Envisioning the Future and Self-Regulation

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A vital skill that humans possess is the ability to envision the future. By creating imagined scenarios of future events, people are able to regulate their behaviors and emotions so as to bring about future events, adjust to inevitable difficult situations, or manage their reactions to ongoing events. People conjure up images, stories, and projections of things not currently present on the basis of what they want to have happen or what they think is likely and use those projections for entertaining the self, planning for the future, and performing other basis tasks of self-regulation.

Our program of research on mental simulation was spearheaded by several disappointing trips to the bookstore. Before Amazon existed, I used to prowl the psychology shelves and was invariably disappointed and annoyed to find them overpopulated by self-help books. A quotation from a self-help book written by Patrick Fanning (1994) best captures the source of this annoyance:

> See yourself enjoying favorite activities in your new-found leisure, running, dancing, swimming, or whatever you would like to do. See yourself surrounded by loved ones and friends, popular and relaxed, having a good time. See yourself wearing stylish clothes, driving a new car, playing with a new tennis racquet, or skiing on new skis (p. 21).

This quotation and many others like it suggest that merely by envisioning the outcome one wants to achieve, one will make progress toward that goal. We doubted that this was the case and set out to test the idea (Taylor, Pham, Rivkin, & Armor, 1998).

We conducted a program of research on mental simulation, which we define as the imitative representation of some event or series of events. Mental simulation can address a number of purposes. They include rehearsals of future events, such as envisioning the activities of an upcoming wedding; replays of past events, such as going over the events of a failed relationship to determine what went wrong; fantasies, such as imagining what one will do when one has won the lottery; and mixtures of real and hypothetical events, such as mentally replaying a real argument with an imaginary “what I should have said” resolution.

Our research focuses primarily on planning for future events. Mental simulations can be valuable for anticipating and managing future events because they address the two main tasks of coping: the need to come up with plans for forthcoming events or solutions for anticipated problems and the need to manage emotional reactions to future events or problems (cf. Lazarus & Folkman, 1984).

Attributes of Mental Simulations

There are several intrinsic qualities of mental simulations that make them useful for anticipating the future, solving problems, reaching goals, and coping with stressful events. First, mental simulations make events seem real (e.g., Koehler, 1991 for a review). When people run a set of events through in their minds and imagine them in concrete form, it can make those events seem true. One may have the experience of imagining a conversation with someone, and later not been altogether sure as to whether the conversation actually took place or not. (Unhappily, this particular problem only gets worse with age.)

One reason why mental simulations make events seem true is that they are typically constrained by reality (Kahneman & Miller, 1986). That is, mental simulations may be imaginary, but they are typically not magical. For example, one of the most common fantasies that people have is suddenly becoming wealthy. But even a fantasy about acquiring wealth typically begins with an unexpected inheritance or winning a lottery, rather than with a large cloud opening up and dumping the money in the front yard. This is an intriguing characteristic of mental simulations because, after all, it is your fantasy, and you can have the cloud dump the money in the front yard if you want to. But people rarely do. Instead, most mental simulations are constrained by what is possible, if not always plausible, and this constraint can make them useful for anticipating the future.

Mental simulations prompt problem solving activities (e.g., Hayes-Roth & Hayes-Roth, 1979). Usually when we imagine events that are going to occur, we imagine them in the way that social reality actually transpires. The events occur in their logical order with the characters one expects to encounter. Like reality, a simulation involves a sequence of successive interdependent actions and the organization of those actions can yield a plan. Consider Peter Lynch, the legendary former manager of the multi-billion dollar Fidelity Magellan Fund. In his books (e.g., Lynch, 1989), Lynch provides highly entertaining accounts of the stories he mentally generated for making decisions about what stocks to buy. For example, one day Lynch's wife, Caroline, brought home a pair of L'Eggs pantyhose from the supermarket. This caught Lynch's attention because pantyhose had not before been sold in a supermarket. Lynch was able to envision the large numbers of working women who needed pantyhose on a regular basis but who had very little time to go to a department store. At the time, women typically went to a department store once every three weeks, but went to the grocery store on average a couple times a week. Lynch's recognition that they could pop this product into their grocery cart with the cereal and coffee led him to make a very timely and lucrative investment.

Mentally imagining events evokes emotions (e.g., Wright & Mischel, 1982). For example, if one thinks of a particularly sad event, this thinking may so completely evoke the original sadness that it is experienced all over again. Or remembering a wonderful event from the past, such as one's child winning a prize or graduating from school, can fully bring back the warm glow that experience generated initially. Mentally imagining events reliably evokes these emotional states and their physiological consequences, such as changes in heart rate, blood pressure and skin conductivity (e.g., Lyman, Bernardin, & Thomas, 1980).

A fifth important characteristic of mental simulations is that they produce links to action by virtue of the self-regulatory benefits they provide. At least two important literatures illustrate this valuable link between thought and action. The first is a large literature from sports psychology on mental practice effects, much of it with elite athletes (Cratty, 1984). Mental practice refers to using mental imagery or simulation to improve performance. For example, Jack Nicklaus (1976) used this method to succeed at golf tournaments.

> Before every shot I go to the movies inside my head. Here is what I see. First, I see the ball where I want it to finish, nice and white and sitting up high on the bright green grass. Then, I see the ball going there; its path and trajectory and even its behavior on landing. The next scene shows me making the kind of swing that will turn the previous image into reality. These home movies are a key to my concentration and to my positive approach to every shot (p. 45).

Many athletes remark that they can actually feel the muscle twinges associated with their actions as they imagine themselves executing a dive or a service in tennis. Linda Thom, an Olympic medalist in shooting, reported that one day while she was in line at the bank to cash a check, she was mentally rehearsing her shot and discovered that she had raised the barrel of an imaginary gun and was pointing it directly at the head of a very startled bank teller. Formal investigation of mental practice effects with athletes typically find that mental practice of an athletic skill enhances performance, although not as much as real performance (Feltz & Landers, 1983).

A second literature illustrating how mental simulation produces links to action is research from cognitive behavior therapy on relapse prevention. Most people who try to break bad habits have relapses, and so preventing permanent relapse is important. Alan Marlatt and others (e.g., Marlatt & Gordon, 1985) have shown how mental rehearsal of high-risk-for-relapse situations can help to maintain abstinence from health-compromising behaviors such as smoking and excessive drinking. For example, a man trying to overcome a drinking problem might mentally rehearse exactly how he will handle Superbowl Sunday with his friends, so he can refrain from drinking during the afternoon. Through such rehearsals and formal training, people develop specific coping skills that will help them avoid these temptations.

Types of Mental Simulations

The sports psychology literature and the relapse prevention literature illustrate a particular type of mental simulation. The critical component is an emphasis on simulating the process needed for reaching a goal. According to this viewpoint, one sets a goal and then mentally rehearses the steps required to reach it, which leads one to make the appropriate changes in behavior, increasing the likelihood that the goal will be obtained.

Why would simulation of a process be an effective way of regulating behavior? Rehearsal of the process forces a person to organize the steps involved in mind, which in turn can yield a plan. At the same time, as one is mentally moving through these activities, the emotions involved may be evoked, at least modestly, such that one can anticipate and control what these emotional reactions will be.

An alternative viewpoint, namely outcome simulation, has been a staple of the self-help movement and is embodied in the Fanning quote, with which this article opened. This approach maintains that if one actively focuses on an outcome one wants to achieve, it will help to bring it about. A quotation by Norman Vincent Peale (1982) illustrates essentially the same point of view:

> Hold the image of yourself succeeding, visualize it so vividly, that when the desire success comes, it seems to be merely echoing a reality that has already existed in your mind (p. 15).

The self-help literature has not for the most part explained why a focus on the outcome one wants to achieve would be successful. Drawing on the distinction made early between emotion regulation and problem solving activities, one might assume that outcome simulation would be particularly effective in engaging emotional responses to help people muster the motivation to achieve their goals.

Process versus Outcome Simulations: Empirical Tests

The Planning Fallacy. In a program of research conducted with Lien Pham, Inna Rivkin, and David Armor (1998), we examined how effective process versus outcome simulations are for bringing about desired outcomes. We began with an investigation of something that people do not seem to do very well, namely planning.

The planning fallacy is a charming problem identified by Roger Buehler and associates (1994) embodied by the dilemma experienced by anyone who has ever been involved in a construction project. It refers to the fact that people invariably underestimate the amount of time and resources such as money that will be required to finish a project and overestimate how easily it can be done. Anyone who has spent six months waiting for a kitchen that was supposed to take three months to complete or a year and a half for a home addition that was supposed to be done in six months knows this experience firsthand. In fact, construction is one of the most notorious examples of the planning fallacy. The Sydney Opera House, begun in 1957, was initially expected to be completed by 1963 at a cost of $7 million. In reality, a greatly scaled-down version was completed in 1973, and it cost $192 million. More recent examples include the Chunnel connecting England and France, the Denver airport, and the largely non-existent Los Angeles subway system.

The planning fallacy also exists at an individual level. It is embodied in the daily “to do” list, which many people create in a fit of unrealistic optimism at the beginning of each day, only to find that at least half the items are left undone at the end of the day. But each day, a new list is created, just as overly optimistic as the old one. Or if it has been a really bad day, one simply crosses out the day at the top of the page “Wednesday” and puts the next day, “Thursday”. This goes on day after day. We seem to be oblivious to the feedback our own behavior should provide. Individuals appear to be as vulnerable to the planning fallacy as group projects. Accordingly, in our research, we used the process-outcome distinction to see if process simulations would enable people to plan projects more effectively.

In this investigation (Taylor et al., 1998), we recruited students and asked them to describe a school-related project that had to be completed during the subsequent week. We told them to pick a project that required some time and effort, such as a lab report or a short paper. Students in our control group were told simply to monitor their progress on the assignment each day. Students in the process simulation condition were told to envision themselves gathering the materials or resources they would need for the completion of the project and to see themselves getting organized and beginning work on the assignment. A third group was told to perform an outcome simulation each day that involved envisioning how pleased they would be by the final result. They were told to see themselves packing up the project and taking it to class, confident that they had done well.

We first addressed whether the planning fallacy asserts itself in the form of procrastination, in the form of not finishing on time, or both. Overall, the evidence suggests that it is both. Only 21% of participants began their projects when they said they would, and only 30% finished when they said they would. We then examined how the different mental simulation conditions affected these processes. The control condition behaved abysmally: Only 14% of the students began their projects when they expected to, and only 14% finished them when they expected to. The process simulation group fared somewhat better. They started somewhat closer to the time that they estimated (24%), and they were significantly more likely to finish when they said they would (41%). The outcome simulation had similar effects: 26% started on time, and 33% finished on time. The outcome simulation may have facilitated progress because it kept an inevitable assignment in mind. However, there was no assessment of the quality of the product, which, as will shortly be seen, turns out to be an important measure.

People who practice outcome simulations report that it is quite motivating and inspiring. We were therefore concerned that people who are asked to mentally rehearse process simulations instead might find them to be a bit depressing. It is much more fun to think about how great a project will be when it is completed than to think about the steps along the way. Consequently, we examined whether the process simulation undermined enjoyment. What we found surprised us. People who used the process simulation found the assignment they had to complete to be easier than people in either the control condition or the outcome simulation condition, who reported that the assignment was slightly harder than they had expected it to be. It appears that, because they had thought through the steps they would need to go through during their mental simulations, the people who practiced the process simulation had a plan which made completion of the project easier. Thus, although the process simulation may not be quite as much fun to practice as the outcome simulation is, the effects on overall ease of the project may offset these rather modest costs.

The Exam Studies. To further our understanding of the relative benefits and liabilities of process and outcome simulations, we conducted an intervention with Introductory Psychology students at UCLA, who were studying for their first midterm examination (Pham & Taylor, 1999b). We contacted them a week before their midterm exam and explained that we were evaluating the success of different ways of managing the stress of forthcoming exams. Students instructed in the process simulation intervention were told to visualize themselves studying for the exam in a way that would lead them to obtain their desired grade. They were told how important it was to see themselves studying and to hold that picture in their minds. They were given some sample details, such as visualizing themselves sitting at their desk or bed and studying the chapters and going over the lecture notes. After they had practiced the mental simulation in the lab, they were told to do it for each of the next five to seven days before the exam took place, for five to seven minutes each day.

Participants in the outcome simulation condition were told to imagine themselves getting the high grade they desired. They were told to see themselves standing in front of the glass case where the midterm exam grades were posted, holding their breath, moving their gaze horizontally to find their score, finding out that they got the grade they wanted, beaming with joy, and feeling confident and proud. They were also told to practice this mental simulation for several minutes each day for the five to seven days prior to the exam. Participants in the control condition simply monitored their studying over the same time period. The night before the exam, we re-contacted all participants by phone. We asked them how many hours they had studied, when they had started studying, and the number of times they had reviewed each chapter.

The students who had mentally rehearsed the process of studying for the exam benefited substantially from this mental simulation. They started studying early and spent more hours studying for the exam. They also added several points to their exam score. The students who had rehearsed the outcome simulation, however, were not for the most part benefited by its practice. There were negligible effects on how much they studied for the exam, and they performed significantly more poorly than students who practiced the process simulation. Indeed, the only beneficial effect of the outcome simulation was that these students said that they were highly motivated to study for the exam, more so than was true in the other conditions. Apparently, the outcome simulation got them cranked up, but they failed to translate that feeling into effective action.

These findings are similar to findings reported by Oettingen (1995), who has found that positive fantasies and daydreams can undermine future achievement because they lead to anticipatory consummation of success. Like the fantasies studied by Oettingen, outcome simulations may make people feel good without providing a basis for achieving the desired outcome in the future.

We did a second study and replicated what we had found in the first study, except the results were worse. Participants who practiced the process simulation did quite well on the exam, whereas those who focused on the outcome they wanted to achieve did significantly worse than both the process simulation participants and the control condition. In this second study, we had also included a condition that combined the process and outcome simulations. The basis for this intervention was the mental practice literature: it appears that athletes often move back and forth between the outcome they want to achieve and the process needed to achieve it, and so we created a mental simulation that attempted to mirror this process. It was unsuccessful. Although students faithfully practiced the process and outcome simulations individually, they were less likely to practice the simulation that combined the two. Moreover, exam scores for those in the combined condition were more similar to those of the students rehearsing the outcome simulation than those practicing the process simulation condition. We have not repeated these interventions, inasmuch as we now know that outcome simulations not only do not consistently help people, but can actually harm performance.

What is responsible for the adverse effects of outcome simulations and the beneficial effects of process simulations on performance? We conducted structural equation analyses to identify the underlying mechanisms. Those results suggested that students who had practiced the outcome simulation rehearsed the excitement that they would experience over the high grade but failed to study more. Over time, they reduced their aspirations, with a detrimental effect on performance. When we asked them what grade they thought they would get, they had lowered their desired grade by a full letter grade by the night before the exam, compared to the initial grade they had told us they were striving to obtain, and they had studied fewer hours. By contrast, those who practiced the process simulation had studied more, had lower anxiety, and appeared to have planned their study time better, which increased the grade they strove for. Specifically, the impact of the process simulation on planning and reduced anxiety appear to be the critical determinants of the better exam performance this condition created (c.f., Castaño, Sujan, Kacker, & Sujan, 2008). As noted, problem solving and emotion regulation are two vital components of coping, and they appear to account for the beneficial effects of process simulation in the exam studies.

Coping with Stress

The fact that mental simulations appear to achieve their beneficial effects by facilitating planning and emotion regulation provides an implicit link to a large and growing coping literature, which maintains that these are the central tasks of coping (Lazarus & Folkman, 1984). In the next study, we made those connections explicit.

We (Rivkin & Taylor, 1999) asked college students to designate a stressful event they were currently going through and gave them examples of academic or interpersonal stressors they might name. One group of participants was asked to visualize the process surrounding the stressor, including how the problem arose, what happened step-by-step, the actions they had undertaken or might undertake, the circumstances surrounding the event, and the feelings they experienced. A second group of participants completed an outcome simulation and was asked to imagine the problem beginning to resolve itself, to imagine their relief that the problem was no longer bothering them, and to experience satisfaction in having dealt successfully with the problem. A control group did not perform a mental simulation. Following the initial practice of the mental simulation and then again one week later, after participants had had the opportunity to practice the simulation during the intervening week, they reported on their emotional responses to the stressful event, the coping activities they planned to use (immediately after practicing the mental simulation), and the ones they had actually used (one week later) to deal with the problem.

The students who had mentally simulated the ongoing process reported more positive affect, compared to the outcome simulation group and control groups, immediately after performing the simulation, and one week later, this positive effect on mood persisted. In addition, the participants in the process simulation condition reported having used more positive re-interpretation and social support for emotional solace as coping techniques, compared with participants in the outcome simulation and control conditions.

The intervention uncovered significant changes in problem solving activities as well. Those who had practiced the process simulation reported, one week later, that they had used more active coping and had sought more instrumental social support, relative to the outcome simulation condition and the control group. The outcome simulation had no significant impact on either the intended use of active coping strategies or the reported use of active coping strategies, relative to the process simulation condition or to the control condition. When people are coping with ongoing stressful events, then, a mental simulation that focuses their attention on the unfolding processes surrounding those events can have both emotion-regulation benefits as well as problem solving benefits, especially with respect to active coping and use of social support.

The students had been asked to characterize the stressful event they had selected, and serendipitously, these events split evenly into academic problems, which were initially conceived of as quite controllable, and interpersonal problems, which were initially seen as less controllable. In the past, research has found that controllable problems are especially amenable to coping via problem solving activities, whereas uncontrollable problems are more amenable to coping via emotion-regulation (e.g., Vitaliano et al., 1990). An intriguing pattern emerged regarding changes in the perceptions of these problems following practice of the process simulation. Interpersonal stressors came to be seen as more amenable to active coping strategies among those who had practiced the process mental simulation, whereas the reverse was true for academic problems: The process simulation led participants to perceive that emotion-regulation strategies, including acceptance, could help with the management of academic stressful events as well.

These patterns fit very well with the extant coping literature, emphasizing problem solving and emotion-regulation efforts as critical to successful coping. They suggest that process mental simulations can have beneficial effects on self-regulation, by helping people to regulate their emotions effectively and engage in problem solving activities. In particular, stressors for which active coping efforts are not immediately obvious solutions (interpersonal stressors) and those for which emotion-regulation coping efforts may not be immediately obvious solutions (e.g., academic stressors) may be especially benefited by this kind of process simulation.

Other studies have replicated these findings in other life domains. For example, Armitage and Reidy (2008) found that process, but not outcome, simulations led people to change health cognitions related to health behaviors, in their case, donating blood. Health behaviors, such as exercise and diet, may be altered through interventions that include process simulations as well (Cameron & Chan, 2008). Process simulations are not always more successful than outcome simulations: In some high involvement situations (Escalas & Luce, 2004) or when people are making difficult decisions (Thompson, Hamilton, & Petrova, 2009), process simulations can interfere with effective performance. Moreover, for simple goals, outcome simulations may be effective as well (Pham & Taylor, 1999a). However, for stressors and self-regulatory tasks of moderate complexity, on balance, process simulations appear to be more effective.

Brain Mechanisms Linking Mental Simulations to Performance

The research just described was completed more than a decade ago, and in recent years, psychologists have uncovered some of the neural bases for effects such as these. Among the most important insights gained is the realization that memory is used not only to retain and recall past experiences, but also to permit people to imagine future events, by drawing on representations in memory and knowledge of likely future events. In particular, episodic memory is crucially implicated in the ability to imagine non-existent events and simulate future ones (Schacter, Addis, & Buckner, 2007). Imagining future events evokes activity in the prefrontal cortex and parts of the medial temporal lobe, specifically the hippocampus and the parahippocampal gyrus. Related investigations have also implicated a posterior midline region near the precuneus. Replication across multiple studies (Okuda et al., 2003; Szpunar, Watson, & McDermott, 2007) indicates that the process of imagining the future evokes activation of a specific core brain system, including medial prefrontal regions, posterior regions in the medial and lateral parietal cortex (extending into the precuneus and the retrosplenial cortex), the lateral temporal cortex and the medial temporal lobe.

The fact that mental simulations often produce links to action suggests that brain regions implicated in motor behavior or its anticipation would also be activated during mental simulations. Studies with monkeys who observed other monkeys performing actions found brain activations especially in premotor cortical regions and also in motor cortical regions that parallel activations associated with actual performance (e.g., Cisek & Kalaska, 2004; Raos, Evangeliou, & Savaki, 2007), consistent with this prediction. One might therefore predict that a successful mental simulation, that is, one that leads to effective action, would be more likely to be associated with activation in brain regions implicated in relevant motor activity than would an ineffective mental simulation. Given the distinction between process and outcome simulations described earlier and the fact that process simulations appear to more reliably evoke goal-related actions, one might expect to see more pre-motor and motor region activation during process than outcome simulations.

The coping literature generates hypotheses regarding what brain regions may be involved in mental simulations of different kinds as well. As noted, imagining how events will transpire in the future appears to achieve its effects on behavior primarily by enabling people to develop plans and to assess or manage their emotional reactions to unfolding events. Regions of the brain that have been consistently implicated in planning include the prefrontal cortex, and regions implicated in the management of emotional reactions to events include the right ventrolateral prefrontal cortex and the amygdala. On this last point, a number of studies reveal that when coping efforts are successful in down-regulating emotions related to fear, threat, or uncertainty, heightened activity in the ventrolateral prefrontal cortex and corresponding lower activity in the amygdala are often found (e.g., Hariri, Bookheimer, & Mazziotta, 2000; Ochsner et al., 2004; Taylor et al., 2008). Thus, one might expect that to the extent that a mental simulation, such as the process simulation described earlier, helps people control their emotional responses to events, lower amygdala and higher RVLPFC activity would be found.

As noted, Oettingen (1995) raised intriguing arguments regarding why mental simulations that involve focusing on the outcomes one wants to achieve often fail to produce goal-directed action. She concluded that outcome simulations represent the symbolic consummation of rewards in advance of their actual occurrence. Accordingly, during outcome simulations, one might expect to see activity in brain regions related to reward, such as the ventral striatum and orbitofrontal cortex, with lesser activity in prefrontal regions devoted to planning. Whether a focus on reward leads to heightened activation in reward-related brain regions that may in turn be related to lower activity in the PFC is a hypothesis, but a potentially intriguing one that would fit the evidence to date.

A fifth potential line of empirical inquiry related to mental simulations derives from brain research which identifies the underpinnings of behavioral intentions. In a recent study (Gilbert, Gollwitzer, Cohen, Burgess, & Oettingen, 2009), researchers distinguished between goal intentions, which are representations of things people want to achieve, similar perhaps to outcome simulations, and implementation intentions, which are representations of how, when, and where one will implement a particular action plan, similar, perhaps, to process simulations. Implementation intentions are characterized as representations of specific environmental events which cue behavioral responses that may bring about a desired goal state. Goal intentions, by contrast, are more abstract, and thus do not necessarily engage specific behavioral responses, because they are less reliant on intention-related actions and instead are more dependent on spontaneous action.

In the Gilbert et al. (2009) study, participants were given two prospective memory tasks to perform and told either to respond to the task using the cues indicated (analogous to implementation intentions), or, in the second condition, they were given the option of responding spontaneously (more characteristic of goal intentions). Consistent with the process versus outcome distinction reviewed earlier, the authors predicted that participants would respond more efficiently in the cued condition than in the spontaneous condition. These predictions were supported.

Previous studies have suggested that activity in the rostral prefrontal cortex approximating Brodmann area 10 (BA10) plays an important role in attending to both internally and externally represented information, such as intentions for future action. Gilbert et al. (2009) predicted that if the cued condition prompts more efficient external coding of behavior, activity in medial BA10 should be evoked, because this region is involved in environmentally-triggered behavior. By contrast, in the spontaneous condition, which involves self-initiated behavior, activity in lateral BA10 would be implicated. As predicted, the cued condition was associated with greater activation in medial area 10, whereas the spontaneous condition was associated with greater activation in lateral area 10. The difference in activity between these two conditions in left lateral area 10 was mirrored in performance differences, with greater activity in lateral area 10 tied to poorer performance.

The spontaneous condition was associated with activation in a predominantly fronto-parietal network, whereas the cued condition was not associated with significant activity in any region. It may be that implementation intentions, or planning as generated by a process simulation, allows behavior to proceed relatively automatically in response to environmental cues, whereas goal intentions, or a focus on the outcome, may be more dependent on self-initiated behavior, and thus lead to greater brain activation and poorer performance (Gollwitzer & Sheeran, 2006). Whether these lines of investigation inform each other is currently not definitive, but the parallels are intriguing.

Conclusions

What do we conclude from these and the other investigations of mental simulation? Mental simulations can help people manage potential problems and reach goals that might otherwise be more difficult. Such activities as health behavior change (Cameron & Chan, 2008), achievement of personal goals (Gollwitzer & Sheeran, 2006), and consumer decision-making (Castaño et al., 2008) can all be benefitted by mental simulations. Although imagining either the outcome one wishes to achieve or the process required to achieve it can be helpful (e.g., Greitemeyer & Würz, 2006), on the whole, the evidence supporting the value of process simulations, namely envisioning the steps needed to achieve a goal, is more consistent. Process simulations appear to aid performance primarily by helping people come up with specific plans and steps that they can take to solve problems or further their goals, and by helping people manage their emotions effectively. As such, the range of behaviors to which process simulations might profitably be directed could be enlarged. Current developments in neuroscience hold promise for revealing the brain mechanisms that underlie these effects.

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