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Prototypical prospection: future events are more prototypically represented and simulated than past events

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Abstract

The results of four experiments support the hypothesis that mental time travel is more prototypical in the future tense than in the past tense. That is, prospection more than retrospection is grounded in scripts, schemas, stereotypes, and other prototypical mental representations of what people, places, and events are typically like. People reported that events in prospection rather than retrospection were more similar to each other and more similar to a prototypical event (encounters with homeless people in Experiment 1, ordering pizza in Experiment 2). Because prototypes tend to be abstract, people selected higher levels of action identification during prospection than during retrospection (Experiment 3) an effect that was not moderated by distance. Finally, drawings of future vacations that were generated by one sample of people were judged by a different sample of people, who were unaware of the drawings' tense, as more prototypical compared with drawings of past vacations (Experiment 4). Discussion centers on the underlying explanations of prototypical prospection and on the implications of these temporal asymmetries for theories of psychological distance. Copyright © 2012 John Wiley & Sons, Ltd.

The distinction between past, present, and future is only a stubbornly persistent illusion.

> Albert Einstein (cited in Dyson, 1979, p. 193)

Temporal distinctions may be an illusion to physicists, but to people in everyday life, the distinctions between past, present, and future are very real indeed. Nearly every culture distinguishes between them (Hall, 1959). Shared means of measuring and understanding time are critical to successful social interaction, planning, and goal setting (McGrath & Tschan, 2004; Zimbardo, Keough, & Boyd, 1997).

People frequently engage in mental time travel, re-living past events and "pre-living" future events (Atance & O'Neill, 2001; Johnson & Sherman, 1990; Suddendorf & Corballis, 1997; Tulving, 2002). The topic of mental time travel—of how people psychologically traverse the separation between the "here and now" and some distal past or future event—is of perennial interest to psychological scientists (e.g., Liberman & Trope, 2008; Suddendorf, Addis, & Corballis, 2009). Most research on mental time travel has, until recently, focused on either prospection or retrospection, but not both prospection and retrospection. This is perhaps because theories of mental time travel have assumed temporal symmetry between retrospection and prospection. Construal level theory assumes, for example, that level of mental representation is equally influenced by psychological distance in the past and the future (Trope & Liberman, 2010). And affective forecasting research

has implied that people's memory for emotional intensity is similar to their predictions of emotional intensity (Wilson, Meyers, & Gilbert, 2003).

Our focus is on temporal asymmetries in mental time travel. Emerging research demonstrates that, in contrast with assumed temporal asymmetry, prospection differs in content and experience from retrospection (Van Boven, Kane, & McGraw, 2008). Research on temporal asymmetries is generally consistent with a functional view of mental time travel: People are oriented toward engaging and coping with the future more than the past (Parfit, 1984; Schacter & Addis, 2007; Suddendorf et al., 2009; Van Boven & Ashworth, 2007). Although retrospection and prospection involve many similarities, given that they both involve mental time travel to situations that are not directly experienced (Liberman & Trope, 2008), prospection feels different and may be associated with different mental representations than retrospection.

Our investigation continues in this vein by examining whether people are more likely to simulate and represent future events by their prototype: the abstract, central, typical instance of what a category of events is like. This tendency toward prototypical prospection, we suggest, arises partly because mental simulations of the past are shaped and constrained by historical events, which reduces the prototypicality of retrospection. The demonstration that prospection is more prototypical than retrospection would be an important extension of research on temporal asymmetries, which has thus far

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emphasized subjective experience (such as visual perspective and emotion, D'Argembeau & Van der Linden, 2004; Van Boven & Ashworth, 2007) and evaluation (such as value, Caruso, Gilbert, & Wilson, 2008, and moral judgment, Caruso, 2010). Whereas previous research has held constant mental representations of past and future events to examine people's temporally asymmetric reactions to those events, our hypothesis is that, left to their own psychological devices, people mentally represent the future differently than the past.

PROSPECTION: LOOKING FORTH

People often see the future as relatively unconstrained by base rates and historical events. For example, people see complementary events (e.g., both winning and losing a coin toss) as more likely in the future than in the past (Hanko & Gilovich 2008). Prospection may be more imaginative and, for healthy individuals, optimistic (e.g., Weinsten, 1980). But the absence of historical constraints does not mean that prospection is completely unbounded. Prospection may be largely shaped by exemplars, archetypes, schemas, scripts, and other generalized beliefs about what an event is prototypically like.[1] For example, when simulating an upcoming Caribbean vacation, people may draw on a prototype of tropical vacations that includes palm trees, parrots, and piña coladas rather than basing their simulation on historical knowledge of whether they have actually seen a parrot or tasted a piña colada.

That prospection is relatively unconstrained by historical facts and relies more on prototypical mental representations is illustrated by research on the planning fallacy (Buehler, Griffin, & MacDonald, 1997) and affective forecasting (Wilson & Gilbert, 2003). Research on the planning fallacy indicates that when people think about when they will accomplish future tasks, they tend not to incorporate information about how long it has taken them to accomplish similar tasks in the past (Buehler et al., 1997; Buehler, Griffin, & Ross, 1994). When predicting task completion times, people think about when they would prefer to complete a task and when they intend to complete a task (Koehler & Poon, 2006), but not how long it took them to complete previous similar tasks. Explicitly asking people to contemplate both past task completion times and how past tasks are similar to future tasks reduces the planning fallacy, suggesting that a failure to consider such information contributes to unrealistic predictions (Buehler, Griffin, & Ross, 2002).

Research on affective forecasting paints a similar picture of prototypical prospection. People's predictions of how they will feel in response to future emotional events often neglect information about how they felt in response to similar emotional events in the past, focusing instead on prototypical beliefs about emotional reactions (Wilson, Wheatley, Meyers,

[1]Throughout this paper, we use the term *prototype* to refer to the class of generalized mental representations of what people, events, and activities are typically like—their archetype, their typical attributes, the scripts by which they usually unfold, the instances that best exemplify an event, and so on. Although these specific constructs can be distinguished from each other, it is widely recognized that prototypes, scripts, schemas, and exemplars are all forms of generalized mental representations of what people, places, things, and events are like (Colcombe & Wyer, 2002; Fiske & Taylor, 1991; Kunda, 1999; Smith, 1998). These prototypical generalized mental representations are reflected by people's judgments of resemblance between specific events and the typical instance.

Gilbert, & Axsom, 2000). When imagining living in California versus the Midwest, for instance, people expect they would be happier in California because they focus on the salient, prototypical difference in the weather, neglecting less salient, less prototypical information about the details of everyday life, such as social contacts, which differ less by region (Schkade & Kahneman, 1998). Even when people have repeated experiences with highly similar emotional events (e.g., performance on exams), they exhibit limited learning from past emotional reactions when predicting future emotional reactions (Wilson et al., 2003). People's over-weighting of focal emotional events and their underweighting of non-focal but relevant events when predicting future emotions is illustrated by research indicating that affective forecasting errors are reduced by explicit "defocusing" procedures, asking people to consider non-focal events that may occur alongside focal emotional events (Wilson et al., 2000). That is, steering people's thoughts toward the realistic details of future events and away from the central prototypes of those events causes people to forecast a less intense emotional future than they normally would.

Prospection is thus often prototypical, even when people have at their disposal relevant non-prototypical information. In both the planning fallacy and affective forecasting, people have relevant historical evidence regarding task completion times (in the planning fallacy) and emotional reactions (in affective forecasting). But, in both cases, people seem to neglect this information when simulating the future. People instead seem to base predictions on prototypical information about what will happen and how they will respond.

RETROSPECTION: LOOKING BACK

In contrast with people's tendency to prototypically simulate and mentally represent future events, simulations and representations of past events seem more grounded in episodic, contextually situated, historical facts. Such episodic historical details reflect the broad range of events that actually occurred, rather than the narrow range of prototypical simulations and representations. Although memory is clearly reconstructive (Loftus, 1979; Loftus & Palmer, 1973; Neisser & Harsch, 1992; Schacter, 1996; Schooler, Gerhard, & Loftus, 1986), people often experience the process of retrospection as one of retrieving (rather than reconstructing) factual information. The experience of retrospection thus contrasts with the experience of prospection, which emphasizes imagination shaped by prototypical information.

Two areas of research illustrate the idea that retrospection is grounded in contextual details of the historical past, even when retrospection is egregiously inaccurate. First, research on "flashbulb" memories suggests that retrospection does not subjectively feel imaginative and unbounded but is firmly grounded in historical facts and details (Alba & Hasher, 1983; Johnson & Raye, 1981; Kunda, 1990). Retrospection seems, to the person doing it, closely aligned with actual events (Johnson, 1988). Flashbulb memories feel very "real" and tend to include vivid and detailed elements (Brown & Kulik, 1977; Talarico & Rubin, 2003), although flashbulb

memories are often surprisingly inaccurate (Neisser & Harsch, 1992).

Second, research on counterfactual thinking examines mental simulations of alternative historical events that are, by definition, counter to the facts. Counterfactual thoughts occur within a very narrow range constrained by historical events (Kahneman & Miller, 1986; Roese, 1997). Counterfactual thinking usually involves only minimal departures from reality— the minimal mental mutation of specific, highly accessible attributes of an experience. The following scenario illustrates these constraints:

> Mr. Crane and Mr. Tees were scheduled to leave the airport on different flights, at the same time. They traveled from town in the same limousine, were caught in a traffic jam, and arrived at the airport 30 minutes after the scheduled departure time of their flights. Mr. Crane is told that his flight left on time. Mr. Tees is told that his flight was delayed, and just left five minutes ago (p. 203).

When discussing why most (96%) participants thought that Mr. Tees would be more upset than Mr. Crane, Kahneman and Tversky (1982) noted, "There is an Alice-in-Wonderland quality to such examples, with their odd mixture of fantasy and reality. If Mr. Crane is capable of imagining unicorns— and we suspect he is—why does he find it relatively difficult to imagine himself avoiding a 30-minute delay, as we suggest he does? Evidently, *there are constraints on the freedom of fantasy. . .*" (p. 203–204, italics added). These constraints, we suggest, are typical of retrospection. Although people can freely imagine an infinite list of possible pasts, they tend to stick closely to the facts.

TEMPORAL ASYMMETRIES: LOOKING BACK AND FORTH

We hypothesize that prospection is more prototypical than retrospection. Research on the planning fallacy and affective forecasting implies that prospection often relies on prototypes, neglecting ample, readily accessible, non-prototypical historical facts. Research on flashbulb memories and counterfactual thinking implies that retrospection often adheres to historical details, even when those memories are false. As Johnson and Sherman (1990, p. 499) wrote, "With regard to constraints in thinking about the future, we might suppose that there would be far fewer constraints than occur in thinking about the past. The past has already taken place; it is what it is."

The hypothesis that prospection is more prototypical than retrospection is broadly consistent with the idea that people have a "bias toward the future" (Parfit, 1984), grounded in the functionality of mental time travel (Schacter & Addis, 2007; Suddendorf et al., 2009; Van Boven & Ashworth, 2007). A functional view toward the future implies some similarities between retrospection and prospection, given that an important purpose of memory is to facilitate future thinking (Johnson & Sherman, 1990; Schacter & Addis, 2007; Suddendorf et al., 2009). When constructing mental representations, both retrospection and prospection are associated with increased brain activity in the autobiographical memory retrieval network, including the hippocampus, which probably reflects that retrospection and prospection both involve self-referential processing and episodic imagery (Addis et al., 2007; Schacter & Addis, 2007).

But the functional view of mental time travel also implies asymmetries between prospection and retrospection. For example, if people are oriented toward engaging and coping with future events, prospection should have greater impact on emotion and evaluation than retrospection. Indeed, people's emotions are more aroused when they contemplate future emotional events than when they contemplate past emotional events (D'Argembeau & Van der Linden, 2004; Van Boven & Ashworth, 2007). People value future outcomes more than past outcomes (Caruso et al., 2008). People's personal optimism is also more evident in prospection, which is characterized by highly accessible positive events, than in retrospection, which is characterized by a more realistic balance between positive and negative events (Newby-Clark & Ross, 2003). And people evaluate future moral violations more harshly than past moral violations (Caruso, 2010), possibly because future behavior is seen as more intentional than past behavior (Burns, Caruso, & Bartels, 2011). The fact that mental representations of future events are often associated with intentionality is consistent with the observation that prospection is associated with increased brain activity in the right prefrontal cortex (Addis et al., 2007).

Our hypothesis that prospection is more prototypical than retrospection is also consistent with the functional view of mental time travel. Prototypical mental simulations and representations afford greater flexibility when one encounters new information (Atance & O'Neill, 2001; Schacter & Addis, 2007), guide attention and information processing (von Hippel, Jonides, Hilton, & Narayan, 1993), require minimal cognitive resources (Sherman, Lee, Bessenoff & Frost, 1997), and are a generally economical means of representing information (Komatsu, 1992). Prospection may therefore be more prototypical than retrospection as a means of preparing individuals to more flexibly and efficiently incorporate information about a greater number of future situations. For example, a prototypical mental representation of a tropical vacation (sun, sand, and surf) can be readily applied to a greater number of episodic details that might actually occur compared with a more detailed, contextually situated mental representation (getting locked on the balcony of one's 18th floor hotel room).

OVERVIEW OF THE PRESENT EXPERIMENTS

We tested in four experiments whether prospection is more prototypical than retrospection. We invited participants to mentally simulate events they were likely to be highly familiar with and to have had previous experience with. That the events were mundane and familiar is important because participants had relevant, historical information about the events that could be accessible during both prospection and retrospection. Observed temporal asymmetries are therefore unlikely to be attributable to asymmetries in the accessibility of relevant historical information. We also held constant the objective temporal distance of past and future events so that tense was not confounded with distance.

In two experiments regarding mundane events (meeting homeless people in Experiment 1, ordering pizza in Experiment 2), we first tested the hypothesis that if people's mental simulations of multiple events rely on shared prototypes, those simulations should be more similar to each other and more similar to the "typical" event in prospect than in retrospect. We then tested the prediction that because prototypes are relatively abstract, events are more abstractly represented in prospection than in retrospection (Experiment 3); we also tested whether objective distance moderated the effect of tense. Finally, we tested the hypothesis that people's mental representations of future tropical vacations—conveyed in a drawing—would be seen by others unaware of the drawing's tense as more prototypical than representations of past vacations (Experiment 4).

EXPERIMENT 1: MEETING HOMELESS PEOPLE

If mental simulations of future events are more prototypical, those simulations should be more similar to the prototype and more similar to each other than mental simulations of past events. We tested this prediction by asking participants to imagine three encounters with three different homeless people, an occurrence with which all of our participants were familiar. Participants were asked to mentally simulate these encounters either in prospect or retrospect.

Method

Fifty-six undergraduate students at the University of Colorado Boulder (36 women) participated in exchange for course credit. We asked participants to imagine, depending on random assignment, that they had met three homeless people in the last year or would meet three homeless people in the next year. Participants wrote their descriptions in three separate text boxes on one page of a questionnaire.

Participants were then asked to consider "the three homeless people as a set." Participants were asked how similar or different the three homeless people were to each other (1 = *completely different*; 7 = *completely similar*). Participants were then asked to rate how characteristic the homeless people were of the prototypical "average homeless person" (1 = *completely uncharacteristic*; 7 = *completely characteristic*).

Results and Discussion

We submitted participants' ratings of how similar the homeless people were to each other and of how characteristic they were of the average homeless person to a multivariate analysis of variance, which yielded the predicted effect of tense, $F(2, 53) = 5.37$, $p = .007$ (Table 1). Participants in the prospection condition rated the three homeless people as more similar to each other ($M = 4.38$, $SD = 1.02$) than did participants in the retrospection condition ($M = 3.64$, $SD = 1.19$), $F(1, 54) = 7.86$, $p = .015$. Participants in the prospection condition also rated the homeless people as more characteristic of the average homeless person ($M = 4.65$, $SD = .94$) than did participants in the retrospection condition ($M = 3.97$, $SD = 1.19$), $F(1, 54) = 6.58$, $p = .021$. These findings are consistent with the

Table 1. Rated similarity to other instances within the set and rated resemblance of "typical" instance by participants who mentally simulated experiences (of meeting homeless people in Experiment 1 and of ordering pizza in Experiment 2) in retrospection or prospection

	Tense condition			
	Retrospection		Prospection	
Experiment and measure	M	SD	M	SD
Experiment 1: encountering homeless people				
Intra-set similarity	3.64	1.19	4.38	1.02
Resemble "average" person	3.97	1.19	4.65	.94
Experiment 2: ordering pizza				
Intra-set similarity	5.43	2.10	6.58	1.66
Resemble "typical" pizza experience	6.71	1.92	7.38	1.59

hypothesis that prospection is more prototypical than retrospection, even when people simulate familiar events for which episodic details are equally accessible.

EXPERIMENT 2: ORDERING PIZZA

We sought to conceptually replicate the results of Experiment 1 with events that did not involve encounters with strongly stereotyped individuals (homeless people). It is possible that stereotypes about homeless individuals are particularly salient and accessible. Replicating these findings with intentionally initiated, less strongly stereotyped events such as ordering pizza might therefore constitute a more conservative test of our hypothesis.

Method

Seventy-three respondents (49 women) in the United States completed an online survey in exchange for $0.50. We asked participants to imagine and to describe three experiences ordering pizza. Participants were asked, depending on random assignment, to write three separate descriptions of pizza ordering experiences in the future (prospection condition) or in the past (retrospection condition). Participants wrote their descriptions in text boxes presented individually on three separate web pages. Participants were asked to "write enough detail that someone reading your description would understand what the experience you imagine having will be [was] like."

After writing their three descriptions, participants were asked some questions about the three pizza ordering experiences "as a set." Participants were first asked, "How similar would you say the three descriptions are to each other? That is, how much do each of the three descriptions resemble each other?" (1 = *not at all similar*; 9 = *very similar*). Participants were then asked, "how much would you say the three descriptions are characteristic of the typical pizza ordering experience? That is, how much are the three descriptions characterized by the stereotypical pizza ordering experience?" (1 = *not at all characteristic*; 9 = *very characteristic*).

Results and Discussion

We submitted participants' ratings of similarity and typicality to a multivariate analysis of variance, which revealed the predicted effect of tense, $F(2, 70) = 3.51$, $p = .035$ (Table 1). Participants in the prospection condition rated the three pizza ordering experiences as more similar to each other ($M = 6.58$, $SD = 1.66$) than did participants in the retrospection condition ($M = 5.43$, $SD = 2.10$), $F(1, 71) = 6.75$, $p = .011$. Participants in the prospection condition rated the three pizza ordering experiences as more characteristic of the typical experience ($M = 7.38$, $SD = 1.59$) than did participants in the retrospection condition ($M = 6.71$, $SD = 1.92$), although the difference was not significant, $F(1, 71) = 2.57$, $p = .113$. These findings replicate and extend the finding that prospection is more prototypical than retrospection. Participants who mentally simulated three future pizza ordering experiences reported that they were more similar to each other and were more similar to the prototypical pizza ordering experience than participants who mentally simulated past pizza ordering experiences.

EXPERIMENT 3: IDENTIFYING ACTIONS

If prospection is more prototypical, then events should be more abstractly represented during prospection than retrospection. Prototypical mental representations of actions tend to be more abstractly interpreted, identified, and construed (Liberman & Trope, 1998, Study 1; Trope & Liberman, 2010; Vallacher & Wegner, 1987). Suppose that the prototypical mental representation of "conducting an experiment" entails clean-cut scientists in lab coats, carefully scrutinizing the scientific literature, deriving clear predictions to test theoretically derived hypotheses, conducting experiments, communicating scientific reports, and so on. Such a prototype corresponds more closely with the higher-level description "advancing science" than with the lower-level description "generating a cover story and writing questionnaires."

We tested the prediction that events are more abstractly represented in prospect than in retrospect by asking people to consider various activities (e.g., making a list), and to choose either a high-level (getting organized) or low-level (writing things down) identification. People were to imagine these activities as occurring in prospect or in retrospect. We predicted that actions would be identified at a higher level in prospect than in retrospect.

We also manipulated the temporal distance of the actions, which would (or did) occur in 1 week (close) or 1 year (far). Construal level theory implies that distant actions are identified at a higher level than near actions (Liberman & Trope, 1998, Study 1). By orthogonally manipulating tense and distance, this design allowed us to independently test the main effect of tense (based on the prototypical prospection hypothesis) and the main effect of distance (based on construal level theory) and to explore the possibility that tense and distance interactively influence action identification.

Method

Seventy-six undergraduates (participant sex was not recorded) at the University of Colorado Boulder participated in exchange for partial course credit. Following procedures from previous research, participants read that any behavior can be identified in multiple ways (Liberman & Trope, 1998; Vallacher & Wegner, 1987). Participants were informed that the study was about how people preferred to describe various behaviors.

Participants were given a version of the levels of personal agency questionnaire (Vallacher & Wegner, 1987). For each of 25 activities, participants were asked to choose either a low-level concrete description or a high-level abstract description that "better described the event." For example, participants were asked to consider "making a list" and to select as the more appropriate description either "writing things down" (concrete) or "getting organized" (abstract).

We modified the levels of personal agency questionnaire to describe the activities at one of four times. We orthogonally manipulated whether the events were in the future or the past and whether the events' distance was 1 week or 1 year. The experiment was thus a 2 (tense: past, future) × 2 (distance: week, year) factorial design.

Results and Discussion

For each participant, we computed the percentage of the 25 actions for which abstract identifications were selected. Confirming our central prediction, participants identified actions more abstractly in prospect ($M = 72.80\%$, $SD = 19.67\%$) than in retrospect ($M = 62.28\%$, $SD = 18.48\%$). A 2 (tense: past, future) × 2 (distance: week, year) analysis of variance revealed a main effect of tense, $F(1, 72) = 5.82$, $p = .018$ (Table 2). The tense × distance interaction was not significant, $F(1, 72) = 2.05$, $p = .156$. Replicating and extending the results of our other studies, then, actions were identified more abstractly in prospect than in retrospect.

In contrast with the prediction derived from construal level theory, the main effect of distance did not approach significance, $F(1, 72) = .009$, *ns*. However, in a straightforward replication of previous research (Liberman & Trope, 1998, Study 1), participants identified future events that were 1 year away more abstractly ($M = 76.09\%$, $SD = 13.42\%$) compared with future events that were 1 week away ($M = 69.43\%$, $SD = 25.04\%$), although the difference was not significant, $t(69) = 0.99$, $p = .328$. The effect size of this replication ($d = 0.33$) is smaller than the effect size obtained in the initial study (Liberman & Trope, 1998, Study 1, $d = 0.93$). Of course, failures to replicate effect sizes or significance are neither unusual nor unexpected, although the lack of a straight replication is often counterintuitive (Tversky & Kahneman,

Table 2.   Average percentage of 25 actions identified by participants as abstract rather than concrete, contingent on whether those actions were to have occurred in retrospection or prospection and on whether the distance between the present and the actions' occurrence was near (1 week) or distant (1 year)

| Distance condition | Tense condition | | | |
| | Retrospection | | Prospection | |
	M (%)	*SD* (%)	*M* (%)	*SD* (%)
One week	65.00	14.62	69.43	25.04
One year	59.08	22.17	76.09	13.42

1971). And the absence of a significant effect of distance obviously is not evidence for the absence of an effect of distance; the failure to replicate the effect of distance on action identification is not particularly informative.

In any event, the central finding of this study is that future actions were identified more abstractly than were past actions. This finding replicates and extends the results of our first two experiments, providing further evidence that people mentally simulate future events more prototypically than past events. This experiment also used a different dependent measure—the selection of a higher action identification—than was used in previous studies.

EXPERIMENT 4: TAKING A TROPICAL VACATION

In our final experiment, we sought to conceptually replicate the tendency of people to mentally represent future events more prototypically than past events by turning people's mental representations into visual representations. Such visual representations can be seen and evaluated by others, providing a more objective assessment of mental representations' prototypicality. The present experiment thus extended our previous results in two ways.

First, rather than asking people to judge their own mental representations of events from the past and future, we asked people simply to draw a picture of their mental representation. Specifically, we asked people to imagine and draw a tropical vacation that they had taken in the past or would take in the future. We then randomly paired the past-tense and future-tense drawings and asked a separate group of people to select which drawing was more prototypical. We predicted that future-tense drawings would be selected as the more prototypical drawing more frequently than the past-tense drawings. This procedure does not rely on introspection about the similarity or prototypicality of events, which might be swayed by people's intuitive beliefs about their mental representations.

Second, the people who judged the drawings' prototypicality were unaware that the drawings might differ in tense. This procedure thus precluded the possibility that people select prospective drawings as more prototypical simply because they believe prospective mental simulations are more prototypical. Observing differences as a function of tense in this study would indicate that drawings' prototypicality differ in ways observable to other people.

Method

Phase 1: Drawing

Thirty-eight undergraduate students at the University of Colorado Boulder (27 women) participated in exchange for course credit. Participants were asked to imagine, depending on random assignment, that they had taken a tropical vacation exactly 1 year ago or that they would take a tropical vacation exactly 1 year in the future: "Imagine that you will go [went] on a tropical vacation a year from now [ago]... Please take a minute or two to sketch a picture of the tropical vacation in the box below." Nineteen participants were assigned to draw

prospective vacations, and 19 participants were assigned to draw retrospective vacations. Participants were provided with a 7.6 by 12.7 cm space on a blank page and asked to sketch a picture of the vacation they imagined. All but one of the participants had been on a similar tropical vacation in the past.

Phase 2: Prototypicality Rating

Twenty-one people participated in the second phase of the experiment, five undergraduate students from the University of Colorado Boulder and 16 adults seated in a workplace cafeteria in a major metropolitan city. Each person viewed 19 pairs of drawings, each containing one randomly assigned prospective drawing and one randomly assigned retrospective drawing. The order of drawings within the pair was randomly determined. Participants were not told that some drawings were prospective and others were retrospective—nor, obviously, that each pair contained one prospective and one retrospective drawing. Participants were instructed to "look at both drawings in the pair and decide which is closer to the 'prototypical vacation drawing'." Participants were simply told to "use [their] best judgment to make a decision."

Results and Discussion

For each of the 21 participants from the prototypicality rating Phase 2, we computed the percentage of the 19 pairs of drawings in which the participant selected the prospective drawing as more prototypical. As predicted, participants selected a majority of prospective drawings ($M = 58.83\%$, $SD = 10.64\%$) as more prototypical, one sample test against 50%, $t(20) = 25.33$, $p < .0001$. Most participants (17 of 21) selected a majority of prospective drawings as more prototypical, binomial $p = .007$.

These results indicate that visual presentations (drawings) of people's prospective mental simulations were judged by naïve observers as more prototypical than visual presentations (drawings) of people's retrospective mental simulations. These results thus conceptually replicate the finding that prospection is more prototypical than retrospection, but with more objective ratings by observers unaware of the mental representations' tense. These findings provide additional and stronger evidence that prospection is more prototypical than retrospection.

GENERAL DISCUSSION

The results of four experiments indicate that prospection is more prototypical than retrospection. People reported that events in prospect were more similar to each other and more similar to the typical event (encounters with homeless people in Experiment 1, ordering pizza in Experiment 2) than were events in retrospect. People selected higher levels of identification for future actions more frequently than for past actions (Experiment 3). And people's drawings of mentally simulated vacations in prospect were judged by other people, unaware of the drawings' tense, as more prototypical than people's drawings of vacations in retrospect (Experiment 4). Whereas previous research held constant people's mental representations of past and future events to examine temporal asymmetries in experience and evaluation,

the present research indicates that mental simulations and representations of the future are different: they are more prototypical than mental simulations and representations of the past.

Explanations

Future research will be needed to understand the psychological processes that explain why prospection is more prototypical than retrospection. One possibility is that because the past has happened and the future is necessarily hypothetical, people may be more imaginative during prospection than during retrospection—imaginative freedom that people ironically use to represent and simulate prototypical events. We examined this possibility in a pilot study.

Forty-nine university undergraduates at the University of Colorado Boulder were asked to mentally simulate having attended a party in the past month or attending in the next month. Participants reported, separately, how much (1 = *not at all*; 7 = *completely*) they relied on imagination and memories when they simulated the party. They reported less reliance on imagination during retrospection ($M = 2.04$) than during prospection ($M = 4.38$), whereas they reported equal reliance on memories during retrospection ($M = 5.13$) and prospection ($M = 5.31$), as reflected by a significant tense × process interaction, $F(1, 47) = 11.69$, $p < .001$. Participants thus perceived themselves as being more imaginative during prospection. It is interesting that the relative imaginative freedom people experience during prospection allows their mental simulations to wander systematically in the direction of prototypical events. People's imaginative freedom may thus be more constrained than they might suppose.

One question is whether the tendency toward prototypical prospection is grounded in the fact that the future is hypothetical and uncertain. On the one hand, temporal asymmetries are fundamentally connected to the distinction between remembering and imagination: the future has not happened (imagination) whereas the past has happened (memory), so hypotheticality and uncertainty are inherent in future events (Jung-Grant & Tybout, 2008). On the other hand, we took some measure to minimize differential uncertainty by asking people to imagine mundane events with which all participants were familiar (e.g., encountering homeless people, ordering pizza, attending a party, and various everyday events such as writing things down). Although imagining "making a list" in 1 year is necessarily hypothetical and uncertain relative to "making a list" a year ago, we suspect those differences are minimal. Moreover, some research suggests that the uncertainty associated with prospection rather than retrospection can, if anything, lead people to incorporate a greater number of situational details when evaluating future rather than past events (Jung-Grant & Tybout, 2008). It is therefore not obvious whether the uncertainty associated with prospection would increase or decrease the prototypicality of mental representations. We leave it to future research to examine whether, beyond hypotheticality and uncertainty, there is a residual effect of tense on prototypical prospection.

Implications

The present findings have at least four theoretical implications. First, prototypical prospection may help explain why prospection feels different than retrospection. Previous research has shown, for example, that people experience more intense emotional arousal when they mentally simulate future rather than past events and that this temporal asymmetry is associated with people's expectation that reactions to future events will be more extreme than their emotional reactions to past events (Van Boven & Ashworth, 2007). If relatively extreme emotional reactions to temporally distant events are more prototypical reactions to temporally distant events, then the tendency toward prototypical prospection goes some way toward explaining why people feel more intense emotion during prospection versus retrospection.

Second, prototypical prospection implies that, beyond emotional arousal, prospection may feel subjectively easier than retrospection. This is because prospection relies more on easily accessible abstract prototypes that require relatively few resources to bring to mind (Higgins, 1996; Kunda & Thagard, 1996; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006). We conducted a preliminary test of the prediction that prospection feels easier than retrospection as part of a study reported elsewhere (Van Boven, Kane, McGraw, & Dale, 2010, Study 1). Sixty-three university undergraduate students (45 women) at the University of Colorado Boulder thought of either, depending on random assignment to condition, their last or their next visit to the dentist. They were also randomly assigned to think about their visit in an emotional or neutral way. When asked "How easy or difficult was it for you to think of the visit?" (1 = *very easy*; 9 = *very difficult*), participants reported that it was more difficult to recall their last dentist visit ($M = 3.07$) than to anticipate their next dentist visit ($M = 2.06$), as reflected by a significant main effect of tense in a 2 (tense: future, past) × 2 (emotionality: emotional, neutral) analysis of variance, $F(1, 59) = 6.63$, $p = .013$. These results thus provide preliminary evidence that prospection not only is more prototypical than retrospection but also feels easier.

Third, the present findings may imply that psychological distance operates differently in the future than in the past. In Experiment 3, there was even a slight (non-significant) reversal of the effect of distance in the past tense: Participants identified actions from 1 year ago slightly *less* abstractly ($M = 59.08\%$) than actions from 1 week ago ($M = 65.00\%$). Moreover, another intriguing finding from the pilot study just described is that participants estimated that their next dentist visit would be sooner ($M = 80.18$ days) than their last visit was ($M = 163.65$ days), $F(1, 56) = 4.59$, $p = .006$ (degrees of freedom vary between tests because of missing data). The emerging pattern of results across studies reported here may be quite theoretically provocative, implying that the tendency for relatively distant events to be construed more abstractly is less robust in the past tense—a pattern that contrasts with construal level theory (Trope & Liberman, 2003, 2010). We are hesitant to draw overly strong conclusions based on these pilot and tentative results. We simply note that the possibility that distance operates differently in the past than in the future could have broad implications for theories that assume temporal symmetry (Trope & Liberman, 2003, 2010; Van Boven et al., 2010; Wilson et al. 2003).

Finally, the finding that prospection is more prototypical than retrospection is broadly consistent with the functionalist view of mental time travel, which implies both similarities and dissimilarities between prospection and retrospection

(e.g., Addis et al., 2007; Suddendorf et al., 2009; Van Boven & Ashworth, 2007). Together with past research, our results indicate that, compared with the past, people mentally represent the future more prototypically, experience more intense emotions when contemplating the future (D'Argembeau & Van der Linden, 2004; Van Boven & Ashworth, 2007), place greater value on future outcomes (Caruso et al., 2008), and more strongly evaluate future behavior (Caruso, 2010). These findings collectively highlight a psychological orientation that may prepare the individual to engage and cope with future events. The temporal asymmetries in emotion and motivation prepare the individual to approach or avoid future events. The temporal asymmetries in mental representations that were demonstrated in the present investigation may afford the individual greater flexibility and efficient incorporation of information about future events (Komatsu, 1992).

Conclusion

Mental time travel is an essential adaptive facet of human cognition (Schacter & Addis, 2007; Suddendorf et al., 2009; Suddendorf & Corballis, 1997). Although studies have focused on either backward or forward thinking, a growing body of research examines the relationship between retrospection and prospection (Caruso, 2010; Caruso et al., 2008; D'Argembeau & Van der Linden, 2004; Schacter & Addis, 2007; Van Boven & Ashworth, 2007). One emerging theme is the substantial overlap between retrospection and prospection, as mental time travel in both directions engages similar brain structures involved in episodic autobiographical memory (Addis et al., 2007; Schacter & Addis, 2007). Yet another emerging theme is that prospection feels different and entails different mental representations than retrospection (Caruso, 2010; Caruso et al., 2008; D'Argembeau & Van der Linden, 2004; Van Boven & Ashworth, 2007). The present studies demonstrate that prospection is more prototypical than retrospection. These findings highlight tense as an important dimension of mental time travel.

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.

Alba, J., & Hasher, L. (1983). Is memory schematic? *Psychological Bulletin*, *93*, 203–231.

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

Brown, R., & Kulik, J. (1977). Flashbulb memories. *Cognition*, *5*, 93–99.

Buehler, R., Griffin, D., & MacDonald, H. (1997). The role of motivated reasoning in optimistic time predictions. *Personality and Social Psychology Bulletin*, *23*, 238–247.

Buehler, R., Griffin, D., & Ross, M. (1994). Exploring the "planning fallacy": Why people underestimate their task completion times. *Journal of Personality and Social Psychology*, *67*, 366–381.

Buehler, R., Griffin, D., & Ross, M. (2002). Inside the planning fallacy: The causes and consequences of optimistic time predictions. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 250–270). New York, NY: Cambridge University Press.

Burns, Z. C., Caruso, E. M., & Bartels, D. (2011). Predicting premeditation: Future behavior is seen as more intentional than past behavior. *Journal of Experimental Psychology. General*, Advance online publication. doi: 10.1037/a0024861

Caruso, E. M. (2010). When the future feels worse than the past: A temporal inconsistency in moral judgment. *Journal of Experimental Psychology. General*, *139*, 610–624.

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

Colcombe, S. J., & Wyer, R. S. (2002). The role of prototypes in the mental representation of temporally related events. *Cognitive Psychology*, *44*, 67–103.

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.

Dyson, F. J. (1979). *Disturbing the universe*. New York, NY: Basic Books.

Fiske, S. T., & Taylor, S. E. (1991). *Social cognition*. New York, NY: Random House.

Hall, E. T. (1959). *The silent language*. Garden City, NY: Doubleday.

Hanko, K., & Gilovich, T. (2008). On once and future things: A temporal asymmetry in judgments of likelihood. Paper presented at the Society for Consumer Psychology.

Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins, & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133–168). New York, NY: Guilford Press.

von Hippel, W., Jonides, J., Hilton, J. L., & Narayan, S. (1993). Inhibitory effect of schematic processing on perceptual encoding. *Journal of Personality and Social Psychology*, *64*, 921–935.

Johnson, M. K. (1988). Reality monitoring: An experimental phenomenological approach. *Journal of Experimental Psychology. General*, *117*, 390–394.

Johnson, M. K., & Raye, C. L. (1981). Reality monitoring. *Psychological Review*, *88*(1), 67–85.

Johnson, M. K., & Sherman, S. J. (1990). Constructing and reconstructing the past and the future in the present. In E. T. Higgins, & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 482–526). New York, NY: Guilford Press.

Jung-Grant, S., & Tybout, A. (2008). The effect of temporal frame on the consideration of information in new product evaluation. *Journal of Consumer Research*, *34*, 897–913.

Kahneman, D., & Miller, D. T. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review*, *93*, 136–153.

Kahneman, D., & Tversky, A. (1982). The simulation heuristic. In D. Kahneman, P. Slovic & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases* (pp. 201–208). New York, NY: Cambridge University Press.

Koehler, D. J., & Poon, C. S. (2006). Self-predictions overweight strength of current intentions. *Journal of Experimental Social Psychology*, *42*, 517–524.

Komatsu, L. K. (1992). Recent views of conceptual structure. *Psychological Bulletin*, *112*, 500–526.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*, 480–498.

Kunda, Z. (1999). *Social cognition: Making sense of people*. Cambridge, MA: MIT Press.

Kunda, Z., & Thagard, P. (1996). Forming impressions from stereotypes, traits, and behaviors: A parallel-constraint-satisfaction theory. *Psychological Review*, *103*, 284–308.

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*, 5–18.

Liberman, N., & Trope, Y. (2008). The psychology of transcending the here and now. *Science*, *322*, 1201–1205.

Loftus, E. F. (1979). The malleability of human memory. *American Scientist*, *67*, 313–320.

Loftus, E. F., & Palmer, J. C. (1973). Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior*, *13*, 585–589.

McGrath, J. E., & Tschan, F. (2004). *Temporal matters in social psychology*. Washington, DC: American Psychological Association.

Neisser, U., & Harsch, N. (1992). Phantom flashbulbs: False recollections of hearing the news about Challenger. In E. Winograd, & U. Neisser (Eds.), *Affect and accuracy in recall: Studies of "flashbulb" memories* (4th ed., pp. 9–31). New York, NY: Cambridge University Press.

Newby-Clark, I. R., & Ross, M. (2003). Conceiving the past and future. *Personality and Social Psychology Bulletin*, *20*(7), 807–818.

Parfit, D. (1984). *Reasons and persons*. Oxford: Clarendon Press.

Roese, N. J. (1997). Counterfactual thinking. *Psychological Bulletin*, *121*, 133–148.

Schacter, D. L. (1996). *Searching for memory: The brain, the mind, and the past*. New York, NY: Basic Books.

Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and constructing the future. *Philosophical Transactions of the Royal Society B*, *362*, 773–786.

Schkade, D. A., & Kahneman, D. (1998). Does living in California make people happy? A focusing illusion in judgments of life satisfaction. *Psychological Science*, *9*, 340–346.

Schooler, J. W., Gerhard, D., & Loftus, E. F. (1986). Qualities of the unreal. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *12*, 171–181.

Sherman, J. W., Lee, A. Y., Bessenoff, G. R., & Frost, L. A. (1997). Stereotype efficiency reconsidered: Encoding flexibility under cognitive load. *Journal of Personality and Social Psychology*, *75*, 589–606.

Smith, E. R. (1998). Mental representation and memory. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed., Vol. *1*, pp. 391–445). New York, NY: McGraw-Hill.

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., Addis, D. R., & Corballis, M. (2009). Mental time travel and the shaping of the human mind. *Philosophical Transactions of the Royal Society*, *364*, 1317–1324.

Talarico, J. M., & Rubin, D. C. (2003). Confidence, not consistency, characterizes flashbulb memories. *Psychological Science*, *14*(5), 455–461.

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review*, *110*, 403–421.

Trope, Y., & Liberman, N. (2010). Construal level theory of psychological distance. *Psychological Review*, *117*, 440–463.

Tulving, E. (2002). Episodic memory: From mind to brain. *Annual Review of Psychology*, *53*(1), 1–25.

Tversky, A., & Kahneman, D. (1971). Belief in the law of small numbers. *Psychological Review*, *76*, 105–110.

Vallacher, R. R., & Wegner, D. M. (1987). What do people think they're doing? Action identification and human behavior. *Psychological Review*, *94*, 3–15.

Van Boven, L., & Ashworth, L. (2007). Looking forward, looking back: Anticipation is more evocative than retrospection. *Journal of Experimental Psychology. General*, *136*, 289–300.

Van Boven, L., Kane, J., & McGraw, A. P. (2008). Temporally asymmetric constraints on mental simulation: Retrospection is more constrained than prospection. In K. Markman, W. Klein, & J. Suhr (Eds.), *The handbook of imagination and mental simulation* (pp. 131–149). New York, NY: Psychology Press.

Van Boven, L., Kane, J., McGraw, A. P., & Dale, J. (2010). Feeling close: Emotional intensity reduces perceived psychological distance. *Journal of Personality and Social Psychology*, *98*, 872–885.

Weinsten, N. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology*, *39*, 806–820.

Wilson, T. D., & Gilbert, D. T. (2003). Affective forecasting. In M. Zanna (Ed.), *Advances in experimental social psychology* (Vol. *35*, pp. 345–411). New York: Elsevier.

Wilson, T. D., Meyers, J., & Gilbert, D. T. (2003). "How happy was I, anyway?" A retrospective impact bias. *Social Cognition*, *21*(6), 421–446.

Wilson, T. D., Wheatley, T., Meyers, J. M., Gilbert, D. T., & Axsom, D. (2000). Focalism: A source of the durability bias in affective forecasting. *Journal of Personality and Social Psychology*, *78*, 821–836.

Winkielman, P., Halberstadt, J., Fazendeiro, T., & Catty, S. (2006). Prototypes are attractive because they are easy on the mind. *Psychological Science*, *17*, 799–806.

Zimbardo, P. G., Keough, K. A., & Boyd, J. N. (1997). Present time perspective as a predictor of risky driving. *Personality and Individual Differences*, *23*, 1007–1023.