

Imagining the personal past: Episodic counterfactuals compared to episodic memories and episodic future projections

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Abstract Episodic counterfactuals are imagined events that could have happened, but did not happen, in a person's past. Such imagined past events are important aspects of mental life, affecting emotions, decisions, and behaviors. However, studies examining their phenomenological characteristics and content have been few. Here we introduced a new method to systematically compare self-generated episodic counterfactuals to self-generated episodic memories and future projections with regard to their phenomenological characteristics (e.g., imagery, emotional valence, and rehearsal) and content (e.g., reference to a cultural life script), and how these were affected by temporal distance (1 month, 1 year, 5+ years). The findings showed that the three types of events differed phenomenologically. First, episodic memories were remembered more easily, with more sensory details, and from a dominant field perspective, as compared to both future projections and episodic counterfactuals. Second, episodic future projections were more positive, more voluntarily rehearsed, and more central to life story and identity than were both episodic memories and episodic counterfactuals. Third, episodic counterfactuals differed from both episodic memories and future projections by neither having the positivity bias of the future events nor the enhanced sensory details of the past events. Across all three event types, sensory details decreased, whereas importance,

reference to a cultural life script, and centrality increased with increasing temporal distance. The findings show that imagined events are phenomenologically different from memories of experienced events, consistent with reality-monitoring theory, and that imagined future events are different from both actual and imagined past events, consistent with some theories of motivation.

Keywords Episodic counterfactuals · Episodic memory · Episodic future projections · Mental time travel · Phenomenology · Temporal distance

My sister almost lost her life because of the doctor's fault. Her operation was delayed due to a late diagnosis and the situation was fatal. If it had gone unnoticed for a longer time, I might have had a life without her. (Woman, 19 years old)

When I went to the embassy for my visa application, the officer said that my application had been rejected. If it had been approved, I would have traveled to the USA that summer and this might have been an important experience for me. (Man, 24 years old)

When people are asked to imagine important personal events that could have happened but did not happen in their lives, they think about various alternatives to what actually happened, as is shown in the examples above. A quick introspection as to how frequently we engage in thought experiments involving the phrases “what if,” “even if,” “if only,” and so forth, regarding the ways that things might have turned out may give us an idea about how often this mental activity occurs. Roese, Sanna, and Galinsky (2005) defined the outcome of this mental activity as

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“thoughts of what might have been,” and stated that “they are imaginative constructions fabricated from stored representations, typically embracing a blend of traces from both episodic and semantic memory” (p. 138).

These imaginative constructions, also known as *counterfactuals*, have been studied extensively in the reasoning and decision-making literatures. Byrne (2005) reviewed the consistent ways in which people mentally change parts of what actually happened in order to come up with alternatives that might have happened. Byrne noted that counterfactuals may encompass “actions, controllable events, unacceptable actions, causal relations, and recent events” (p. 14), and people often experience different emotions, such as regret, relief, anticipation, shame, or guilt after counterfactual thinking.

Although counterfactuals are considered important aspects of our mental life, affecting our emotions, decisions, and behaviors (for a review, see Byrne, 2016), naturalistic studies examining their phenomenological characteristics and content have been few. For example, Landman and Manis (1992) explored counterfactuals about personal events, by asking people, “If you could start all over, what would you do differently?” In this descriptive study, most people reported having something that they wished they had done differently. However, the contents of these counterfactual alternatives were limited to education, career/extracurricular activities, marriage/romance, and children/family, since people were specifically probed for these domains. Other studies have targeted specific samples to examine the emotional regulation of negative personal experiences that could have ended either worse (e.g., survivors of the tsunami disaster; Teigen & Jensen, 2011) or better (e.g., bereaved individuals who contemplated personal in/actions that could have prevented the death of a loved one; Davis, Lehman, Wortman, Silver, & Thompson, 1995).

These seminal studies raised many important questions about episodic counterfactuals (Schacter, Benoit, De Brigard, & Szpunar, 2015). First, little is known about episodic counterfactuals’ phenomenological characteristics, as compared to both episodic memories and episodic future projections, because no studies have compared the characteristics of episodic counterfactuals to those of episodic memories and future projections when all three categories were generated in an unconstrained and open-ended fashion. Second, it therefore is not known whether the characteristics of such episodic counterfactuals are affected by experimental manipulations, such as temporal distance, in the same ways as the characteristics of episodic memories and episodic future projections. Third, it is not known whether episodic counterfactuals differ from episodic memories and episodic future projections concerning the semantic influences on their content.

Here, we aimed to answer these questions by employing a new method to sample naturalistic episodic counterfactuals—that is, episodic counterfactuals that people freely generated in response to a short instruction. We conceptualized episodic

counterfactuals as constructive mental activities initiated by the mental time travel (MTT) ability, just like episodic memories and episodic future projections (De Brigard, 2014; Epstude & Peetz, 2012). At the same time, we investigated possible differences between these three types of constructive mental activities, since each has a unique position on the temporal direction (past vs. future) and reality (real vs. imagined) dimensions. Studying episodic counterfactuals therefore can inform us of potential interactions of these two dimensions.

Past and future MTT

The idea that people are able to mentally travel in time to remember events from their pasts and to imagine events that might occur in their futures was introduced by Tulving (1983, 1985, 2002) and has since been examined thoroughly by other memory researchers (e.g., Atance & O’Neill, 2001; Berntsen & Bohn, 2010; Buckner & Carroll, 2007; Suddendorf & Corballis, 1997, 2007; Szpunar, 2010). Numerous MTT studies have compared the phenomenological, functional, and neurological characteristics of remembering the past and imagining the future in both healthy and clinical populations (e.g., Botzung, Denkova, & Manning, 2008; D’Argembeau & Van der Linden, 2004, 2006; Okuda et al., 2003; Spreng & Levine, 2006; Williams et al., 1996). The findings seem to converge on the conclusion that these processes share similar underlying neurocognitive mechanisms (for reviews, see D’Argembeau, 2012; Szpunar, 2010).

Despite these similarities, several studies have also shown important differences between past and future MTT (e.g., Berntsen & Bohn, 2010; Berntsen & Jacobsen, 2008; D’Argembeau & Van der Linden, 2004; Kane, Van Boven, & McGraw, 2012; Newby-Clark & Ross, 2003; Painter & Kring, 2015; Rasmussen & Berntsen, 2013). These studies showed marked differences between past and future events in emotional valence, sensory details, and idealized/schema-based construction, which manifest themselves as higher importance and centrality to life story and identity, as well as reliance on schematic content for future relative to past events. Relatedly, Rubin (2014) found that negative future events were rated as being more extreme on a number of dimensions, consistent with schema-based construction. Additionally, differences between temporally close and distant events concerning phenomenology and content have been observed in several studies (Addis, Wong, & Schacter, 2008; Berntsen & Bohn, 2010; Berntsen & Jacobsen, 2008; D’Argembeau & Van der Linden, 2004).

Newby-Clark and Ross (2003) showed in a series of studies that people conceive future events as being more positive than past events; that they take longer to imagine negative events in their futures; and that they consider future events to have more personal importance. This idealization and positivity of the future was also found in a study by Berntsen and Bohn (2010), in which people’s future projections were more positive and

idyllic than were their memories. Berntsen and Bohn concluded that this was due to people's "uncorrected positive illusions" (p. 275) for imagined future events. These findings were replicated and extended by Rasmussen and Berntsen (2013), who specifically asked participants to describe both negative and positive past and future events. They found that phenomenological differences between negative and positive events were larger for future events than for memories. Moreover, Szpunar, Addis, and Schacter (2012) found that details from simulated negative future scenarios were more difficult to remember than details from simulated positive and neutral future scenarios after a long delay (10 min. vs. 1 day). Grysman, Prabhakar, Anglin, and Hudson (2013) examined self and other (close-friend and non-close-friend) narratives of past and future events and found, consistent with Berntsen and Bohn's findings, that past events had higher phenomenological quality, whereas future events were more positive.

Furthermore, extending Berntsen and Bohn's (2010) work, their results showed that people rely on cultural life scripts (CLSs) to imagine not only their own, but also others' futures. CLSs are a type of semantic knowledge of the important events that are expected to happen in a prototypical individual's life in a given culture and the events' expected timeline (Berntsen & Rubin, 2004; Rubin & Berntsen, 2003). Studies have shown that CLSs guide MTT into both the past and the future (e.g., Berntsen & Bohn, 2010; Berntsen & Jacobsen, 2008). Moreover, findings on temporal distance indicate that distant events are experienced as being more scripted and personally significant, whereas close events have higher levels of sensory detail, regardless of temporal direction (e.g., Addis, et al., 2008; Berntsen & Bohn, 2010; D'Argembeau & Van der Linden, 2004). These findings are in line with "temporal construal theory" (Trope & Liberman, 2003), which suggests that events are represented in more abstract terms as their temporal distance from the present increases.

Episodic counterfactuals: A matter of temporal direction or reality?

Although an abundance of studies have compared naturalistic (freely self-generated) future projections with naturalistic episodic memories, naturalistic episodic counterfactuals have been largely unexamined in the MTT literature. At the same time, several theorists have acknowledged the similarities of such counterfactuals to other types of episodic constructions. De Brigard (2014) argued that human memory may constitute a larger system than previously thought, processing not only what was and what might be, but also what could have been. The definition of counterfactuals proposed by Roese et al. (2005) already implies that imagining the past (i.e., generating counterfactuals) is supported by the same system that gives rise to episodic memories and episodic future projections.

Consequently, our current knowledge about the characteristics of episodic counterfactuals (Schacter et al., 2015) in comparison to episodic memories and episodic future projections is limited, because research has not yet examined whether differences might occur because of the temporal direction or reality status of the represented event. Following the taxonomy from Szpunar, Spreng, and Schacter (2014), one can argue that episodic counterfactuals are more similar to episodic future projections, because both are hypothetical episodic simulations. Nonetheless, considering the marked differences between past and future MTT, one can also argue that episodic counterfactuals are more similar to episodic memories, because both involve past-oriented cognition and are constrained by real events that actually occurred.

Findings from studies of episodic counterfactuals

Few empirical studies have compared episodic counterfactuals with memories and future projections. De Brigard and Giovanello (2012) asked their participants to generate emotionally valenced episodic memories. They then asked the participants to form episodic counterfactuals by changing the emotional contents of the remembered events (i.e., the valence was changed, but temporal direction was fixed), and to form future events by generating events that were similar to the memories but would take place in the future (i.e., valence was fixed, but temporal direction was changed). De Brigard and Giovanello showed that the past events included more sensory details than did the episodic counterfactuals and future events. The episodic counterfactuals, however, were less emotionally intense than the other event types.

In another study, De Brigard, Szpunar, and Schacter (2013) showed that repeated simulation of episodic counterfactuals decreased their perceived plausibility, even while their ease of simulation, degree of detail, and valence ratings increased. This was in contrast to the finding that the perceived plausibility of episodic future projections increased with repeated simulation. Thus, although both episodic counterfactuals and episodic future projections are simulations of hypothetical events, their temporal direction creates a difference in the perceived plausibility of the simulated events. Furthermore, neural evidence has been inconclusive, showing that mental simulation of alternatives to past events activates many regions in the default network, and that both episodic counterfactuals and episodic future projections activate a common neural network despite differences in hippocampal activity (e.g., Schacter et al., 2012; Schacter et al., 2015; Van Hoeck et al., 2013; Van Hoeck, Watson, & Barbey, 2015).

One limitation of these studies is that the episodic counterfactuals were constructed through a process that was more constrained by the experimenter than was the construction of the other two event types. First, the participants generated an actual memory of a past event in response to either a word cue

(De Brigard & Giovanello, 2012) or an emotion cue (De Brigard et al., 2013). Next, they transformed this memory into an episodic counterfactual by changing either a key feature (e.g., valence; De Brigard & Giovanello, 2012) or the details of their memories (e.g., person, location, object, or activity; De Brigard et al., 2013) to create upward, downward, and neutral counterfactual alternatives to negative, positive, and neutral memories, respectively. Thus, in both cases the episodic counterfactuals were generated through an experimenter-determined process and through a two-step procedure, which may have affected their characteristics relative to the self-generated episodic memories and/or future projections. We overcame this limitation by using naturalistic episodic counterfactuals that were generated as freely as the episodic memories and future projections.

The present study

The present study addressed three questions left unanswered by previous research: (1) whether and how the phenomenological characteristics of self-generated episodic counterfactuals are similar to, or different from, those of episodic memories and episodic future projections; (2) how temporal distance affects these characteristics; and (3) whether these events are different with regard to the semantic influences on their contents—more specifically, their reliance on CLSs.

To do so, we developed a new method of eliciting episodic counterfactuals. We were interested in naturalistic episodic counterfactuals, and therefore adopted methods similar to those used in research on episodic memory. Thus, we restricted our participants as little as possible in their answers, so that they could provide any type of episodic counterfactual that came to mind in response to a short instruction.

We examined phenomenological characteristics such as sensory detail, emotional valence, emotional intensity, ease of remembering/imagining, and perspective, as has been done in previous studies with experimenter-defined episodic counterfactuals (e.g., De Brigard & Giovanello, 2012; De Brigard et al., 2013). We also included measures of other phenomenological characteristics of interest that previous studies had examined for episodic memories and episodic future projections, but that have not been examined for episodic counterfactuals, such as voluntary and involuntary rehearsal, importance, and centrality to one's life story and identity.

On the basis of the literature and our theoretical reasoning, the following predictions were generated: Concerning phenomenological characteristics, we expected episodic memories to be higher in sensory detail than episodic counterfactuals and episodic future projections. We expected episodic future projections to be more positive, more important, and more central to the life story and identity than episodic memories and episodic counterfactuals. Finally, we expected episodic counterfactuals to be less emotionally intense than other events.

Concerning temporal distance, we expected sensory detail ratings to decrease, and importance and centrality ratings to increase, with increasing temporal distance into the past or future. Finally, we expected temporally distant events to be more schema-based or reliant on CLSs than were temporally close events.

Method

Participants

Sixty-nine undergraduate students (40 women, 29 men; mean age = 21.09 years, $SD = 2.20$, range = 18 to 29) from Boğaziçi University participated in the study. Their mean years of education was 15.72 ($SD = 1.85$, range = 12 to 22). Most of the participants were single (91.3%), and none had children. All participants received course credit for participating.

Materials

The participants were asked to write down “a memory of an important event from your life” (episodic memory); “an important imagined event that could have happened, but did not happen in your life” (episodic counterfactual; see Appx. B for examples); and “an important imagined future event that might happen in your life” (episodic future projection). Furthermore, the participants were instructed to generate events from 1 month ago/into the future, 1 year ago/into the future, and five or more years ago/into the future. Hence, participants generated a total of nine events. The order of events was counterbalanced between participants, for a total of six possible orders. The order of temporal distance was fixed: Participants reported the most recent event first and the most remote event last. They were asked to write a few sentences for each memory/imagined event and to give it a brief title.

After recording each event, participants answered questions concerning the phenomenological characteristics of the events. These questions were adapted from Rubin, Schrauf, and Greenberg (2003), Rubin and Berntsen (2009), Berntsen and Bohn (2010), and Szpunar and Schacter (2013). Questions on the following topics measured the extents of people's subjective experience when they recollected and imagined an event (on 7-point-Likert scales): vividness, pre/living, visual imagery, auditory imagery, spatial imagery, emotional valence, emotional intensity, importance, perspective, voluntary rehearsal, involuntary rehearsal, ease of remembering/imagining, and specificity. The participants also dated the events, to ensure that they had followed the instructions to write down events from different temporal distances.

Table 1 shows all the phenomenology questions for episodic memories, and their corresponding scales. Appendix A then shows the modified questions for episodic counterfactuals and episodic future projections. The wordings of the questions

were modified for the different event types, so that all three types of events were clearly distinguishable.

Following the questions related to event phenomenology, participants filled in the 7-item version of the Centrality of Event Scale (CES, Short form; Berntsen & Rubin, 2006) for each event. This scale measures to what extent negative and/or positive life events are evaluated as being central to one's life story and identity (e.g., "I feel that this event has become a central part of my life story," "This event permanently changed my life"). Participants indicated to what degree they agreed or disagreed with each of the statements on a 5-point Likert scale, from 1 = *Totally disagree* to 5 = *Totally agree*.

For episodic memories, the standard instructions for answering the CES questions were used (Berntsen & Rubin, 2006). For episodic counterfactuals and episodic future projections, the instructions were modified slightly. For episodic counterfactuals, the instructions were

When answering the following seven questions, think about how you would have felt if the imagined event had actually happened. Please place yourself in the situation that the imagined event had actually taken place and then answer the following questions in an honest and sincere way by choosing a number from 1 to 5.

For episodic future projections, the instructions were

When answering the following seven questions, think about how you would feel if the imagined event happens. Please place yourself in the situation that the

imagined event has taken place in the future and then answer the following questions in an honest and sincere way by choosing a number from 1 to 5.

Procedure

Participants were tested in groups of 15–20; the testing sessions took approximately an hour. Each student was first asked to read and sign the informed consent form, and then was given the "memories and imagined events" booklet, which contained the following information and instructions:

Dear participant, this is a study about memories and imagined events. On the following pages you will be asked to remember important memories from your life. You will also be asked to imagine important events that might happen in your future or might have happened in your past, but did not occur. Please read the instructions on each page carefully and write down specific memories/imagined events. This means that memories/imagined events you write should belong to a specific time and a specific place, and their duration should not exceed a full day—24 hours. Please write a few sentences for each memory/imagined event. After you finish writing each memory/imagined event, please provide a brief title and answer a number of questions about it. All of your answers will remain confidential.

Table 1 Phenomenology questions answered for episodic memories

1. (Vividness) This memory is vivid. (1 = *not at all*, 7 = *to a very high degree*).
2. (Reliving) As I remember the memory, I feel as though I am reliving the original event. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
3. (Visual imagery) As I remember the memory, I can see it in my mind. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
4. (Auditory imagery) As I remember the memory, I can hear it in my mind. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
5. (Spatial imagery) As I remember the memory, I know the location of people/objects in the place where it occurred—spatial layout. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
6. (Emotional valence) The emotions I have when I recall the memory are (−3 = *very negative*, +3 = *very positive*).
7. (Emotional intensity) The emotions I have when I recall the memory are intense. (1 = *not at all*, 7 = *to a very high degree*).
8. (Importance) The memory is important to my life. (1 = *not at all*, 7 = *to a very high degree*).
9. (Perspective) When I recall the memory, I primarily see what happened from a perspective as seen through (1 = *my own eyes*, 7 = *an observer's eyes*).
10. (Voluntary rehearsal) Since it happened, I have willfully thought back to this event in my mind and thought about it or talked about it. (1 = *not at all*, 7 = *very often*).
11. (Involuntary rehearsal) Has the memory of the event suddenly popped up in your thoughts by itself—that is, without your having attempted to remember it? (1 = *not at all*, 7 = *very often*).
12. (Ease of remembering) Remembering this memory was (1 = *very easy*, 7 = *very difficult*).
13. (Specificity) This memory was specific in the sense that it happened at a specific time and place, and its duration did not exceed a full day—24 hours. (1 = *not at all*, 7 = *very specific*).
14. (Date) How long ago did this event occur? (weeks/months/years ago).

Participants focused on events at different temporal distances, one at a time, and answered the phenomenology and centrality questions for each before moving to another. The last page of the booklet consisted of demographic information questions (e.g., gender, years of education, and marital status). At the end of the testing sessions, participants were thanked and debriefed.

Content scoring

All events were content-coded for CLS events by the first author and an independent coder, on the basis of the Turkish CLS (Erdoğan, Baran, Avlar, Taş, & Tekcan, 2008). The interrater agreement was substantial (87%, Cohen's $\kappa = .76$, $p < .001$), and disagreements were resolved by discussion. To determine whether participants had understood the instructions and produced actual episodic counterfactuals, and not just more randomly imagined events, the first author and an independent coder coded all episodic counterfactuals ($N = 205$). This coding was based on generally accepted theoretical definitions of counterfactuals (e.g., Beck & Riggs, 2014; Byrne, 2007; De Brigard et al., 2013; Epstude & Roese, 2008; Schacter et al., 2015). A key requirement was the explicit description of an alternative outcome of an actual past experience—an outcome that could have happened but did not take place. The two coders unanimously agreed that 93% of the records were counterfactuals (Cohen's $\kappa = .54$, $p < .001$). The remaining 7% were classified as counterfactuals after discussion, because nothing in the descriptions indicated that they were not counterfactuals, and because the participants had not been instructed to provide sufficiently detailed descriptions to allow for objective coding. Some examples of episodic counterfactuals are presented in Appendix B.

Results

We will first present results for our manipulation check for temporal distance. In line with the order of our hypotheses, we will then present results for the variables for which episodic memories received higher scores (e.g., sensory imagery, perspective, ease of remembering/imagining, and specificity), the variables for which episodic future projections received higher scores (e.g., emotional valence, importance, voluntary rehearsal, and centrality to life story and identity), and the content. Finally, we will present results for emotional intensity and involuntary rehearsal.

Manipulation check for temporal distance

To check whether the temporal distance manipulation worked, we converted all answers for temporal distance into weeks and conducted a 3 (Event Type: episodic memory, episodic counterfactual, episodic future projection) \times 3 (Time Distance: 1 month, 1 year, 5+ years) repeated measures analysis of variance

(ANOVA) with temporal distance in weeks as the dependent variable. As expected, we found a significant main effect of temporal distance on temporal distance in weeks, $F(2, 126) = 959.29$, $p < .001$, $\eta_p^2 = .93$. The main effect of event type was not significant, but there was a significant interaction, $F(4, 252) = 2.78$, $p = .03$, $\eta_p^2 = .04$. Simple-effects analyses showed that at all temporal distances, the datings of all event types were similar ($ps > .05$). For all event types, the events at 5+ years were the remotest, and the events at 1 month were the most recent. Overall, this ensured that the only difference between temporal distances could be attributed to our experimental manipulation and not to the event types. Hence, our temporal distance manipulation worked.

Higher phenomenology ratings for actual past events

Since the interitem correlations were high between the sensory detail items for vividness, pre/living, visual imagery, and auditory imagery, a composite score called “sensory-imagery” was created for each event type before the analyses (Cronbach's α s ranged from .75 to .93; see Berntsen & Bohn, 2010, for a similar procedure). To examine differences in sensory-imagery, spatial imagery, specificity, ease of remembering/imagining and perspective as a function of event type and temporal distance, we conducted 3 (Event Type: episodic memory, episodic counterfactual, episodic future projection) \times 3 (Time Distance: 1 month, 1 year, 5+ years) repeated measures ANOVAs. Figure 1 shows the means for sensory-imagery, spatial imagery, specificity, ease of remembering/imagining, and perspective as a function of event type and temporal distance. In the graphs, episodic memories are referred to as “past” and episodic future projections as “future.” The figure shows a quite consistent pattern, with episodic remembering being rated higher (or, for observer perspective, lower) on these measures than are the other event types. At the same time, there was a tendency for these measures to show a decrease across time. Both observations are consistent with our hypotheses. In the following discussion, we offer more detailed analyses.

We observed a significant main effect of event type for sensory-imagery, $F(2, 128) = 21.85$, $p < .001$, $\eta_p^2 = .25$. Bonferroni-corrected post-hoc analyses showed that episodic memories were rated significantly higher than both episodic counterfactuals and episodic future projections (both $ps < .001$), but episodic counterfactuals and episodic future projections were not different from each other ($p > .05$). The main effect of temporal distance on sensory-imagery ratings was also significant, $F(2, 128) = 9.42$, $p < .001$, $\eta_p^2 = .13$. Bonferroni-corrected post-hoc analyses showed that events at 1 month and 1 year were rated similarly ($p > .05$), but both were rated higher than events at 5+ years ($ps \leq .05$). The interaction was not significant. The main effect of event type on spatial imagery was also significant, $F(2, 128) = 39.98$, $p < .001$, $\eta_p^2 = .38$. Bonferroni-corrected post-hoc analyses showed that episodic memories were rated higher than other event types (both $ps < .001$). Temporal distance had a significant main effect, as well: $F(2, 128) = 4.52$, $p = .01$, $\eta_p^2 = .06$. Events at 1 month were

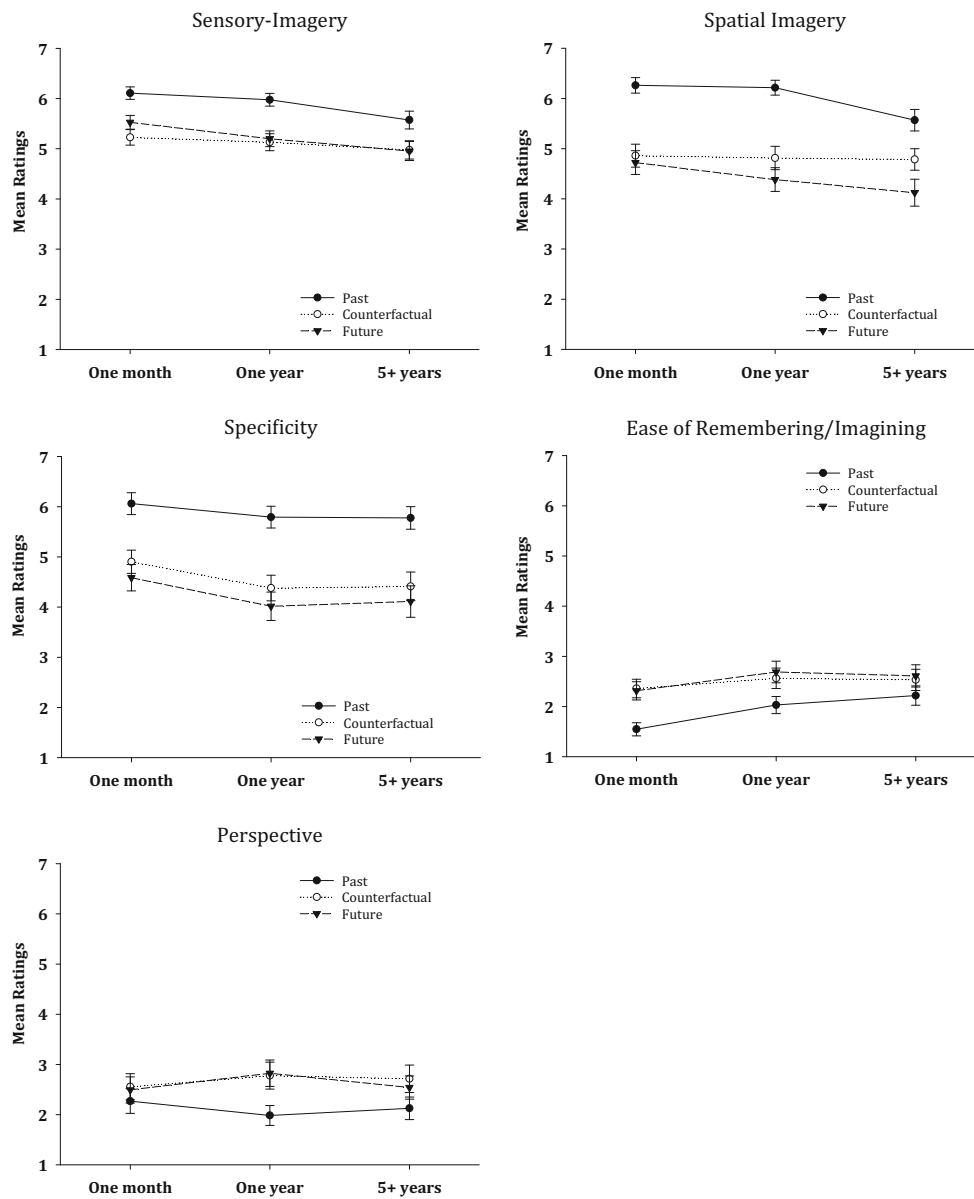


Fig. 1 Mean ratings of sensory-imagery, spatial imagery, specificity, ease, and perspective, as a function of event type and temporal distance. Error bars represent the standard errors of the means.

higher on spatial imagery than were events at 5+ years ($p = .03$). Events at 1 year did not differ from events at either 1 month or 5+ years (both $ps > .05$). Event type and temporal distance did not interact.

Significant main effects of event type also emerged for specificity [$F(2, 124) = 36.33, p < .001, \eta_p^2 = .37$], perspective [$F(2, 124) = 4.15, p = .018, \eta_p^2 = .63$], and ease of remembering/imagining [$F(2, 126) = 8.92, p < .001, \eta_p^2 = .12$]. Bonferroni-corrected post-hoc analyses showed that episodic memories were significantly more specific than episodic future projections and episodic counterfactuals (both $ps < .001$), which did not differ from each other ($p > .05$). Episodic memories involved significantly more field (first-person) perspective than did episodic

counterfactuals ($p = .05$) and episodic future projections ($p = .03$), which again did not differ from each other ($p > .05$). Moreover, remembering episodic memories was considered easier than imagining either episodic counterfactuals ($p < .001$) or episodic future projections ($p = .002$). There were significant main effects of temporal distance on both ease of remembering/imagining [$F(2, 126) = 4.87, p = .01, \eta_p^2 = .07$] and specificity [$F(2, 124) = 4.04, p = .02, \eta_p^2 = .06$]. Bonferroni-corrected post-hoc analyses showed that events at 1 month were easier to remember/imagine than events at either 1 year ($p = .006$) or 5+ years ($p = .05$). Ease of remembering/imagining ratings for events at 1 year and 5+ years did not differ ($p > .05$). Similarly, events at 1 month were more specific than

events at 5+ years ($p = .05$), but no other comparisons were significant ($ps > .05$). We observed no significant interactions.

Higher phenomenology ratings for imagined future events

Figure 2 shows that the mean ratings for emotional valence, importance, voluntary rehearsal, and centrality to the life story and identity as a function of event type and temporal distance were generally higher for future projections (e.g., Berntsen & Bohn, 2010). For some of these measures, a systematic increase with increasing temporal distance was seen. Both findings are consistent with our hypotheses. In the following paragraphs, we offer more detailed analyses.

We found a significant main effect of event type on emotional valence, $F(2, 128) = 93.61, p < .001, \eta_p^2 = .59$. Bonferroni-corrected post-hoc analyses showed that episodic future projections were more positive than the other event types (both $ps < .001$). Temporal distance did not have a significant main effect, but there was a significant interaction between event type and temporal distance, $F(4, 256) = 3.53, p < .01, \eta_p^2 = .05$. Simple-effects analyses showed that across temporal distances, episodic future projections were consistently rated as more positive than both episodic memories and episodic counterfactuals (all $ps < .001$), whereas episodic memories and episodic counterfactuals were not different from each other ($ps > .05$). Moreover, for episodic future projections, ratings at 1 month were lower than ratings at both 1 year ($p = .01$) and 5+ years ($p = .001$). No

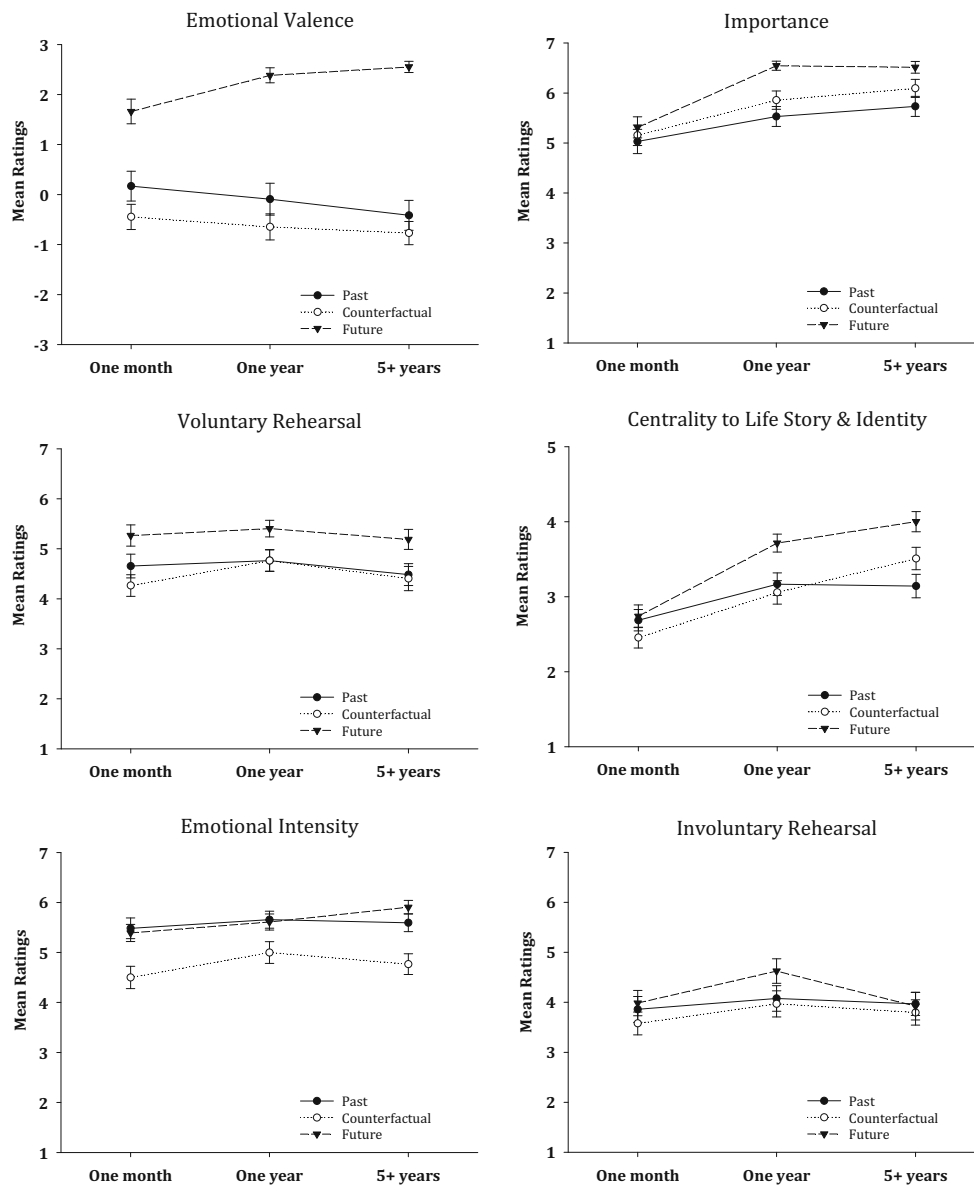


Fig. 2 Mean ratings of emotional valence, importance, voluntary rehearsal, centrality, emotional intensity, and involuntary rehearsal, as a function of event type and temporal distance. Error bars represent the standard errors of the means.

significant difference was observed between emotional valence at 1 year and 5+ years ($p > .05$). For the other two event types, no significant differences in valence ratings were apparent across temporal distances ($ps > .05$).

The main effect of event type on importance was significant, $F(2, 126) = 13.04, p < .001, \eta_p^2 = .17$. Bonferroni-corrected post-hoc analyses showed that episodic future projections were significantly more important than either episodic memories ($p < .001$) or episodic counterfactuals ($p = .006$), which did not differ from each other ($p > .05$). There was also a significant main effect of temporal distance, $F(2, 126) = 24.09, p < .001, \eta_p^2 = .28$. Bonferroni-corrected post-hoc analyses showed that events at 1 month were less important than events at 1 year and at 5+ years (both $ps < .001$), which did not differ from each other ($p > .05$). The interaction between event type and temporal distance was not significant.

We observed a significant main effect of event type on voluntary rehearsal, $F(2, 126) = 14.30, p < .001, \eta_p^2 = .19$. Bonferroni-corrected post-hoc analyses showed that episodic future projections were more voluntarily rehearsed than both episodic memories ($p = .002$) and episodic counterfactuals ($p < .001$), which did not differ from each other ($p > .05$). Neither the main effect of temporal distance nor the interaction was significant. For involuntary rehearsal, the main effect of event type was not significant. Moreover, although the main effect of temporal distance on involuntary rehearsal reached a statistical significance of $p = .05$, Bonferroni-corrected post-hoc analyses did not yield any significant differences in ratings between 1 month, 1 year, and 5+ years ($ps > .05$). The interaction between event type and temporal distance was not significant, either.

A significant main effect of event type on CES ratings emerged, $F(2, 124) = 12.04, p < .001, \eta_p^2 = .16$. Bonferroni-corrected post-hoc analyses showed that episodic future projections were significantly more central to the life story and identity than were other event types (both $ps < .001$). The main effect of temporal distance was significant, as well: $F(2, 124) = 45.99, p < .001, \eta_p^2 = .43$. Events at 1 month were less central to the life story and identity than were events at 1 year and at 5+ years (both $ps < .001$). Furthermore, the interaction between event type and temporal distance was significant for CES ratings, $F(4, 248) = 4.17, p < .01, \eta_p^2 = .06$. Simple-effects analyses showed that at 1 month, all event types were equally central to the life story and identity ($ps > .05$). At 1 year, episodic future projections were more central than episodic memories ($p = .006$) and episodic counterfactuals ($p = .002$), whereas these did not differ from each other ($p > .05$). Finally, at 5+ years, the centrality ratings were higher for episodic future projections than for episodic counterfactuals ($p = .01$) and episodic memories ($p < .001$). Episodic counterfactuals received higher ratings than episodic memories ($p = .04$), as well. For episodic memories, ratings at 1 month were lower than the ratings at 1 year ($p = .003$) and 5+ years ($p = .033$). The ratings at 1 year and 5+ years did not differ from each other ($p > .05$). The same pattern was observed for episodic future

projections: Ratings at 1 month were lower than ratings at both 1 year and 5+ years (both $ps < .001$). The ratings at 1 year and at 5+ years were, again, not different ($p > .05$). For episodic counterfactuals, however, the ratings at 5+ years were higher than those at 1 month ($p < .001$) and 1 year ($p = .03$), but the ratings at 1 year were also higher than the ratings at 1 month ($p < .001$).

Distinct phenomenology of episodic counterfactuals

The bottom of Fig. 2 shows the means for emotional intensity as a function of event type and temporal distance. We observed a main effect of event type, $F(2, 126) = 24.86, p < .001, \eta_p^2 = .28$. Bonferroni-corrected post-hoc analyses showed that episodic counterfactuals were less emotionally intense than the other two event types (both $ps < .001$), which did not differ from each other ($p > .05$). Neither the main effect of temporal distance nor the interaction was significant.

Reliance on the cultural life script

One of the aims of the present study was to examine whether there were any differences between episodic memories, episodic counterfactuals, and episodic future thoughts regarding their reliance on the CLS. A 3 (Event Type: episodic memory, episodic counterfactual, episodic future projection) \times 3 (Time Distance: 1 month, 1 year, 5+ years) repeated measures ANOVA yielded a significant main effect of temporal distance [$F(2, 130) = 33.52, p < .001, \eta_p^2 = .34$] on the percentage of CLS events. Bonferroni-corrected post-hoc analyses showed that the percentages of CLS events consistently increased from temporally close (1 month) to temporally distant (5+ years) events (14%, 30%, and 51%, respectively; all $ps < .01$). Thus, CLS events on average are mentioned equally frequently for episodic memories, episodic counterfactuals, and episodic future projections, and their frequencies of mention increase equally across temporal distances from the present, as is shown in Fig. 3.

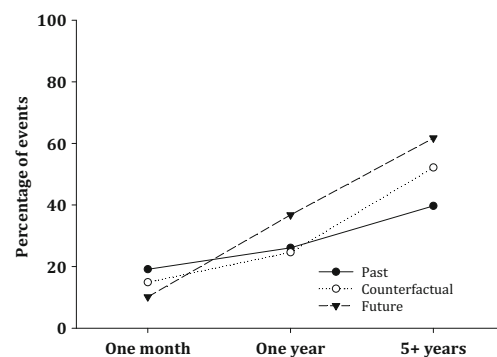


Fig. 3 Reference to cultural life script events in percentages, as a function of event type and temporal distance

Discussion

We have examined episodic counterfactual thinking in the context of episodic remembering and episodic future projection. We developed a new method to elicit episodic counterfactuals, which allowed participants to freely generate counterfactual thoughts about personal events in the same way as they did for episodic memories and future projections, in order to allow for systematic comparisons across the three event types. The three event types were compared with regard to their content and phenomenological characteristics, and how these were affected by temporal distance. This study design offered a unique opportunity to disentangle the complexity of episodic counterfactuals, as being both simulations of hypothetical events and past-oriented cognitions. Their special combination of positions on the two dimensions crucial for understanding MTT—that is, temporal direction (past vs. future) and reality (real vs. imagined)—enabled us to examine whether these dimensions are orthogonal, or whether episodic simulation generally should be seen as more of a future-oriented type of cognition (Szpunar et al., 2014).

As predicted, episodic memories were recalled with higher levels of sensory and spatial details. They were also more specific, more easily remembered, and experienced more from a field perspective than were the other event types. These results agree with findings from previous studies showing that memories contain more perceptual and contextual event details (e.g., D'Argembeau & Van der Linden, 2004; De Brigard & Giovanello, 2012).

Importantly, episodic counterfactuals and future projections followed different patterns than memories, and also differed from one another. First, future projections were rated as more positive, more important, more voluntarily rehearsed, and more central to the life story and identity. As was suggested by previous research, these higher subjective ratings of future projections on voluntary rehearsal, positivity, importance, and centrality may stem from self-enhancement biases (e.g., Grysman, Prabhakar, Anglin, & Hudson, 2015) or future goals and motivations (e.g., D'Argembeau & Mathy, 2011). Second, when people imagined episodic counterfactuals, they neither produced as many details as they did for episodic memories of actual past events, nor did they consider these alternatives as being as positive, important, or central to the life story and identity as imagined future events.

Overall, our findings suggest an interaction between past versus future temporal direction and real versus imagined events, resulting in different cognitive and motivational processes underlying the unique characteristics of each of the three mental event types. First, in line with the reality- and source-monitoring frameworks (e.g., Johnson, Hashtroudi, & Lindsay, 1993; Johnson & Raye, 1981; McGinnis & Roberts, 1996), the recall of rich perceptual and contextual details from

actually experienced events helps people differentiate their episodic memories from other constructive cognitive processes, such as imagining counterfactual and future events. Although our memory is error-prone (e.g., Bartlett, 1932; Loftus & Pickrell, 1995; Roediger & McDermott, 1995), we usually are able to distinguish our personal memories from products of our imagination in general (Johnson & Raye, 1981). This is consistent with our finding that episodic memories were more detailed and sensory rich than the two imagined event categories. Second, as we predicted, and in line with previous findings (e.g., Berntsen & Bohn, 2010; Grysman et al., 2013; Kane et al., 2012; Newby-Clark & Ross, 2003; Rasmussen & Berntsen, 2013; Sharot, Riccardi, Raio, & Phelps, 2007; Van Boven & Ashworth, 2007), future projections were conceived as being highly positive and idealized, whereas episodic counterfactuals did not show such a positivity bias. This finding supports our hypothesis that episodic counterfactuals and episodic future thoughts have different phenomenological characteristics, even though they are both simulations of hypothetical events.

Several explanations might account for the positivity bias for future events. First, healthy individuals tend to see the personal future in a positive light, and lack of this positive view is generally linked to psychopathology (e.g., MacLeod & Byrne, 1996; MacLeod & Conway, 2007; Sharot et al., 2007; Weinstein, 1980), suggesting that the optimism bias has important implications for psychological and physical health (Taylor & Brown, 1988; Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). Second, previous studies have shown that everyday future-oriented thoughts have important implications for action planning and goal pursuit (e.g., D'Argembeau & Mathy, 2011; D'Argembeau, Renaud, & Van der Linden, 2011). Hence, imagining desired positive outcomes for the future may be beneficial for goal attainment, through increased motivation, effective planning, and problem solving (but see Pham & Taylor, 1999; Taylor, Pham, Rivkin, & Armor, 1998). Third, the mere fact that the future is yet to occur, in contrast to the past, may result in unrealistic optimism and a sense of control over future events (e.g., Heckhausen, 1997; Markus & Nurius, 1986; Taylor & Brown, 1988) and may make it difficult to imagine negative events in the future (e.g., D'Argembeau & Van der Linden, 2004; Newby-Clark & Ross, 2003). Finally, as has been suggested by the “temporal self-appraisal” theory (Ross & Wilson, 2002; Wilson & Ross, 2000, 2001, 2003), self-enhancement biases, as manifested by people's tendency to conceive themselves as improving over time, are stronger for the future (e.g., Rasmussen & Berntsen, 2013), and the effects of self-enhancement on positivity have been shown to be independent of the increased reference to CLSs for future events (Grysman et al., 2013, 2015).

In addition to the systematic differences between the three event types, we also found systematic effects of temporal distance across event types. Distance in time was generally accompanied by a reduction of the phenomenological qualities of episodic memories (e.g., sensory imagery and specificity) and by an increase in characteristics associated with future projections (e.g., importance, centrality to the life story and identity, and higher percentages of CLS events). These findings agree with previous findings (Berntsen & Bohn, 2010) and with the “temporal construal theory” (Trope & Liberman, 2003), according to which events are represented in more abstract terms (high-level construals) as the temporal distance from the present increases. Trope and Liberman suggested that high-level, as compared to low-level, construals include more generalized and decontextualized information about event representations. Hence, as people mentally move farther away in time from the present, they imagine highly schematic events in broader terms, such as culturally normative schemas (e.g., the CLS; Berntsen & Bohn, 2010), for which specific sensory details are lacking or deemphasized (e.g., D’Argembeau & Van der Linden, 2004; Gryzman et al., 2013).

However, when imagined future events occur naturally in everyday life, they tend to be dated closer to the present than are past events (see, e.g., Berntsen & Jacobsen, 2008; Spreng & Levine, 2006). Yet, in the present study, we kept the temporal distances for future and past events similar by requesting events at fixed time intervals for both temporal directions. We did so in order to examine how the characteristics of the remembered and imagined events unfold under the same temporal constraints. Previous research using less constrained methods with regard to the time course of MTT suggests that constructions of distant future events rely more on schematic knowledge than do the constructions of distant past events (e.g., Addis, Wong, & Schacter, 2007; Berntsen & Jacobsen, 2008; Rasmussen & Berntsen, 2013; Szpunar et al., 2007).

In the present study, some of the effects of temporal distance were more pronounced for future events, resulting in significant interactions. For example, future projections were more central to the life story and identity with increasing time distance, whereas episodic memories and counterfactuals were not. This may suggest that schema-based construction increases as a function of future time distance and, hence, that event representations become more abstract and idealized with an increasingly remote future horizon. Here, the finding that episodic counterfactuals were more central to the life story and identity than were episodic memories for temporally distant events suggests that counterfactual thinking about the past may have greater preparatory function for future behavior than does just remembering the past (Roese & Olson, 1995). However, people might need some time to reflect on what might have happened in the past, in order to judge how important and central to the life story and identity these other events could have been. Thus, when an episodic

counterfactual is about a very recent event, people might not have had enough time to evaluate how much this event would have shaped their life story and identity.

The present study has some limitations. First, we used a college student sample, and this could potentially affect the generalizability of the results. The replication of a number of established findings from previous research, however, supports the validity and reliability of the present findings. Nonetheless, further research might focus on different age groups to better understand the life-span development of the characteristics of episodic memories, episodic counterfactuals, and future projections. For example, the role of episodic counterfactuals in old age could inform the reminiscence literature (Fitzgerald, 1996; Westerhof & Bohlmeijer, 2014; Westerhof, Bohlmeijer, & Webster, 2010). Second, we used one type of cueing (by time intervals and requests for events). Thus, we do not know whether our findings would generalize to other cueing methods. Previous research (e.g., D’Argembeau & Van der Linden, 2004; Rasmussen & Berntsen, 2013) has pointed out that methodological differences in event sampling (e.g., manipulating temporal distance vs. keeping it open-ended) may lead to different results (e.g., an increased positivity bias for the future). Thus, future studies might compare different methods, in order to examine temporal effects on the phenomenological characteristics of episodic memories, episodic counterfactuals, and future projections.

Conclusion

Taken together, we successfully used a new and relatively open-ended method to systematically compare episodic counterfactuals to episodic memories and future projections. Because they refer to imagined events in the past, episodic counterfactuals can be seen as a crossover of two important dimensions in the MTT literature—namely, past versus future and real versus imagined. Our findings suggest that these two dimensions are best viewed as orthogonal, since in general the characteristics of episodic counterfactuals resembled either episodic memories or future projections. We found that episodic memories of actually experienced events had greater perceptual and contextual details, consistent with the reality- and source-monitoring frameworks (e.g., Johnson et al., 1993; Johnson & Raye, 1981). These perceptual and contextual details may help people to confidently assess their memories as being accurate and believable and to differentiate actually experienced from imagined past and future events. Our findings also suggest that past- versus future-oriented imaginations clearly differ, in that only future projections are associated with uncorrected positive illusions and a more abstract and idealized view of life, consistent with the view that episodic future thinking has important motivational functions in relation to goal pursuit.

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Appendix A

Table 2 Phenomenology questions answered for episodic counterfactuals

1. (Vividness) This imagined event is vivid. (1 = *not at all*, 7 = *to a very high degree*).
2. (Reliving) As I imagine the event, I feel as though I am experiencing the event now. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
3. (Visual imagery) As I imagine the event, I can see it in my mind. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
4. (Auditory imagery) As I imagine the event, I can hear it in my mind. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
5. (Spatial imagery) As I imagine the event, I know the location of people/objects in the place where it could have occurred—spatial layout. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
6. (Emotional valence) The emotions I have when I imagine the event are (−3 = *very negative*, +3 = *very positive*).
7. (Emotional intensity) The emotions I have when I imagine the event are intense. (1 = *not at all*, 7 = *to a very high degree*).
8. (Importance) If it had happened, the imagined event would have been important to my life. (1 = *not at all*, 7 = *to a very high degree*).
9. (Perspective) When I imagine the event, I primarily see what could have happened from a perspective as seen through (1 = *my own eyes*, 7 = *an observer's eyes*).
10. (Voluntary rehearsal) Since the time it could have happened, I have willfully thought back to this event in my mind and thought about it or talked about it. (1 = *not at all*, 7 = *very often*).
11. (Involuntary rehearsal) Has the imagined event suddenly popped up in your thoughts by itself—that is, without your attempting to imagine it? (1 = *not at all*, 7 = *very often*).
12. (Ease of remembering) Imagining this event was (1 = *very easy*, 7 = *very difficult*).
13. (Specificity) This imagined event was specific in the sense that it could have happened at a specific time and place, and its duration would not have exceeded a full day—24 hours. (1 = *not at all*, 7 = *very specific*).
14. (Date) If this event had happened, how long ago would it have happened? (weeks/months/years from now).

Table 3 Phenomenology questions answered for episodic future projections

1. (Vividness) This imagined event is vivid. (1 = *not at all*, 7 = *to a very high degree*).
2. (Reliving) As I imagine the event, I feel as though I am preliving the event. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
3. (Visual imagery) As I imagine the event, I can see it in my mind. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
4. (Auditory imagery) As I imagine the event, I can hear it in my mind. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
5. (Spatial imagery) As I imagine the event, I know the location of people/objects in the place where it might occur—spatial layout. (1 = *not at all*, 7 = *as clearly as if it were happening now*).
6. (Emotional valence) The emotions I have when I imagine the event are (−3 = *very negative*, +3 = *very positive*).
7. (Emotional intensity) The emotions I have when I imagine the event are intense. (1 = *not at all*, 7 = *to a very high degree*).
8. (Importance) The imagined event will be important to my life. (1 = *not at all*, 7 = *to a very high degree*).
9. (Perspective) When I imagine the event, I primarily see what might happen from a perspective as seen through (1 = *my own eyes*, 7 = *an observer's eyes*).
10. (Voluntary rehearsal) I have willfully imagined the event in my mind and thought about it or talked about it. (1 = *not at all*, 7 = *very often*).
11. (Involuntary rehearsal) Has the imagined event suddenly popped up in your thoughts by itself—that is, without your attempting to imagine it? (1 = *not at all*, 7 = *very often*).
12. (Ease of remembering) Imagining this event was (1 = *very easy*, 7 = *very difficult*).
13. (Specificity) This imagined event was specific in the sense that it might happen at a specific time and place, and its duration will not exceed a full day—24 hours. (1 = *not at all*, 7 = *very specific*).
14. (Date) How long from now might this imagined event happen? (weeks/months/years ago).

Appendix B

Table 4 Examples of episodic counterfactual thoughts

Time distance: 1 month

Example (Woman, 20 years)

I did not study for one of my departmental courses because I thought the teacher asks very difficult questions at the exam and the course is so complicated that even if I study, I cannot understand anyways. Yet, the exam was really easy. If I had studied a bit, I would have gotten all questions correct, but I did not; I failed the departmental course. Since this course was a prerequisite, it really affected my schedule. Everything would have been much easier, if I had studied.

Time distance: 1 year

Example (Man, 23 years)

Little more than a year ago, I had a terrible experience with drugs. It kept going worse; I experienced blackouts and loss of consciousness. If the circumstances had been just slightly different during that time, it could have definitely led to my death.

Time distance: 5+ years

Example (Woman, 21 years)

When I took the high school entrance exam almost 7 years ago, I got lower scores than I had expected. Therefore, I attended a high school of a lower degree. However, if I had waited for the 2nd round of placement after the exam, I could have attended a high school of a higher degree and I could have gotten a better education.

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