Consciousness and Cognition 22 (2013) 471–478

Contents lists available at SciVerse ScienceDirect

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

The shape of things to come: Exploring goal-directed prospection

Brittany M. Christian *, Lynden K. Miles, Fiona Hoi Kei Fung, Sarah Best, C. Neil Macrae

School of Psychology, University of Aberdeen, King's College, Aberdeen AB24 3FX, Scotland, United Kingdom

ARTICLE INFO

Article history:
Received 8 December 2012

Keywords:
Mental imagery
Prospection
Action goals
Temporal distance

ABSTRACT

Through the ability to preview the future (i.e., prospection), people can anticipate how best to think, feel and act in just about any setting. But exactly what factors determine the contents of prospection? Extending research on action identification and temporal construal, here we explored how action goals and temporal distance modulate the characteristics of future previews. Participants were required to imagine travelling to Egypt (in the near or distant future) to climb or photograph a pyramid. Afterwards, to probe the contents of prospection, participants provided a sketch of their imaginary experience. Results elucidated the impact of goal type and temporal distance on mental imagery. While a climbing goal prompted participants to draw a larger pyramid in the near than distant future, a photographic goal influenced only the compositional complexity of the sketches. These findings reveal how action goals and temporal distance shape the contents of future simulations.

1. Introduction

> "Mental imagery not only allows us to predict the imminent or distant future, but also to consider many possible futures—or even many possible worlds."
> Moulton and Kosslyn (2009, p. 1274)

Whether preparing a tasty meal, insulting the boss or getting married, behavioral performance is reliably enhanced by prior episodes of goal-directed prospection (i.e., future-oriented thought, see Szpunar, 2010). By simulating potential courses the future may take (e.g., food poisoning, getting fired, irate in-laws), one can establish the optimal seasoning, curse or guest list for the particular task at hand. Fueled by a combination of personal recollections and semantic knowledge (e.g., Addis, Wong, & Schacter, 2007; Buckner & Carroll, 2007; Schacter, Addis, & Buckner, 2007; Szpunar, 2010; Tulving, 1985), prospection is an indispensable tool for navigating the complexities of everyday life. Through the ability to preview the future, people can anticipate how best to think, feel and act in just about any conceivable setting (Gilbert & Wilson, 2007, 2009; Golub, Gilbert, & Wilson, 2009; Suddendorf & Corballis, 2007). As Gilbert and Wilson observed, "We know that chocolate pudding would taste better with cinnamon than dill, that it would be painful to go an hour without blinking or a day without sitting…we know these things not because they've happened to us in the past, but because we can close our eyes, imagine these events, and pre-experience their hedonic consequences in the here and now" (2007, p. 1352).

Planning effectively for the future, of course, rests squarely on the quality of the mental simulations that are generated in the present (Bar-Anan, Wilson, & Gilbert, 2009; Gilbert & Wilson, 2007, 2009; Wilson & Gilbert, 2003). Failure to accurately simulate the fiery intensity of scotch bonnet chilies, for example, may result in a culinary concoction that fails to impress a

* Corresponding author. Address: School of Psychology, University of Aberdeen, King's College, Aberdeen AB24 3FX, Scotland, UK.
E-mail address: b.christian@abdn.ac.uk (B.M. Christian).

1053-8100/$ - see front matter
http://dx.doi.org/10.1016/j.concog.2013.02.002

spice-intolerant date. To optimize behavioral selection, prospection must not only be uniquely tailored to a desired outcome (i.e., goal), but also capture essential components of to-be-enacted events. Herein lies a troublesome feature of future previews, however. On occasion, mental representations deviate from the elements of real-world experience they are endeavoring to reproduce, prompting a raft of well-documented effects to emerge (for overviews see Gilbert & Wilson, 2009; Wilson & Gilbert, 2003). Most notably, when prospection goes awry, so too does the accuracy of people's affective forecasts and their ability to make effective future-oriented decisions (see Boyer, 2008; Gilbert, Gill, & Wilson, 2002; Morewedge, Gilbert, & Wilson, 2005; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000).

Judgmental error aside, recent work has focused on what is unquestionably the most important aspect of prospection—the contents of future previews (i.e., the representations on which prospective judgments are based). In particular, valuable insights into how exactly people think about and describe the future have been garnered from Trope and Liberman's (2003, 2010) and Liberman & Trope, 2008 influential writings on construal level theory (CLT). According to this account, representations increase in abstraction as mental simulations shift from events in the immediate to distant future (e.g., going on vacation tomorrow vs. next year). While high-level construals are abstract, decontextualized representations that convey the gist or meaning of a prospective experience (e.g., enjoying a weekend break in Italy), low-level construals comprise concrete, detail-rich characterizations of an event (e.g., packing one's suitcase, driving to the airport, boarding the plane). Empirical support for CLT is widespread and compelling, having been documented across a range of spatial, temporal and linguistic measures (see Amit, Algom, & Trope, 2009; Arnold, McDermott, & Szpunar, 2011; Bar-Anan, Liberman, Trope, & Algom, 2007; Henderson, Fujita, Trope, & Liberman, 2006; Liberman & Förster, 2009; Stephan, Liberman, & Trope, 2010; Wakslak & Trope, 2009). Put simply, temporal distance impacts people's representations of the future.

Together with the timing of an event, other influences loom large in shaping conceptions of the future. One potent, though largely understudied, factor concerns the goals around which prospection unfolds (Szpunar, 2010). Personal goals, in particular, have been shown to facilitate the organization and generation of detail-specific future representations (D'Argembeau & Demblon, 2012; D'Argembeau & Mathy, 2011). In so doing, these self-relevant construals drive prospection (Markus & Nurius, 1986) and serve a crucial preparatory function for future action (Pham & Taylor, 1999a, 1999b; Taylor, Pham, Rivkin, & Armor, 1998). Curiously, however, not all goals are conceptualized in the same manner. Presaging the principles of CLT, Vallacher and Wegner (1985) noted that goals/actions are represented in either a super- or sub-ordinate manner. Whereas superordinate (i.e., abstract) representations center on the overarching purpose of an action (i.e., *why* the action occurred), subordinate (i.e., concrete) characterizations focus instead on the specific means through which a behavior can be realized (i.e., *how* the action is performed).

Given therefore structural similarities in the properties of temporal construal and action identification, an interesting question emerges. Does temporal distance impact the representation of action goals? Preliminary evidence suggests that it does. Liberman and Trope (1998) presented participants with a series of to-be-imagined future activities (e.g., eating tomorrow or sometime next year), followed by statements pertaining to the why (e.g., getting nutrition) and how (e.g., chewing and swallowing) of each action (Vallacher & Wegner, 1989). The task was simply to select the description they believed described the activity most appropriately. Critically, a preference for superordinate (i.e., abstract) construal emerged when activities were slated to take place in the distant than near future (for related research, see Fujita, Henderson, Eng, Trope, & Liberman, 2006; Liviatan, Trope, & Liberman, 2008; Wakslak, Trope, Liberman, & Alony, 2006). Event representations tend to shift from subordinate (i.e., means to an end) to superordinate (i.e., end) characteristics as to-be-enacted goals increase in temporal distance (Liberman & Trope, 1998; Sagristano, Trope, & Liberman, 2002).

Beyond verbal descriptions of future activities however, less is known about the visual characteristics of prospective simulations. This gives rise to an important issue. When people generate mental images of the future (Atance & O'Neill, 2001; Moulton & Kosslyn, 2009; Suddendorf & Corballis, 1997) what do they look like? Moreover, are these representations shaped by the nature (goal-directed) and timing (temporal distance) of to-be-enacted future activities and how might this topic be explored empirically? Using a variety of methodological techniques (e.g., fMRI, TMS, patient studies), neuroscience research has revealed that imagery recruits the same underlying mechanisms as perception and action (see Kosslyn, Ganis, & Thompson, 2001). In addition, visual images retain the structural (e.g., spatial, organizational) properties of the objects/events they denote (Kosslyn, 1973, 1994; Rouw, Kosslyn, & Hamel, 1997). When one imagines sipping a strawberry daiquiri, for example, the resultant mental representation is supported, in large part, by the same perceptual and motoric operations that accompany the veridical experience. As a result, imagining and perceiving an object (or event) trigger equivalent subjective (e.g., emotional) responses. Given that processing objectives exert a direct influence on perception (e.g., Bar, 2009; Bar et al., 2006), what this suggests is that mental imagery likely serves as the primary medium through which action goals and temporal distance impact representations of the future (Moulton & Kosslyn, 2009). We explore this possibility in the current inquiry.

1.1. The current research

To elucidate how action goals and temporal distance shape the contents of prospection, participants were given a guided-imagery task in which they were asked to mentally simulate one of two goal-oriented activities. Specifically, participants were instructed to imagine travelling to Egypt to visit a pyramid either next week (i.e., near future) or in 10 years time (i.e., distant future). When on site, their task was to either to climb (i.e., energetic action) or to photograph (i.e., non-energetic action) the pyramid. Afterwards, to probe the contents of prospection, a drawing of the pyramid was requested as sketching has previously been shown to be an effective means of tapping the contents of perceptual representations (Fish & Scrivener, 1990; Mitchell, Ropar, Ackroyd, & Rajendran, 2005).

Our rationale is as follows. When confronted with an energetic action goal (i.e., climbing), the most goal-relevant feature of the pyramid should be its size. Generally speaking, perceptions of the environment are shaped by people's goals/intentions and their ability to act on them (Witt, Proffitt, & Epstein, 2005). Elsewhere, research has demonstrated that visual perception is moderated by the energetic demands of anticipated action. For example, a to-be-climbed hill appears steeper when one is encumbered by a heavy pack back (Bhalla & Proffitt, 1999). Here, we expect similar biases to emerge in visual imagery when the goal is salient. Specifically, participants will draw larger pyramids in the near than distant future as the mental prominence of the energetic costs of action (albeit imaginary) decline with increasing temporal distance. That is, in the terminology of CLT, the low-level, goal-relevant features of action (i.e., the means to achieve a goal) should diminish in salience as simulations shift from the near to distant future (Trope & Liberman, 2003, 2010).

In contrast, for participants with the non-energetic goal (i.e., photograph the pyramid), the size of the pyramid should remain constant as a function of temporal distance. In this condition, the most goal-relevant feature of the pyramid is its photogenic quality. As such, we expect the compositional complexity of participants' sketches (i.e., the number of elements represented in the drawings) to reflect the impact of temporal distance. Specifically, drawings will contain more elements (e.g., palm trees, camels) when the photograph is taken in the near than distant future. In summary, using a drawing methodology to probe the contents of prospective thought, we expect the interaction between action goals and temporal distance to impact the core characteristics of how people represent future events.

2. Method

2.1. Participants and design

Sixty-four undergraduates (32 females) completed the experiment for course credit. The study had a 2 (Goal: climb or photograph) × 2 (Temporal Distance: near or far) between-participants design and was reviewed and approved by the School of Psychology, University of Aberdeen ethics committee.

2.2. Stimulus materials and procedure

Participants arrived at the laboratory individually and were greeted by a female experimenter who reported that the study comprised an investigation into mental time travel (i.e., guided visual imagery). Prior to the task, participants were randomly assigned to an experimental condition and blindfolded to enhance the vividness of their imagery. The mental time travel instructions were then delivered. Specifically, participants were told to imagine travelling to Egypt to visit a pyramid either next week (i.e., near future) or in 10 years time (i.e., distant future). Critically, while half the participants were instructed that they were to take a photograph of the pyramid, the others were told they were going to climb it. The mental time travel experience was timed by the experimenter and lasted for 60 s. The blindfold was then removed and participants were given a sheet of paper (A4) on which they were asked to draw a picture of the pyramid they had imagined visiting. They were given as much time as required to complete this task. Of interest were two aspects of the drawings: (i) the size (i.e., area) of the pyramids that were depicted; and (ii) the compositional complexity (i.e., number of extra elements in the scene) of the depictions. Specifically, any item that was drawn in addition to the pyramid (e.g., camels, palm trees) contributed to the total compositional complexity score. Participants then completed a brief questionnaire that probed the vividness and valence of their time travel experiences. They did so by placing a mark on an analogue scale (14 cm line) anchored with appropriate endpoints (i.e., not at all vivid/very vivid; very negative/very positive). Finally, participants were debriefed and dismissed.

3. Results and discussion

Each measure of interest was submitted to a 2 (Action Goal: climb or photograph) × 2 (Temporal Distance: near or far) between-participants analysis of variance (ANOVA), the results of which are summarized below.

3.1. Area of pyramid

The analysis yielded main effects of Action Goal [$F(1,60) = 9.29$, $p = .003$, $\eta_p^2 = .13$] and Temporal Distance [$F(1,60) = 6.44$, $p = .014$, $\eta_p^2 = .10$] that were qualified by an Action Goal × Temporal Distance interaction, $F(1,60) = 4.43$, $p = .04$, $\eta_p^2 = .07$ (see Fig. 1, top panel). Simple effects analysis revealed that participants with a climbing goal (M = 69.62 cm, SD = 47.28 cm) drew larger pyramids than those with a photographic goal (M = 33.34 cm, SD = 19.98 cm) when travelling to the near future ($p = .001$), but there was no difference in pyramid size as a function of goal (M_{climb} = 36.93 cm, SD = 15.81 cm; $M_{photograph}$ = 30.28 cm, SD = 17.02 cm) in the distant time travel condition ($p = .53$). Simple effects analysis also revealed that participants who imagined travelling to the near future drew larger pyramids than those who imagined travelling to the

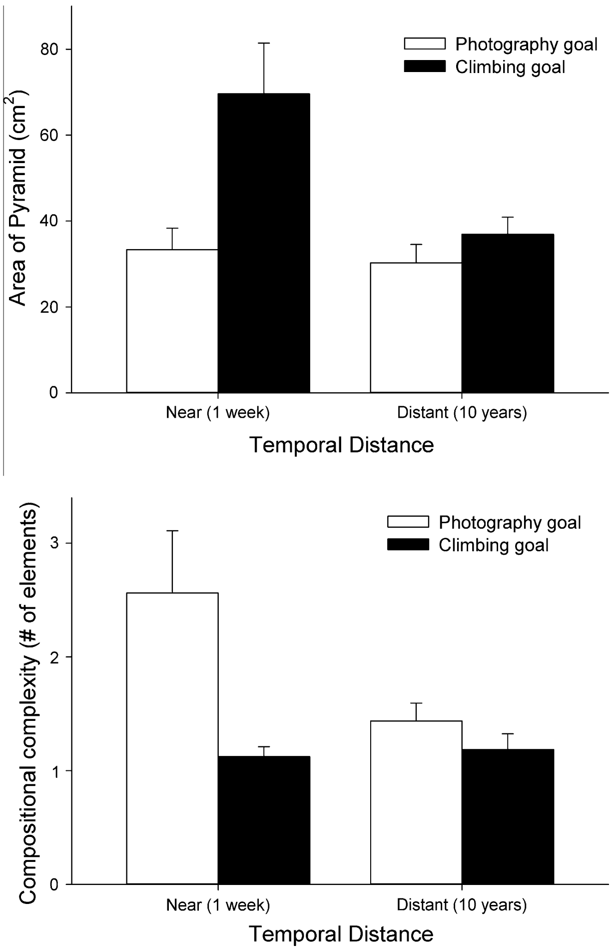

Fig. 1. Mean area (top panel) and compositional complexity (bottom panel) of pyramid drawings as a function of temporal distance (near vs. far) and action goal (climb vs. photograph). Error bars represent 1 SEM.

distant future when instructed with a climbing goal ($p = .003$), but there was no difference in the size of the pyramids as a function of temporal distance (near vs. far) if instructed with a photographic goal ($p = .78$).[1]

3.2. Compositional complexity

The analysis yielded a main effect of Action Goal [$F(1,60) = 8.13$, $p = .006$, $\eta_p^2 = .12$] and an Action Goal × Temporal Distance interaction, $F(1,60) = 4.03$, $p = .05$, $\eta_p^2 = .06$ (see Fig. 1, bottom panel). Simple effects analysis revealed that those with a photographic goal drew more elaborate representations of the scene ($M = 2.56$, $SD = 2.19$) than those with a climbing goal ($M = 1.13$, $SD = .34$) in the near future condition ($p = .001$), but there was no difference in complexity between the goal conditions ($M_{climb} = 1.44$, $SD = .63$; $M_{photograph} = 1.19$, $SD = .54$) when travelling to the distant future ($p = .56$). Simple effects analysis also revealed that participants who imagined travelling to the near future drew more complex pictures than those who imagined travelling to the distant future when instructed with a photographic goal ($p = .01$), but there was no difference in complexity as a function of temporal distance (near vs. far) if instructed with a climbing goal ($p = .89$).

3.3. Vividness

The analysis showed a main effect of Temporal Distance [$F(1,60) = 9.29$, $p = .003$, $\eta_p^2 = .13$], such that participants reported more vivid mental images in the near compared to far mental time travel conditions. No other significant effects were found.

[1] Importantly, the absence of size effects when a photographic goal was in place is unlikely to be due to the excessive amount of space that was occupied by the additional scenic items. As no pyramid in any condition covered more than 29% of the paper ($M_{space\ occupied} = 6.8\%$) ample space remained for the depiction of other items.

3.4. Valence

No significant effects emerged.

4. Discussion

The current study investigated the impact of action goals and temporal distance on the content and characteristics of prospection. Post-imagery drawings were utilized to capture how participants portrayed temporally near and far future events as a function of goal type (i.e., climb vs. photo). The results revealed that task-related components (i.e., pyramid size for climbing, scene complexity for picture taking) were prominent in drawings of near (i.e., 1 week) but not distant (i.e., 10 year) future simulations. Specifically, reflecting the salience of an energetically demanding goal, when participants were mentally gearing up for a climbing activity next week, the size of the pyramid loomed large. Preparing to take a snap shot (a much less effortful task), however, enhanced the number of scenic details that were depicted, but did not influence the size of the pyramid. In short, task-relevant characteristics were evident in illustrations of proximal events, thereby revealing how temporally relevant goals shape the contents of future previews.

4.1. The construal of the Nile

The present results confirm that prospection does not only maintain the structural properties of the real world (Kosslyn, 1973, 1994; Rouw et al., 1997), but is also sensitive to personal goals and the temporal salience of events (Austin & Vancouver, 1996; D'Argembeau & Demblon, 2012; D'Argembeau & Mathy, 2011). So while it is the same general semantic and episodic knowledge (Anderson & Dewhurst, 2009; D'Argembeau & Demblon, 2012; D'Argembeau, Renaud & Van der Linden, 2011; Schacter, Addis, & Buckner, 2008; Suddendorf & Corballis, 2007; Szpunar, 2010), that participants draw upon to imagine an experience (i.e. a trip to Egypt,) goal-relevant information is accessed (Conway, 2005, 2009; Conway & Pleydell-Pearce, 2000) to enhance prospective acuity (Taylor et al., 1998). Further, simply knowing the demands of a future undertaking alters construal in ways that are analogous to the variation that arises in perception as a result of action-oriented constraints (e.g., Bhalla & Proffitt, 1999; Witt, Proffitt & Epstein, 2005; Stefanucci, Proffitt, Banton, & Epstein, 2005; Witt, 2011). Interestingly, the task requirements in the current experiment may have prompted participants to view the pyramids from different imaginary distances (i.e., close up for climbing vs. farther away for picture taking), hence impacting their depictions. While the current results cannot discount this possibility, it is unclear why such an effect would only operate in the near future. Nevertheless, imaginary physical distance likely serves as an important element of goal-based prospection and merits direct empirical investigation (Witt & Proffitt, 2008).

The malleability observed in the construction of mental images highlights the use of prospection as an adaptive, albeit occasionally fickle, tool for future planning. As the content and characteristics of mental imagery inevitably influence behavior (Fiske, 1992; Griffin & Ross, 1991; James, 1890; Pennington & Hastie, 1988, 1993; Semin & Fiedler, 1988; Semin & Smith, 1999; Smith, 1998; Trafimow & Wyer, 1993; Vallacher & Wegner, 1987; Wegner & Vallacher, 1986; Wilson & Brekke, 1994), any goal-relevant information captured in a simulation has the potential to enhance its efficacy (Gollwitzer, 1999). Crucially, the current results suggest that feature-rich illustrations of near future events (e.g. trip to Egypt next week) are not arbitrarily ornate, but rather reflect specific action-oriented functions. To explain, the more closely representations are aligned to the characteristics and demands of future situations, the more informative and preparatory the simulation becomes (Beauchamp, Bray, & Albinson, 2002; Pham & Taylor, 1999a, 1999b; Wegner & Vallacher, 1986). To this end, the current findings substantiate the action-orientation of simulations (Witt & Proffitt, 2008; Witt et al., 2005). As prospection is essential for planning and executing upcoming behaviors, it is our suspicion that these customized mental images serve a preparatory function. Specifically, these goal-relevant construals could inform estimations of task difficulty or provide a template against which to compare actual experience (Gilbert & Wilson, 2007, 2009; Golub et al., 2009; Suddendorf & Corballis, 2007).

Beyond insight into goal-directed prospection, the present findings reveal that the integration of essential task components into mental simulations is temporally selective. Specifically, the extent to which simulations are populated with goal-relevant elements is modulated by temporal distance, with the greatest amount of relevant detail featured in mental previews of temporally proximal events. The asymmetric representations of near and far events are consistent with the principles of CLT (Trope & Liberman, 2000, 2003). According to Trope and Liberman (2003, 2008), the construction of mental representations increase in abstraction as an event becomes removed along any dimension of psychological distance (e.g., space, time, sociality or hypotheticality). Providing additional evidence for this viewpoint, here we demonstrated that remote imaginary adventures are pictorially depicted with less concrete detail than those at a temporally proximal locus. Interestingly, however, the observed effect did not impact all aspects of the illustrations equally, but rather targeted those specifically related to the task. Thus, variations in the participants' drawings reflect a conceptual shift from subordinate (i.e., individual subcomponents) to superordinate (i.e., broader meaning) goal-based construal (Vallacher & Wegner, 1985).

Problematically, however, mental constructs remain key informants for assessments of the distant future and all that it will entail (Gilbert & Wilson, 2007, 2009; Wilson & Gilbert, 2003). If temporally remote representations are lacking in pertinent detail, can they be trusted to provide reliable evaluations of distant events? An abundance of evidence has begun to suggest that they cannot. Far-off goal-related predictions are often illogical and incompatible with judgments of an equivalent temporally proximal event. These temporally discordant conclusions run parallel to the distinctions between near and far future representations evidenced here. In what are perhaps the most striking examples, behavioral evidence has identified consistent tendencies to underestimate the amount of effort a future task will require (Akerlof, 1991) and how likely one is to succeed (Gilovich, Kerr, & Medvec, 1993; Shepperd, Ouellette, & Fernandez, 1996; Taylor & Shepperd, 1998). With a brief appraisal of the mental images that shape these assessments (i.e., a smaller pyramid would require less effort to climb), we provide one tangible explanation for the otherwise puzzling variability in people's judgments.

Elsewhere, unique conceptualizations of the near and distant future permeate the scientific literature, reflecting people's tendency to miscalculate what lies (far) ahead. For example, false beliefs that next year will be less jam-packed than the current one are potentially fueled by a diminished representation of episodic detail at temporally distant loci (Christian, Miles, & Macrae, 2012; Zauberman, Kim, Malkoc, & Bettman, 2009; Zauberman & Lynch, 2005). Diminished content can also impact emotional judgments of events outside of the 'present' by deceptively weighting their importance. Affective forecasts regularly fail to accurately predict reactions to an experience (i.e., getting a PhD) because they tend to overlook other relevant factors or extenuating circumstances that will co-occur with the event (i.e., poverty, sleep deprivation, the impending threat of the job market; see Caruso, Gilbert, & Wilson, 2008; McClure, Laibson, Loewenstein, & Cohen, 2004; Pennington & Roese, 2003; Wilson & Gilbert, 2003). Notwithstanding the complications, the abstract nature of temporally remote simulations may have a number of redeeming qualities. The absence of low-level task features can, for instance, generate enthusiasm and facilitate 'bigger picture' perceptions. So while these impoverished future representations are not necessarily the most realistic or adaptive for task assessments or completion, they are consistent with the use of the promotion strategies that characterize temporally distant planning (Pennington & Roese, 2003).

That converging methodologies from different domains identify the distant future as less substantive than the near future augments the role of the present as an anchor for the authenticity of mental representations. Put quite simply, the temporal relevance of 'now' appears to be a critical component of detail rich simulations (Ainslie, 2001; Ainslie & Haslam, 1992; Berns, Laibson, & Loewenstein, 2007; Christian et al., 2012; Laibson, 1997; Loewenstein & Prelec, 1992; O'Donoghue & Rabin, 1999; Zauberman, 2003). While acknowledging the potential for positive and negative outcomes, precisely why and how the salience of vital features fades over time remains inconclusive. Future work will therefore be vital to identifying whether it is a lack of personal relevance (i.e., increased psychological distance, Liberman & Trope, 2008; Trope & Liberman, 2003), a shift from subordinate to superordinate goal representations (Vallacher & Wegner, 1985), a post hoc alteration of an atemporal simulation (Barsalou, 1991; D'Argembeau & Demblon, 2012) or an alternative explanation that underlies the formation of these imaginary constructs. This additional work is likely to elucidate whether the integration of goal related information in temporally proximal simulations is a spontaneous or intentional phenomena.

4.2. Conclusions

The current findings provide novel insight into the mental images that precede behavior. Specifically, we emphasize the action-based nature of prospection and give credence to a methodology (i.e., drawings) that can capture core components of the internally simulated world. As Kassam, Gilbert, Boston, and Wilson (2008) surmised, previous research (Caruso et al., 2008; McClure et al., 2004; Schacter et al., 2007; Trope & Liberman, 2003; Van Boven & Ashworth, 2007) suggests that "Representations of present and future events are not like two photographs with different time stamps, but rather, they are like two photographs taken from different angles with different lenses and different settings" (p. 1553). Indeed, the current results offer direct evidence for this speculation, illustrating how action goals and temporal distance interact to influence these mental pictures. Further, that task-specific details are incorporated into imaginary near future events lends valuable insight into a number of temporally dependent outcomes and demonstrates that prospection is not a static, one-dimensional tool but instead, it is a dynamic, interactive simulator. In this way, the integration of temporally proximal goal-related features creates a highly adept and uniquely tailored preview of the shape of things to come.

References

Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). Remembering the past and imagining the future: Common and distinct neural substrates during event construction and elaboration. *Neuropsychologia, 45*, 1363–1377.

Ainslie, G. (2001). *Breakdown of will*. New York: Cambridge University Press.

Ainslie, G., & Haslam, N. (1992). In G. Loewenstein, & J. Elster (Eds.). *Hyperbolic discounting in choice over time*. NY: Russell Sage.

Akerlof, G. A. (1991). Procrastination and obedience. *American Economic Review, 81*(2), 1–19.

Amit, E., Algom, D., & Trope, Y. (2009). Distance-dependent processing of pictures and words. *Journal of Experimental Psychology: General, 138*(3), 400–415.

Anderson, R. J., & Dewhurst, S. A. (2009). Remembering the past and imagining the future: Differences in event specificity of spontaneously generated thought. *Memory, 12*, 367–373.

Arnold, K. M., McDermott, K. B., & Szpunar, K. K. (2011). Imagining the near and far future: The role of location familiarity. *Memory and Cognition, 39*, 954–967.

Atance, C. M., & O'Neill, D. K. (2001). Episodic future thinking. *Trends in Cognitive Sciences, 5*(12), 533–539.

Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological Bulletin, 120*(3), 338–375.

Bar, M. (2009). The proactive brain: Memory for predictions. *Philosophical Transactions of the Royal Society Biological Sciences, 364*(1521), 1235–1243.

Bar, M., Kassam, A. S., Ghuman, J., Boshyan, A. M., Schmid, A. M., Dale, M. S., et al (2006). Top-down facilitation of visual recognition. *Proc. Natl. Acad. Sci. USA, 103*(2), 449–454.

Bar-Anan, Y., Liberman, N., Trope, Y., & Algom, D. (2007). Automatic processing of psychological distance: Evidence from a Stroop task. *Journal of Experimental Psychology: General, 136*, 610–622.

Bar-Anan, Y., Wilson, T. D., & Gilbert, D. T. (2009). The feeling of uncertainty intensifies affective reactions. *Emotion, 9*, 123–127.

Barsalou, L. W. (1991). Deriving categories to achieve goals. In G. H. Bower (Ed.). *The psychology of learning and motivation: Advances in research and theory* (Vol. 27, pp. 1–64). San Diego, CA: Academic Press (Reprinted in A. Ram, & D. Leake (Eds.), *Goal-driven learning* (1995, pp. 121–1766). Cambridge, MA: MIT Press/Bradford Books).

Beauchamp, M. R., Bray, S. R., & Albinson, J. G. (2002). Pre-competition imagery, self-efficacy and performance in collegiate golfers. *Journal of Sports Sciences, 20*(9), 697–705.

Berns, G. S., Laibson, D., & Loewenstein, G. (2007). Intertemporal choice – Toward an integrative framework. *Trends in Cognitive Sciences, 11*(11), 482–488.

Bhalla, M., & Proffitt, D. R. (1999). Visual-motor recalibration in geographical slant perception. *Journal of Experimental Psychology: Human Perception and Performance, 25*(4), 1076–1096.

Boyer, P. (2008). Evolutionary economics of mental time travel? *Trends in Cognitive Sciences, 12*(6), 219–224.

Buckner, R. L., & Carroll, D. C. (2007). Self-projection and the brain. *Trends in Cognitive Science, 11*(2), 49–57.

Caruso, E. M., Gilbert, D. T., & Wilson, T. D. (2008). A wrinkle in time: Asymmetric valuation of past and future events. *Psychological Science, 19*(8), 796–801.

Christian, B. M., Miles, L. K., & Macrae, C. N. (2012). Your space or mine? Mapping self in time. *PloS One, 7*(11), e49228. http://dx.doi.org/10.1371/journal.pone.0049228.

Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language, 53*(4), 594–628.

Conway, M. A. (2009). Episodic memories. *Neuropsychologia, 47*(11), 2305–2313.

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107*(2), 261–288.

D'Argembeau, A., & Demblon, J. (2012). On the representational systems underlying prospection: Evidence from the event-cueing paradigm. *Cognition, 125*(2), 160–167.

D'Argembeau, A., & Mathy, A. (2011). Tracking the construction of episodic future thoughts. *Journal of Experimental Psychology: General, 140*(2), 258–271.

D'Argembeau, A., Renaud, O., & Van, der Linden. (2011). Frequency, characteristics and functions of future-oriented thoughts in daily life. *Applied Cognitive Psychology, 25*, 96–103.

Fish, J., & Scrivener, S. (1990). Amplifying the mind's eye: Sketching and visual cognition. *Leonard, 23*(1), 117–126.

Fiske, S. T. (1992). Thinking is for doing: Portraits of social cognition from Daguerreotype to laserphoto. *Journal of Personality and Social Psychology, 63*(6), 877–889.

Fujita, K., Henderson, M. D., Eng, J., Trope, Y., & Liberman, N. (2006). Spatial distance and mental construal of social events. *Psychological Science, 17*, 278–282.

Gilbert, D. T., Gill, M. J., & Wilson, T. D. (2002). The future is now: Temporal correction in affective forecasting. *Organizational Behavior and Human Decision Processes, 88*(1), 430–444.

Gilbert, D. T., & Wilson, T. D. (2007). Prospection: Experiencing the future. *Science, 317*(5843), 1351–1354.

Gilbert, D. T., & Wilson, T. D. (2009). Why the brain talks to itself: Sources of error in emotional prediction. *Philosophical Transactions of the Royal Society B, 364*(1521), 1335–1341.

Gilovich, T., Kerr, M., & Medvec, V. H. (1993). Effect of temporal perspective on subjective confidence. *Journal of Personality and Social Psychology, 64*(4), 552–560.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*(7), 493–503.

Golub, S. A., Gilbert, D. T., & Wilson, T. D. (2009). Anticipating one's troubles: The costs and benefits of negative expectations. *Emotion, 9*, 277–281.

Griffin, D. W., & Ross, L. (1991). Subjective construal, social inference, and human misunderstanding. *Advances in Experimental Social Psychology, 24*, 319–359.

Henderson, M. D., Fujita, K., Trope, Y., & Liberman, N. (2006). Transcending the "here": The effect of spatial distance on social judgment. *Journal of Personality and Social Psychology, 91*(5), 845–856.

James, W. (1890). *The principles of psychology*. Cambridge: Harvard University Press.

Kassam, K. S., Gilbert, D. T., Boston, A., & Wilson, T. D. (2008). Future anhedonia and time discounting. *Journal of Experimental Social Psychology, 44*, 1533–1537.

Kosslyn, S. M. (1973). Scanning visual images: Some structural implications. *Perception and Psychophysics, 14*(1), 90–94.

Kosslyn, S. M. (1994). *Image and brain: The resolution of the imagery debate*. Cambridge, MA: MIT Press.

Kosslyn, S. M., Ganis, G., & Thompson, W. L. (2001). Neural foundations of imagery. *Nature Reviews Neuroscience, 2*, 635–642.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *The Quarterly Journal of Economics, 112*, 443–478.

Liberman, N., & Förster, J. (2009). Distancing from experienced self: How global-versus-local perception affects estimation of psychological distance. *Journal of Personality and Social Psychology, 97*, 203–216.

Liberman, N., & Trope, Y. (1998). The role of feasibility and desirability considerations in near and distant future decisions: A test of temporal construal theory. *Journal of Personality and Social Psychology, 75*(1), 5–18.

Liberman, N., & Trope, Y. (2008). The psychology of transcending the here and now. *Science, 21*(5905), 1201–1205.

Liviatan, I., Trope, Y., & Liberman, N. (2008). The effect of similarity on mental construal. *Journal of Experimental Social Psychology, 44*, 1256–1269.

Loewenstein, G., & Prelec, D. (1992). Anomalies in intertemporal choice: Evidence and interpretation. *The Quarterly Journal of Economics, 107*(2), 573–591.

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist, 41*, 954–969.

McClure, S. M., Laibson, D. I., Loewenstein, G., & Cohen, J. D. (2004). Separate neural systems value immediate and delayed monetary rewards. *Science, 306*(5695), 503–507.

Mitchell, P., Ropar, D., Ackroyd, K., & Rajendran, G. (2005). How perception impacts on drawings. *Journal of Experimental Psychology: Human Perception and Performance, 31*(5), 996–1003.

Morewedge, C. K., Gilbert, D. T., & Wilson, T. D. (2005). The least likely of times: How remembering the past biases forecasts of the future. *Psychological Science, 16*(8), 626–630.

Moulton, S. T., & Kosslyn, S. M. (2009). Imagining predictions: Mental imagery as mental emulation. *Philosophical Transactions of the Royal Society London, Series B: Biological Sciences, 364*(1521), 1273–1280.

O'Donoghue, T., & Rabin, M. (1999). Doing it now or later. *The American Economic Review, 89*(1), 103–124.

Pennington, N., & Hastie, R. (1988). Explanation-based decision making: Effects of memory structure on judgment. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 14*, 521–533.

Pennington, N., & Hastie, R. (1993). Reasoning in explanation-based decision making. *Cognition, 49*(1–2), 123–163.

Pennington, G. L., & Roese, N. J. (2003). Regulatory focus and temporal distance. *Journal of Experimental Social Psychology, 39*(6), 563–576.

Pham, L. B., & Taylor, S. E. (1999a). From thought to action: Effects of process- versus outcome-based mental simulations on performance. *Personality and Social Psychology Bulletin, 25*(2), 250–260.

Pham, L. B., & Taylor, S. E. (1999b). The effect of mental simulation on goal-directed performance. *Imagination, Cognition and Personality, 18*(4), 253–268.

Rouw, R., Kosslyn, S. M., & Hamel, R. (1997). Detecting high-level and low-level properties in visual images and visual percepts. *Cognition, 63*, 209–226.

Sagristano, M. D., Trope, Y., & Liberman, N. (2002). Time-dependent gambling: Odds now, money later. *Journal of Experimental Psychology: General, 131*(3), 364–376.

Schacter, D. L., Addis, D. R., & Buckner, R. L. (2007). Remembering the past to imagine the future: The prospective brain. *Nature Reviews Neuroscience, 8*, 657–661.

Schacter, D. L., Addis, D. R., & Buckner, R. L. (2008). Episodic simulation of future events: Concepts, data, and applications. *Annals of the New York Academy of Sciences, 1124*, 39–60.

Semin, G. R., & Fiedler, K. (1988). The cognitive functions of linguistic categories in describing persons: Social cognition and language. *Journal of Personality and Social Psychology, 54*(4), 558–568.

Semin, G. R., & Smith, E. R. (1999). Revisiting the past and back to the future: Memory systems and the linguistic representation of social events. *Journal of Personality and Social Psychology, 76*(6), 877–892.
Shepperd, J. A., Ouellette, J. A., & Fernandez, J. K. (1996). Abandoning unrealistic optimism: Performance estimates and the temporal proximity of self-relevant feedback. *Journal of Personality and Social Psychology, 70*(4), 844–855.
Smith E. R. (1998). Mental representation and memory. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (4th ed., Vol. 1, pp. 391–445). New York: McGraw Hill.
Stefanucci, J. K., Proffitt, D. R., Banton, T., & Epstein, W. (2005). Distances appear different on hills. *Attention, Perception, & Psychophysics, 67*(6), 1052–1060.
Stephan, E., Liberman, N., & Trope, Y. (2010). Politeness and social distance: A construal level perspective. *Journal of Personality and Social Psychology, 98*(2), 268–280.
Suddendorf, T., & Corballis, M. C. (1997). Mental time travel and the evolution of the human mind. *Genetic, Social, and General Psychology Monographs, 123*, 133–167.
Suddendorf, T., & Corballis, M. C. (2007). The evolution of foresight: What is mental time travel and is it unique to humans? *Behavioral and Brain Sciences, 30*, 299–351.
Szpunar, K. K. (2010). Episodic future thought: An emerging concept. *Perspectives on Psychological Science, 5*(2), 142–162.
Taylor, S. E., Pham, L. B., Rivkin, I. D., & Armor, D. A. (1998). Harnessing the imagination. Mental simulation, self-regulation, and coping. *American Psychologist, 53*(4), 429–439.
Taylor, K. M., & Shepperd, J. A. (1998). Bracing for the worst: Severity, testing and feedback as moderators of the optimistic bias. *Personality and Social Psychology Bulletin, 24*(9), 915–926.
Trafimow, D., & Wyer, R. S. (1993). Cognitive representation of mundane social events. *Journal of Personality and Social Psychology, 64*(3), 365–376.
Trope, Y., & Liberman, N. (2000). Temporal construal and time-dependent changes in preference. *Journal of Personality and Social Psychology, 79*(6), 876–899.
Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review, 110*(3), 403–421.
Trope, Y., & Liberman, N. (2010). Construal level theory of psychological distance. *Psychological Review, 117*(2), 440–463.
Tulving, E. (1985). Memory and consciousness. *Canadian Psychologist, 26*, 1–12.
Vallacher, R. R., & Wegner, D. M. (1985). *A theory of action identification*. Hillsdale, NJ: Erlbaum.
Vallacher, R. R., & Wegner, D. M. (1987). What do people think they're doing? Action identification and human behavior. *Psychological Review, 94*(1), 3–15.
Vallacher, R. R., & Wegner, D. M. (1989). Levels of personal agency: Individual variation in action identification. *Journal of Personality and Social Psychology, 57*(4), 660–671.
Van Boven, L., & Ashworth, L. (2007). Looking forward, looking back: Anticipation is more evocative than retrospection. *Journal of Experimental Psychology: General, 136*(2), 289–300.
Wakslak, C. J., & Trope, Y. (2009). The effect of construal-level on subjective probability estimates. *Psychological Science, 20*(1), 52–58.
Wakslak, C. J., Trope, Y., Liberman, N., & Alony, R. (2006). Seeing the forest when entry is unlikely: Probability and the mental representation of events. *Journal of Experimental Psychology: General, 135*(4), 641–653.
Wegner, D. M., & Vallacher, R. R. (1986). Action identification. In R. M. Sorrentino & E. L. Higgins (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (pp. 550–582). New York: Guilford.
Wilson, T. D., & Brekke, N. (1994). Mental contamination and mental correction: Unwanted influences on judgments and evaluations. *Psychological Bulletin, 116*(1), 117–142.
Wilson, T. D., & Gilbert, D. T. (2003). Affective forecasting. In M. P. Zanna (Ed.). *Advances in experimental social psychology* (Vol. 35, pp. 345–411). San Diego, CA: Academic Press.
Wilson, T. D., Wheatley, T., Meyers, J., Gilbert, D. T., & Axsom, D. (2000). Focalism: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology, 78*(5), 821–836.
Witt, J. K. (2011). Action's effect on perception. *Current Directions in Psychological Science, 20*(3), 201–206.
Witt, J. K., & Proffitt, D. R. (2008). Action specific influences on distance perception: A role for motor simulation. *Journal of Experimental Psychology: Human Perception and Performance, 34*(6), 1479–1492.
Witt, J. K., Proffitt, D. R., & Epstein, W. (2005). Tool use affects perceived distance, but only when you intend to use it. *Journal of Experimental Psychology: Human Perception and Performance, 31*(5), 880–888.
Zauberman, G. (2003). The intertemporal dynamics of consumer lock-in. *Journal of Consumer Research, 30*(3), 405–419.
Zauberman, G. B., Kim, K., Malkoc, S., & Bettman, J. R. (2009). Discounting time and time discounting: Subjective time perception and intertemporal preferences. *Journal of Marketing Research, 46*(4), 543–556.
Zauberman, G., & Lynch, J. G. (2005). Resource slack and propensity to discount delayed investments of time versus money. *Journal of Experimental Psychology, 134*(1), 23–37.