autobiographical memory. In a pioneer study exploring age-related differences and similarities in episodic

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