Visual perspective in remembering and episodic future thought

Kathleen B. McDermott[1], Cynthia L. Wooldridge[2], Heather J. Rice[1], Jeffrey J. Berg[1], and Karl K. Szpunar[3]

[1]Department of Psychology, Washington University in St. Louis, St Louis, MO, USA
[2]Department of Psychology, Washburn University, Topeka KS, USA
[3]Department of Psychology, University of Illinois at Chicago, Chicago, IL, USA

According to the constructive episodic simulation hypothesis, remembering and episodic future thinking are supported by a common set of constructive processes. In the present study, we directly addressed this assertion in the context of third-person perspectives that arise during remembering and episodic future thought. Specifically, we examined the frequency with which participants remembered past events or imagined future events from third-person perspectives. We also examined the different viewpoints from which third-person perspective events were remembered or imagined. Although future events were somewhat more likely to be imagined from a third-person perspective, the spatial viewpoint distributions of third-person perspectives characterizing remembered and imagined events were highly similar. These results suggest that a similar constructive mechanism may be at work when people remember events from a perspective that could not have been experienced in the past and when they imagine events from a perspective that could not be experienced in the future. The findings are discussed in terms of their consistency with—and as extensions of—the constructive episodic simulation hypothesis.

Keywords: Autobiographical memory; Episodic future thought; Mental time travel; Simulation; Visual perspective

Episodic future thought refers to a type of self- and future-oriented imagery that is centred on a distinct episode in time (Atance & O'Neill, 2001; Szpunar, 2010). For example, envisioning oneself taking an upcoming driving test or imagining oneself passing through a busy intersection on a cycling outing that is to take place later in the day would both be considered episodic future thinking. This type of thought is tied closely to remembering, in terms of both definition (it is, in essence, the flip side of remembering) and its characteristics (see Szpunar, 2010, for a review).

For example, people with medial temporal lobe amnesia experience not only profound breakdowns in the ability to remember episodes from their personal past, but also impaired ability to envision events in their personal futures (Hassabis, Kumaran, Vann, & Maguire, 2007; Klein, Loftus, & Kihlstrom, 2002; Tulving, 1985). Moreover, conditions that lead to more subtle memory impairments, such as schizophrenia and depression, also produce an accompanying deficit in episodic future thought (D'Argembeau, Raffard, & Van der Linden, 2008; Williams et al., 1996, for

---

Correspondence should be addressed to Kathleen McDermott, Psychology Dept., CB 1125, Washington University, One Brookings Drive, St Louis, MO 63130-4899, USA. E-mail: kathleen.mcdermott@wustl.edu

schizophrenia and depression, respectively). Both capacities develop at about four years of age (Busby & Suddendorf, 2005). Furthermore, neuroimaging studies have shown similarities in the neural signature of remembering and episodic future thought (e.g., Addis, Wong, & Schacter, 2007; Szpunar, Watson, & McDermott, 2007; for a recent review, see Schacter et al., 2012).

These similarities do not, however, tell the complete story. Clearly, there is a phenomenological difference between remembering and envisioning the future—the two subjective experiences are not typically confused. For instance, remembering leads to higher ratings of sensorial details and clarity of location than does episodic future thought (Arnold, McDermott, & Szpunar, 2011; D'Argembeau & Van der Linden, 2004). A network of brain regions in parahippocampal cortex and retrosplenial complex activates more during remembering than during episodic future thinking (Gilmore, Nelson, & McDermott, 2014), a finding that has been interpreted in light of the observation that contextual associations are more readily available for episodes being remembered than for those being constructed from scratch. That is, parahippocampal cortex and retrosplenial complex activate more when contextual associations are plentiful (Bar & Aminoff, 2003) and activate more for remembering than for episodic future thought (Gilmore et al., 2014).

Notwithstanding the differences, the similarities between these two processes have been integrated in a hypothesis termed the *constructive episodic simulation hypothesis* (Schacter & Addis, 2007). This hypothesis holds that memory's constructive nature may exist in order to allow individuals to flexibly recombine prior experiences in order to envision potential future scenarios. As such, "memory" regions are engaged when envisioning the future so as to merge elements from memory in the creation of a plausible future scenario. This hypothesis, of course, also fits well with the aforementioned neuropsychological findings that impairments of memory in hippocampal amnesia are accompanied by deficits in episodic future thought (Addis & Schacter, 2012).

Visual perspective in remembering

A central distinction in the autobiographical memory literature has been made between field memories (i.e., memories experienced from the first-person perspective, as originally experienced) and observer memories (i.e., those recollected from the third person perspective, as if an observer watching oneself participate in the event; Nigro & Neisser, 1983). Yet Rice and Rubin (2011) noted that although numerous studies have asked subjects to classify individual memories as having occurred from the first- or third-person perspective, none had directly queried third-person perspectives to examine the location(s) from which these memories take place. That is, third-person perspectives had been bundled together as an undifferentiated category, despite the possibility that third-person perspectives could originate from disparate spatial locations.

Using a novel methodology, Rice and Rubin (2011) demonstrated that third-person perspectives are common—indeed, more common than previously observed. More importantly, however, the authors also showed that the third-person perspective is quite variable with respect to spatial position (i.e., where the observer is located) and that the typical third-person perspective varies across event type. For example, when remembering a group performance, people tended to remember the event from a perspective in front of their location during the original event. When remembering running from a threat, conversely, individuals tended to remember the event from a perspective behind their location during the original event.

Goals of the present study

In the present study, we applied the approach of Rice and Rubin (2011) to both memory *and* episodic future thought. Our study addressed the following questions: Do first-person (or third-person) perspectives predominate in episodic future thought? How does the distribution of spatial perspectives in future thought compare to that of remembering? To the extent that third-person perspectives are adopted in episodic future thought, do

they vary (as do third-person perspective memories), or do they occur from a canonical perspective? To this end, a direct comparison of first- and third-person perspectives for memory and episodic future thought was conducted.

An ancillary goal was to contrast phenomenological characteristics of remembering and episodic future thought (Arnold et al., 2011; D'Argembeau & Van der Linden, 2004; Szpunar & McDermott, 2008). How do they differ with respect to difficulty, vividness, and other characteristics? Further, can the first-person/third-person classification shed light on these phenomenological differences between memories and future thoughts?

EXPERIMENTAL STUDY

Method

Participants
Sixty undergraduate volunteers from Washington University in St. Louis participated in partial fulfilment of a course requirement.

Materials
Ten event cues, previously employed by Rice and Rubin (2011), were utilized: (a) *being in a group performance*; (b) *demonstrating a skilled act to a child or a friend*; (c) *giving an individual public presentation*; (d) *having a face-to-face conversation*; (e) *in an accident or near an accident*; (f) *running for exercise*; (g) *studying*; (h) *swimming*; (i) *walking or running from a threatening situation*; and (j) *watching the news on television*.[1] Each event cue was paired at random with a time cue, which instructed participants either to remember a personal event (*past*) or to imagine a plausible personal future event (*future*). Each participant received a different randomized order of event cues, and counterbalancing ensured that each event cue was paired with the past and future orientations equally often across participants. Stimuli and instructions were presented using E-prime software (Psychology Software Tools, Pittsburgh, PA).

Procedure
Participants were informed that they would be given a series of cues and asked to, for each cue, recall a specific related memory or imagine a specific related event that could plausibly occur in the future. They then completed three temporally contiguous phases (see Figure 1 for a summary), adapted from Rice and Rubin (2011). The entire session lasted approximately 45 minutes.

Phase 1. Participants were presented with a series of event–time cue pairs (e.g., future–*watching the news*). For each pair, the participants were asked to think of a related specific future event or memory, as indicated by the cue. After an individual event–time cue pair had been imagined or remembered, participants were to type in a two-to-three-word description of the event that could help them retrieve their mental image at a later time. This phase was self-paced with no time limits.

Phase 2. Participants were informed that visual perspectives can originate from various spatial positions within an image, then were subsequently given examples of different positions and how each one could be described in terms of *height* (e.g., from about ceiling height), *location* (e.g., directly behind myself), and *distance* (e.g., approximately 10 feet away). These instructions included a first-person perspective position, as well as several third-person perspective positions. Subsequently, participants were informed that they would be provided their two-to-three-word descriptions from Phase 1, be asked to reenvision the events, and—finally—describe the locus of each perspective in relation to its position within the scene. For example, if a participant saw the scene from a position floating in front and above, he or she might respond, "directly in front of myself, from above, about 10 feet away". These instructions were provided *after* Phase 1 to avoid introducing any bias into the original mental images.

After typing their perspective description, participants answered 15 questions about the

---

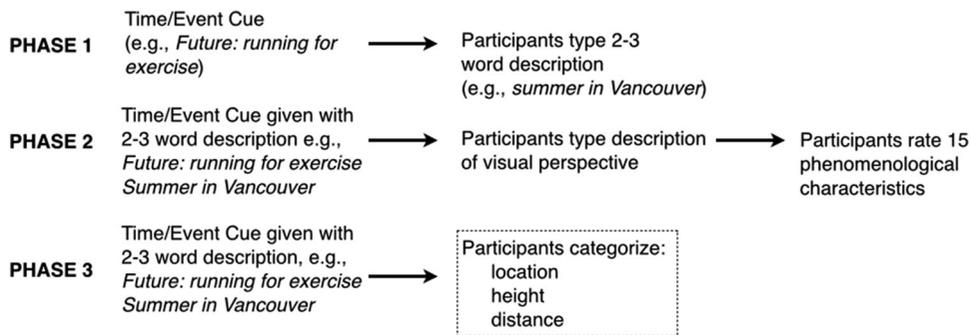[1]These cues had been adapted from Nigro and Neisser's (1983) study.

Figure 1. *Schematic of the steps involved in each of the three temporally contiguous phases.*

phenomenological characteristics of the remembered or imagined event (e.g., "The relative spatial arrangement of people in my image of the event is. . . . 1 = vague to 7 = clear"), which were adapted from the Memory Characteristics Questionnaire (Johnson, Foley, Suengas, & Raye, 1988). This process (cue, description, ratings) was repeated for all 10 event–time cue pairs.

Phase 3. Each event–time cue pair and its accompanying two-to-three-word description were presented once again. Participants were asked to categorize their perspectives from among sets of options within the *height*, *location*, and *distance* dimensions (as opposed to the self-generated depictions in Phase 2). For example, the height of a given visual perspective could be classified as: "own eye level," "slightly above own head," "from waist height," "from ceiling height," and so forth. These categorizations were queried in a separate phase so that participants would not simply adopt them in their Phase 2 descriptions of visual perspective (please see the Appendix for descriptions and response options for each visual perspective dimension).

Results

The primary question of interest was whether, and how, the visual perspective that participants adopted differed as a function of engaging in episodic future thought or remembering, which is described first. The secondary question of how

episodic future thought and memory differ on other phenomenological characteristics is then described. The significance threshold was set at $p < .05$, with corrections for multiple comparisons where appropriate (described below).

Visual perspective

Visual perspective was considered in two ways, both of which derive from the data obtained at the end of Phase 3 (see Figure 1). We consider first whether the perspective adopted was from a first- or a third-person point of view. Subsequently, we explore more deeply the nuances of the third-person perspective.

First or third person. A perspective was coded as being first person if the participant chose "from my own eyes" for both the distance and location questions. In any event in which there was disagreement between these two questions (33 of 600 perspectives, or 5.5%), the descriptions of perspective from Phase 2 (see Figure 1) were examined by the authors, and the data were coded according to that description. The height dimension was not used to code perspective because there was no "from my own eyes" option, and a perspective "from the level of my eyes" could represent a first- or third-person perspective.

As can be seen in Figure 2, there were more third- than first-person perspectives in both episodic future thought and memory. Further, the figure suggests that third-person perspectives occurred more often in episodic future thought than in
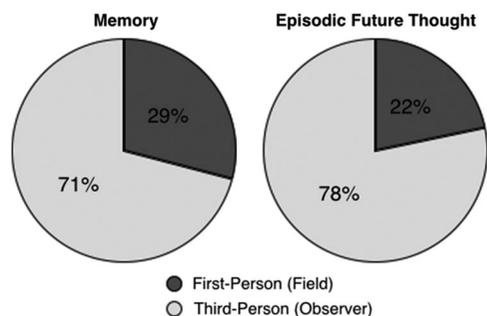
Figure 2. *Percentage of first- and third-person perspectives in memory and episodic future thought (data from Phase 3).*

memory. Indeed, a Wilcoxon signed-rank test (computed with SPSS, v.22) comparing the frequency with which future thoughts were experienced in the third-person perspective to the frequency with which memories were experienced in the third-person perspective showed that participants reported significantly more third-person perspectives—and therefore fewer first-person perspectives—for episodic future thoughts (78.3%, $SEM = 3.6\%$) than memories (70.7%, $SEM = 4.0\%$), $z(N = 32) = 2.60,$[2] $p = .009$, $r = .24$. The correlation between the number of third-person memories and the number of third-person future thoughts across people was $r = .70$, $p < .001$, indicating that people who were more likely to generate third-person memories were also more likely to generate third-person future thoughts.

Characteristics of the third-person perspective. To answer whether or not episodic future thought and memory differed with respect to the spatial location of third-person perspectives, perspective locations were categorized into four dimensions taken from their Phase 3 categorizations: (a) *height* (below eye level, eye level, above eye level); (b) *distance* (less than six feet, greater than six feet); (c) *location—front/back* (behind, alongside, in front); and (d) *location—side/body* (right, centre, left). To the extent that the constructive nature of memory is responsible for the occurrence

of remembered third-person perspectives, one might predict little difference between memories and future thoughts given that episodic future thought is inherently constructive.

Indeed, as can be seen in Figure 3, perspective locations were fairly similar for memories and future thoughts when collapsing across the event cues. In particular, there was no difference between memories and future thoughts in the distance, $\chi^2(2, N = 436) = 0.3$, $p = .581$, $\phi_c = .03$, front/back, $\chi^2(3, N = 416) = 1.68$, $p = .431$, $\phi_c = .06$, and side/body dimensions, $\chi^2(3, N = 416) = 1.30$, $p = .522$, $\phi_c = .06$. Within the height dimension, however, memories and future thoughts differed significantly, $\chi^2(3, N = 426) = 6.96$, $p = .031$, $\phi_c = .13$, as future thoughts (vs. memories) were more often viewed from below eye level (27.1% vs. 19.0%, respectively) and less often viewed from eye level (30.3% vs. 41.5%, respectively), with similar proportions of above eye level perspectives across future and past episodes (42.5% vs. 39.5%, respectively).

Furthermore, because each participant responded to 10 different event cues and therefore could have contributed multiple responses to any one cell in Figure 3, we chose to analyse the data for each event cue separately. That is, memory and episodic future thought were contrasted for each of the 10 events in each of the four dimensions. Within the height and side/body dimensions, none of the event cues demonstrated significant differences in perspective. Moreover, only one event cue within the distance dimension was significant at the $p < .05$ level: Imagining running for exercise in the future was associated with more perspectives from closer than six feet than a memory of the same event, $\chi^2(2, N = 45) = 4.98$, $p = .026$, $\phi_c = .33$. Lastly, two of the 10 event cues featured significant differences within the front/back dimension: Imagining being in a group performance, $\chi^2(3, N = 47) = 7.85$, $p = .02$, $\phi_c = .41$, and watching the news on television, $\chi^2(3, N = 38) = 7.92$, $p = .019$, $\phi_c = .46$, in the future were both associated with more perspectives from behind than memories of

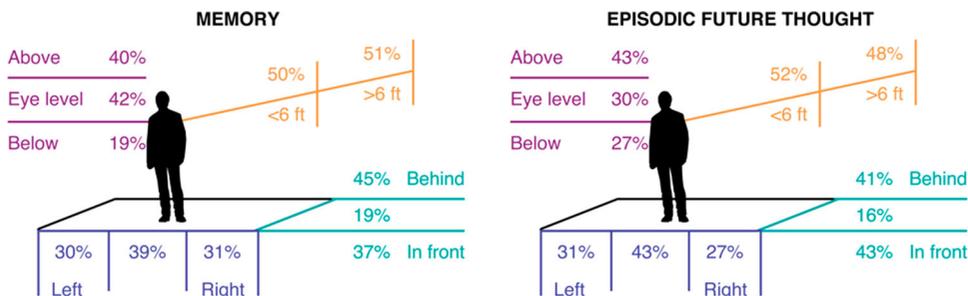[2]The sample size is reduced as a result of tied observations.

Figure 3. *Distributions of third-person perspective locations across memory and episodic future thought. Data from Phase 3. Cases in which the sum of percentages do not equal 100 are due to rounding error. To view this figure in color, please visit the online version of this Journal.*

the same events. When correcting for multiple comparisons (10 events; corrected $\alpha = .05/10 = .005$), however, memory and episodic future thought did not differ on any of the four dimensions for any event. Of course, this Bonferroni correction is conservative, so the appropriate conclusion from these suggestive results awaits future research.

Phenomenological characteristics
Here we consider the phenomenological characteristics that were rated at the end of Phase 2 (see Figure 1). Of primary interest was the comparison between memories and future thoughts. Therefore, phenomenological ratings were compared across memories and episodic future thoughts, collapsing across first- and third-person perspectives, as well as across event cues. We then averaged each subject's rating per characteristic for memory and future thought and conducted paired t tests. Because there were 15 characteristics, we corrected for multiple comparisons by setting $\alpha = .05/15 = .003$. Prior work in this area (e.g., Arnold et al., 2011; D'Argembeau & Van der Linden, 2004) led to the prediction that memories would be accompanied by more vivid ratings than future thought.

As can be seen in Figure 4, memories were rated higher than future thoughts on 10 of the 15 phenomenological characteristics, all of which survived the multiple comparisons correction (corrected $\alpha = .003$): (p)reexperiencing ($M_P = 4.91$, $M_F = 4.50$; $d = 0.45$); location clarity ($M_P = 6.20$, $M_F = 4.94$; $d = 1.1$); movement

clarity ($M_P = 4.69$, $M_F = 4.25$; $d = 0.48$); object clarity ($M_P = 5.32$, $M_F = 4.57$; $d = 0.68$); people clarity ($M_P = 5.21$, $M_F = 4.48$; $d = 0.79$); sound details ($M_P = 3.89$, $M_F = 3.31$; $d = 0.55$); visual details ($M_P = 5.45$, $M_F = 4.89$; $d = 0.63$); whether the event formed a coherent story ($M_P = 4.82$, $M_F = 3.64$; $d = 0.86$); time clarity ($M_P = 5.39$, $M_F = 4.35$; $d = 0.87$); and the feeling of traveling in time to the event ($M_P = 4.88$, $M_F = 4.05$; $d = 0.84$) [all ts$(59) > 3.5$, ps $\leq .001$].

Memories were rated as less difficult to produce than were future thoughts ($M_P = 3.14$, $M_F = 3.57$), $t(59) = -2.7$, $p = .009$, $d = -0.35$, although this difference did not survive the correction for multiple comparisons (corrected $\alpha = .05/15 = .003$). The remaining four characteristics (emotion intensity, positive emotion, negative emotion, and taste/smell details) did not differ between memory and episodic future thought [all ts$(59) \leq 2.07$, ps $\geq .043$] when subjected to the multiple comparisons corrections. An examination of these data broken down by solely first-person or solely third-person perspective produced no appreciable differences.

To the extent that memory and episodic future thought represent two manifestations of a common set of processes, one might expect individual variation in the clarity of memory to correlate with that for episodic future thought. For example, do subjects who tend to report high clarity of visual details when remembering also report high clarity of visual details for their episodic future thoughts? To this end, we again collapsed
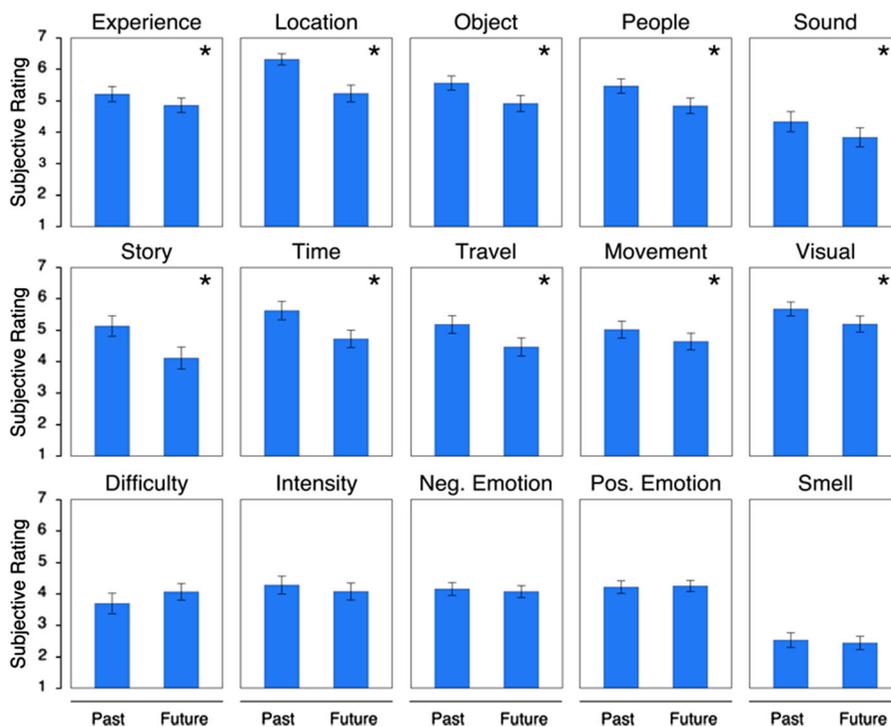
Figure 4. *Mean ratings for phenomenological characteristics for memory and episodic future thought. Error bars represents standard errors of the mean.*

Note: * = comparisons achieving statistical significance after correcting for multiple comparisons *(p < .003).*

across perspectives and across event cues, averaged each subject's rating (per characteristic) for memory and future thought, and found the correlation (across subjects) between the average memory and average future thought ratings for each phenomenal characteristic. In particular, subjects' average ratings for memories and future thoughts were significantly correlated on each phenomenological characteristic (all $rs \geq .40$, $ps < .001$) except for negative emotion ($r = .18$, $p = .177$).

Are first-person perspectives more vivid than third-person perspectives? The data reported here revealed some evidence of such a difference (cf. Nigro & Neisser, 1983; Robinson & Swanson, 1993). For each phenomenal characteristic, paired t tests were conducted on each subject's average rating for first- and third-person perspectives (collapsing across memory and future thought). Four phenomenal characteristics demonstrated differences between first- and third-person perspectives: Feelings of (p)reexperiencing, people clarity, and negative emotion all were rated higher when subjects maintained first-person perspectives, whereas positive emotion was greater when subjects took third-person perspectives. After correcting for multiple comparisons (corrected $\alpha = .05/15 = .003$), however, only feelings of (p)reexperiencing and people clarity differed, with negative emotion, $t(41) = 2.65$, $p = .011$, $d = 0.41$, and positive emotion, $t(41) = -2.23$, $p = .031$, $d = -0.34$, failing to meet the correction. Specifically, feelings of re- (or pre)experiencing were greater for first-person ($M_{1st} = 5.09$) than for third-person ($M_{3rd} = 4.52$) perspectives, $t(41) = 3.43$, $p = .001$, $d = 0.53$, and the clarity of people in the image was also greater for first-person ($M_{1st} = 5.21$) than for third-person ($M_{3rd} = 4.60$) perspectives, $t(41) = 3.27$, $p = .002$, $d = 0.5$.

Discussion

In this study, episodic future thought and remembering both tended to be experienced from the third-person perspective, but this tendency was greater for future thought than for remembering. An examination of third-person perspective events suggests that memories and future thoughts are experienced from similar vantage points and that these vantage points vary as a function of the specific event being remembered or imagined. Further, we observed individual differences in the experiences of remembering and future thought; people who experience remembering in a vivid way tend also to imagine vividly. And finally, remembering and episodic future thought tend to covary, but with the tendency for remembering to be more vividly experienced. For example, both remembering and future thinking elicited low vividness ratings for smell, whereas location, objects, and people were rated as being vividly experienced.

The results reported replicate Rice and Rubin's (2011) findings that third-person perspectives can be common in remembering and extend this conclusion to future thought. Further, these results replicate their finding that third-person perspectives are not a single, canonical visual perspective but instead vary from event to event. Interestingly, this variability in third-person perspective locations extends to future thought. In addition, people who tended to experience third-person perspectives when remembering also tended to experience them during future thought, suggesting that this may be a stable individual difference across people.

The results extend our understanding of the constructive episodic simulation hypothesis, which states that constructive processes support remembering and episodic future thought. One corollary of this hypothesis is that episodic future thought is inherently more constructive than remembering because future events have not yet taken place. Our data support this view in that future thoughts were more likely to be imagined from a third-person perspective than memories. Notably, there is no indication in the literature as to whether common or distinct constructive processes are at work in the context of remembering and episodic future thought. The highly overlapping distributions of third-person perspectives observed for remembered and simulated events in the present study point to the influence of a common constructive process.

Specific experimental factors may have contributed to the high rate of third-person perspectives reported in our study and the accompanying overlap in distribution of third-person perspectives. For instance, it is possible that the high level of third-person perspectives observed in this study may be an artefact of the particular cues employed (e.g., remember/imagine having a face-to-face conversation). In another study, D'Argembeau and Van der Linden (2004) used a more open-ended cueing technique (e.g., remember/imagine an event within the past/next year) and found a higher incidence of first-person perspectives in memory and future thought than what we report here. Importantly, instructions about perspective in that study were presented prior to simulation. Moreover, studies that find high rates of first-person perspectives often explicitly instruct participants to generate memories and future events from a first-person (as opposed to a third-person) perspective (e.g., Addis et al., 2007). Clearly, additional work that takes into consideration the role of cue type and nature of instructions about visual perspective is needed to tease apart experimental influences on the occurrence of first- and third-person perspectives in memory and future thought. Such work should also take into consideration the role of temporal distance, as prior research has shown that temporally distant memories and future events are more likely to be experienced from a third-person perspective (D'Argembeau & Van der Linden, 2004).

The above considerations aside, it was still the case that the distribution of third-person perspectives in our study was highly similar across remembered and simulated events. Along these lines, we note that participants were required to remember simulated events prior to categorizing those events in terms of perspective. Although the extent to which such short-term reactivation of a

simulated event might change its mental representation is unclear at this point, additional work that more stringently controls for the presence/absence of prior simulation would be valuable. Finally, it will be important for future work to discriminate between the influence of episodic and semantic memory in terms of the constructive process(es) that support remembering and future thought. For example, it is possible that third-person perspectives of remembered and simulated events can be based on either elements extracted from relevant episodic memories (Szpunar & McDermott, 2008) or schematic biases extracted from repeated experiences or perhaps repeated viewings of movies and television shows (e.g., a speech is typically seen from the perspective of an audience, and such schematic biases may influence the formation of third-person perspectives in memory and future thought).

Our findings provide further insights into the emerging literature on individual differences in the phenomenology of episodic future thought and remembering. For example, Arnold et al. (2011) demonstrated that one's proclivities in thinking about time (as measured by the Zimbardo Time Perspective Inventory; Zimbardo & Boyd, 1999) predict the phenomenological experiences of remembering and future thought. D'Argembeau and Van der Linden (2006) demonstrated that people who are low in expressive suppression (i.e., who are open to experiencing feelings) tend to have high levels of re- and preexperiencing events. Here we show that across visual perspective, people who tend to report vivid experiences in remembering tend also to report vivid episodic future thinking.

In summary, the present data extend the observations that episodic future thought and remembering share phenomenological characteristics. As has often been observed, the phenomenology is not identical across the two (nor should it be, as we can typically tell the difference between imagining and remembering). Commonalities in third-person perspective across remembering and episodic future thought add to the literature demonstrating similarities in the two processes. These similarities have been proposed to arise from constructive processes (Schacter & Addis,

2007), a hypothesis that fits well with the data observed here. In short, visual perspective (first or third person, and the specific vantage point within third person) is highly similar for remembering and future thinking.

REFERENCES

Addis, D. R., & Schacter, D. L. (2012). The hippocampus and imagining the future: Where do we stand? *Frontiers in Human Neuroscience*, *5*, 173. doi:10.3389/fnhum.2011.00173

Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). Remembering the past and imagine the future: Common and distinct neutral substrates during event construction and elaboration. *Neuropsychologica*, *45*, 1363–1377. doi:10.1016/j.neuropsychologia.2006.10.016

Arnold, K. M., McDermott, K. B., & Szpunar, K. K. (2011). Individual differences in time perspective predict autonoetic experience. *Consciousness and Cognition*, *20*, 712–719. doi:10.1016/j.concog.2011.03.006

Atance, C. M., & O'Neill, D. K. (2001). Episodic future thinking. *Trends in Cognitive Sciences*, *5*, 533–539. doi:10.1016/S1364-6613(00)01804-0

Bar, M., & Aminoff, E. (2003). Cortical analysis of visual context. *Neuron*, *38*, 347–358. doi:10.1016/S0896-6273(03)00167-3

Busby, J., & Suddendorf, T. (2005). Recalling yesterday and predicting tomorrow. *Cognitive Development*, *20*, 362–372. doi:10.1016/j.cogdev.2005.05.002

D'Argembeau, A., Raffard, S., & Van der Linden, M. (2008). Remembering the past and imagining the future in schizophrenia. *Journal of Abnormal Psychology*, *117*, 247–251. doi:10.1037/0021-843X.117.1.247

D'Argembeau, A., & Van der Linden, M. (2004). Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: Influence of valence and temporal distance. *Consciousness and Cognition*, *13*, 844–858. doi:10.1016/j.concog.2004.07.007

D'Argembeau, A., & Van der Linden, M. (2006). Individual differences in the phenomenology of mental time travel: The effect of vivid visual imagery and emotion regulation strategies. *Consciousness and Cognition*, *15*, 342–350. doi:10.1016/j.concog.2005.09.001

Gilmore, A. W., Nelson, S. M., & McDermott, K. B. (2014). The contextual association network activates more for remembered than for imagined events. *Cerebral Cortex*. Advance online publication. doi:10.1093/cercor/bhu223

Hassabis, D., Kumaran, D., Vann, S. D., & Maguire, E. A. (2007). Patients with hippocampal amnesia cannot imagine new experiences. *Proceedings of the National Academy of Sciences of the United States of America*, *104*, 1726–1731. doi:10.1073/pnas.0610561104

Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General*, *117*, 371–376. doi:10.1037/0096-3445.117.4.371

Klein, S. B., Loftus, J., & Kihlstrom, J. F. (2002). Memory and temporal experience: The effects of episodic memory loss on an amnesic patient's ability to remember the past and imagine the future. *Social Cognition*, *20*, 353–379. doi:10.1521/soco.20.5.353.21125

Nigro, G., & Neisser, U. (1983). Point of view in personal memories. *Cognitive Psychology*, *15*, 467–482. doi:10.1016/0010-0285(83)90016-6

Rice, H. J., & Rubin, D. C. (2011). Remembering from any angle: The flexibility of visual perspective during retrieval. *Consciousness and Cognition*, *20*, 568–577. doi:10.1016/j.concog.2010.10.013

Robinson, J. A., & Swanson, K. L. (1993). Field and observer modes of remembering. *Memory*, *1*, 169–184. doi:10.1080/09658219308258230

Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and imagining the future. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, *362*, 773–786. doi:10.1098/rstb.2007.2087

Schacter, D. L., Addis, D. R., Hassabis, D., Martin, V. C., Spreng, R. N., & Szpunar, K. K. (2012). The future of memory: Remembering, imagining, and the brain. *Neuron*, *76*, 677–694. doi:10.1016/j.neuron.2012.11.001

Szpunar, K. K. (2010). Episodic future thought: An emerging concept. *Perspectives on Psychological Science*, *5*, 142–162. doi:10.1177/1745691610362350

Szpunar, K. K., & McDermott, K. B. (2008). Episodic future thought and its relation to remembering: Evidence from ratings of subjective experience. *Consciousness and Cognition*, *17*(1), 330–334. doi:10.1016/j.concog.2007.04.006

Szpunar, K. K., Watson, J. M., & McDermott, K. B. (2007). Neural substrates of envisioning the future. *Proceedings of the National Academy of Sciences*, *104*, 642–647. doi:10.1073/pnas.0610082104

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology*, *26*, 1–12. doi:10.1037/h0080017

Williams, J. M. G., Ellis, N. C., Tyers, C., Healy, H., Rose, G., & MacLeod, A. K. (1996). The specificity of autobiographical memory and imageability of the future. *Memory & Cognition*, *24*, 116–125. doi:10.3758/BF03197278

Zimbardo, P. G., & Boyd, J. N. (1999). Putting time in perspective: A valid, reliable individual-differences metric. *Journal of Personality and Social Psychology*, *77*, 1271–1288. doi:10.1037/0022-3514.77.6.1271

APPENDIX

Descriptions and response options for each visual perspective dimension in Phase 3

Height
When referring to the height, we are interested in the height of the origin of your visual perspective. That is, does it seem that you are floating above the scene or lying on the floor looking up at the scene? We are interested in the ORIGIN of the perspective, NOT where you are looking.

1: Own eye level
2: Slightly above own head
3: From waist height
4: From ceiling height
5: From above ceiling height
6: From level of floor
7: Other

Location
When referring to the spatial location, we are again interested in the location of the origin of your visual perspective. That is, does it seem that the origin is directly to the left of your location during the event or is it in front and to the right of your location during the event? We are interested in the ORIGIN of the perspective, NOT where you are looking.

1: Directly in front of yourself, facing yourself

2: Directly behind yourself
3: To the left and behind you
4: To the right and behind you
5: To your left and in front of you
6: To your right and in front of you
7: Directly to your left
8: Directly to your right
9: From your own eyes
10: Other

Distance

When referring to the distance, we are again interested in the distance of the origin of your visual perspective from yourself.

That is, does it seem that you are approximately a foot away from your location during the event or 10 feet away from your location?

1: From your own eyes
2: 3 feet away or closer (arm's length is approximately 2–3 feet)
3: 3–6 feet away (6 feet is the wingspan of a 6-foot-tall person)
4: 6–20 feet away (20 feet is approximately the distance from the top of the key on the basketball court to the basket)
5: 20–100 feet away (100 feet is approximately the length of a college basketball court)
6: 100 feet away or more