9 Temporally Asymmetric Constraints on Mental Simulation: Retrospection Is More Constrained Than Prospection

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INTRODUCTION

"A long time ago, in a galaxy far, far away ..." So read the opening lines of each of the *Star Wars* films, which have captured the fascination of science fiction fans for more than 30 years. Among the many captivating features of *Star Wars*—the Jawas, Darth Vader, and the mysterious "force"—fans' fantasies were also engaged by the supposition that a futuristic society with space travel, intelligent androids, and multicultural alien life existed not in the future, as we might expect, but in the past. Technologically fantastic worlds are supposed to take place not in the past but in the future—like *1984* (published in 1949) or *2001: A Space Odyssey* (released in 1968). Futuristic fantasies framed in the past tense are puzzling; they linger in the mind as we try to reconcile the notion of a fantastically "futuristic" past with the suspicion that our ancestors were inventing wheels and hunting woolly mammoths rather than flying X-wing spacecraft and battling with light sabers.

In this chapter, we explore whether the peculiarity of contemplating a futuristically fantastical past might reflect an important facet of mental simulation in the past versus future tense (in addition to being good science fiction). We hypothesize that past tense mental simulation (retrospection) feels different and is more constrained—more subject to "reality checks"—than is future tense mental simulation (prospection). We also hypothesize that temporally asymmetric constraints on retrospection render it phenomenologically different from prospection (i.e., more effortful and difficult) and lead retrospection to yield predictably different outcomes from those that follow from prospection.

To illustrate the temporally asymmetric constraints on mental simulation, we invite readers to try a thought experiment (or, better yet, administer a thought experiment in a between-persons fashion to indulgent friends or family members). Mentally simulate a first-class tropical vacation in the British Virgin Islands that either took place 2 years in the past or will take place 2 years in the future. How does it feel to retrospect versus prospect? How does the simulated vacation seem different in the past versus future?

We suspect that both retrospective and prospective simulations will involve a good number of realistic details—sandy beaches, sunny days, and warm waters. But, we suspect that compared with the future tense simulations, the past tense simulations will also include contextual details of the past that actually was: those persistent love handles, needing to squeeze in the vacation between winter professional conferences, the financial constraints that would have reined in the tropical adventure, and so on. Even though the retrospective vacation may be as detailed as the prospective

vacation, the retrospective details may be more realistic, informed by the past that was, than the prospective details. The prospective details may therefore be more prototypical and extreme (e.g., clear blue skies *every* day of the trip). More generally, we argue that the greater constraints on retrospection than prospection reflect a general temporal asymmetry in retrospection and prospection.

The possibility that retrospection is more constrained than prospection has important theoretical implications because most theories regarding time's effect on thinking, feeling, and deciding are agnostic with respect to tense. These theories include the effect of time on discounting future outcomes (e.g., Harris & Laibson, 2001; Loewenstein, 1992); self-control (Metcalfe & Mischel, 1999); memory decay (Schacter, 1996), construal level (Amit, Algom, Trope, & Liberman, Chapter 4, this volume; Trope & Liberman, 2003); and predictions of adaptation to emotional events (Dunn, Forrin, & Ashton-James, Chapter 22, this volume; Gilbert, Gill, & Wilson, 2002; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). In each case, people are thought to respond differently to events that are close and far in time (see also Perunovic & Wilson, Chapter 23, this volume).

Although previous theories provide many insights into temporal *distance's* effect on feeling, thinking, and behaving, they provide limited insight into temporal *tense's* effects on feeling, thinking, and behaving. To the degree that there exist temporal asymmetries in retrospection and prospection—and we suggest that there are—existing theories of temporal distance are descriptively incomplete and in need of reexamination and revision. In this chapter, we offer a simple principle about temporal asymmetries in mental simulation—that reality considerations constrain retrospection more than prospection—that we hope will guide theoretical refinement and empirical study.

In this chapter, we review previous work from diverse research domains supporting the hypothesis that reality considerations tend to constrain retrospection more than prospection. We then explore preliminary evidence implying that these everyday differences are mirrored in different subjective experiences and outcomes associated with retrospection and prospection. We conclude with a discussion of theoretical implications and potential moderators of temporally asymmetric constraints on mental simulation.

EVERYDAY DIFFERENCES BETWEEN RETROSPECTION AND PROSPECTION

Relative to our personal pasts and futures, the present is vanishingly brief. Not surprisingly, then, people spend a great deal of time and psychic energy engaged in mental time travel, looking back to the past and forward to the future (Atance & O'Neill, 2001; Johnson & Sherman, 1990; Szpunar & McDermott, Chapter 8, this volume; Tulving, 2002). Given the frequency with which people mentally travel in time, it is somewhat surprising to consider the paucity of research directly comparing mental processes associated with retrospection and prospection (for exceptions, see D'Argembeau & Van der Linden, 2004; Newby-Clark & Ross, 2003; Van Boven & Ashworth, 2007). In this section, we make indirect tense comparisons by reviewing research that separately examined retrospection and prospection.

Our brief and selective review of retrospection and prospection research implies that people's thoughts in everyday life about the past tend to be more constrained by reality concerns than are their thoughts about the future. People regularly engage in retrospective "reality monitoring," that is, thinking about whether their mental representations are of real or imagined past events (Johnson & Raye, 1981). In prospection, by contrast, people engage in less reality monitoring, imagining futures that are less linked to reality considerations.

It may seem mundane, given that the past has happened and the future has not, to point out that past tense mental simulation is more constrained by reality than future tense mental simulation. Notice, however, that people are perfectly capable of mentally simulating a past that did *not* happen, as when thinking about what might have been. And, people are perfectly capable of thinking about a future that actually will happen, especially when they are about to experience events they have experienced previously.[1] As we review, however, people's (blatantly) imaginative acts appear to be more constrained by reality in the past tense than in the future tense.

RETROSPECTION: LOOKING BACK

People tend to think about the past in two ways. People can engage in "remembering," thinking about a past that actually happened. Or, they can engage in counterfactual thinking about a past that could have happened but did not. It might seem that remembering is more constrained by reality than counterfactual thinking. As we will see, however, even when people think counterfactually about the past, they do so in close adherence to reality.

Remembering Realistically

Research makes clear that memory is reconstructive, and therefore departs regularly from veridicality. People do not store memories on a neural hard drive and then later retrieve them (subject to memory degradation). Rather, people reconstruct memories, making educated guesses about what must have happened (Bernstein, Godfrey, & Loftus, Chapter 6, this volume; Loftus, 1979; Loftus & Palmer, 1973; Neisser & Harsch, 1992; Schacter, 1996; Schooler, Gerhard, & Loftus, 1986).

Although memories are not always accurate records of experience, the phenomenology of memory—what it *feels* like to remember—is that remembering is closely tied to and constrained by reality (Alba & Hasher, 1983; Johnson & Raye, 1981; Kunda, 1990). When looking back, people continuously ask whether they remember an event that actually happened or are imagining an event that did not actually happen. This process of reality monitoring is among the most important metacognitive tasks people perform (Johnson & Raye, 1981; Johnson & Sherman, 1990) and may pervade the qualitative characteristics of retrospection. Indeed, people would be reluctant to refer to their retrospective thoughts as "memories" to the degree that those thoughts felt like products of creative imagination rather than veridical representations of reality. Regardless of the factual accuracy of memories, then, the habitual phenomenology of remembering is characterized by the pursuit of factually accurate memories. People remember in a way that attends closely to what feels like objective reality.

Counterfactual Constraints

Imaginative thoughts about the past that purposefully stray from reality are counterfactuals—thoughts that are counter to the facts. Counterfactual thoughts entail the imagination of a past that clearly did not happen: a gold medal rather than a silver one (Medvec, Madey, & Gilovich, 1995), an uneventful drive home rather than a tragic accident (Kahneman & Tversky, 1982), or a courageous moment of asking a secret crush on a date rather than failing to "seize the moment" (Gilovich & Medvec, 1994). Because counterfactuals are blatant departures from reality, people do not monitor reality in terms of asking whether the counterfactual events actually occurred. The potential freedom from reality might seem to allow counterfactual thoughts to stray toward the fantastical, as when a humdrum academic imagines a counterfactual career as a professional bike racer.

Yet, an intriguing observation about the nature of counterfactuals is that they tend to stick surprisingly close to the past that actually happened (Kahneman & Miller, 1986; Roese, 1997). Counterfactual thinking usually involves minimal departures from reality, the smallest mental mutation of specific attributes that would have produced a different outcome. Counterfactual thinking about history that strays too far from reality may seem implausible or illegitimate, a violation of a "minimal rewrite rule" (Tetlock & Belkin, 1996).

Individuals' reactions to the following scenario from Kahneman and Tversky (1982) nicely illustrate the reality constraints on counterfactual thinking:

> 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 min 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 5 min ago.

When discussing why nearly all (96%) participants thought that Mr. Tees would be more upset than Mr. Crane, Kahneman and Tverksy 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*. (pp. 203–204, emphasis added)

These constraints on the "freedom of fantasy" illustrate that even when retrospective thought departs blatantly from reality, looking back is nevertheless reined in by reality checks. That is, imaginative thinking in the past tense seems habitually confined to events that realistically could have happened.

Summary

Our brief (and selective) review of mental simulation in the past tense suggests that in everyday life, retrospection adheres closely to the tenures of reality (for more extensive reviews of the counterfactual thinking literature, in this volume see Byrne & Girotto, Chapter 10; Markman, Karadogan, Lindberg, & Zell, Chapter 12; Wong, Galinsky, & Kray, Chapter 11). Even though acts of memory can be scientifically established as reconstructive, they nevertheless have the phenomenal quality of being veridical. Even counterfactual thoughts that depart blatantly from reality tend not to stray too far from reality. Retrospective thoughts are thus habitually subject to reality checks, whether those thoughts are explicitly tied with or depart from reality. As elaborated in this chapter, we suggest that the mental practice of reality checking retrospection generally constrains the practice of past tense mental simulation.

PROSPECTION: LOOKING FORTH

The future is inherently uncertain. Unlike past events, which people usually perceive as having either happened or not, there tends to be more uncertainty when people look forth to the future (Grant & Tybout, 2007; Mitchell, Russo, & Pennington, 1989). People's prospective thoughts can nevertheless be roughly categorized into thoughts about future events they believe will (probably) happen and thoughts about future events they believe will (probably) not happen, just as people tend to retrospect about events that did and did not happen. We hypothesize that regardless of whether people prospect about probable or improbable events, they tend to worry less about the kind of reality checks that constrain retrospection. This habitual freedom from reality constraints characterizes various kinds of mental simulation in the future tense.

Planning Fallaciously

Planning to implement future tasks is arguably a kind of prospective thought quite likely to be shaped and constrained by reality concerns. Given their importance for budgeting time, money, and other resources, plans for the future seemingly should be highly constrained by future-oriented considerations of reality. Before firmly committing to a February 1 deadline for a chapter draft, authors might ask themselves whether they will actually finish a draft by that date or whether they are thinking too wishfully about how they will get it done in time. It seems plausible (and advisable), in other words, to check their plans for the future against reality just as they monitor how realistic their memories are.

As it happens, people's plans about the future are unrealistically optimistic and show an almost wanton disregard for information about previous task completion times (Buehler, Griffin, & MacDonald, 1997; Buehler, Griffin, & Ross, 1994). People are overly optimistic about how much time they will need to complete tasks like filing taxes or holiday shopping, even when they accurately

recall how much time was required to complete similar tasks in the past (Buehler et al., 1997). When planning for the future, people behave as though there were more than 24 hr in a day (Zauberman & Lynch, 2005).

One reason why people's plans are unrealistically optimistic is that their plans focus primarily on the event under consideration, neglecting to consider the full range of experiences that are likely to interfere with their plans (Lam, Buehler, McFarland, Ross, & Cheung, 2005). This neglect of relevant experiences occurs even though people can readily retrieve information about previous task completion times. Indeed, one way to reduce the planning fallacy is by directing people to think explicitly about future task details (Kruger & Evans, 2004). When planning for the future, then, people think about when they would *like* to (Buehler et al., 1997) and *intend* to complete a task (Koehler & Poon, 2006). People do not consider how long similar tasks took in the past or think about the task's subcomponents.

To the degree that planning fallacy type thoughts characterize prospection, people may habitually fail to think about reality constraints and plausibility constraints on plans for the future. The juxtaposition of the experience of remembering, which is highly constrained by reality, and the experience of planning, which is apparently not as constrained by reality, illustrates how retrospection may be more constrained than prospection.

Imagining Focally

Just as people can engage in counterfactual thoughts about events that could have happened (but did not), they can engage in prospective thoughts about events that might happen (but probably will not). In fact, imaginative thoughts of a future that probably will not happen are commonly studied when participants are asked to predict how they would behave or feel in unlikely hypothetical situations. A recurrent theme in studies of behavioral and affective forecasting is that people tend to focus on salient attributes of hypothetical situations to the neglect of mundane but influential attributes. Thus, people expect that living in California would make them happier than living in the Midwest because they focus on salient attributes about better weather to the neglect of more commonplace similarities between the two locales (Schkade & Kahneman, 1998). And when people predict whether they will take the high road when they face moral dilemmas in the future, they focus on what they would ideally like to do (e.g., donate to charity) to the neglect of what they and others have done in the past (e.g., kept their money to themselves; Epley & Dunning, 2000).

As with the planning fallacy, then, people imagine hypothetical futures by focusing on central attributes to the neglect of peripheral attributes such as the contextual details of future realities. Indeed, manipulations designed to "defocalize" people's thoughts about hypothetical futures cause individuals to make less extreme, more accurate forecasts about how they would behave and feel in those future situations (Epley & Dunning, 2000; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000). Because mental simulations of the past are generally more mixed in terms of valence, we predict that when thinking about the past people naturally make less extreme and more accurate estimates of what experiences (both actual and counterfactual) were like.

Summary

The research on planning and imagination implies that prospection is habitually less constrained by reality checks than retrospection. More generally, people think about the future from what has been termed an "inside" rather than an "outside" perspective (Kahneman & Lovallo, 1993). Whereas an inside perspective focuses on salient attributes, intentions, and desires, an outside perspective includes previous experiences, base rates, and other information outside of one's immediate self (Buehler et al., 1994; Griffin & Tversky, 1992; Kahneman & Tversky, 1972). By thinking about the future from an inside perspective, prospection is relatively free of the contextual details of reality compared with retrospection.

LOOKING BACK AND FORTH

We hypothesize that the habitual ways in which reality checks constrain thoughts about the past more than thoughts about the future influence mental simulation in the past and future tense generally. That is, mental simulation in the past tense is more constrained by "reality checks" than is mental simulation in the future tense. Previous researchers have speculated about the possibility of such temporally asymmetric constraints on mental simulation (Johnson & Sherman, 1990), although their focus was on the ways in which thoughts about the past and future are similarly rather than differentially constrained. We agree that looking back and looking forth are constrained by reality in similar ways. However, we suggest that looking back is constrained to a greater degree than looking forth.

The potential of temporally asymmetric constraints on mental simulation raises two related questions. First, does the temporal asymmetry of reality constraint on mental simulation have implications for the phenomenology of mental simulation in the past versus future tense? That is, does the mental simulation of future events *feel* different from the mental simulation of past events? Second, does the temporal asymmetry of reality constraints on mental simulation have implications for the output of mental simulation in the past versus future tense? That is, do people make different judgments of events that they simulate in the past tense compared with events simulated in the future tense? Preliminary evidence from our own and others' labs, which is summarized in Table 9.1, suggests that the answer to both questions is "yes."

TEMPORALLY ASYMMETRIC PHENOMENOLOGY

If reality constrains retrospection more than prospection, mental simulation in the past tense should feel relatively less imaginative than mental simulation in the future tense. Mentally simulating the past, with its greater emphasis on adherence to realistic events, should also feel more mentally effortful than mentally simulating the future, with its emphasis on creative imagination.

We have obtained preliminary evidence that thinking about personal events from the past feels more difficult than thinking about personal events in one's future (Kane, Van Boven, & McGraw, 2008). We asked participants to describe either their last or their next visit to the dentist. We presumed that participants were familiar with dentist visits, could realistically predict what would occur during dentist visits, and so could plausibly use detailed personal memories of dentist visits to think about both their last and next dentist visits. We did not predict differences in whether participants would consult their memories when writing their descriptions, but in how participants would use their memories. When describing past visits to the dentist, we hypothesized that participants would consider their memories as factual representations, which they should faithfully render through their descriptions. In describing future visits, on the other hand, we hypothesized that participants would feel less of a need to adhere strictly to the precise details of the visits they recalled and would think more flexibly and creatively about the visits they described. Consistent with these hypotheses, participants reported that thinking about past dentist visits was more cognitively difficult than thinking about future dentist visits (cf. Sanna, Schwarz, & Kennedy, Chapter 13, this volume).

One reason why retrospective mental simulation may feel more difficult than prospective mental simulation is that retrospection is relatively less imaginative than prospection. Consistent with this possibility are the results of a study in which university students thought about attending a party either 1 month in the past or 1 month in the future, depending on random assignment to condition (Kane et al., 2008). Participants were asked to report how much, while thinking about attending the party, they relied on their memories of previous parties they had attended and how much they relied on imagination about what attending a party would be like. Participants reported that mentally simulating a past tense party was relatively less imaginative than mentally simulating a future tense party, but that mentally simulating a past tense party was equally based on personal memories as

was mentally simulating a future tense party.[2] This pattern highlights that although mental simulation in both the past and future tense is somewhat constrained by memories of reality (Johnson & Sherman, 1990), mental simulation in the past tense is also less imaginative.

Other research focused particularly on counterfactual thinking is supportive of our hypothesis that mentally simulating future events engenders more creative thinking, whereas mentally simulating past events engenders more careful reality checking and, perhaps, more analytical thinking. Previous research has distinguished between "additive structures," which may be thought of as decreasing reality constraints through the addition of counterfactual elements, and "subtractive structures," which may maintain or increase constraints on reality by removing counterfactual elements (Roese & Olson, 1993). Additive structures seem to increase creativity, whereas subtractive structures seem to improve analytical problem solving (Markman, Lindberg, Kray, & Galinsky, 2007; Wong et al., Chapter 11, this volume). Consistent with our characterization of future tense mental simulation as more imaginative than past tense simulation, we suspect that prospection tends to be more additive compared with retrospection.

One extension of the tendency to think less imaginatively about past than future events is that people may be less likely to mentally simulate past events in a personally involving, episodic way compared with their mental simulation of future tense events. Mental simulations of the future may be characterized by "prefactual" thinking, akin to preexperiencing the event, rather than "evaluative" thinking, or evaluating the event against reality (Markman & McMullen, 2003). To the extent that people think about future events in a more imaginative way, with less emphasis on memory-based details, they should be more inclined during mental simulation to feel as though they are actually experiencing future than past events.

In one demonstration of this difference, participants contemplated listening to an annoying noise—the disharmonic sound of an analog telephone modem connecting to an Internet service provider, either in the future or in the past (Van Boven & Ashworth, 2007, Study 5). Participants who contemplated the future annoying noise, compared with those who contemplated the past annoying noise, agreed more strongly with statements such as, "It feels as though I am actually listening to the noise right now." Moreover, this tendency to simulate the future annoying noise in a more involving way than a past annoying noise statistically mediated the tendency to report more intense emotions in the "here and now" when contemplating the future annoying noise than when contemplating the past annoying noise.

This temporal asymmetry in thinking about events in an involving, first-person way was similarly demonstrated in another study in which participants were asked either to imagine a birthday they would have 5 years in the future or a birthday they had 5 years in the past (Pronin & Ross, 2006, Study 5). Participants rated how much their simulated behavior on that day was based on the situation (e.g., "it depends who else was there"), which often involve first-person perspectives seen from the mind's eye, versus being based on traits (e.g., "calm or serious"), which tend to be associated with third-person perspectives, as though looking in on the self (see also Libby & Eibach, Chapter 24, this volume). Participants generally reported less situationally based behavior seen from inside the mind's eye during retrospection than during prospection about their birthday. Together, these studies, summarized in the top portion of Table 9.1, demonstrate that mental simulation in the past tense is phenomenologically different from mental simulation in the future tense. Thoughts about past events feel more difficult, less imaginative, and less personally involving than thoughts about future events.

TEMPORALLY ASYMMETRIC JUDGMENTAL OUTCOMES

If the temporal asymmetries in how it feels to engage in retrospective versus prospective mental simulation reflect genuine differences in reality constraints, then retrospective mental simulations should yield different outcomes than prospective mental simulations. More specifically, if retrospective mental simulations are more adherent to the details of a realistic past, then judgmental

TABLE 9.1

Research Comparing Retrospection and Prospection That Suggests Temporally Asymmetric Constraints on Mental Simulation

Research Domain	Participants' (Ps) Task	Principal Findings
	Judgmental Phenomenology	
Subjective ease	P's described either their last or next trip to the dentist.	Retrospection felt more difficult than prospection.
Imaginative thought	P's reported how much they used imagination and memory details when describing past or future parties.	Thinking about a past party was less imaginative than thinking about a future tense party, but thinking about past and future parties was equally based on memory.
Personal involvement (Van Boven & Ashworth, 2007)	P's reported how experientially involved they were in contemplating a future or past emotional experience.	Participants were less experientially involved in thinking about a past than a future emotional experience.
First- versus third-person visual perspective (Pronin & Ross, 2006)	P's thought about past or future birthday parties and reported their visual perspective.	Future parties were seen from an involving first-person perspective more than were past parties.
	Judgmental Outcomes	
Action identification	P's chose between abstract and concrete identifications of past or future actions.	Past actions were identified more concretely than future actions.
Contextual details (D'Argembeau & Van der Linden, 2004)	P's described autobiographical past or future experiences and rated their mental representations.	P's indicated that mental representations of past events contained more contextual details than representations of future events.
Event prototypicality	P's drew pictures and wrote descriptions of hypothetical tropical vacations in the past or future.	Raters judged past vacations as less prototypical. Descriptions of past vacations included more idiosyncratic details.
Event similarity	P's wrote descriptions of three hypothetical homeless people they imagined having met in the past year or would meet in the upcoming year.	P's rated the homeless people they imagined having met as less similar to each other than the homeless people they imagined meeting in the past.
Event alternatives (Bavelas, 1973)	P's listed alternatives to future or past vacation itineraries taken by someone else.	P's listed less-varied itineraries for past than future vacations.
Event alternatives (Caruso, Seo, & Gilbert, 2007)	P's listed alternatives to watching a movie in the future or past.	P's listed fewer alternatives to watching a past than a future movie.
Affective intensity (D'Argembeau & Van der Linden, 2004)	P's described autobiographical past or future experiences and rated their mental representations.	P's judged past experiences as less affectively intense than future experiences.
Affective intensity (Van Boven & Ashworth, 2007)	P's judged how intense their affective reactions would be or had been to emotional events.	P's judged past experiences as less affectively intense than future experiences.
Likelihood (Hanko & Gilovich, 2007)	P's judged the likelihood of uncertain past or future events.	P's judged uncertain future events as more likely than past events.
Motivated reasoning (Newby-Clark & Ross, 2003)	P's described autobiographical days in the past or future.	P's described realistically affectively mixed events from the past but uniformly positive events in the future.

Note: Unless otherwise specified, the data come from Kane, Van Boven, and McGraw, 2008.

biases that result from a relative neglect of realistic contextual details should be diminished when people engage in retrospective versus prospective mental simulation. For instance, people's tendency to simulate events in a prototypical fashion should be diminished when those mental simulations also include contextual details. Similarly, people's tendency to judge the likelihood of a particular event by focusing on that event to the neglect or exclusion of other possible events (Rottenstreich & Tversky, 1997; Tversky & Koehler, 1994) should be diminished when people judge the likelihood of events having occurred in the past. Preliminary evidence summarized in the bottom portion of Table 9.1 is supportive of these predictions.

Abstraction and Contextual Detail

When people think about temporally distant future events, they tend to do so abstractly (Trope & Liberman, 2003; see also Amit et al., Chapter 4, this volume), and across temporal distances, most people tend to think about events abstractly rather than concretely (Vallacher & Wegner, 1987). For instance, most people identify "making a list" in abstract terms of "getting organized" rather than in concrete terms of "writing things down," and this tendency increases linearly over future temporal distance (Pennington & Roese, 2003, Study 3).

Our hypothesis implies that people are more constrained by the details of reality when they engage in retrospection than prospection. Thus, temporal perspective should moderate this tendency toward abstraction, and people should engage in relatively more concrete retrospection than prospection.

To test this possibility, we (Kane et al., 2008) asked participants to contemplate various actions in one of four temporal perspectives: 1 year past, 1 week past, 1 week hence, and 1 year hence. Accompanying the actions was a relatively concrete description of the action and a relatively abstract description of the action, as in the example of identifying list-making as getting organized (abstract) versus writing things down (concrete; Vallacher & Wegner, 1987). Participants chose whether each action was better identified by the concrete or abstract description. Overall, participants tended to identify actions abstractly (65%). More important, the degree to which participants identified actions abstractly decreased as the temporal frame moved from distant-future actions (76% 1 year hence) to near-future actions (70% 1 week hence) and from near-past actions (65% 1 week past) to distant-past actions (59% 1 year past).

A related prediction is that mental representations of past events should contain more realistic contextual details of time and place than should mental representations of future events. If reality concerns constrain retrospection more than prospection, then those constraints should leave cognitive traces. Support for this possibility comes from a study in which participants were asked to think back to two events (one positive, one negative) they experienced in the recent past (between 1 and 12 months ago) and in the distant past (between 5 and 10 years ago; D'Argembeau & Van der Linden, 2004). Participants were also asked to think forward to two events (one positive, one negative) that might reasonably happen to them in the near future (between 1 and 12 months) and in the distant future (in 5 to 10 years). Participants rated their mental representations of past experiences as including more contextual details, including specific dates, times of day, and locations. Together, these studies imply that people retrospect on past events at lower contextually detailed levels of identification compared to prospection.

Prototypicality, Similarity, and Variety

People's mental representations of common, everyday events can incorporate, to varying degrees, prototypes or scripts of how those events occur and nonprototypical contextual details about how those events might occur (Colcombe & Wyer, 2002). A family meal, for instance, has a prototypical script: hands washed, salad served, followed by main course and desserts. The mentally represented family meal can also include contextual details: Caesar salad or mixed greens? Spaghetti or stir-fry?

Chocolate cake or ice cream? An implication of the possibility that reality concerns constrain retrospection more than prospection is that past tense mental simulations should adhere less to shared scripts than future tense mental simulations. Mental simulations of past family meals, for instance, should deviate from the socially shared "family meal" script more than mental simulations of future family meals.

We tested this prediction in a study conducted during late winter and early spring in which participants were asked to imagine that they took a tropical beach vacation to a fancy resort either 1 year ago or 2 year in the future (Kane et al., 2008). Participants were asked to spend a few minutes drawing a sketch of their imagined vacation. We then randomly paired drawings of past tense vacations with drawings of future tense vacations. Several coders who were blind to condition viewed each pair and rated which drawing was more prototypical—which drawing more closely followed the prevailing prototypical beach vacation with a bright sun, sandy beach, and palm tree. As expected, drawings of future vacations were rated as more prototypical compared with drawings of past vacations. Just as descriptions of alien life-forms draw heavily from familiar creatures (Ward, 1994), it seems that in the past, at least, hypothetical vacations draw heavily from familiar ones.

We conceptually replicated this pattern in a study in which participants (all university students) were asked to imagine either that they had attended three parties in the past month or would attend three parties in the next month (Kane et al., 2008). We presumed that most, if not all, participants had personal experience with college parties and could therefore draw on a wealth of personal memories to mentally simulate attending parties in both the past and future tense. After writing brief descriptions of these three parties, participants rated how similar their descriptions were to the "typical" party experience. As predicted, participants rated the three past parties as less typical than the three future parties.

One implication of people's tendency to think about past events in a less-prototypical way than future events is that mental representations of past events should be less similar to each other than mental representations of future events. If people think about future events in a way that follows the prototype more closely than people's thoughts about past events, then their representations of future events should be less discrepant from each other than their representations of past events. That is, mental simulations of future events should tend to be cut from the same prototypical mental cloth to a greater degree than should mental simulations of past events.

We obtained support for this possibility from a study in which participants were asked to imagine three encounters with homeless people that occurred either in the past year or in the upcoming year (Kane et al., 2008). Consistent with our reasoning, participants rated the three homeless people that they imagined encountering in the future as more similar to each other than they rated the three homeless people that they imagined having encountered in the past year.

Relatedly, when participants were asked to think about alternative ways they could spend their time rather than watching a movie, they generated more alternatives to viewing a movie in the future than to having viewed a movie in the past (Caruso, Seo, & Gilbert, 2008). Also, when participants were asked to describe a vacation itinerary that a protagonist either had taken in the past or would take in the future, participants wrote more varied itineraries for the future trip than for the past trip (Bavelas, 1973). Participants treated the past as relatively fixed, possibly constrained by reality concerns, compared with the future. In sum, research from various sources indicates that people simulate past tense events less prototypically, less similarly, and less variably than they simulate future tense events.

Affective Extremity

An extension of the idea that people think about past events less prototypically than future events is that people may think about emotional events in the past in a less extreme fashion compared with their thoughts about emotional events in the future. This is because the prototype of emotional events tends to be highly affective (e.g., Gilbert, Morewedge, Risen, & Wilson, 2004). People tend

to expect the best of good events and the worst of bad events (Schkade & Kahneman, 1998; Wilson et al., 2000). Because the prototypical affective experience tends to be relatively extreme (see Dunn et al., Chapter 22, this volume), people's actual affective experiences tend to be more moderate than they anticipate. To the degree that mental simulations of affective experiences follow the realistically mundane details of past experience, people should think about emotional experiences as less extreme in retrospect than in prospect.

Preliminary support for this prediction comes from three sources. First, studies comparing on-line reports of emotion with temporally distant estimates of emotions experienced during vacations found that people expected to enjoy their vacations more than they recalled having enjoyed their vacations, although the statistical significance of these comparisons was not reported in the original articles (Mitchell, Thompson, Peterson, & Cronk, 1997; Wirtz, Kruger, Napa Scollon, & Diener, 2003). Second, when thinking about both good and bad events from one's personal past and personal future, participants anticipated that future events would be more intense than they recalled past events having been (D'Argembeau & Van der Linden, 2004). Finally, in research on the emotional consequences of mental time travel for affective experience in the "here and now," participants consistently predicted that they would experience more intense reactions to future emotional events than they "recalled" having experienced during previous emotional events (Van Boven & Ashworth, 2007).

Likelihood

Usually when people predict the likelihood of a given event, they do so based on support for the focal event, neglecting to consider fully the support for the nonfocal event (Rottenstreich & Tversky, 1997; Tversky & Koehler, 1994). For instance, people's estimates of the likelihood that a randomly selected San Franciscan would vote in favor of a Democratic candidate is largely influenced by the evidence consistent with the focal event (e.g., easily accessible examples of San Franciscan Democrats) and insufficiently influenced by evidence consistent with nonfocal events (e.g., the recently wealthy San Franciscans who may favor Republican tax cuts). Such focalism is one reason why people tend to be overconfident: They focus more on why a given event might happen than on why the event might not happen (Koriat, Lichtenstein, & Fischoff, 1980). One consequence of thinking about realistic contextual details is that it encourages people to think about nonfocal events. Such increased thought about nonfocal events can influence people's judgments of the likelihood of focal events.

If people think about past tense events in a way that adheres more to contextual details of reality, then the tendency to focus on the target event should be reduced when thinking about past tense events compared with future tense events. People should therefore judge the likelihood of events in the past tense as less likely than events in the future. This is because people may be more inclined to incorporate information about nonfocal events into "postdictions"—estimates of likelihood in the past tense—than they are to incorporate nonfocal information into predictions.

For example, students who imagined taking a molecular biology exam during the previous semester might judge it to be less likely that they would have aced the exam than students who imagined taking a molecular biology exam during the following semester (Hanko & Gilovich, 2007). We propose that students mentally simulating their preparation for a difficult exam during the previous semester would be more likely to consider all the other (nonfocal) activities in which they were involved at the time (other challenging courses, work, extracurricular activities on campus, etc.), whereas students mentally simulating their preparation for a difficult exam during the following semester would be less likely to consider these nonfocal activities and the ways in which they would interfere with studying.

Such temporally asymmetric likelihood judgments are confirmed by a recent series of studies suggesting that people judge focal events to be more likely in the future tense than in the past tense (Hanko & Gilovich, 2007). In one study, participants judged it more likely that a university student

would engage in a variety of activities in the following week than that she had engaged in those same activities over the past week. In another study, people judged it more likely that their peers would endorse a particular political stance if they thought their peers would be surveyed in the near future than if they thought their peers had been surveyed in the near past.

Motivated Reasoning

We have thus far focused on the cognitive consequences of relatively constrained retrospection versus prospection. This temporally asymmetric constraint can also influence the outcomes of motivated reasoning in the past versus future tense. When people remember their pasts, they often do so in a motivated fashion, reconstructing themselves in a favorable light. Importantly, however, even though people reconstruct their pasts motivationally, they also reconstruct realistically (Kunda, 1990). The desires underlying motivated reasoning must also therefore contend with objective (and observable) facts. As we have seen, however, such reality concerns tend to constrain retrospection more than prospection.

One implication of the temporally asymmetric constraints is that people should have more rosy, optimistic views about their futures compared with more realistic, mixed views about their pasts. Specifically, people's retrospections should contain a realistic mixture of the ups and downs of everyday life than their prospections. This prediction was confirmed in a series of studies that examined people's thoughts about negative and positive events in their personal pasts and futures (Newby-Clark & Ross, 2003). In one study, people tended spontaneously to anticipate uniformly positive future events but to recall more affectively mixed events (Newby-Clark & Ross, 2003, Study 1). In two other studies, people took longer to generate future negative events than future positive events, suggesting the relative inaccessibility of negative future events; in contrast, there was no difference in the time taken to generate past negative and past positive events (Newby-Clark & Ross, 2003, Studies 2 and 3). Thus, negative events in the future tense seem to be less comparatively accessible than negative events in the past, consistent with our notion that retrospective mental simulation, with its adherence to a life actually lived, is a more realistic reflection of the ups and downs of daily life than is prospective mental simulation.

SUMMARY

The varied research reviewed here and summarized in the bottom portion of Table 9.1 points to temporally asymmetric constraints on mental simulation. These constraints make retrospection feel different than prospection—more cognitively effortful, detailed, and contextually situated. These temporally asymmetric constraints also produce different judgmental outcomes of retrospection versus prospection. Looking back to the past seems less prototypical, less extreme, less likely, and less rosy than looking forward to the future. Habitual differences in thinking about the past in a more constrained and realistic manner appear to shape the way that people mentally simulate the past and future.

DISCUSSION

Mental time travel is central to the psychological science of mental simulation. People routinely travel back in time, thinking about pasts that actually were and might have been. They also travel forward in time, imagining futures that probably will and probably will not occur. In this chapter, we explored whether there might be systematic differences in the way people generally mentally simulate pasts and futures. Our brief review of the research on retrospection, both to actual and imagined pasts, implied that retrospection is subject to reality checks, as people monitor whether their memories reflect real events and their counterfactual thoughts reflect plausible events. In contrast, our review of the research on prospection, both to futures that probably will and probably will

not happen, implied that prospection is less subject to reality checks and tends to neglect the many and varied contextual details of future realities.

Contrasting the literatures on looking back and on looking forth suggested that reality concerns might generally constrain people's retrospective thoughts more than their prospective thoughts. This possibility is supported by a host of recent studies on various types of judgments from various labs. Retrospection appears to feel more constrained than prospection. And retrospection appears to yield different judgmental outcomes than prospection.

Assuming for the time being that retrospection does feel different and yields different outcomes than prospection, three important questions present themselves. The first is whether asymmetric reality constraints are an underlying process shaping retrospection and prospection or an indicator of some alternative underlying process. The second question is whether, and in what ways, theories of psychological distance should be modified to accommodate temporally asymmetric constraints. The third question focuses on identifying some potentially important moderators of temporally asymmetric constraints. We consider each question in turn.

ALTERNATIVE TENSE TENDENCIES

Are asymmetric reality constraints the best way to think about how retrospection and prospection feel different and yield different outcomes? Might some other temporally asymmetric process provide an explanation for the results reviewed here? If there are alternative judgmental tendencies that differ by tense, what might they be?

One possibility is that retrospection tends to rely more on systematic, deliberative "rational" processing, whereas prospection relies on more heuristical, associative, "experiential," or intuitive" processing (Epstein, 2003; Kahneman, 2003; see also Dunn et al., Chapter 22, this volume). Indeed, many of the reviewed findings indicate that prospection is more heuristic than retrospection. Our interpretation, however, is that concerns about reality constrain processing such that past tense mental simulation is more systematic than future tense mental simulation. That is, reality constraints signal to the information-processing system that "experiential" judgment outcomes are insufficiently accurate and thereby prompt more careful information processing (Kahneman, 2003).

Another possibility is that people's goals for the future are primed more by future tense mental simulation than by past tense simulation, and that this differential goal salience explains many of the differences summarized here. Goals probably do differ by tense—indeed, what does it mean to have a present goal for one's past?—and these different goals probably do contribute to some of the present findings, as when people expect their futures to be rosier than were their pasts. But it is unclear why increased goal salience would yield prospective outcomes that are more prototypical and likely, as appears to be the case. Nevertheless, investigating whether rational processing or differential goals coincide and contribute to differential reality constraints is an important question for future research.

BROADER THEORETICAL IMPLICATIONS

Theories of temporal psychological distance typically assume, explicitly or implicitly, temporal symmetry. That is, the judgmental and behavioral effects of being temporally close to or far from an event operate similarly in retrospect and in prospect (see Perunovic & Wilson, Chapter 23, this volume). However, the research reviewed here suggests that these theories are descriptively incomplete.

Construal-level theory, for instance, posits that people construe temporally distant events at a higher, more abstract level than temporally proximate events, and that "the same general principles hold for other distance dimensions, including temporal distance from past events" (Trope & Liberman, 2003, p. 403). However, the preliminary results reported here suggest that people generally construe past events at a lower level than future events. If these results hold up to further empirical scrutiny, the general claim that temporal distance is positively associated with level of construal

should be modified to reflect these temporal asymmetries. That is, level of construal may increase less steeply when that distance increases toward the past than toward the future.

Research on affective forecasting implies another set of ideas that may require modification to accommodate temporal asymmetries. Although researchers of affective forecasting note that "it may be that some of the same factors that produce the impact bias in prospect ... also produce an impact bias in retrospect" (Wilson, Meyers, & Gilbert, 2003, p. 425), our results imply that people may be more likely to exhibit errors when predicting future affective reactions than when post-dicting previous affective reactions. Looking back, people appear less likely to remember having experienced extreme emotions compared with when they look forward (Caruso, Gilbert, & Wilson, 2007; Dunn et al., Chapter 22, this volume; Van Boven & Ashworth, 2007).

POTENTIAL MODERATORS

Future research may profit from the investigation of variables that moderate the temporal asymmetries we have described. One potential moderator is age. It may be that the tendency to think about the past and future asymmetrically is more common among young adults and middle-aged individuals who have more of their lives both ahead of them and behind them compared with the very young and very old. Young children, eager to feasibly navigate everyday life, may be more inclined to attend to the "how" questions of life, thinking about both the future and past at more concrete levels. More elderly individuals, in contrast, may find themselves in more of a reflective mode, attending to the "why" questions of life (Libby & Eibach, Chapter 24, this volume) and therefore be particularly inclined to construe both the past and the future at relatively high levels.

Another potential moderator is self-relevance. All of the preliminary experiments we have reviewed in this chapter involve highly self-relevant experiences. Participants were asked to describe events such as birthday parties, vacations, and movie screenings—all of which are likely to be extremely familiar to the college students who participated. In this chapter, we have argued that individuals are more likely to insert contextual details into descriptions of past events than descriptions of future events; we suspect that this tendency is due to the fact that individuals consult their personal pasts and attempt to fit even hypothetical or counterfactual events into the past life they recall experiencing. If a past event is presented as having been experienced by another person, individuals may not consult their personal past experience or conduct reality checks against it. As a result, we suggest that individuals may be less likely to include contextual details when describing past events experienced by another person.

CONCLUSION

A constellation of research findings supports the general, tentative hypothesis described in this chapter: Reality checks constrain mental simulation in the past tense more than mental simulation in the future tense. We argue that temporally asymmetric constraints in imagining hypothetical and real events are important to developing more descriptive psychological theory and to achieving a more accurate understanding of mental simulation in everyday life. Fittingly, when we look forward to future research, we expect that there is a great deal of exciting and important work to be done by looking both back and forth.

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NOTES

1. Both participants in psychology experiments and professional science fiction writers seem somewhat constrained by reality even when engaging in totally imaginative tasks, like describing alien creatures (Ward, 1994). We are not suggesting that prospection is totally free of realistic considerations, just that it is less constrained by reality than retrospection.
2. Asking participants to consider the extent to which they relied on memories of previous parties when describing a previous party might create experimental demand. Notice, however, that there is actually *no* significant difference between self-reported reliance on memories between the two conditions. Instead, people report relying more on imagination in the future tense than in the past tense.

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