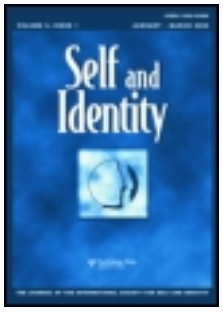

Self and Identity

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Autobiographical Memory, Past and Future Events, and Self-images in Younger and Older Adults

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There are differences in the ways in which younger and older adults remember the past and imagine the future. However, little research has examined this finding in relation to the self. Older and younger adults described current and future self-images and generated associated memories and future events. Age differences in the generation of past and future events were paralleled in self-images: Older adults' future self-images were closer to the present, whereas their current self-images were formed longer ago. Both groups' memories and future events clustered temporally around times of self-image formation. We propose that the self governs event construction in both younger and older adults, and discuss the role of self-related processing in imagining the future and remembering the past.

Keywords: Self; Identity; Autobiographical memory; Future events; Aging.

> *As one moves forward through life, the future rises up to meet the present moment as the past falls away.*
>
> (Spreng & Levine, 2006, p. 1649).

Given the relationship between autobiographical memory and the self (e.g., Conway, 2005; McAdams, 2003), the impact of the aging process on the representation of self and identity is a critical issue. In memory-impaired groups, for instance, it has been shown that impairments in autobiographical memory are accompanied by a diminished self-concept (Addis & Tippett, 2004). In healthy older adults the issue of how self is maintained and accessed is of critical importance. In the present study we aimed to elucidate the relationship between self-images, memories, and imagined future events in aging. This research centers on three key areas of the autobiographical memory literature: (1) the relationship between self-images and autobiographical memory; (2) the relationship between remembering the past and imagining the future; (3) the positivity effect in autobiographical retrieval in older adults. Our main objective was to understand how self-images (both current and future) are related to older adults' conceptions of the past and future.

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Autobiographical Memory and the Self

Autobiographical memory can be studied using a variety of methods, ranging from the controlled environment of lab-based studies (e.g., functional neuroimaging; Rugg & Henson, 2002) to the more ecologically valid—albeit less controlled—paradigms such as diary methods (Schlagman, Schulz, & Kvavilashvili, 2006; for a review of the differences between laboratory and non-laboratory based retrieval conditions, see Cabeza et al., 2004). In addition, neuropsychological tests (e.g., the Autobiographical Memory Interview; Kopelman, Wilson, & Baddeley, 1989) provide standardized measures of people's ability to remember autobiographical events from across the lifespan. One of the hallmarks of autobiographical memory is that it involves the "self." Both episodic (e.g., event-specific) and semantic (e.g., factual) forms of autobiographical memory involve conceptions of the self in the past, but for episodic memory this "self-relatedness" is key: Episodic retrieval involves "mental time travel," in which we detach ourselves from the present and project into the past—or the future (Tulving, 2005).

One of the ways in which the relationship between autobiographical memory and the self has been considered is through the use of the self as an organizational structure, whereby memories are organized in reference to specific identities or "self-images" (Rathbone, Moulin, & Conway, 2008). Whilst the term "self" is used to refer to a wide variety of constructs and processes (e.g., Leary & Tangney, 2012), the focus of the present research is on the dynamic, multifaceted sets of "self-images" that enable people to describe the different elements of their identity (Conway, 2005; Markus, 1977). These can be in the form of traits (e.g., I am outgoing) or more concrete, social constructs (e.g., I am a mother, I am a student; e.g., Kuhn & McPartland, 1954).

Our own previous research examined the extent to which the self is used to organize retrieval from memory, with the finding that memories cluster temporally around the self-image that cued them, creating a stable and coherent sense of self. In this I Am Memory Task (IAM Task; e.g., Rathbone et al., 2008; developed from the Twenty-Statements Test, Kuhn & McPartland, 1954) participants first generate a set of self-image statements using the cue "I am" and then retrieve memories associated with those cues, before finally dating both the memories and self-images. It is then possible to measure the temporal distance between memories generated and the date at which the self-image first emerged, with the finding that memories are typically drawn from the time at which the self-image was formed. Autobiographical memories have been shown to cluster temporally around times of self-image formation in healthy college students and middle-aged older adults, as well as in people with memory impairment following brain injury or as a result of epilepsy (Rathbone, Moulin, & Conway, 2011; Rathbone et al., 2008; Rathbone, Moulin, & Conway, 2009; Illman, Rathbone, Kemp, & Moulin, 2011). Equally, events have been shown to cluster around the generation of imagined future self-images (Rathbone et al., 2011). However, the extent to which memories and future events cluster around times of self-image formation in healthy older adults has not yet been explored, and there are no published studies which compare the temporal organization of self-images in younger and older adults. Considering the impact that memory loss associated with dementia has on identity (Addis & Tippett, 2004) and well-being (Jetten, Haslam, Pugliese, Tonks, & Haslam, 2010), an important question is whether normal age-related changes in memory (e.g., deficits in episodic specificity, Balota, Dolan, & Duchek, 2000) are also associated with changes in self and identity. Research to date suggests that self-memory processes may be intact in older adults. For instance, it has been suggested that older adults preserve memories that aid in maintaining their self-concept (Dijkstra & Kaup, 2005; Martinelli & Piolino, 2009). Furthermore, older adults retain a self-reference effect in their episodic

memory, with significant improvements in memory materials encoded with reference to the self (e.g., Hamami, Serbun, & Gutchess, 2011) and with the same brain areas activated as younger adults (Gutchess, Kensinger, & Schacter, 2007). Although evidence suggests that the self-reference effect is unaffected by aging, less is known about the role self-images might play in organizing autobiographical memory distributions as people age. Thus, a key objective of this study was to examine the temporal relationship between memories, imagined future events, and self-images in older adults.

Remembering the Past and Imagining the Future

We were also interested in examining representations of the self in the future. Autobiographical cognitions about the future are extremely important as possible selves can help to unify one's past, present, and future self-concepts. Possible selves can be defined as what the individual "might become, what they would like to become, and what they are afraid of becoming" (Markus & Nurius, 1986, p. 954) and therefore represent future self-images. Future cognitions help to create an adult identity in adolescence (Dunkel & Anthis, 2001), defend the current self through adult development, motivate future behavior (Cross & Markus, 1991), and play an important role in self-regulation through which behavior and motivation are influenced (Hoyle & Sherrill, 2006). Possible selves can be positive and hoped-for or negative and feared, and consequently encourage individuals to adopt or avoid particular behaviors. Importantly, a person with a discrepancy between their current and possible selves will be likely to experience dejection-related emotions (Higgins, Klein, & Strauman, 1985). People make comparisons between their current and possible selves and when differences are evident they are motivated to change, in order to maintain a sense of well-being (Carver & Scheier, 1982).

Previous research has suggested that older adults generate fewer possible selves than younger adults (Markus & Herzog, 1992) and that those selves overlap more with present identities (Cross & Markus, 1991). Older adults are more likely to generate health-related self-images than younger adults (Fraizer, Gonzalez, Kafka, & Johnson, 2002; Hooker & Kaus, 1994), perhaps making it difficult for older adults to maintain positive possible selves as their health gradually deteriorates. It has been demonstrated that older adults have lower future expectations than younger adults but also that they have a closer fit between ideal and actual representations of self (Ryff, 1991). This could aid in maintaining their self-esteem and resilience (Brandstader & Greve, 1994). The role that memory might play in producing these effects has not yet been explored.

Imagining the future or "episodic future thinking" (Atance & O'Neill, 2001) is a form of self-projection essential for effective human functioning. Schacter, Addis, and Buckner (2007) proposed the constructive episodic simulation hypothesis and the "prospective brain" suggesting that the simulation of future episodes in the brain requires drawing-on and recombining elements of past experiences. Their research showed that both remembering the past and imagining the future engaged the autobiographical memory network, including the left hippocampus and posterior visuo-spatial regions. Similar overlaps in neural activation have also been demonstrated when people consider past and future selves, with no significant difference in neural activity in the medial prefrontal cortex (D'Argembeau, Stawarczyk, et al., 2010). In addition, patients with amnesia (Hassabis, Kumaran, Vann, & Maguire, 2007; Tulving, Schacter, McLachlan, & Moscovitch, 1988), depression (Williams et al., 1996), and schizophrenia (D'Argembeau, Raffard, & Van der Linden, 2008) fail to project themselves into the future, a finding which has been related to their inability to retrieve contextual details from memory.

Of most relevance to the current study, Spreng and Levine (2006) examined past and future event generation in two experiments. The first experiment tested 300 young adults (mean age = 18.9), whilst the second tested young ($N = 50$), middle-aged ($N = 50$), and older ($N = 35$) adults. Across both experiments they found a power function for memories and events generated around the present moment, with more events being generated in the near future and near past, compared to time periods more distant from the present. Spreng and Levine (2006) found an interesting interaction, in that older adults looked less far into the future when generating future events, but further back when retrieving from their past. Their older adults (mean age 72.5 years) did not generate a single future event more than 15 years from the present. Spreng and Levine (2006) do not discuss the aging effect specifically, but account for their data in two main ways. A cognitive explanation is that it is somewhat more effortful to generate future events which are too far into the future. A second "life events" explanation is tied to the fact that with a longer lifespan in front of them with more notable events to take place, younger adults can sample further from the present moment.

In favor of the cognitive interpretation is evidence that older adults give fewer episodic details for future events than younger adults (Addis, Wong, & Schacter, 2008), suggesting that they are perhaps unable cognitively to produce descriptions of events in the distant future. Viard et al. (2011) demonstrated an overlap between remembering the past and imagining the future in older participants (mean age = 67.2), finding a common network of activation. Behaviorally they found that older adults' memories were more episodic, engaged a higher level of autonoetic consciousness and had clearer and more numerous visual images than their future events, but these were not compared to younger people.

A further reason for this limited view of the future could be related to older adults' perception of their future selves and their identity. Indeed, other researchers suggest that older adults see their well-being deteriorating in the years ahead, whereas younger adults expect continued gains (Ryff, 1991). There has been less research on the relationship between future events and the self in older adults. The present study had the novel aim of examining both the generation of self-images and events in the past and future in younger and older adults, with a view to examining the relationship between self-images and self-relevant future and past events.

Positivity Effect in Aging

Finally, one of the more robust findings in older adults' memory research is the positivity effect (Charles, Mather, & Carstensen, 2003; Kennedy, Mather, & Carstensen, 2004; Schlagman, Schulz, & Kvavilashvili, 2006). Older adults demonstrate "emotionally gratifying" memory distortions for past decisions and have a larger proportion of positive memories than younger adults (e.g., Mather & Carstensen, 2005). The higher proportion of positive memories is perhaps explained by Schlagman et al.'s (2006) finding that when older adults recalled negative events they were rated as neutral or positive. Indeed, it has been found that older adults tend to reappraise negative memories in a more positive light than younger adults (Comblain, D'Argembeau, & Van der Linden, 2005). Fernandes, Ross, Wiegand, and Schryer (2008) did not find consistent evidence for a positivity effect, but they did observe that older adults were more likely to recall false memories of positive events compared to younger adults, who did not show differences in memory errors depending on whether events were positive, negative, or neutral. Thus, according to Fernandes et al. (2008), older adults demonstrated a positivity effect in their false memory recall. This is consistent with previous research showing that older adults use positive reappraisal as a coping strategy for stressful encounters more often than younger adults (Folkman, Lazarus, Pimley, & Novacek, 1987).

Socioemotional theory offers a further explanation for this positivity effect in older adults' memory (Carstensen, 1993; Carstensen, Isaacowitz, & Charles, 1999). As daily life possibly becomes more limited older adults' goals become increasingly focused on emotion regulation and less on information acquisition. Therefore, to avoid upsetting emotion regulation processes they may avoid recalling negative memories. Another theory put forward to explain the positivity effect is that older adults recruit more resources to cognitive control processes to strengthen positive and lessen negative emotion in their memories (Mather & Carstensen, 2005; Mather & Knight, 2005). Kensinger and Leclerc (2009) found that as people age they are more likely to process positive information in a self-referential way. Furthermore, they demonstrated that, at the neural level, the same regions were activated when older adults remembered positive memories (as opposed to negative memories) as when they processed information relevant to the self. It seems plausible therefore that the positivity effect in older adults' memory occurs at least in part from their increased tendency to process information in reference to the self (Grady, Springer, Hongwanishkul, McIntosh, & Winocur, 2006; Lustig et al., 2003). Despite much research into the emotional valence of memories and identities, the present study is the first to examine the emotional valence of memories and self-images in aging. Kotter-Grühn and Smith (2011) found that aging was associated with generation of fewer future plans and lower levels of optimism about the future, but to the authors' knowledge, there has been no research into the emotional valence of imagined future events in older adults. One of the aims of this study is to investigate whether the positivity bias found in older adults' memories (Kennedy et al., 2004; Mather & Carstensen, 2005; Schlagman et al., 2006) combined with the established susceptibility to unrealistic optimism toward the future in adults of all ages (Luo, Huang, Chen, Jackson, & Wei, 2010; Shao, Yao, Ceci, & Wang, 2010; Szpunar, 2010; Weinstein, 1980), will extend to future events.

Study Aims

In sum, this study explored memory and self-images for both past and future events. We employed two recently developed paradigms for examining the temporal relationship between autobiographical memories and current self-images, and future events and future self-images. The first is the IAM Task (Rathbone et al., 2008; Rathbone et al., 2009) in which participants generate self-images in the form of "I am" statements (e.g., "I am a friend") and memories are then cued by those self-images. The second task is the I Will Be Task (Rathbone et al., 2011), which examines future cognitions. Participants are asked to generate future self-images (e.g., "I will be a mother") and imagined future events (e.g., "the birth of my first child") are then cued by those self-images.

Previous research using these tasks with undergraduates (Rathbone et al., 2011) and middle-aged adults (Rathbone et al., 2008) showed a clear relationship between the self and memory (e.g., Conway, 2005), with results demonstrating that memories and future events both cluster temporally around periods of self-image formation, but this has not been examined with older adults. It has been proposed that when a new self-image is formed it is associated with the encoding of memories relevant to that self, and this clustering effect promotes the maintenance of a coherent and enduring sense of self. This study aimed to explore whether future events also cluster around the emergence of future selves in older adults. Our expectation was that the temporal distribution of current and future self-images should follow the established pattern for past and future autobiographical events. Notably, we predict that future self-images should be generated closer to the present than current self-images. Following Spreng and Levine (2006) we predict that this pattern would be accentuated in older adults. Finally, following research

showing positivity effects in older adults' autobiographical recall (e.g., Charles, Mather, & Carstensen, 2003; Kennedy, Mather, & Carstensen, 2004; Schlagman, Schulz, & Kvavilashvili, 2006), we predicted that older adults would rate a higher proportion of their self-images, memories, and future events as positive, compared to younger adults.

Method

Participants

The younger participants were 21 undergraduate students (11 female, 10 male; mean age 21, $SD = 1.14$, range 18–22). The older participants were 24 adults over 60 years of age (17 female, seven male; mean age 69.13, $SD = 8.90$, range 60–89). All participants filled in a questionnaire individually which was distributed through a participant panel, word of mouth, and community groups. Neither group received compensation for taking part. Older adults were all community dwelling and did not report any neurological or psychiatric illness.

Materials and Procedure

The IAM and I Will Be Tasks were administered in one questionnaire booklet. The order of tasks within the questionnaire was counterbalanced. Both tasks asked participants to generate three self-images (current or future, dependent on the task) and then to generate five associated memories (IAM Task) or future events (I Will Be Task). The study received ethical approval from the Institute of Psychological Sciences subpanel of the University of Leeds Ethics Committee, 10-0082.

IAM Task. Participants generated three self-images that they felt defined them at present and were enduring aspects of their sense of self. The self-images could be a role (e.g., I am a sister), a personality trait (e.g., I am honest) or something else they felt defined their self-image in some way (e.g., I am a thrill-seeker). Each current self-image was then used to cue five memories of associated specific autobiographical events, for which a brief description (one sentence) was provided by the participant. After all 15 memories were generated, participants dated them with their age at the time of the recalled event. Finally the current self-images were dated for when participants believed each became an integral part of their sense of self (e.g., the age at which each statement first became a defining part of their identity).

I Will Be Task. The I Will Be Task used the same format as the IAM task except participants generated three self-images that did not describe them at present but that they felt might describe them in the future. Again these self-images could be a role, a personality trait, or something else they felt would define their identity. Each future self-image was then used to cue five associated specific future events, for which a brief description (one sentence) was provided by the participant. After 15 future events were generated, participants dated them with the age they thought they would be when the future event would take place. The future self-images were then dated according to the age participants believed they would be when each might become a part of their sense of self.

Ratings. Past and future events were rated for emotional intensity and valence. Participants reported whether each event was positive, negative, or neutral, and used a

rating scale of 1–5 for emotional intensity (1 = *minimum*; 5 = *maximum*). Current and future self-images were categorized as positive, negative, or neutral by the participant. Finally, future self-images were rated on how certain participants were that they would become that future self-image (1 = *very unlikely*; 10 = *very certain*).

Reformulation analysis. The data produced with the IAM and I Will Be Tasks enables examination of the distribution of memories and future events around self-image formation. To analyze the data, the age of memories and future events were reformulated in relation to the current or future self-image that cued them, creating a "cluster score." In this way, all memories and future events became either negative (the memory/future event occurred before the self-image emerged), zero (the memory/future event occurred in the same year that the self-image emerged), or positive (the memory/future event occurred after the self-image emerged). For example, if a participant generated a current self-image of "I am a brother" that emerged at age seven, a memory of "snowboarding with my brother in Colorado" dated at age 18 would be reformulated as 11 (because the memory occurred 11 years after the self-image was formed).

Results

The 45 participants generated a total of 675 memories and 673 future events, of a possible 675 for each. Some of these memories and future events were generated without sufficient information, such as the age of the participant at the time of the event. Specifically, in the younger adult sample, one participant only generated four (out of a possible five) future events, and another failed to date one of their future events. Across the older adult sample seven memories were not dated, one future event was not generated, and 13 future events were not dated. Participants produced a mean number of 15 memories and 14.93 future events. To account for any variation between groups or individuals the data were analyzed proportionately.

Current and Future Self-images

Ages of self-image formation. Every self-image generated was given an age by the participants at which it either occurred (current self-images) or might occur (future self-images). For completeness, the mean ages are presented in Table 1, but our analysis concentrates on how these events are distributed relative to the current age of the participant. One interesting feature of the data is that the standard deviations are very much larger for the older adults; they have more of the lifespan to sample from.

TABLE 1 Means and Standard Deviations of Participants' Current and Future Self-images

	Current self-images		Future self-images	
	Younger	Older	Younger	Older
Age of self-image formation	10.80 (3.25)	31.56 (14.69)	27.35 (3.51)	72.05 (9.52)
Distance between Age of self-image formation and Current Age	− 10.20 (3.50)	− 37.65 (16.74)	6.35 (3.87)	2.60 (2.05)
Proportion Positive	0.86 (0.20)	0.88 (0.24)	0.94 (0.13)	0.81 (0.24)
Proportion Negative	0.00 (0.00)	0.07 (0.17)	0.00 (0.00)	0.14 (0.19)
Certainty	n/a	n/a	7.83 (1.02)	7.26 (1.59)

Age of self-image formation relative to participants' current age. The average distance in years between the age of each participant's self-image formation (current and future) and their current age was calculated. The mean distances are presented in Table 1. A mixed 2 (current versus future) × 2 (young versus old) ANOVA was carried out on these distances. There was a significant main effect of age, $F(1, 43) = 68.53$, $MSE = 74.57$, $p < .001$, $\eta_p^2 = .631$, a main effect of temporal focus, $F(1, 43) = 208.31$, $MSE = 81.32$, $p < .001$, $\eta_p^2 = .839$, and a significant interaction, $F(1, 43) = 36.28$, $MSE = 81.32$, $p < .001$, $\eta_p^2 = .476$. These results show that participants' future self-images are dated as emerging much closer to their present age compared to their current self-images, particularly in the older sample (see Table 1). Interestingly, neither group dated self-images as emerging very far into the future (e.g., even the younger group's future self-images were only dated a mean of 6.35 years in the future). An independent samples t-test examined the mean distances for the current and future self-images separately, showing significant differences between age groups for both current ($t(43) = 7.710$, $p < .001$, $d = 2.27$) and future self-images ($t(40) = 3.92$, $p < .001$, $d = 1.21$). In turn, there were significant differences between past and future distances in each group separately (older adults, $t(20) = 10.50$, $p < .001$, $d = -3.37$; younger adults, $t(20) = 18.61$, $p < .001$, $d = -4.49$). This interaction shows that the older adult group dated their current self-images as emerging longer ago, and perceived future self-images as emerging closer to the present.

Emotional valence of current and future self-images. Participants rated every self-image (current and future) as being positive, negative, or neutral. The proportions of participants' self-images that were positive or negative were calculated as a proportion of the total number of self-images. The mean proportions are presented in Table 1. In all the following analyses, we did not analyze the number of neutral self-images (they are implied in the proportions, since neutral selves = 1-proportion of positive selves + proportion of negative selves). Two separate ANOVAs were conducted on the current and future self-images. Each compared valance and age group in a 2 (positive versus negative) × 2 (young versus old) ANOVA. For current self-images, there was no main effect of age, $F(1, 43) = 2.57$, $MSE = .016$, $p = .116$, $\eta_p^2 = .056$, as one would expect so long as neutral responses were equal between the two groups. There was a main effect of valence, $F(1, 43) = 324.57$, $MSE = .048$, $p < .001$, $\eta_p^2 = .883$, with more positive self-images generated than negative. Most importantly, there was no significant interaction, $F < 1$, $\eta_p^2 = .007$, suggesting that young and old groups had the same tendency to generate positive self-images.

A 2 × 2 ANOVA was also carried out on the proportions for future self-images. There was no significant main effect of age, $F < 1$, $\eta_p^2 = .001$, as expected. As with current self-images, the future self-images were more positive than negative, $F(1, 43) = 286.05$, $MSE = .05$, $p < .001$, $\eta_p^2 = .869$. However, in the case of the future self-images, there was a significant difference between older and younger adults with a significant interaction, $F(1, 43) = 8.02$, $MSE = .05$, $p = .007$, $\eta_p^2 = .157$. Independent samples *t*-tests showed that the younger and older samples differed significantly for both positive, $t(43) = 2.22$, $p = .032$, $d = .68$; and negative, $t(43) = -3.26$, $p = .002$, $d = -1.01$, future self-images. As shown in Table 1, older participants generated a higher proportion of negative future self-images, and a lower proportion of positive future self-images, compared to the younger participants. In turn, separate significant effects were found in each group, with young ($t(20) = 32.34$, $p < .001$, $d = 10.11$) and old ($t(23) = 7.86$, $p < .001$, $d = 3.18$) both producing more positive than negative selves.

Certainty of self-images. We were also motivated to explore whether there were any differences between how certain older, compared to younger, adults were about their future self-images occurring. It was found that younger and older participants rated the certainty of their future self-images equally (see Table 1), with no significant difference between groups, $t(43) = 1.39$, $p = .17$, $d = -.43$. The mean ratings suggested a relatively high level of certainty in all participants (1 = *very unlikely*; 10 = *very certain*).

Memories and Future Events

Age at event for participants' memories and future events. After generating all of their memories and future events, participants were asked to give their age in years when each event had occurred or when they thought it might occur, respectively. The mean ages of participants' memories and future events are presented in Table 2. To analyze ages of the memories and future events, a mixed 2 (current versus future) × 2 (young versus old) ANOVA was carried out on the mean age of participants' memories and future events. There was a significant main effect of age as would be expected, $F(1, 43) = 419.76$, $MSE = 64.89$, $p < .001$, $\eta_p^2 = .907$, a main effect of temporal focus, $F(1, 43) = 204.29$, $MSE = 48.70$, $p < .001$, $\eta_p^2 = .826$, and a significant interaction, $F(1, 43) = 21.20$, $MSE = 48.70$, $p < .001$, $\eta_p^2 = .330$. This interaction was decomposed with *t*-tests. First, independent samples *t*-tests showed that there were group differences for both past and future events (past, $t(43) = 11.378$, $p < .001$, $d = -3.51$; future, $t(43) = 20.70$, $p < .001$, $d = -6.27$). Paired samples *t*-tests showed that both groups differed in the ages of past and future events (young, $t(20) = 13.75$, $p < .001$, $d = -4.26$; old, $t(23) = 10.71$, $p < .001$, $d = -2.85$).

To compare our results with Spreng and Levine's data, we calculated PTP (Past Time Perspective) and FTP (Future Time Perspective) scores. This was achieved by examining the unsigned distance from the current age to the age given for the memories or future events. The median value of the set of 15 memories or events was used (see Spreng & Levine, 2006; see Table 2 for means). We found a main effect of group, $F(1, 43) = 13.57$, $MSE = 102.36$, $p = .001$, $\eta_p^2 = .240$, with shorter temporal perspective in the younger adults. With this main effect, like Spreng and Levine, we found that the distance looked into the future was shorter than the past, $F(1, 43) = 19.05$, $MSE = 97.00$, $p < .001$, $\eta_p^2 = .307$. We also replicated their interaction between age group and time perspective, $F(1, 43) = 34.65$, $MSE = 97.00$, $p < .001$, $\eta_p^2 = .446$. Independent samples *t*-tests showed that older adults had higher PTP, $t(43) = -4.93$, $p < .001$, $d = -1.52$, and lower FTP, $t(43) = 4.12$, $p < .001$, $d = 1.21$, than the younger adults, in line with Spreng and Levine. However, whereas paired samples *t*-test showed that both groups had significant differences in perspective for the past and future (younger adults, $t(20) = 2.788$, $p = .011$, $d = -.91$; older adults $t(23) = 5.67$, $p < .001$, $d = 1.6$), the means are such that whereas the older adults look further back into the past, the younger adults look further forward into the future than they look back into the past. Arguably, this comes about because the younger adults' past is somewhat constricted—they are a sample with a mean age of 21, and the mean for age for the memories they generated was 16.

Emotional valence of memories and future events. Participants rated each memory as being positive, negative, or neutral. The mean proportions of participants' positive or negative memories are presented in Table 2. A mixed 2 (positive versus negative) × 2 (young versus old) ANOVA was carried out on these memories. There was a main effect of age, $F(1, 43) = 8.49$, $MSE = .004$, $p = .006$, $\eta_p^2 = .165$. There was a main effect of

TABLE 2 Means and Standard Deviations of Participants' Memories and Future Events

	Memories		Future Events	
	Younger	Older	Younger	Older
Age at Event	16.01 (1.92)	44.15 (11.15)	30.35 (4.34)	72.01 (8.27)
Time Perspective score	3.83 (2.05)	23.96 (18.58)	7.00 (4.47)	2.63 (2.50)
Proportion Positive	.65 (.15)	.73 (.20)	.85 (.13)	.77 (.18)
Proportion Negative	.19 (.13)	.19 (.18)	.08 (.09)	.14 (.14)
Emotional Intensity	3.13 (.80)	3.77 (.91)	3.47 (.72)	3.26 (.85)
Unsigned Distance from Self-image	5.66 (2.29)	18.61 (7.87)	4.77 (2.53)	2.04 (2.42)

valence, $F(1, 43) = 102.27$, $MSE = .058$, $p < .001$, $\eta_p^2 = .704$, indicating that both groups tended to generate positive, rather than negative, memories. Most importantly there was no significant interaction, $F < 1$, $\eta_p^2 = .015$. The main effect of age needs interpreting in the context of how the proportions were calculated. The difference arises because young people have a lower aggregate of positive and negative memories, i.e., they generate more neutral memories. The interaction however speaks to the key issue. The proportions of positive and negative memories are no different across groups. The means demonstrate that across both age groups there was a much lower proportion of negative than positive memories. As with current self-images there was no interaction with age, thus memory valence was no different between the groups. In sum, at least two thirds of all memories generated by both the younger and older samples were positive.

A mixed 2 × 2 ANOVA was also carried out on the mean proportions of participants' positive or negative future events. There was no significant main effect of age, $F < 1$, $\eta_p^2 = .017$. There was a significant main effect of valence, $F(1, 43) = 300.06$, $MSE = .037$, $p < .001$, $\eta_p^2 = .875$. There was no significant interaction, $F(1, 43) = 2.64$, $MSE = .037$, $p = .111$, $\eta_p^2 = .058$. In this case, the results for future events contrasted with future self-images. Whereas older adults produced future self-images that were less positive and more negative, no such difference between age groups was found for future events.

Emotional intensity. Participants were asked to rate how emotional their memories and future events were on a scale of 1–5 (1 = *minimum*; 5 = *maximum*). The mean ratings for participants' emotional intensity scores are presented in Table 2. A mixed 2 (past versus future) × 2 (young versus old) ANOVA was carried out on these emotional intensity scores. There was no significant main effect of age, $F < 1$, $\eta_p^2 = .022$, and no main effect of past versus future, $F < 1$, $\eta_p^2 = .011$. There was a significant interaction, $F(1, 43) = 14.03$, $MSE = .289$, $p = .001$, $\eta_p^2 = .246$. The interaction was explored by *t*-tests. Independent samples *t*-tests showed that young and old did not differ for emotional intensity of future events, $t < 1$, whereas, the older adults rated their memories as significantly more emotional, $t(43) = -2.49$, $p = .017$, $d = -.75$. In turn, paired samples *t*-tests showed that the young group had only a marginally significant difference between the emotionality of past and future events ($t(20) = -1.76$, $p = .09$, $d = -.45$), whereas the older adults showed a significant difference, $t(23) = 4.05$, $p < .001$, $d = .58$. In general, the younger sample rated future events as more emotional (but this was not significant at $p = .05$ (uncorrected)), whereas the older adults rated memories as more emotional.

Clustering. One aim of this study was to investigate whether the findings of Rathbone et al. (2008, 2011) could be extended to older adults. As explained in the method

section, participants' memory and future event dates were reformulated by subtracting the age that the self-image emerged from the age of the memory or future event, to create a cluster score.

Figure 1 shows the distribution of these cluster scores around year zero (age of future/present self-image emergence). There is a clear clustering effect, with memories and future events decreasing as years from the self-image formation increases. Participants' future events were more clustered around periods of future self-image formation than their memories were around current self-image formation. Thirty-five (78%) participants generated future events with a modal clustering score of 0 and 21 (46%) participants generated memories with a modal clustering score of 0.

A mixed 2 (past versus future) × 2 (young versus old) ANOVA was carried out on the clustering effect using the participants' reformulated cluster scores. There was no significant main effect of age, $F(1, 43) = 1.75$, $MSE = 67.69$, $p = .193$, $\eta_p^2 = .039$. There was a main effect of temporal focus (past versus future), $F(1, 43) = 18.41$, $MSE = 65.01$, $p < .001$, $\eta_p^2 = .300$ and a significant interaction, $F(1, 43) = 8.36$, $p = .006$, $MSE = 65.01$, $\eta_p^2 = .163$. The means demonstrate that, overall, future events were more clustered around periods of self-image formation compared to memories. The younger sample's memories were more clustered around current self-image formation than the older sample's, whereas the older sample's future events were more clustered around future self-image formation than those of the younger sample. This interpretation is supported by independent samples t-tests which showed significant differences between groups for both past and future clustering scores (past: $t(43) = -2.18$, $p = .035$, $d = -.67$; future: $t(43) = 2.81$, $p = .007$, $d = .84$). In turn, there were significant differences in clustering for the past

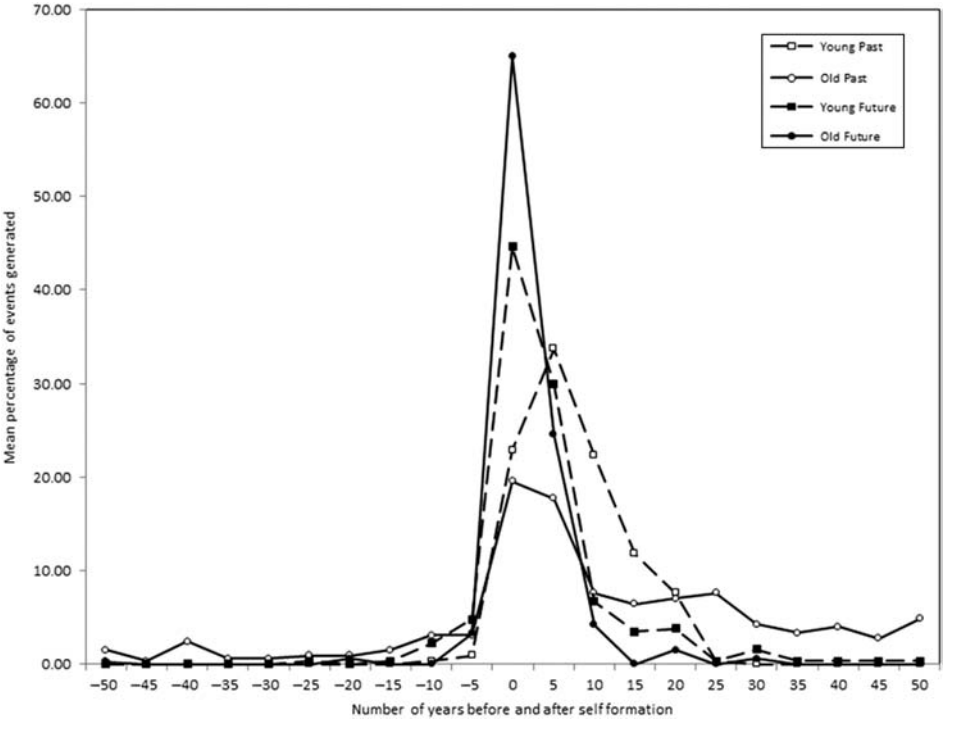

FIGURE 1 Mean percentage of events centered around the year of self-image formation (reformulated scores).

and future for both groups, as ascertained by paired samples *t*-tests (young, $t(20) = 2.73$, $p = .013$, $d = .86$; older adult, $t(23) = 3.96$, $p = .001$, $d = 1.12$).

The foregoing analysis is with signed data—i.e., where an event is reported two years before a self-image was formed, it would yield a score of minus two, and two years after would be plus two. Such a scoring means that the average of zero can be misleading. To overcome this, the same 2 × 2 ANOVA was conducted using unsigned clustering scores (i.e., two years after or two years before would both be scored as two, see Table 2 for means). This produced the same main effect of temporal focus, $F(1, 43) = 82.68$, $MSE = 20.68$, $p < .001$, $\eta_p^2 = .658$; and again a significant interaction with group, $F(1, 43) = 66.53$, $MSE = 20.68$, $p < .001$, $\eta_p^2 = .607$. However, the effect of group was also now significant, with the older adults having memories and events in general which were more distant from the self-image formation, $F(1, 43) = 27.85$, $MSE = 20.99$, $p < .001$, $\eta_p^2 = .393$; marginal means: 5.21 years (younger adults) and 10.32 years (older adults). Thus, older adults have memories which, although centered on zero, are nonetheless clustered less closely on the time of image formation. Independent samples *t*-tests confirmed that the groups differed in the clustering of past memories, $t(43) = 7.26$, $p < .001$, $d = -2.23$; and future events, $t(43) = 3.69$, $p = .001$, $d = 1.10$; and paired sample *t*-tests found significant differences in the clustering for past and future events only in the older group (Young, $t(20) = 1.03$, $p = .31$, $d = .37$; Older adults, $t(23) = 10.19$, $p < .001$, $d = 2.85$). In sum, the older adults produce memories for past events which are very much more distant from the age of self formation than the younger adults; they have an unsigned clustering score which suggests their memories are on average 18 years distance from their self-image statement.

Discussion

This study examined the effects of aging on the organization and evaluation of past and future events and self-images. We found that for both older and younger age groups, memories and future events clustered around periods of self-image formation. However, the older sample's future events were significantly more clustered around times of future self-image formation compared to the younger sample, whereas the younger sample's memories were significantly more clustered around the time of their current self-image formation compared to the older sample. Contrary to expectations, no positivity effect was demonstrated in the older adults' emotional ratings of memories and future events (both groups rated memories and future events as equally positive). Furthermore, whilst current self-images were rated as equally positive by the younger and older age groups, future self-images were in fact rated as less positive by the older adults, compared to the younger adults. Finally, the pattern of memories and future events retrieved are in support of previous data reported by Spreng and Levine (2006): Older adults tended to recall memories from longer ago than younger adults, and conversely older adults' future events were dated as occurring closer to the present than those of younger adults.

Spreng and Levine (2006) examined the temporal distributions of imagined and remembered events using a modified Crovitz word-cue task. We replicated their pattern of results using a different cueing method and our results extend this finding from the dating of events to the dating of self-images. Spreng and Levine (2006) propose cognitive and life event-based explanations for their pattern of results, whereas here we have investigated the potential role of the self in these event distributions. In essence, self-images behave much like imagined or remembered events; people date events as occurring and self-images as emerging in temporal association. Whilst we cannot infer directional causality between conceptions of self and memory from the results in this study, it is perhaps useful to

imagine the self-images generated (e.g., I will be a mother; I am a grandmother) as higher-level semantic representations in memory. Thus, someone could possess the semantic knowledge that they are a sister or hard-working, in much the same way that they know they grew up in London or own a cat. Conway's (2005) hierarchical model of memory suggests that semantic lifetime-period level knowledge (e.g., when I lived in Leeds) is used to direct retrieval to episodic event-specific memories (e.g., painting the walls in my kitchen). In this way, knowledge of being a grandmother (or the future cognition of perhaps becoming a mother) indexes event-specific memories associated with these self-images.

The fact that both future events and future self-images were dated closer to the present in older adults, compared to younger adults, is pertinent. Whilst it is obvious that younger adults have a wider lifespan to draw on when imagining who they will be in the future, in fact we found the younger group only dated future self-images as emerging on average six years from the present. This time-span would constitute a reasonable distance from the present within which the older adults (who had a mean age of 69) could extend future cognitions, but results showed that the older sample dated future self-images as emerging on average only three years in the future. It is possible that this tendency for older adults to date future self-images closer to the present might reflect the fact that negative life events are more likely to happen at the end of the lifespan (e.g., illness, frailty, and death), and that avoiding looking too far into the future is a protective mechanism.

Memories and future projections can provide a structure for a life narrative or life story (McAdams, 2003). Cultural life scripts (Rubin & Berntsen, 2003) have been suggested to raise accessibility of positive social normative events when people imagine their future (e.g., Bohn & Berntsen, 2011); a theory supported by results in the present study as 16 of the 63 (i.e., 25%) future self-images that were generated in the young were about parenthood. Therefore, it might be a lack of salient socially-normed events in later life that drives the discrepancy between the dates of future self-images in younger and older adults; without these highly accessible normative future self-images, perhaps older adults have to draw upon ideas about who they might become in the more proximal future. As an example, Janssen and Rubin (2011) present a survey of life script events. Only three life events after the age of 60 were generated for a hypothetical character across their lifespan: death, at mean age of 81 years (generated by 16.6% of all respondents), retirement at a mean age of 66 years (generated by 8.4% of all respondents) and death of a spouse at a mean age of 68 years (generated by 6.1% of all respondents). By way of comparison, 72% of all respondents generated the event of having children (at a mean age of 29). We suggest that future studies examine whether younger adults generate a higher percentage of life script-related current and future self-images, compared to older adults. Results from the present study are also relevant to theories of the reminiscence bump (the finding that autobiographical memories are preferentially accessible from the period of young adulthood; Rubin, Wetzler, & Nebes, 1986). In particular, the finding that younger adults' future events were mostly dated in young adulthood echoes the results of other researchers (e.g., Bohn & Berntsen, 2011) and suggests that cultural life scripts may play a key role in shaping the distributions of both imagined and remembered events. Older adults' memories did not follow the typical reminiscence bump pattern (the mean age at time of encoding was in participants' mid-40s), however, this result is likely to be an effect of using self-images as memory cues (for more details and a similar finding, see Rathbone et al., 2008).

In addition to examining the temporal organization of memories, events, and self-images, we were also interested in their emotional valence. A key aim of this study was to investigate whether the robust positivity effect in the memories of older adults (e.g., Kennedy, Mather, & Carstensen, 2004; Mather & Carstensen, 2005; Schlagman, Schulz,

& Kvavilashvili, 2006) would extend to future cognitions. Across both age groups we saw a positivity bias, with higher proportions of positive current self-images, future self-images, memories, and future events. However, we also found a significant interaction with age for valence of future self-images: Older adults generated significantly fewer positive and significantly more negative future self-images although only a very small proportion of negative self-images were generated. The results for future self-images suggest that, in fact, younger adults tended to be more optimistic about the future than older adults.

Thus, the present study failed to replicate the positivity effect for memories in aging, in that both younger and older adults were equally positive about the past. One possible explanation for this is the nature of the IAM Task; a paradigm that involves self-description followed by generation of self-defining memories. Previous research has established that people have a tendency to be positive about the current self (e.g., Baumeister, 1998, Ross & Wilson, 2003), a theory borne out by our results. It then follows that memories cued by these positive self-images are somewhat inevitably going to be positive in nature, particularly when we consider biases towards retrieval of positive memories demonstrated by all age groups (e.g., fading affect bias; Walker, Skowronski, & Thompson, 2003), and the tendency for self-relevant memories to be particularly positive (Rasmussen & Berntsen, 2009). It is important to note that, overall, the older adult group still tended towards generation of positive future self-images (81% of older adults' future self-images were rated positively), suggesting that all participants tended to generate hoped-for selves rather than feared selves. This fits with previous research, demonstrating that hoped-for selves are more readily activated than feared selves (Ruvolo & Markus, 1992).

This study addresses a noticeable gap in research on the emotional valence of future self-images and events, particularly in older adults. Previous work has suggested that aging is associated with the generation of fewer future plans and less optimism about the future (Kotter-Grühn & Smith, 2011). The present study builds on this finding, suggesting that older adults' future self-images and events are still largely positive; however, their future self-images are less positive than younger adults. This has important implications for the care of older adults. Research has shown that the positivity effect can be manipulated through attention (Knight et al., 2007; Kennedy et al., 2004), thus, if older adults are encouraged to generate positive future self-images and focus attention on emotionally regulating positive thoughts, this could result in a decreased likelihood of depression and higher life satisfaction.

To sum up, our goal was to address the temporal patterns in past and future thinking with reference to the self—in particular, what would the pattern of self-images in the future be like, and what might be the relationship between events and self-images in older adults? Our results extend the findings of Rathbone et al. (2011) to a group of older adults: Memories and future events cluster temporally around the self-images that cue them. This suggests that, despite autobiographical memory being affected by aging (e.g., Piolino, Desranges, Benali, & Eustache, 2002), older adults still demonstrate a temporal clustering of memories that may act to support a coherent self (e.g., Conway, 2005; Dijkstra & Kaup, 2005; Martinelli & Piolino, 2009). These findings are of relevance to the psychology of aging. Research has shown that having a coherent and integrated sense of self can be psychologically favorable (Donahue, Robins, Roberts, & John, 1993), and so we have evidence here that older adults can produce coherent, temporally-organized sets of future events and self-images. In spite of a tendency for older adults to envisage negative future self-images more frequently than younger adults, results using the IAM and I Will Be Tasks demonstrate that adults of all ages have a broadly positive outlook on both who they are and who they might become.

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