Back to the Future: Similarities and Differences in Emotional Memories and Prospections

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Summary: Previous research suggests that our prospections rely, in part, upon our memories. However, less is known about the ways in which the content of memories and prospections are similar (or dissimilar) and whether this similarity varies by emotion. In the present study, we coded the content and style of participants' (n = 109) positive, negative, and neutral memory and prospection narratives. Emotional memories were more elaborated, social, and further back in time than neutral memories. By contrast, prospections varied by valence: Positive prospections included more time and place indicators and were more social and closer in time than negative prospections. Although over half of the coded content in memories and prospections matched, regardless of valence, positive memories and prospections matched more than negative. These findings suggest that people are more likely to construct positive futures that are similar to the past but are less likely to do so for negative futures. Copyright © 2014 John Wiley & Sons, Ltd.

What route will you take to work? What will you make for dinner? Where will you go on your next vacation? Thinking about the future is a frequent part of everyday life, with some estimates suggesting that we do so every 16 min (D'Argembeau, Renaud, & Van der Linden, 2011). A growing line of research posits that thinking about the future, prospection (Gilbert & Wilson, 2007), is related to remembering the past (for reviews, see Buckner & Carroll, 2007; Schacter, Addis, & Buckner, 2007; Szpunar, 2010). For example, when thinking about what to do next Friday night with friends, you may recall previous Friday nights and decide to go to your favorite restaurant downtown with the fun cocktails and tasty appetizers. In other words, our prospections likely draw upon our past experiences. Previous research also suggests that emotional events are better remembered than neutral (e.g., Hamann, 2001). However, far less in known about whether emotion influences prospections. That is, does the content and manner of rendering prospections vary by emotional valence? Further, are emotional memories and prospections more similar than nonemotional memories and prospections? In the present study, we sought to examine similarities and differences in memory and prospection narratives by systematically manipulating emotion.

Several lines of theory and research point to similarities in memories and prospections. First, similar brain regions (a hippocampal–cortical network; Buckner, 2010) are recruited when people think about their personal past and future (e.g., Addis, Wong, & Schacter, 2007; Botzung, Denkova, & Manning, 2008; Okuda et al., 2003; Szpunar, Watson, & McDermott, 2007). Second, people with memory deficits or lesions in hippocampal–cortical regions have trouble with memory and prospection (schizophrenia: D'Argembeau, Raffard, & Van der Linden, 2008a; amnesia: Hassabis, Kumaran, Vann, & Maguire, 2007; Klein, Loftus, & Kihlstrom, 2002; complicated grief: Robinaugh & McNally, 2013; and depression: Williams et al., 1996).

Third, the extent to which people recount memories occurring at a specific time and place and that last no longer than a single day—this is called specificity in this literature—is related to the extent to which people recount the same type of specificity in their prospections (Williams et al., 1996). Notably, much of this research has been at the level of the brain, with fewer studies assessing the verbal reports of memories and prospections beyond participants' ratings of their experiences (e.g., Addis et al., 2007; D'Argembeau & Mathy, 2011; D'Argembeau & Van der Linden, 2004; D'Argembeau & Van der Linden, 2006; D'Argembeau, Xue, Lu, Van der Linden, & Bechara, 2008).

In their theoretical model, Schacter and Addis (2007) argued that the content of memories and prospections ought to be similar across a number of domains in arguing that prospection requires a system that 'flexibly extracts and recombines elements of previous experiences' (p. 773). In a functional magnetic resonance imaging study designed to test their 'constructive episodic simulation hypothesis' (see also Schacter et al., 2007), participants were given fragments of their previously reported memories and were instructed to use only these fragments to either remember the past as it happened or imagine a future event (Addis, Pan, Vu, Laiser, & Schacter, 2009). Participants showed similar brain activation in the hippocampal–cortical network when remembering their past and when imagining prospections generated from the predetermined memory fragments. These findings suggest that when prospections are generated from predetermined memory fragments, memories and prospections are similar at the neural level.

Despite these observed similarities between memories and prospections, other studies have documented differences in these processes. For example, Anderson and Dewhurst (2009) found that participants provided greater specificity in their memories than prospections when they were cued with an open-ended sentence completion task (e.g., last year I…; in the future…), suggesting that freely generated memories and prospections may differ. Other evidence indicates that people report greater sensory experience, clarity, and vividness, in their memories compared with prospections (Addis et al., 2009; Berntsen & Bohn, 2010; D'Argembeau

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& Van der Linden, 2004; Rasmussen & Berntsen, 2013). Conversely, people report greater importance, relevance to the self and identity in prospections, compared with memories (Berntsen & Bohn, 2010; D'Argembeau & Mathy, 2011; D'Argembeau et al., 2011).

One possible explanation for the mixed findings regarding the extent to which prospections and memories are similar (or dissimilar) is the role of emotion. Indeed, the extent to which emotion influences the similarities between memories and prospections remains relatively untested (Buckner & Carroll, 2007) despite considerable evidence from affective science indicating that people exhibit greater memory for emotional than neutral stimuli (for reviews, see Buchanan & Adolphs, 2002; LaBar & Cabeza, 2006). Of the few studies that manipulated emotion, most did not include a neutral comparison condition (Addis et al., 2009; D'Argembeau & Van der Linden, 2004; D'Argembeau & Van der Linden, 2006; Rasmussen & Berntsen, 2013; Robinaugh & McNally, 2013). Studies that included a neutral condition did so in a way that rendered comparisons with the emotion conditions difficult to interpret, either because of differences in the type of cues (emotion words such as 'happy' *versus* nouns such as 'library'; Williams et al., 1996) or in the temporal frame (e.g., near or far future for emotional events; current for routine for neutral events; D'Argembeau et al., 2008b). Thus, it is difficult to ascertain from previous studies how memories and prospections of emotional events may (or may not) differ from nonemotional events.

The few studies to date that have included emotion conditions suggest that there may well be differences between memories and prospections depending upon valence. For example, Williams et al. (1996) found that neutral memories and prospections were rated higher in specificity than either positive or negative memories and prospections, whether they were spontaneously generated or provided following precise instructions to either be specific (i.e., discuss an event at a specific time and place and that lasted no longer than a single day) or general. Two other studies have found experiential differences between positive and negative memories and prospections (D'Argembeau & Van der Linden, 2004; Rasmussen & Berntsen, 2013). Specifically, participants experienced their positive memories and prospections as more vivid and clear than their negative memories and prospections. Further, prospections were experienced more vividly than memories.

In the present study, we sought to extend our understanding of the similarities and differences between memories and prospections in several ways. First, we systematically manipulated emotion and included a neutral comparison condition to more readily assess whether emotion may influence the extent to which memories and prospections are (or are not) similar. Second, using a narrative approach, we assessed both the content of memories and prospections as well as the manner in which these narratives were rendered (i.e., narrative style). Third, we tested the constructive episodic simulation hypothesis using freely generated prospections (and memories) rather than predetermined memory fragments as the basis for prospections.

Prior affective science theory and research guided our selection of narrative content and style variables as well as our

hypotheses about the role of emotion. Keltner and Kring (1998) argue that emotions help to coordinate social interactions through dynamic processes, including information gathering, evoking emotion in others, and motivating socially beneficial behaviors. Thus, the level of social involvement of memories and prospections may vary by emotion. Indeed, Rasmussen and Berntsen (2009) found that social autobiographical memories were more likely to be self-rated as positive than negative. To the extent that emotional memories and prospections are similar, positive and negative memories and prospections may be more social than neutral because emotions help to organize social behavior. Further, positive prospections may be more likely to include social involvement than negative.

Other work points to the possibility that emotion may influence the time frame within which people generate memories and prospections. In one study (D'Argembeau & Van der Linden, 2004), people reported experiencing greater sensory and contextual details for future events closer in time than further in time. However, negative prospections were cast further in time compared with positive prospections. To date, no study has compared similarities and differences in the temporal distance of emotional and nonemotional memories and prospections.

As noted earlier, prior research indicates that people exhibit greater recall and recognition of emotional stimuli than of neutral stimuli. However, additional research suggests that people are more likely to remember positive than negative events, whether voluntarily recalled (Berntsen & Rubin, 2002) or restricted to self-relevant adjectives (e.g., sincere and kind; D'Argembeau, Comblain, & Van der Linden, 2005). Taken together, these findings suggest two intriguing possibilities. If prospections are drawn, in part, from the past, and emotional memories are more easily encoded and recalled, emotional prospections and memories may be more similar than nonemotional memories and prospections. However, if positive events are recalled more readily than negative events, positive prospections may also vary from negative prospections.

We tested the following three hypotheses. First, we hypothesized that the content and style of emotional (positive and negative) memories and prospections would differ from the content and style of neutral memory and prospections. Second, on the basis of evidence suggesting memories and prospections may vary by valence (D'Argembeau & Van der Linden, 2004; Szpunar, Addis, & Schacter, 2012), we hypothesized that positive memories and prospections would differ from negative memories and prospections in content and style. Third, on the basis of the constructive episodic simulation hypothesis (Schacter & Addis, 2007), we hypothesized that memories and prospections would contain similar or matched content. Extending this idea to include emotion, we hypothesized that positive memories and prospections would contain more matched content than negative or neutral memories and prospections.

Finally, as a subsidiary question, we assessed whether the time between generating memories and prospections influenced the extent to which they were similar by assigning people either to recall and prospect in the same experimental session or to do so in two separate sessions that were 2 days

apart. If similarities in the content and style of memories and prospections are essentially a methodological artifact of asking these questions in the same session, we would expect greater similarities between memories and prospections for people in the single-session compared with the two-session experimental group.

METHODS

Participants

Undergraduate students ($n = 109$; 56 women) between the ages of 18 and 36 years ($M = 20.05$, $SD = 2.47$) volunteered to participate in this study for psychology course credit. The ethnic diversity of the sample represented the demographics of the local undergraduate population (47.7% Asian American, 29.4% Caucasian, 6.4% African-American, 6.4% Latino, and 10.1% multiethnic).

Procedures

Participants were randomly assigned to one of two groups: (i) *single-session group* ($n = 55$; male = 28, female = 27) in which participants were asked to recount memories and prospections in the same session or (ii) *two-session group* ($n = 54$; male = 25, female = 29) in which participants recounted memories in one session and prospections in a separate session 2 days apart.

Following a standardized interview protocol, trained research assistants asked participants to provide memory narratives to 12 cues (Appendix), prompting the recall of four positive (e.g., accomplishing something), four negative (e.g., losing something important), and four neutral (e.g., going to the grocery store) memories of common life experiences. Participants also provided prospection narratives to the same 12 cues. Thus, all participants provided 24 narratives that varied by valence (positive, negative, and neutral) and condition (memory and prospection).[1] In both the single-session and two-session groups, half of the participants received all memory cues first followed by prospection cues, and the other half received all prospection cues first followed by memory cues.[2] The order of cues presented in each condition (memory and prospection) was counterbalanced across participants. Participants were instructed, 'with as much detail as possible, tell me about a specific time in the (past/future) you [event cue]'. They were given as much time as necessary to provide a response. After the participants provided their responses, they were asked to provide additional details. The next cue was asked once the participants indicated that their narratives were complete.

Emotion manipulation check

We assessed whether narratives conformed to our *a priori* valence designations in two ways. First, participants reported on their *experienced emotion* (recalled and prospected) using a 7-point scale ranging from 1 'very unpleasant' to 7 'very pleasant'. Second, we counted the number of *emotion word*s using an emotion dictionary (Ascher et al., 2010) comprised of approximately 300 words (roots and all possible variations). We then created two composite scores: number of positive emotion words and number of negative emotion words.

Narrative coding

All narratives were recorded, transcribed, and coded by trained research assistants. To assess interrater agreement, two raters coded approximately 37% of the transcripts. Raters coded each narrative on four variables covering the content of the narrative (whether or not a *time and place* indicator was explicitly mentioned, the extent of *social* involvement in the event, *who* was involved, and *where* the event took place), one variable covering the timing of the recalled or prospected event (*timing*), as well as one variable covering the manner or style in which the narrative was rendered (*elaboration*). Each variable was coded once for the entirety of each narrative. We also created a *match* variable that assessed the extent to which the four content variables were coded identically in a memory and prospection narrative of the same event. We detail each of these variables next.

Narrative content
We coded four distinct content variables: time/place, sociality, who, and where. *Time/place* was defined as the inclusion of a *time and place indicator* and coded as whether participants spontaneously provided information detailing 'when' (e.g., next week) and 'where' (e.g., at my friend's house) a memory or prospection took place using a 3-point scale (3 = inclusion of a time and place indicator, 2 = inclusion of either a time or place indicator, 1 = omission of a time and place indicator). *Sociality* was rated on a 3-point scale (3 = active, 2 = passive, 1 = alone). A narrative was rated as 'active' if it included an explicit social interaction. If the narrative involved other people, but there was no direct social engagement (e.g., other people were present, but there was no interaction), the narrative was rated as 'passive'. *Where* the event took place was coded categorically on the basis of the primary location of the event (home, work, school, community, or other). *Who* was coded on the basis of the primary person (if any) involved in the narrative (e.g., family, friend, significant other, coworker/classmate, stranger, or alone).

We also coded the *timing* of memory and prospections by coding participants' response to the question, 'when did/ will this event occur?' Answers to this question were converted into the total number of days since or until the event, and this value was used in the analyses.

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[1] Although all 109 participants provided narratives for each of the 12 future event cues, three of the participants were unable to provide a narrative for one of the past event cues [time in the past you asked someone for help ($n = 1$) and time in the past you argued with someone ($n = 2$)]. When prompted to explain what information they used to imagine the future event, they responded, 'I know I've needed help in the past, anecdotes from other people, and I thought about my interests and hobbies'.

[2] Preliminary analyses revealed four order effects: Participants who talked about the past first provided more social and elaborate memories and memories and prospections further back in time than those who talked about the future first. Further, when the future was narrative first, memories and prospections contained greater match then when memories were narrated first.

Narrative style

We coded the extent to which each narrative was elaborated to assess the manner or style in which narratives were rendered. *Elaboration* was rated using a 3-point scale (3 = elaborate, 2 = moderately elaborate, 1 = general) and measured the overall degree to which participants developed and expanded upon relevant information in order to create a comprehensive and unambiguous narrative. A rating of 'elaborate' indicated that the narrative contained thorough descriptive information throughout the narrative; 'moderately elaborate' indicated that the narrative included somewhat expanded descriptive information on some but not all aspects of the story, and 'general' indicated that the narrative was overly general and not very descriptive with respect to the essentials of the story. Coders were explicitly instructed that elaboration was not a measure of the length of the narrative or the participant's ability to just list relevant details but was rather an assessment of the quality of the words as descriptive storytellers.

Match score

We assessed the extent to which memory and prospection narratives were coded identically computing a *match* score for each narrative cue. For each of the 12 event cues, we assessed whether the memory (e.g., past accomplishment) and prospection (e.g., future accomplishment) narratives received identical codes for the four coded content variables: where, who, time/place, and sociality. We chose to include these four variables for the match score because they represented the content of what was talked about. We did not include elaboration or timing of the event in the match score because they did not measure the content of narratives and instead measured narrative style (elaboration) and when the narrated event occurred (timing). Each event cue could thus receive a match score ranging from 0 (memories and prospections received no identical codes for the four coded variables) to 4 (memories and prospections received the same code for the four coded variables). We created an average match score across all event cues; thus, the metric of matches between all memories and prospections varied from 0 to 4, with a higher number indicating more matches (similarities).

RESULTS

We tested our hypotheses using repeated measures analyses of variance (ANOVAs). In cases when sphericity was violated, we used the Huynh–Feldt correction for degrees of freedom when estimates of sphericity were greater than 0.75, and the Greenhouse–Geisser correction when estimates of sphericity were less than 0.75 (Girden, 1992). Effect sizes are reported as partial eta squared (η_p^2). We examined planned comparisons of all pairwise valence combinations using *Bonferroni* adjustment of significance level for multiple comparisons.

Preliminary analyses

Rater agreement

Coders achieved a high rate of agreement for the narrative content and style variables, with intraclass correlation coefficients (Fleiss & Shrout, 1978; case 2 formula) ranging from 0.75 to 0.94. Given the adequate level of rater agreement, we collapsed across coders for the analyses.

Emotion manipulation check

Event cue valence classification was confirmed in two ways. First, we conducted a 2 (condition: memory, prospection) × 3 (valence: positive, negative, neutral) ANOVA on reported emotional experience collapsed across session type (one *versus* two sessions). We found a significant valence main effect, $F(1.82, 196.92) = 1743.62$, $p < 0.01$, $\eta_p^2 = .94$, but neither the condition main effect nor the condition X VALENCE interaction were significant. All pairwise comparisons were significant (p's < .001); that is, positive memories and prospections were experienced more positively ($M = 5.95$, $SD = 0.54$) than negative and neutral, neutral memories and prospections ($M = 4.33$, $SD = 0.52$) were experienced more positively than negative, and negative memories and prospections ($M = 2.21$, $SD = 0.54$) were experienced more negatively than positive and neutral.

Second, we computed separate ANOVAs for the number of positive and negative emotion words. For positive emotion words, the valence main effect was significant, $F(1.48, 160.29) = 73.76$, $p < .01$, $\eta_p^2 = .41$, with significant pairwise follow-up comparisons (p's < .01). That is, participants used more positive emotion words in positive narratives (memories $M = 3.69$, $SD = 3.73$; prospections $M = 3.26$, $SD = 3.74$) than in negative (memories $M = 0.87$, $SD = 1.39$; prospections $M = 0.78$, $SD = 1.41$) and neutral (memories $M = 1.67$, $SD = 2.83$; prospections $M = 0.89$, $SD = 1.58$) narratives. Similarly, there was a significant valence main effect for negative emotion words, $F(1.48, 159.52) = 127.79$, $p < .01$, $\eta_p^2 = .54$, with significant pairwise follow-up comparisons (p's < .001). Participants used more negative emotion words in negative narratives (memories $M = 6.42$, $SD = 5.11$; prospections $M = 4.33$, $SD = 3.91$) than in positive (memories $M = 1.82$, $SD = 2.23$; prospections $M = 1.18$, $SD = 1.84$) and neutral (memories $M = 1.99$, $SD = 2.67$; prospections $M = 1.31$, $SD = 2.40$) narratives.[3] Taken together, these findings confirmed that our manipulation of emotion was effective.

Gender and ethnicity

Preliminary analyses revealed two significant gender effects. First, men's prospections were more elaborated than women's prospections across all valences, $F(1, 107) = 8.64$, $p = < .001$, $\eta_p^2 = .08$. Second, men's memories and prospections yielded greater match scores across all valences compared with women's, $F(1, 107) = 5.98$, $p = .02$, $\eta_p^2 = .05$. There were no significant ethnicity differences on any variables.

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[3] To adjust for differences in narrative length, positive and negative emotion word proportion scores were created by dividing the total number of positive and negative emotion words by the total number of words in the narrative. The same pattern of results was found using these proportion scores; positive proportion scores were larger for positive narratives than negative and neutral proportion scores, indicating more positive words relative to total words for these narratives. Similarly, negative proportion scores were larger for negative narratives than positive and neutral narratives.

Content and style of memories and prospections

To examine whether the coded content and style of memory and prospection narratives varied by emotion, we conducted four separate 2 (condition: memory, prospection) × 3 (valence: positive, negative, neutral) × 2 (session: one-session, two-session) ANOVAs for our continuously rated variables: time/place, sociality, timing, and elaboration.

With respect to time/place, we found significant main effects for condition, $F(1, 108) = 66.45$, $p < .01$, $\eta_p^2 = .38$, and valence, $F(1.84, 198.61) = 49.83$, $p < .01$, $\eta_p^2 = .32$. However, these were qualified by a significant condition × valence interaction, $F(1.94, 209.13) = 30.10$, $p < .01$, $\eta_p^2 = .22$. Partially consistent with our hypothesis, follow-up tests indicated that positive memories were more likely to include time and place indicators than negative ($p < .01$) and neutral ($p < .05$). Further, positive ($p < .001$) *and* neutral ($p < .001$) prospections were more likely to include time and place indicators compared with negative prospections (Figure 1). Finally, we found a significant session × valence interaction, $F(1.84, 196.61) = 3.60$, $p = .03$, $\eta_p^2 = .03$. Participants in the two-session group provided more time and place indicators for negative and neutral memories and prospections (but not positive memories and prospections) compared with participants in the single-session group.
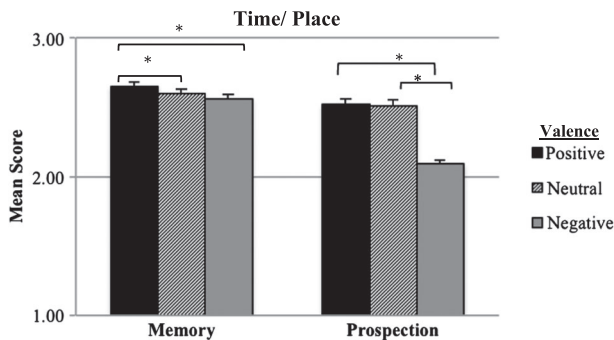

Figure 1. Mean time/place scores as a function of valence (positive, negative, and neutral) and condition (memory and prospection). Scores range from 1 (no time or place indicators) to 3 (both time and place indicators); *p < .05
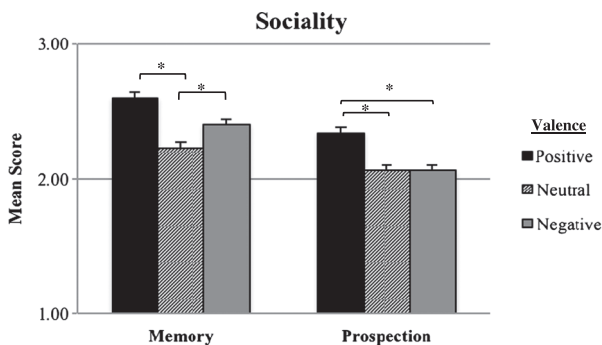

Figure 2. Mean sociality scores as a function of valence (positive, negative, and neutral) and condition (memory and prospection). Scores range from 1 (alone) to 3 (active social involvement); *p < .05

For sociality, we found significant main effects for condition, $F(1, 108) = 77.97$, $p < .01$, $\eta_p^2 = .42$, and valence, $F(2, 216) = 52.14$, $p < .01$, $\eta_p^2 = .33$. These were qualified by a significant condition × valence interaction, $F(2, 216) = 3.43$, $p = .03$, $\eta_p^2 = .03$. Consistent with our hypothesis, emotional memories were coded as more social than neutral (p's < .001). In addition, positive prospections were coded as more social than both negative ($p < .001$) and neutral ($p < .001$) prospections (Figure 2).

For timing, we again found significant main effects for condition, $F(1, 108) = 46.15$, $p < .01$, $\eta_p^2 = .30$ and valence, $F(2, 216) = 30.28$, $p < .01$, $\eta_p^2 = .22$, that were qualified by a significant condition × valence interaction, $F(2, 216) = 5.21$, $p = .01$, $\eta_p^2 = .33$. Consistent with our hypothesis, neutral and emotional memories differed. However, neutral memories were significantly closer in time than positive memories ($p < .001$), which were significantly closer in time than negative memories ($p < .001$). For prospections, both neutral and positive prospections were closer in time than negative prospections (p's < .001; Figure 3).

For elaboration, we also found significant main effects for condition, $F(1, 108) = 75.14$, $p < .01$, $\eta_p^2 = .41$, and valence, $F(2, 216) = 13.14$, $p < .01$, $\eta_p^2 = .11$, as well as a significant condition × valence interaction, $F(2, 216) = 8.44$, $p < .01$, $\eta_p^2 = .07$. In support of our hypothesis, emotional (positive and negative) memories were coded as significantly more elaborated than neutral memories (p's < .001). However, emotional prospections were not coded as more elaborated than neutral prospections (Figure 4).

To summarize, we found partial support for our hypothesis that emotional memories and prospections would differ from nonemotional memories and prospections. Specifically, emotional memories were different from nonemotional memories such that positive and negative memories were more social, further back in time, and elaborated than neutral memories. However, emotional prospections did not differ from neutral prospections. Partially consistent with our second hypothesis, positive and negative prospections differed from one another. Negative prospections contained fewer time and place indicators and were less social and further in the future than positive (and neutral) prospections. By contrast, positive prospections were more social than both neutral and negative prospections. We found only one difference between the one-session and two-session groups: Participants in the two-session group provided more time and place indicators for negative and neutral memories and prospections (but not positive memories and prospections) compared with participants in the single-session group.

Match between memories and prospections

The match score for participants' memories and prospections was relatively high, with over half of the four variables coded identically for emotional (positive $M = 2.37$, $SD = 0.56$; negative $M = 2.08$, $SD = 0.62$) and neutral ($M = 2.49$, $SD = 0.59$) narratives. Thus, our hypothesis that memories and prospections would contain similarly coded content was supported.

To assess whether emotional memories and prospections contained greater match than neutral, we conducted a 3
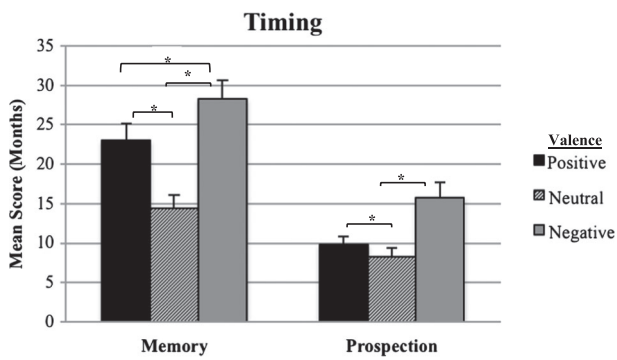
Timing

Figure 3. Mean timing scores as a function of valence (positive, negative, and neutral) and condition (memory and prospection). Scores range from 0 months to 35 months; *p < .05
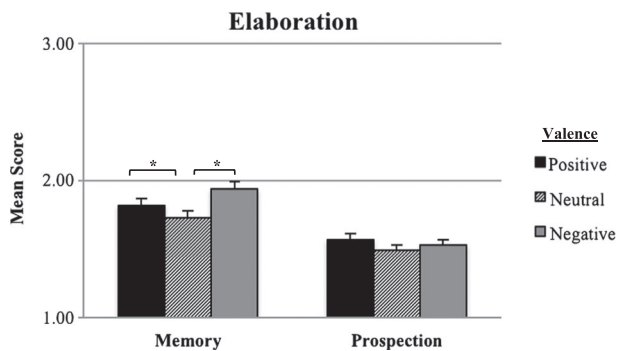
Elaboration

Figure 4. Mean elaboration scores as a function of valence (positive, negative, and neutral) and condition (memory and prospection). Scores range from 1 (general) to 3 (elaborated); *p < .05

(valence: positive, negative, neutral) × 2 (session: one-session, two-session) ANOVA. Only the valence main effect was significant, $F(2, 214) = 16.13$, $p < .00$, $\eta_p^2 = .13$. Follow-up comparisons revealed that negative memories and prospections contained fewer matches than positive ($p < .001$) and neutral ($p < .001$) memories and prospections. However, the number of matches did not differ between positive and neutral memories and prospections. Consistent with our third hypothesis, positive memories and prospections were coded more similarly than negative memories and prospections. However, positive and neutral did not differ with respect to match score, suggesting that the association between memories and prospections is not necessarily limited to emotional events. Further, the lack of significant session differences in match score suggests that reported similarities between memory and prospection are not an artifact of asking participants to recount the past and future in a single session.

DISCUSSION

In the present study, we examined similarities and differences in memories and prospections by systematically manipulating emotion and by assessing both the content and style of memory and prospection narratives. Our findings suggest several ways in which emotion may shape similarities and differences in memory and prospection. First, we found that emotional memories differed in content and style from nonemotional memories. Second, we found that the content (but not style) of prospections varied by valence. Third, we found that over half of the content between memories and prospections matched, supporting the constructive episodic memory hypothesis. However, we also found that emotion influenced the extent of match in that the content of negative memories and prospections matched less than positive and neutral. Taken together, these findings highlight the important role of emotion in our understanding of whether memories and prospections are (or are not) similar.

The primary focus of this study was to examine whether the content and style of memories and prospections varied depending upon emotional valence. With respect to memories, our hypothesis that the content and style of emotional (positive and negative) memories would differ from neutral memories and prospections was supported. Specifically, emotional memories were rated as more social, further back in time, and elaborated than neutral memories. Our finding that positive and negative memories were rated as equally social is somewhat inconsistent with Rasmussen and Berntsen (2009) who found that participants' social memories were more likely to be self-rated as positive than negative. However, differences in the measurement of sociality may help to explain this difference. Rasmussen and Berntsen (2009) explicitly cued for social memories ('try to recall a memory of an event that you have often shared with others') and then compared the self-reported valence of narratives provided in response to a social cue. Without manipulating the emotion of the cue, participants were more likely to generate positive social memories. By contrast, in our study, we explicitly cued for emotional memories and then coded each narrative for level of social involvement. Using this method, participants were equally likely to include other people in their positive and negative memories.

It is perhaps not surprising that neutral memories were reported as closer in time than emotional memories given the frequency of 'neutral' events (e.g., making a meal for yourself or walking to the bus) in daily life. In other words, people may experience more neutral events in their daily lives providing ample recent neutral memories to pull from when cued to remember their neutral past. Further, our finding that participant narrative's were more elaborated when talking about positive (e.g., a birthday) and negative (e.g., an argument) events compared with neutral events (e.g., going to the grocery store) suggests that emotion may help people to remember and talk about the finer points of their past experiences.

We did not find differences in time and place indicators between emotional and neutral memories, perhaps because our instructions explicitly asked participants to remember and imagine events that occurred (past) or will occur (future) at a specific time. Further, we did not find differences between positive and negative memories, suggesting that the content and style of rendering memories vary similarly for positive and negative events. Together, these findings highlight the importance of including a neutral condition in order to demonstrate if and how emotion influences the content of memories and prospections, and they also underscore the importance of assessing multiple content domains.

We found a number of interesting differences between positive and negative prospections. First, we found that participants' positive prospections were more likely to include other people than their negative (and neutral) prospections. This finding provides empirical support for theoretical accounts of positive emotions and social bonding, suggesting that positive emotions are linked with social affiliation, social connectedness, and social support (Fredrickson, 2001; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Keltner & Kring, 1998; Rasmussen & Berntsen, 2009). Further, this finding highlights a difference between the role of emotion for memories and prospections. That is, although positive and negative memories included a similar level of social involvement, it seems that people are less likely to include others in their negative prospections.

We also found that participants' negative prospections contained fewer time and place indicators and were further in the future than both positive and neutral prospections. These findings are consistent with Williams et al. (1996) who found that negative prospections contained less specificity (rated as occurring at a specific time and place and that last no longer than a single day) than positive prospections and D'Argembeau and Van der Linden (2004) who found that negative prospections were further in the future than positive prospections. Interestingly, participants did not elaborate more in their emotional prospections than they did in their neutral prospections. This is a bit puzzling given that positive and negative prospections differed on other rated variables. It seems, then, that the style of rendering prospections is more general for any event that has yet to take place, regardless of emotional valence.

Taken together, our results suggest a number of differences between memories and prospections. These differences, however, are qualified by the emotional valence of a narrated event. That is, significant differences between memory and prospection narratives varied by emotion, providing support for our hypothesis that emotion may help to explain the mixed findings in the literature regarding the extent to which prospections and memories are similar or dissimilar. Although the coded content of both positive and negative memories was similar, positive prospections varied from negative and neutral. These findings suggest that positive valence may influence memories and prospections in similar ways; however, negative valence may differentially influence memories and prospections.

To our knowledge, this is the first study to assess whether people included similar content in their freely generated memories and prospections. As hypothesized, we found that over half of the coded content variables matched between memories and prospections, providing support for the constructive episodic simulation hypothesis (Schacter & Addis, 2007; Schacter et al., 2007). That is, when constructing prospections, people included similar content (i.e., who, where, time/place, and degree of social engagement) as their memories. Future studies could build upon these findings and take a closer look at the extent to which pieces of several different unconstrained memories may be 'flexibility recombined' (Schacter & Addis, 2007; Schacter et al., 2007) when prospecting the future.

We also found that the amount of match between the coded content of memories and prospections varied depending upon emotional valence. Negative memories and prospections contained less content match than did positive (or neutral) memories and prospections. Thus, when prospecting about a positive event, such as a future birthday party, people may be more likely to remember and draw from experiences of previous birthdays (e.g., who was there and where they were). By contrast, when prospecting about a negative event, such as a future disagreement, people may be less likely to draw from a past argument. That we did not find differences in content match between positive and neutral suggests that drawing from the past to generate prospections is not necessarily restricted to emotional events. Indeed, one study of memory *for* prospections constructed from past memory fragments found that participants were more likely to remember the details of their positive and neutral prospections than their negative prospections after a 1-day delay (Szpunar et al., 2012). Thus, positive and neutral prospections may be easier to generate than negative prospections because they share more similarities with previous experiences.

Our finding of fewer matches between negative memories and prospections compared with positive and neutral is consistent with our finding of content differences between negative and positive prospections. That is, when thinking about the negative future, people may be less likely to include content from their past, and they may make more global prospections of the future. Although negative life events are inevitable, focusing on more global and distant components of what a future negative event may entail, instead of drilling down to the minutiae of who, when, and were, may make thinking about the negative unknown more manageable. That is, generating more global and distant content may reflect a coping strategy employed to protect oneself from the effects of thinking about possible future negative scenarios (e.g., feelings of fear, worry, or hopelessness) or even to avoid the negative future. This supposition is similar to the ideas of Rasmussen and Berntsen (2013) who suggested that people may be less likely to generate vivid future negative prospections as part of a broader self-regulation strategy.

Previous studies have shown that the ability to generate specific memories (i.e., memories occurring at a specific time and place and that lasts no longer than a single day) is associated with greater problem-solving skills (e.g., Goddard, Dritschel, & Burton, 1996; Williams et al., 1996), suggesting that everyday problem solving relies on the ability to learn from past experiences. It may be the case that the content differences observed between negative memories and prospections reflect an attempt to learn from the past by creating prospections that are distinctly different from negative memories. In other words, we may have found less similar content in negative memories and prospections because people are more likely to avoid similar situations in their prospections (i.e., learn from previous mistakes). For example, if a person recalls an argument with a partner, he or she may instead prospect about an argument with a friend or colleague because he or she wants to avoid having a similar argument with his or her partner in the future. Future

studies might profitably explore if similarity in the content of negative memories and prospections is related to problem solving abilities. That is, people with high problem-solving skills may include less similar content between negative memories and prospections than people with low problem-solving skills because they are learning from and modifying the past when planning for the future.

As a subsidiary question, we addressed whether assessing memories and prospections in the same session inadvertently primed for similar content, thus accounting for prior observations of similarities between memories and prospections. We found that even with a 48-h delay, memories and prospections remained similar. In fact, participants who had a delay between recalling and prospecting provided more time and place indicators for negative and neutral memories and prospections compared with participants in the single-session group, suggesting that providing memory and prospection narratives back to back did not prime participants to provide greater narrative content. If anything, we found the opposite. Thus, for the first time, we demonstrate that the similarities between memories and prospections are not simply an artifact of study design. Furthermore, our results suggest that people will draw upon their past regardless of when they are prompted to think about the future (e.g., 1 week or 1 month later), although this remains to be tested in future research.

As always, it is important to acknowledge study limitations. First, we used the same event cues to prompt for memories and prospections. Although this approach may have pulled for similarities between memories and prospections, we decided that the consistency of narrative cues was essential given our desire to measure the match between coded memories and prospections. Although we found that memories and prospections were coded identically on over half of the variables we assessed, the narratives did not match on every variable, suggesting that participants did not provide an exact replica of a memory when prospecting the future. Second, we took a conservative approach with our match score, requiring that memories and prospections receive identical codes. However, this 'all or nothing' approach does not readily account for more general similarities in narrative content, and thus, we likely underestimated the amount of similarities between memories and prospections. Indeed, D'Argembeau and Mathy (2011) found that people tend to access more general personal knowledge before providing detailed episodic experiences when prospecting, and our match variable may not have captured these more general personal experiences.

Given the vast pool of past experiences a person may draw upon in order to construct a possible future scenario, it is likely that prospections contain similar content with other memories. For example, a person who narrated about a past birthday at a friend's house and a future birthday at a restaurant would not receive a match point for 'where'. However, it is possible that he or she has experienced a birthday at a restaurant in the past and used this information while constructing his or her prospection. Because we only compared one cued prospection to one cued memory, we were unable to account for match between other (unreported) memories. Thus,

we may have underestimated how often people draw from past experience when prospecting. Nevertheless, this study takes an important first step by demonstrating content similarities between one relatively unconstrained memory and prospection about an everyday event. Future studies could expand upon these findings and take a closer look at the extent to which pieces of several different memories may be flexibility recombined (Schacter & Addis, 2007; Schacter et al., 2007) when prospecting the future.

In summary, our results suggest that not all memories and prospections are created equal. When people remember their emotional past, they do so similarly whether remembering positive or negative events. When people think about the future, however, they generate more global and distant negative than positive prospections. Further, positive prospections appear to draw from the past more than negative, suggesting that people may be more likely to construct a positive future that is similar to what they have experienced in the past and are reluctant to do so for a negative future.

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APPENDIX

Narrative event cues by valence category

'With as much detail as possible, tell me about a specific time in the (past/future) you [event cue]'.

Positive	Negative	Neutral
Having a birthday	Doing poorly on a task	Making a meal for yourself
Spending time with friends	Arguing with someone	Going to the grocery store
Watching favorite movie or TV show	Losing something important or getting lost	Asking someone you do not know for help
Accomplishing something	Getting sick or injured	Commuting to work or school

Event cues were selected to be equally likely to occur in a college sample and involve other people across the three valence categories.