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Brief Report

Episodic future thought and its relation to remembering: Evidence from ratings of subjective experience

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Abstract

The goal of the present study was to examine the hypothesis that the ability to construct vivid mental images of the future involves sampling the contents of memory. In two experiments, participants envisioned future scenarios occurring in contextual settings that were represented in memory in varying degrees of perceptual detail. In both experiments, detailed contextual settings were associated with more detailed images of the future and a stronger subjective experience. Our findings suggest that the contents of memory are routinely sampled during the construction of personal future scenarios.

Keywords: Episodic memory; Episodic future thought

1. Introduction

Imagine for a moment a future gathering with family members and relatives. What is the occasion? Who is there? When and where does the event take place? According to Tulving (1985, 2002; Wheeler, Stuss, and Tulving, 1997) this ability to envision specific future scenarios, termed episodic future thought, may be related to the ability to recollect specific personal episodes from our past (Atance & O'Neill, 2001). In support of Tulving's argument, it has been shown that this capacity for mentally representing personal experiences in subjective time (both past and future) can be selectively impaired through brain damage (Hassabis, Kumaran, Vann, & Maguire, 2007; Klein, Loftus, & Kihlstrom, 2002; Tulving, 1985; Williams et al., 1996); that it appears rather late in ontogenetic development (Atance & Meltzoff, 2005; Atance & O'Neill, 2001, 2005; Busby & Suddendorf, 2005; Suddendorf & Busby, 2005); and that the phenomenological experience associated with both aspects may be similarly influenced by factors such as temporal distance from the present (D'Argembeau & Van der Linden, 2004) and individual difference variables such as capacity for visual imagery (D'Argembeau & Van der Linden, 2006).

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Taken together, the associated evidence suggests a close relationship between the personal past and future. However, it does not specify the nature of the relation. One may only conclude that mental representations of the personal past and future are similarly influenced by a particular set of variables; namely, brain damage, age, and phenomenological characteristics. One possibility might be that envisioning the future tends to involve the reinstatement of perceptual (sensory, visual–spatial) context from memory (Okuda et al., 2003). This hypothesis is supported by a couple of recent functional neuroimaging investigations into the neural correlates of past and future thought (Addis, Wong, & Schacter, 2007; Szpunar, Watson, & McDermott, 2007). In these studies, participants were asked to imagine specific past and future scenarios (for 10–20 s) in response to a series of word cues (e.g., exam, car). Both studies found an impressive correspondence in patterns of brain activity during past and future thought, relative to various non-episodic control tasks. Interestingly, many of the brain regions showing similar patterns of activity during past and future thought are traditionally believed to underlie memory related functions (e.g., medial temporal lobes, Addis et al., 2007; Buckner & Carroll, 2007; Schacter & Addis, 2007; Szpunar & McDermott, 2007; Szpunar et al., 2007).

In light of such findings, Schacter and Addis (2007) have proposed what they call the "constructive episodic simulation" hypothesis. They argue that one important function of retaining personal memories is that aspects of previously-experienced events are used in envisioning the future. Indeed, D'Argembeau and Van der Linden (2004, 2006) have shown that participants tend to envision past and future events in similar settings (e.g., at home).

The aim of the two experiments reported here was to further elucidate the nature of this proposed interrelationship between the past and future. A common index of how well someone is able to recollect their past is based on their subjective experience associated with the memory (Tulving, 1985). The more detailed the mental representation, the more likely that person is to express feeling as if they are back in the past re-experiencing the event (Brewer, 1986; Tulving, 1985). Here we ask whether the same relationship holds when participants are required to imagine the future. That is, if mental representations of the future are based upon the contents of memory, then the phenomenological quality of episodic future thought should vary based on the contents of memory that have been sampled.

2. Experiment 1

Participants imagined future events—occurring within the next week—in the context of either familiar (e.g., home) or novel (e.g., jungle) settings. According to reality monitoring theory (Johnson, Hashtroudi, & Lindsay, 1993; Johnson & Raye, 1981), mental images based on personal experience (i.e., memory) will be associated with more perceptual detail relative to mental images based on imagination and should therefore be experienced as being more vivid. If memory were sampled during episodic future thought, we would expect participants to have a more vivid subjective experience when imagining future scenarios occurring in familiar settings than in novel settings.

2.1. Methods

2.1.1. Participants

Twenty Washington University undergraduates participated in the experiment for partial fulfillment of a course requirement.

2.1.2. Materials and procedure

Participants were asked to envision twelve specific events occurring in the near future. Half of these events were cued with familiar settings (e.g., home, friend's apartment, pub), while the other half were cued with presumably novel settings (e.g., jungle, North Pole, Great Wall of China). Familiar and novel event cues were alternated, and each cue appeared on a separate sheet of paper. Participants were told that they would have one minute to imagine each event in as much detail as possible and were asked to perform the task for the entire allotted time. Following the presentation of each event cue, participants used 7-point scales to rate the characteristics of the mental representation they had just formed. Specifically, each event was rated on three measures that were summed to form a sensorial details index (D'Argembeau & Van der Linden,

2004; visual details, sounds, smell/taste; 1 = none, 7 = a lot); three measures that were summed to form a clarity of context index (D'Argembeau & Van der Linden, 2004; clarity of context clarity of location, clarity of spatial arrangement of objects, clarity of spatial arrangement of people; 1 = vague, 7 = clear); and two measures that formed a composite index of the subjective experience associated with the mental image (D'Argembeau & Van der Linden, 2006; feeling of experiencing the event, feeling of mental projection; 1 = none, 7 = a lot).

2.2. Results

The alpha level was set at $p = .05$. Cohen's d indicates effect size for t-tests. As can be seen in the upper panel of Table 1, in comparison to novel settings, episodic future thought occurring in familiar settings was rated as containing more sensorial detail, $t(359) = 10.02$, $d = 0.53$, and a higher clarity of context, $t(359) = 20.54$, $d = 1.08$. These more vivid mental images were associated with a stronger subjective experience, $t(239) = 12.96$, $d = 0.84$, which is in line with the episodic memory literature (e.g., Tulving, 1985). In support of the hypothesis that episodic future thought is reliant upon the contents of memory, the present data suggest that the characteristics of various memorial representations are preserved as they are projected in constructing novel future scenarios.

Relative to novel settings, familiar settings are associated with more personal knowledge of what occurs within them. Hence, it is possible that participants in this experiment might have simply found it easier to imagine what they were doing in a previously-experienced (self-relevant) setting. Experiment 2 attempted to control for this discrepancy.

3. Experiment 2

In this experiment, we varied the extent to which familiar settings were characterized by perceptual detail. Participants were instructed to engage in episodic future thought—occurring within the next week—in either recently (e.g., university campus) or remotely (e.g., high school) experienced contextual settings. Contextual settings experienced on a daily basis are represented in greater perceptual detail than more remotely experienced settings (Brewer, 1986). Accordingly, we predicted that future images based on recently experienced settings should be experienced as more vivid and associated with a stronger subjective experience. Importantly, both conditions involved imagining settings that participants were familiar with.

3.1. Methods

3.1.1. Participants

Forty-eight Washington University undergraduates participated in the experiment for partial fulfillment of a course requirement.

3.1.2. Materials and procedure

Participants were asked to imagine four specific future events. Half of the events were cued by recently experienced settings (i.e., university campus and home), while the other half were cued with remote settings

Table 1
Means and standard deviations of ratings for phenomenological characteristics of episodic future thought as a function of condition

Condition	Sensorial detail		Clarity of context		Subjective experience	
	M	*SD*	*M*	*SD*	*M*	*SD*
Experiment 1						
Familiar Setting	4.70	(1.81)	5.48	(1.56)	5.30	(1.21)
Novel Setting	3.58	(1.75)	3.39	(1.43)	3.72	(1.48)
Experiment 2						
Recent Setting	4.95	(1.85)	5.75	(1.42)	5.56	(1.07)
Remote Setting	4.04	(1.82)	3.89	(1.56)	4.26	(1.27)

(i.e., high school and childhood home). Event cues were presented to participants one at a time, each on a separate sheet of paper. Recently and remotely experienced event cues were presented in alternating order. Again, participants were asked to attempt to envision a specific future event for the entire duration allowed (i.e., one minute). The remainder of the procedure was identical to Experiment 1.

3.2. Results

As can be seen in the lower panel of Table 1, in comparison to remote settings, future images drawing upon recently experienced settings were rated as containing more sensorial detail, a higher clarity of context, and a stronger subjective experience, $t(287) = 6.94$, $d = 0.41$, $t(287) = 10.76$, $d = 0.99$, and $t(203) = 9.86$, $d = 0.75$, respectively.

4. Discussion

The present study examined the hypothesis that the ability to construct vivid mental images of the future (i.e., episodic future thought) involves sampling the contents of memory. It is well known from research on human episodic memory that the subjective experience of reliving an event from the past is positively correlated with the vividness of the mental representation of the episode (Tulving, 1985). We hypothesized that if episodic future thought does indeed rely upon memory (Addis et al., 2007; Buckner & Carroll, 2007; Okuda et al., 2003; Schacter & Addis, 2007; Szpunar & McDermott, 2007; Szpunar et al., 2007) then memory-based manipulations should influence the quality of episodic future thought. Indeed, in two experiments, the extent to which participants felt as though they pre-experienced a mental representation of the future varied positively with the quality of the memorial information they were able to use to construct the representation.

Our findings corroborate prior research using advanced neuroimaging techniques and subjective reports. Specifically, episodic future thought has been shown to engage many of the brain regions known to be important for recollecting personal memories (Addis et al., 2007; Okuda et al., 2003; Szpunar et al., 2007). In addition, participants typically describe past and future episodes as occurring in similar contexts (D'Argembeau & Van der Linden, 2004, 2006)

That past and future thought are so closely related provides insight into why certain populations who lack access to specific personal details of their past (i.e., brain damaged amnesic patients, young children, clinically depressed individuals) are also unable to imagine specific personal future scenarios. For example, Hassabis et al. (2007) have recently reported on five amnesic patients with brain damage localized to the hippocampal region. Along with a profound deficit in episodic memory, these patients are impaired in the ability to mentally construct personal future scenarios. One intriguing possibility is that such individuals are unable to access the contents (memory) necessary to mentally construct the future. Indeed, Hassabis et al. suggested that the hippocampus, a structure important for pulling together the contents of memory to form a coherent mental image of the past, might also play an important role in constructing mental images of the future (Addis et al., 2007; Miller, 2007; Schacter & Addis, 2007).

The present results also provide insight into why some mental representations of the future are experienced as more vivid than others. For instance, participants are generally found to rate mental representations of the near future as more vivid than the distant future (D'Argembeau & Van der Linden, 2004; Trope & Liberman, 2003), even though neither has occurred. One possibility is that thoughts about the near future involve sampling of recently experienced settings. That is, participants are likely to experience the near future within the context of familiar settings (e.g., current home). These recently experienced settings are represented with a relatively high degree of perceptual detail. On the other hand, participants might be likely to imagine themselves in novel contexts when thinking about the distant future (e.g., future job).

In sum, evidence from a wide range of research disciplines has converged on the hypothesis that episodic future thought is closely related to memory. Schacter and Addis (2007) have recently brought this evidence together in what they refer to as the "constructive episodic simulation" hypothesis that stipulates that memories are sampled in mentally constructing the future. In two experiments, we outline evidence in support of this assumption. Specifically, it appears that the characteristics of memorial representations are preserved as they are projected into novel future scenarios.

Students of psychology have expended more than 100 years of thought and careful experimentation to understanding human memory (Ebbinghaus, 1885). However, there has been surprisingly little psychological inquiry into the ability to mentally represent the future. The coming years will surely see an increase in the number of studies conducted on this ubiquitous mental phenomenon that will allow us to make significant advances in understanding how our mind enables us to mentally represent future thought and how future thought may be related to memory.

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